EA02-027

FORD 8/5/03
LETTER TO ODI

APPENDIX A

5 BOXES
BOX 3 OF 5

PART 1 OF 4

Freeland, Mark (M.)

SRL415

From: Ayers, Don [DAyers@kavfico.com]
Sent: Tuesday, May 28, 2002 1:16 PM
To: Freeland, Mark (M.)
Subject: RE: Part Returned with Dr. Park

Mark -

I did not notice any anomalies on the wire that would indicate damage from the wire bonder. It certainly looks to me that this is a classical fatigue problem.

Don

> -----Original Message-----
> From: Freeland, Mark (M.) [SMTP:mfreela1@ford.com]
> Sent: Tuesday, May 28, 2002 9:21 AM
> To: 'Ayers, Don'
> Subject: RE: Part Returned with Dr. Park
>
> Don,
>
> The I think you are referring to SRL415. The SRL number is engraved in
> the
> side of the case.
> The data sheet for this part is in the attached workbook, which Kyong
> already has.
>
> The part was sent to you at Jim Maurer's request. It was from the
> warranty
> return group that we were selecting parts for the outside lab from, and
> was
> unusual, as there was no visual anomalies in the die, or sign of a high
> current.
>
> I would suggest taking a closer look at the failed wire bond, to try and
> determine if failed because of substrate shifting or possibly an incorrect
> adjustment of the bonder, etc.???
>
>
>
>
> Regards
>
> Mark Freeland
>
> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory
> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7645
>
>

FR02-627-0 0000

> -----Original Message-----
> From: Ayers, Don [mailto:DAyers@kaviico.com]
> Sent: Tuesday, May 21, 2002 5:59 PM
> To: Mark Freeland (E-mail); Freeman Gates (E-mail)
> Cc: Tamashiro, Terry; Park, Kyong; Gillespie, Stuart; makins@ford.com;
> Ray, Randy
> Subject: Part Returned with Dr. Park
>
>
> Other than knowing the part had a date code indicating assembly in August
> of
> 2001 (1H), I know nothing more about the history of this part to describe
> to
> you. I'm hoping that you'll remember based on the subject title.
>
> Anyway, it's obvious that the part failed due to aluminum wire fatigue on
> the terminal pin side. The pictures, although not extremely clear due to
> the presence of the gel, show that the wires broke. I confirmed this
> personally. In addition, Terry's group probed the hybrid and confirmed
> that
> it's still functional.
>
> An aluminum wire fatigue is not a typical failure mode that we observe on
> TMDP. Because the part has been opened up, it's hard for us to determine
> if
> an adequate load was imparted on the hybrid by the cover, to hold the
> hybrid
> in place. The wires do not appear to have been disturbed or damaged from
> an
> external source. I'm not sure what more can be done to this particular
> part. But if I understand a comment Terry made regarding the output of
> the
> device, the failure mode does match the output (5 volts with pull up).
>
> Thanks,
> Don
>
>
> > <<broken Al bond.jpg>>
> >
> << File: Outside Lab Parts Matrix.xls >>

EN02-027-8 0691

Freeland, Mark (M.)

SRL 415

From: Ayers, Don [DAyers@kavlico.com]
Sent: Tuesday, May 21, 2002 5:59 PM
To: Mark Freeland (E-mail); Freeman Gates (E-mail)
Cc: Tamashiro, Terry; Park, Kyong; Gillespie, Stuart; makins@ford.com; Ray, Randy
Subject: Part Returned with Dr. Park


broken Al bond.jpg

Other than knowing the part had a date code indicating assembly in August of
2001 (1H), I know nothing more about the history of this part to describe to you. I'm hoping that you'll remember based on the subject title.

Anyway, it's obvious that the part failed due to aluminum wire fatigue on the terminal pin side. The pictures, although not extremely clear due to the presence of the gel, show that the wires broke. I confirmed this personally. In addition, Terry's group probed the hybrid and confirmed that it's still functional.

An aluminum wire fatigue is not a typical failure mode that we observe on TMDP. Because the part has been opened up, it's hard for us to determine if an adequate load was imparted on the hybrid by the cover, to hold the hybrid in place. The wires do not appear to have been disturbed or damaged from an external source. I'm not sure what more can be done to this particular part. But if I understand a comment Terry made regarding the output of the device, the failure mode does match the output (5 volts with pull up).

Thanks,
Don

> <<broken Al bond.jpg>>
>

EXH2-827-8 0882

Freeland, Mark (M.)

From: Danhoff, Gary (G.L.)
Sent: Thursday, April 05, 2001 2:25 PM
To: Freeland, Mark (M.)
Subject: FW: OBD-II EGR Monitor

Follow Up Flag: Follow up
Flag Status: Flagged

Mark,
Here is an excerpt from the cal guide.
Phantom DELPR:
Phantom DELPR is a false pressure difference signal at the EGR orifice caused by pulsations within the EGR tube and exhaust system and the response of the DPFE sensor to these pulsations. This phantom DELPR changes with air flow (AM) and can be positive (could cause false 1406 codes) or negative (could cause false 1405 codes).
Frozen Hose recovery, from strategy:
/* FROZEN HOSE RECOVERY AND FAULT RETEST LOGIC

If a fault is detected during the first pass through the EGR monitor, all tests are restarted from the beginning to verify the fault. This is done to avoid setting the wrong code if the test was run out of sequence.

If the upstream or downstream hose tests (1405 or 1406) go from a failed to a passing state and the ACT at the start of the tests was low, ice is assumed to have melted in one of the hoses and the tests are restarted from the beginning.

If an insufficient flow failure is present during a low temperature condition, the tests are restarted after a time delay. This has the effect of turning on the EGR system to test 0401 over after all other tests have completed. This could result in poor driveability if the fault is still present, as the failure mode effect of ice in both EPT hoses is a fully opened valve. The system is not turned on again, however, until the individual hose tests (1405 and 1406) have run to completion.
If an insufficient flow failure is present and an upstream or downstream hose failure becomes active, the ice in a single hose is assumed to have melted and the testing is restarted from the beginning. Note that this condition can only become true if the ACT at the start of the hose tests was low.

If the insufficient EGR flow code (0401) changes from a failed state to a passing state, it is possible that a single hose has melted subsequent to both EPT hoses containing ice. Because the no-flow test is not reliable when one hose is plugged, it is necessary under these conditions to start testing over from the beginning of the hose tests. This condition can only occur if the ice melts after the 1405 and 1406 tests are complete but before the 0401 test begins

—Original Message—
From: Freeland, Mark (M.)
Sent: Thursday, April 05, 2001 10:25 AM
To: Danhoff, Gary (G.L.)
Cc: Johnson, Joseph (J.H.); Gates, Freeman (F.C.); Maurer, James (J.B.)
Subject: RE: OBD-II EGR Monitor

Thanks Gary,

Checked out the web site & downloaded commdata.xls, which is I assume the recommended calibration data for all OBDII monitors.

This raises a couple of questions for me, could you please explain the following for my education:

1) What is "Frozen Hose Recovery Logic"
2) What is "Phantom DELPR problem"

Thanks

Regards

HH02-627-B 2151

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EN02-027-B 2152

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

SIFEL Potting Gel

September 2000

EM02-0271-6 5126

Shin-Etsu MicroSi®

SHIN-ETSU SIFEL®

- SIFEL potting gel characteristics
  - Chemically resistant
    - Oils, Fuels, Solvents
  - Heat resistant
  - Low moisture permeability
  - Electrically insulating
  - Nonflammable
- High purity versatile fluoropolymer

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi

SHIN-ETSU SIFEL®

SIFEL potting gel benefits

- Low stress encapsulation for sensitive electronic components
- Long term protection from exposure to harsh environments
- Allows reliable transmission of outside signal to encapsulated sensor

ESNO-427-B 0130

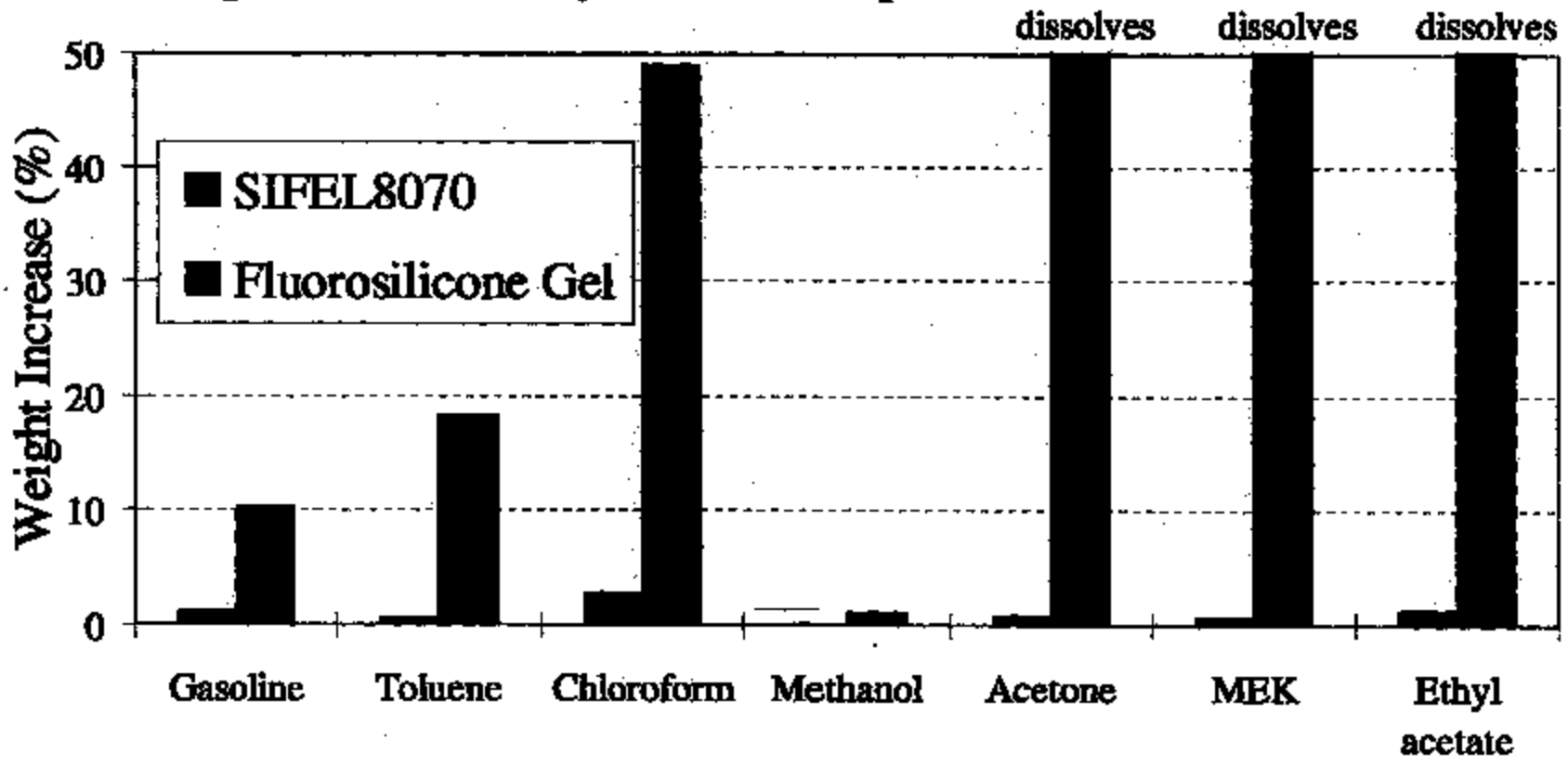
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Solvent Resistance

Weight Increase, 7 days at room temp.

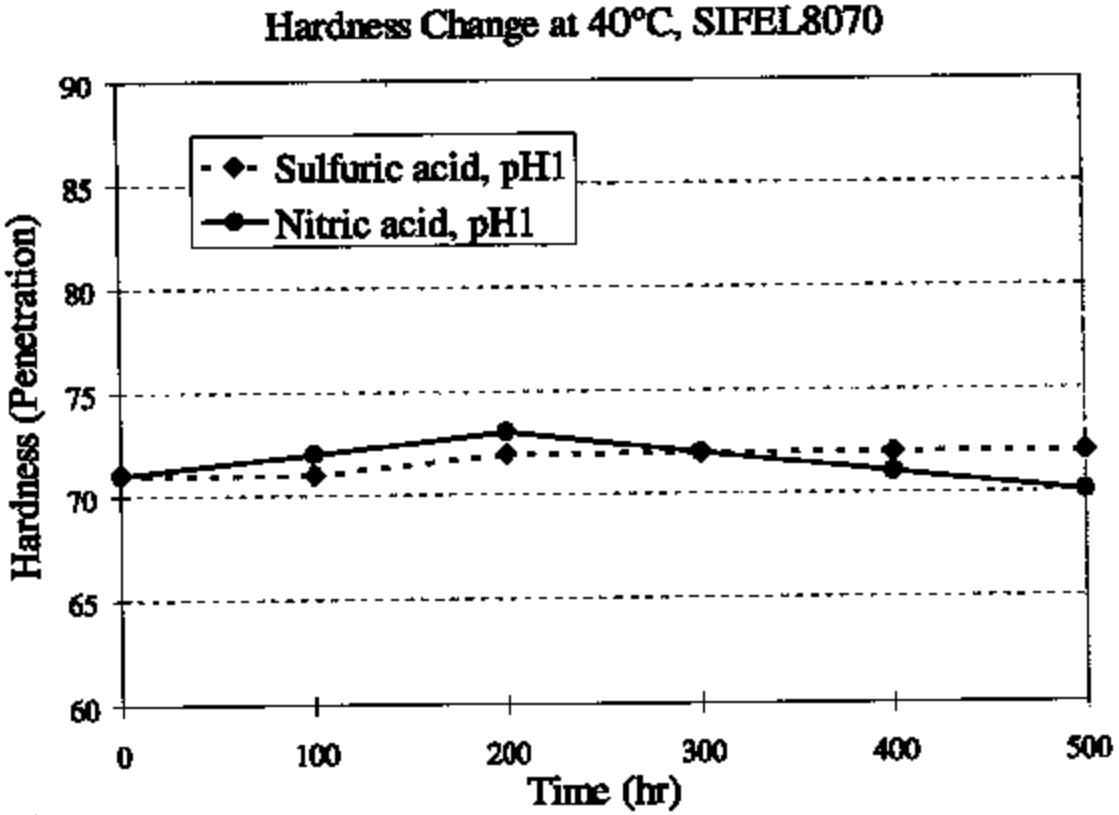


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi™ SHIN-ETSU SIFEL®

Chemical Resistance



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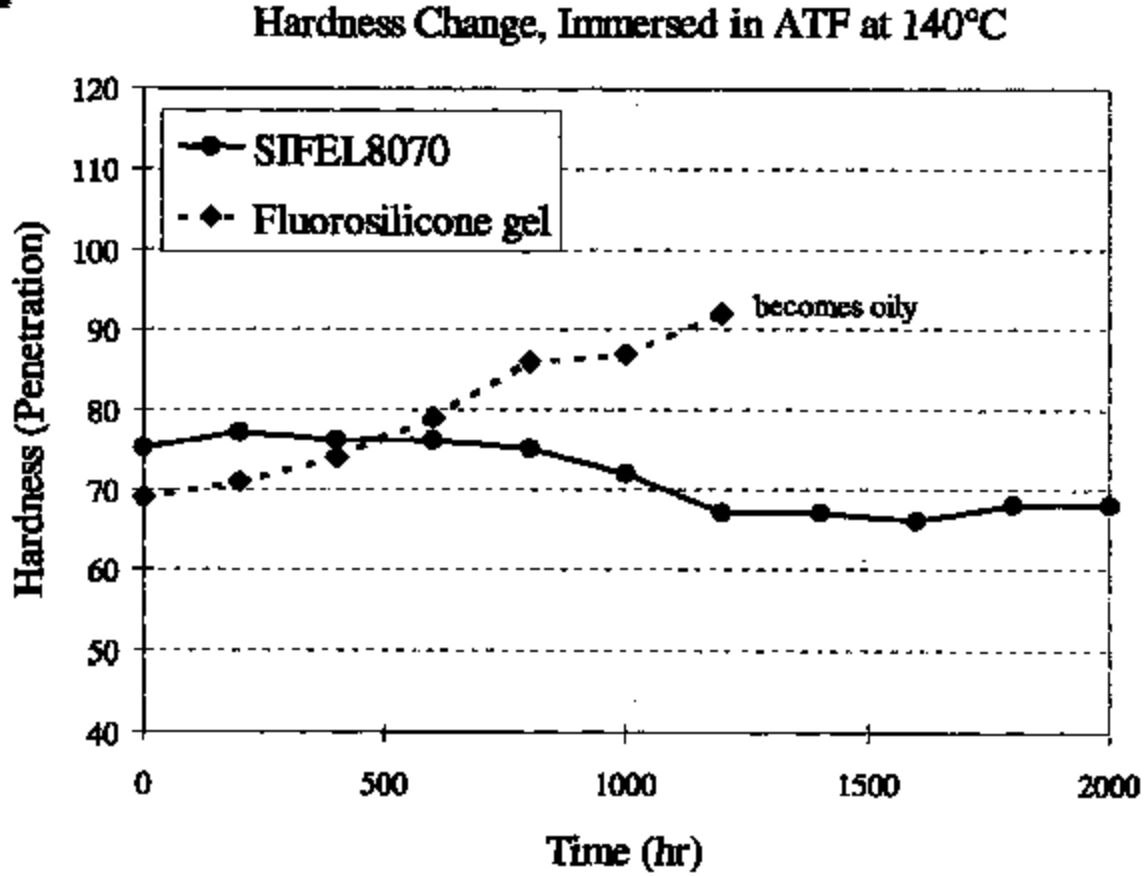
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi SHIN-ETSU SIFEL®

Oil Resistance



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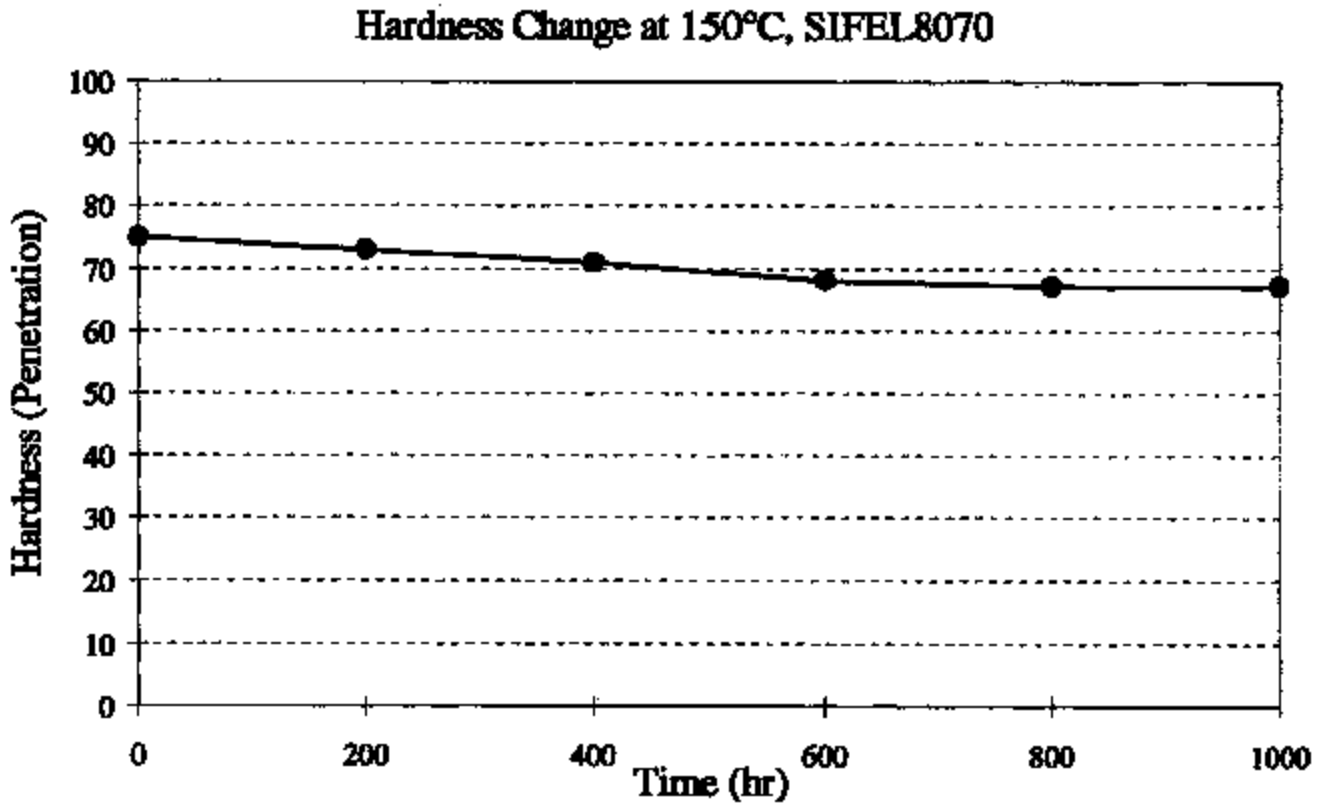
Values listed are typical values and do not constitute a specification

EM02-027-9 5141

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Heat Resistance

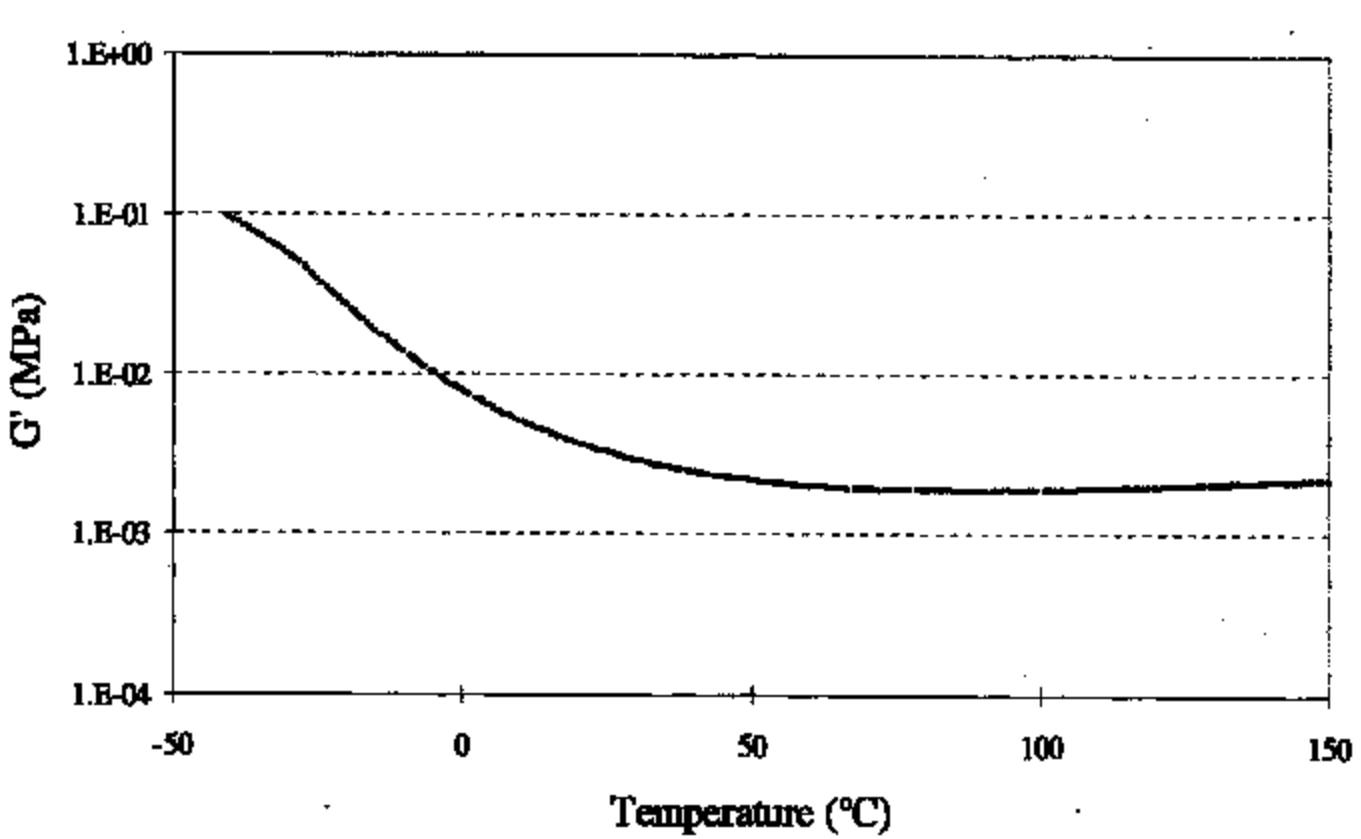


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi SHIN-ETSU SIFEL®

Modulus-Temperature Characteristics



September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Properties

Electrical Insulation Properties	SIFEL8070	Fluorosilicone Gel
Volume Resistivity (Ω-cm)	$2x10^{14}$	$7x10^{11}$
Dielectric Constant (50Hz)	3.1	7.0
Dielectric Dissipation Factor (50 Hz)	$5x10^{-4}$	$5x10^{-2}$
Low Moisture Permeability*		
Moisture Permeability ($g/m^2 \cdot 24$ hr)	7	90
High Purity		
Na^+, K^+, $NH4^+$, F^-, Cl^-, Br^-, NO_3^-, $SO_4^=$	< 1 ppm for each species listed	

*Measured by special methodology at 40° C and 90% RH

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Product Descriptions

	SIFEL8070A/B
	Before curing properties
Appearance	Transparent Liquid, Pale Yellow
Viscosity 23°C	Part A: 20 Poise (2.0 Pa·s) Part B: 25 Poise (2.5 Pa·s)
Specific gravity 23°C	Part A: 1.9 Part B: 1.8
	After curing properties (150°C, 1hr)
Hardness, Penetration (ASTM D1403)	70

SIFEL 8070 should be mixed 1:1 by weight, not by volume

Values listed are typical values and do not constitute a specification

ShinEtsu

Shin-Etsu Silicones of America, Inc.
1150 Damar Drive
Akron, Ohio 44305
Phone: 800-544-1745
Fax: 330-630-9855

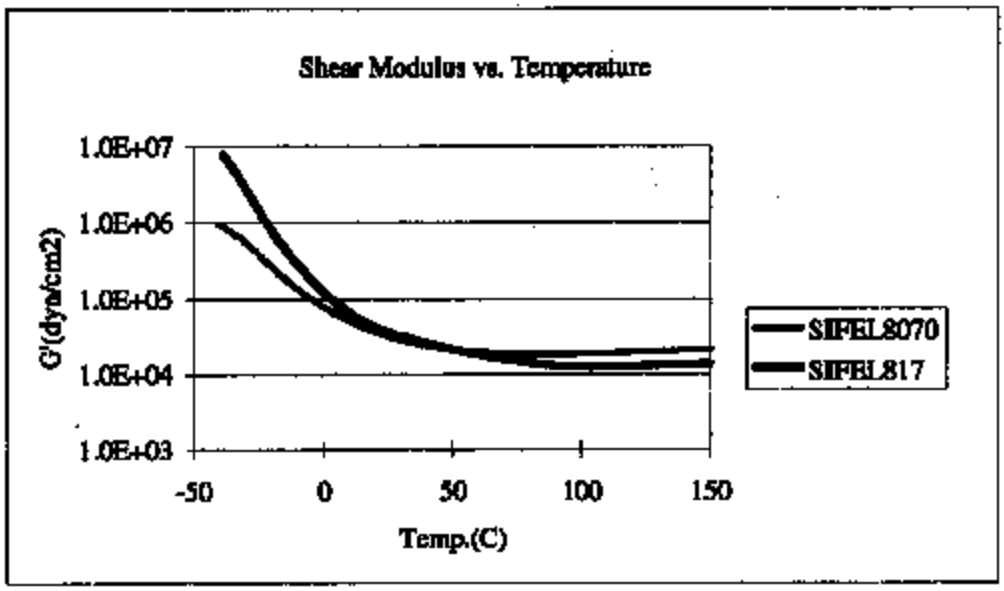
Preliminary Technical DATA SHEET

SIFEL8070 A/B

- **Excellent Low Temperature Performance**
- **Improved Fuel and Solvent Resistance**

Typical Properties (not for specifications):

	SIFEL8070A	SIFEL8070B
Viscosity at 25°C, poise	20	25
Pot Life (Mixed viscosity doubles)	More than 24 hours at 24°C	
Specific Gravity Ratio A:B at 25°C	1.033	
Cured *150°C/1 hour*		
Penetration	70	



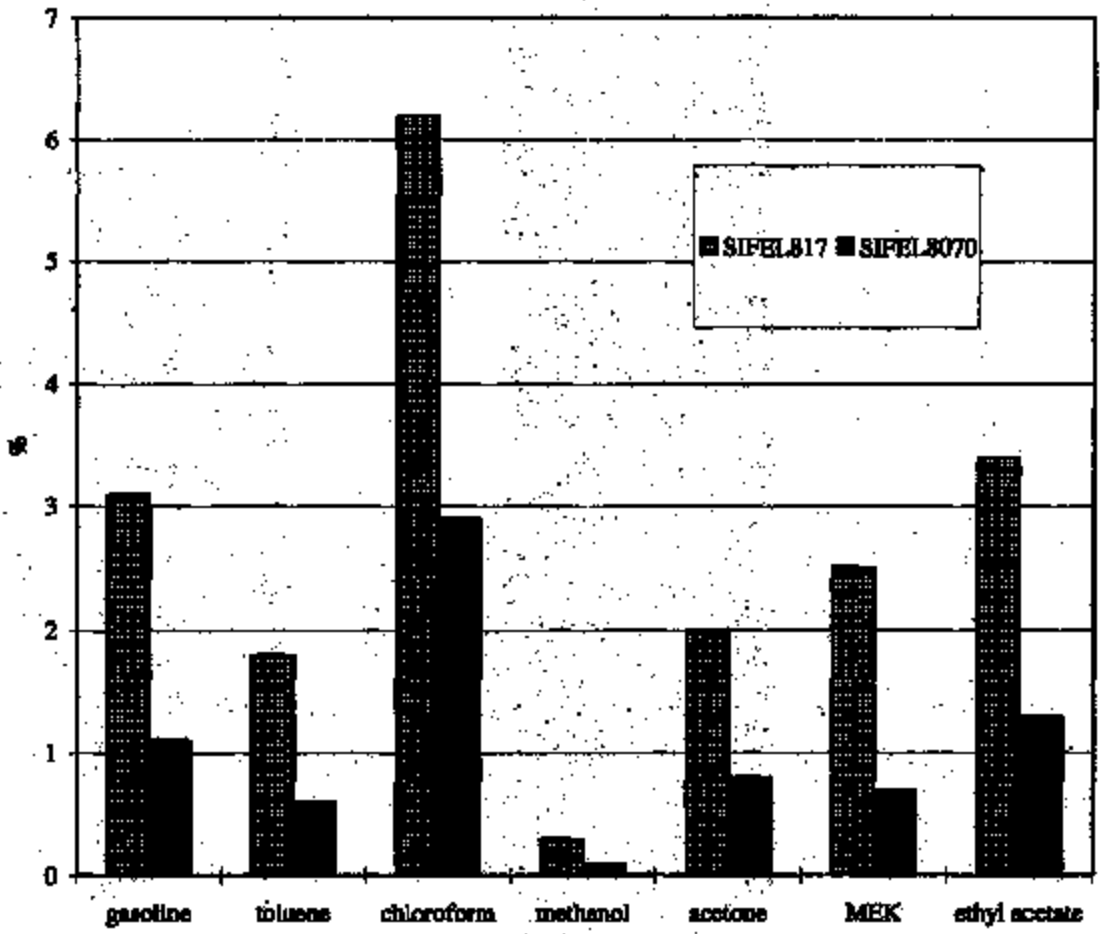
Apparatus:Advanced Rheometric Expansion System ARES Rheometric Scientific, Inc
Volume of sample: 1.7cc, Plate diameter: 25mm, Frequency : 1Hz
Rate of temperature cooling :2C/min, Sample size: 1mm thick, Sample to be cured at 150C for 1hr

5148-627-8

Preliminary Technical DATA SHEET

SIFEL 8070A/B

Fuel and Solvent Resistance, % weight gain at RT for 7 days



Please Note: The information and data contained herein are believed to be accurate and reliable; however, it is the user's responsibility to determine suitability of use. Since Shin-Etsu Silicones cannot know all of the uses to which its products may be put or the conditions of use, it makes no warranties concerning the fitness or suitability of its products for a particular use or purpose.

You should thoroughly test any proposed use of our products and independently conclude satisfactory performance in your application. Likewise, if the manner in which our products are used requires governmental approval or clearance, the customer must obtain it.

Shin-Etsu Silicones warrants only that its products will meet its specifications. There is no warranty of merchantability of fitness for use, nor any other expressed or implied warranties. The user's exclusive remedy and Shin-Etsu Silicones' sole liability is limited to refund of the purchase price or replacement of any product shown to be otherwise than as warranted. Shin-Etsu Silicones will not be liable for incidental or consequential damages of any kind.

Suggestions of uses should not be taken as inducements to infringe any patents.

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	February 21, 2002
Time:	1-3:00 p.m.
Location:	POEE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	February 26, 2002, DI-196, 1-2:30 p.m. February 28, 2002, DI-196, 1-3:00 p.m.
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	BESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Joe Smythe
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panagretos			
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda – 2/21/02

Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated
1. Introductions		All	5 minutes
2. Obtaining Dearborn Customer's vehicle for testing	I1, A3 I3, A3	Paul Plante	5
3.			5
4. Outside experts to help with analysis of failures	I6, A2	All	10
6. Parser report data for Kavlico sensors	I8, A4	Mary Akins	5
7. Report on Ford transient voltage testing	I9, A1	Rob Rossi	10
8. Update on obtaining fleet vehicles from buy-back lists / discussion of car requirements for testing	I6,A3 & I10,A6,7	Carol Verner	5
9. Walk-in's			
10. Next meeting (2/28) agenda			

Proposed Next Meeting Agenda 2/26/02	Person(s) Responsible	Time Estimated
Overlay of Kavlico and Ford changes on stack chart	Mahmoud Awad	10 minutes
Analysis of data from Kavlico returns	Losy Salaich	20 minutes
Pareto of customer symptoms	Mahmoud Awad	10 minutes
Update on vehicles for fleet/engineering	Carol Verner	10 minutes
Offsite assignments	All Don Ayers	30 minutes

Notes

Bring handouts (paper copies) for all presentations
Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
Please be on time as we have a full agenda

Jim Maurer/cp: 2/5/2003
Kavlico dPFE Sensor Core Team

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	February 26, 2002
Time:	1-3:00 p.m.
Location:	POEE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	March 5, 2002, DI-196, 1-2:30 p.m. March 7, 2002, DI-196, 1-3:00 p.m.
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Joe Smythe
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda – 2/26/02

Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated
1. Introductions		All	5 minutes
2. Review of Kavlico work plan for UPAD	I3, A1 I3, A3	Jay Caffee	10
3. Overlay of Kavlico and Ford changes on stack chart	I3, A1	Mahmoud Awad	10
4. Rick Williamson's analysis of F150 stall repairs	I3, A1	All	10
5. Analysis of recently returned parts from vehicle assy. plants		All	30
6. Update on obtaining fleet vehicles from buy-back lists/discussion of car requirements for testing	I6,A3 & I10,A6,7	Carol Verner	5
7. Pressure/voltage data for Zarlink and SMI sensors		All	5
8. Walk-in's			15
9. Next meeting (3/5) agenda			5

Proposed Next Meeting Agenda 3/5/02	Person(s) Responsible	Time Estimated
Analysis of data from Kavlico returns	Loay Salaich	20 minutes
Pareto of customer symptoms	Mahmoud Awad	10 minutes
Update on vehicles for fleet/engineering	Carol Verner	10 minutes
Offsite assignments	All	30 minutes
Vehicle electrical testing	Rob Rossi	20 minutes

Notes

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Jim Maurer/cp: 2/5/2003
Kavlico dPFE Sensor Core Team

Please be on time as we have a full agenda

Jim Maurer/cp: 2/5/2003
Kavlico dPFE Sensor Core Team

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	April 4, 2002
Time:	1-2:30 p.m.
Location:	POEE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	April 9, 2002, Core Team Meeting April 11, 2002, Core Team Meeting
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda –4/04/02

Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated
1. Introductions		All	5 minutes
2. VOQ data update & EPRC paper		Paul Plante	10 minutes
3. Results of Analysis of outstanding Plant returns	I3, A3	Terry Tamashiro	10 minutes
4. Update on Wiring Harness Root Causes / findings	various	Sheran Alles, Robert Rossi	15 minutes
5. Investigation of Stalls – Status	I3, A9	Jon Janda, Mahmoud Awad	15 minutes
6. Outside Lab – Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Freeman Gates	10 minutes
7. Results of "in process testing" of current production vs. warranty UPAD parts.	I5, A6	Kyong Park	15 minutes
8. One pager on MRB wafer usage for production		Freeman Gates	10 minutes
9. Walk-ins		All	10 minutes
10. Next Meeting Agenda Items		All	10 minutes

Proposed Next Meeting Agenda 4/09/02	Person(s) Responsible	Time Estimated
Service part volume projections	John Shore	10
PCM solder crank issue & current draw to stall the vehicle	John Joshua	10

Notes

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Please be on time as we have a full agenda

Jim Maurer/cp: 2/5/2003
Kavlico dPFE Sensor Core Team

Distribution List Name: Kavlico TM dPFE Sensor

Members:

Akins, Mary (M.) makins@ford.com
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Arnold, Kenneth (K.M.) karnold@ford.com
Auller, Jim (J.E.) jauller@ford.com
Awad, Mahmoud (M.I.) mawad@ford.com
Ayers, Don dayers@kavlico.com
Bandoske, Pete (P.F.) pbandosk@ford.com
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Bersuder, Lee (L.C.) lbersude@ford.com
Bissl, Gerry (G.) gbissl@ford.com
Bronni, Mark (M.J.) mbronni@ford.com
Davies, Brady bdavies@kavlico.com
Deeb, Joe (J.S.) jdeeb@ford.com
Douglass, Jim (J.B.)jdouglas@ford.com
Freeland, Mark (M.) mfreela1@ford.com
Gates, Freeman (F.C.) fgates@ford.com
Giordano, Mike (M.A.) mgiorda1@ford.com
Hangas, Jon (.) jhangas@ford.com
Jahahan, John jjahahan@visteon.com
Johnson, Joe (J.H.) jjohnson@ford.com
Kapp, Dan (Daniel R.) dkapp1@ford.com
Kerezi, Karen (K.J.) kkerezi@ford.com
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Kunde, Olaf (O.) okunde1@ford.com
Masura, Gordon (G.P.) gmasura@ford.com
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Oswalt, Greg (G.G.) goswalt@ford.com
Panaretos, Christine (C.M.) cpanaret@ford.com
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Pascany, Ken (K.M.) kpascany@ford.com
Perry, Brian (B.J.) bperry@ford.com
Plante, Paul (P.G.) pplante@ford.com
Popoff, Daniel (D.M.) dpopoff@ford.com
Raquepau, Alden (A.P.) araquep1@ford.com
Rossi, Roberto (R.A.) rrossi1@ford.com
Schieding, Kurt (K.J.) kschiedl@ford.com
Sebold, Lynn (L.A.) lsebold@ford.com
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Verner, Carol (C.J.) cverner@ford.com
White-Johnson, Patrice (P.) pwhitejo@ford.com
Williamson, Richard (E.)rwill10@ford.com
Wilson, Cary (C.A.) cwilso32@ford.com

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

SIFEL
Potting Gel

[redacted]

September 2000

[redacted]

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

- SIFEL potting gel characteristics
  - Chemically resistant
    - Oils, Fuels, Solvents
  - Heat resistant
  - Low moisture permeability
  - Electrically insulating
  - Nonflammable
- High purity versatile fluoropolymer

EM02-027-8 7/03

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi SHIN-ETSU SIFEL®

SIFEL potting gel benefits

- Low stress encapsulation for sensitive electronic components
- Long term protection from exposure to harsh environments
- Allows reliable transmission of outside signal to encapsulated sensor

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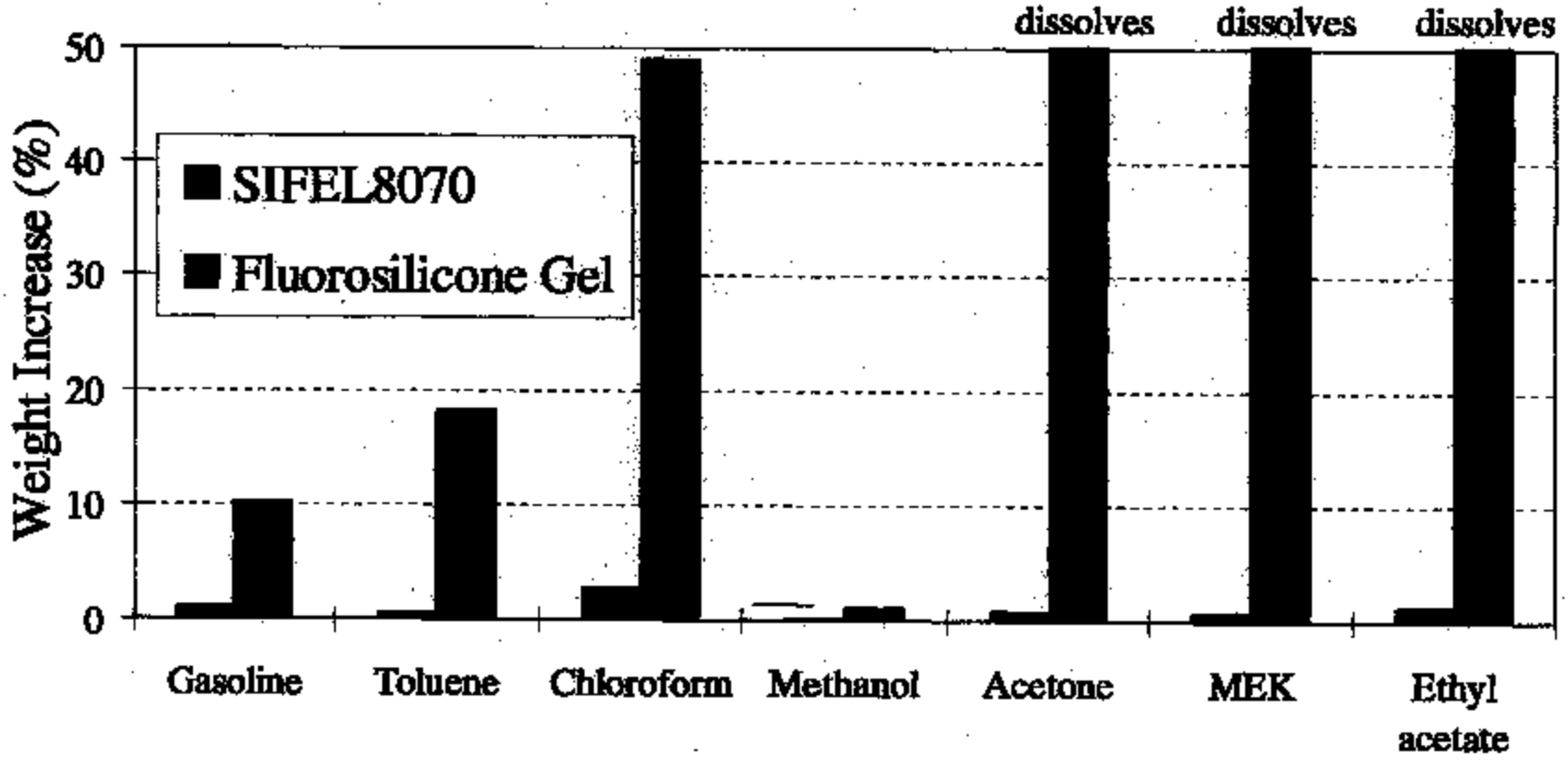
ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Solvent Resistance

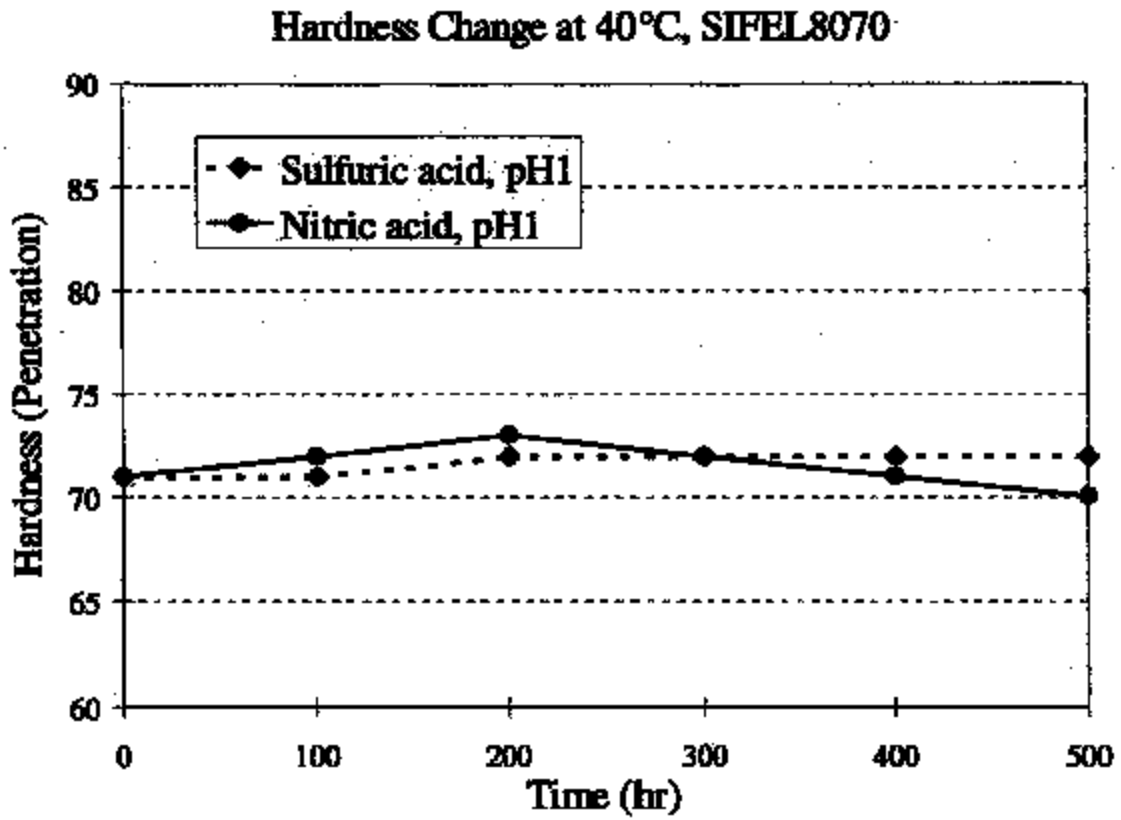
Weight Increase, 7 days at room temp.



Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi™ SHIN-ETSU SIFEL®

Chemical Resistance



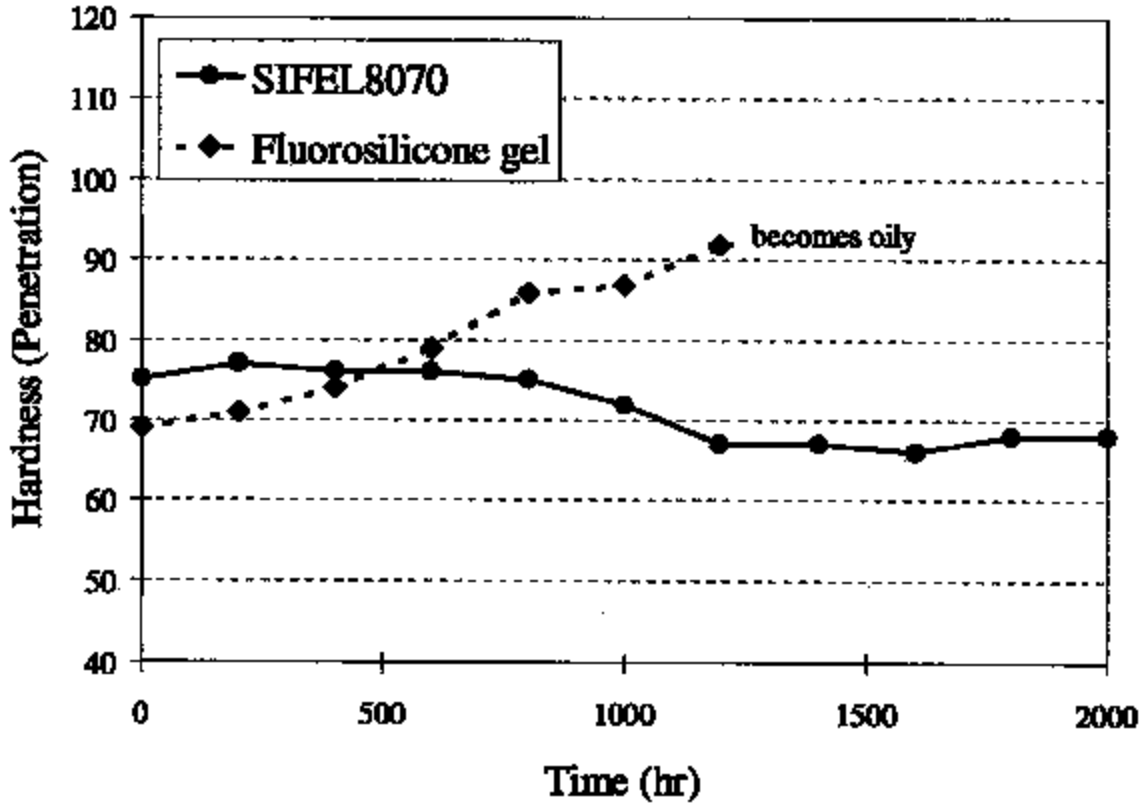
SHIN-ETSU SIFEL® T298

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance

Hardness Change, Immersed in ATF at 140°C

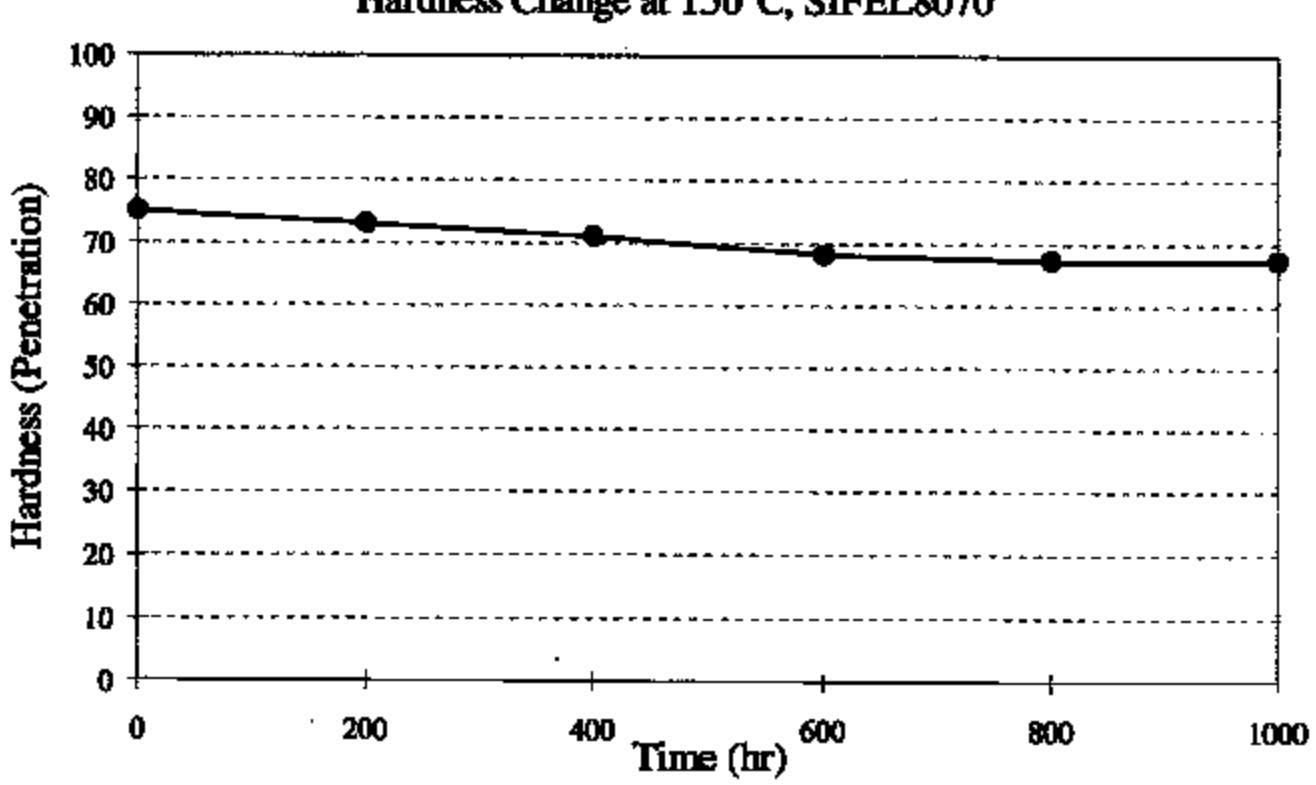


ESH2-027-A 7287

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi SHIN-ETSU SIFEL®

Heat Resistance



September 2000

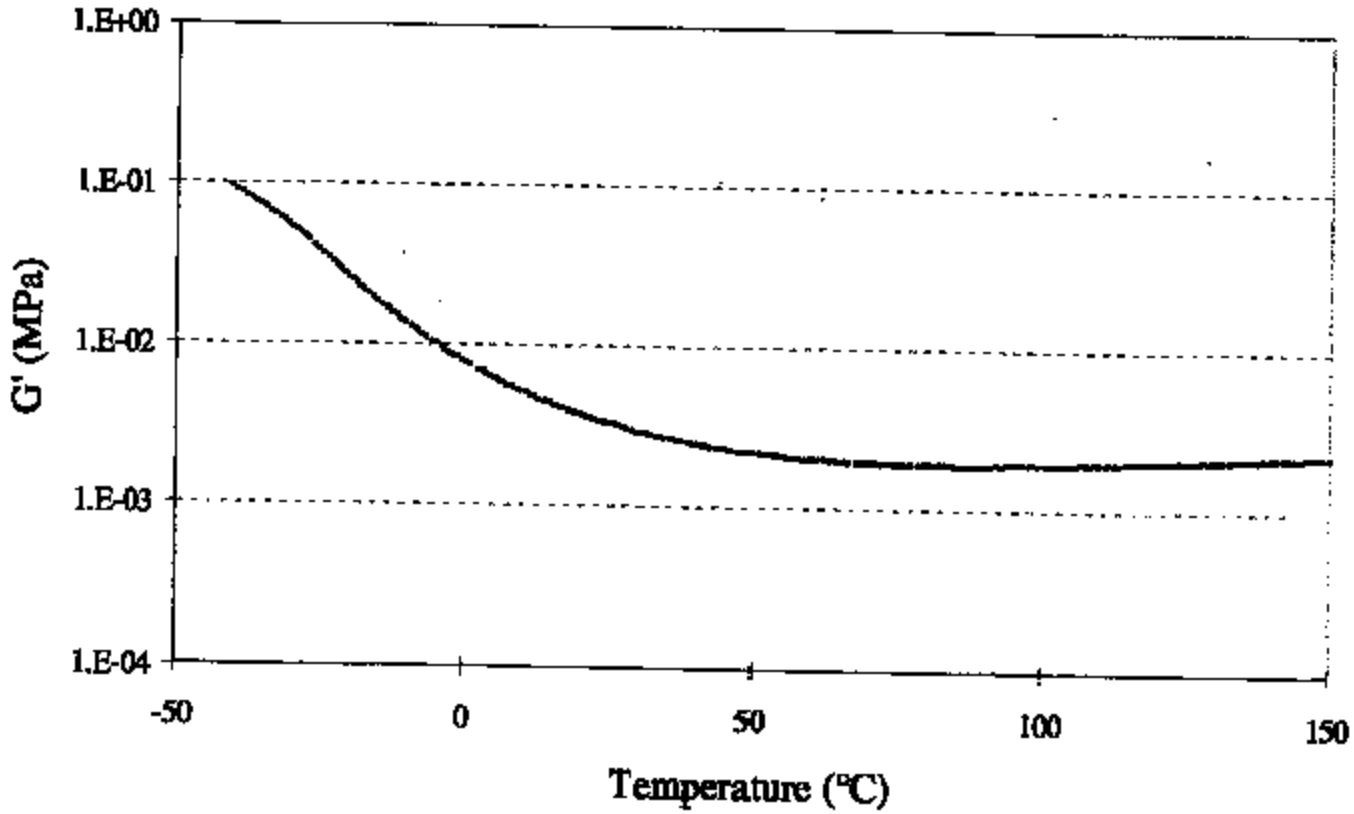
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi

SHIN-ETSU SIFEL®

Modulus-Temperature Characteristics

SIFEL8070 at 1Hz



September 2000

Values listed are typical values and do not constitute a specification

ESHZ-SZT-8 7289

ShinEtsuMicroSi™ SHIN-ETSU SIFEL®

Properties

Electrical Insulation Properties	SIFEL8070	Fluorosilicone Gel
Volume Resistivity (Ω-cm)	$2x10^{14}$	$7x10^{11}$
Dielectric Constant (50Hz)	3.1	7.0
Dielectric Dissipation Factor (50 Hz)	$5x10^{-4}$	$5x10^{-2}$
Low Moisture Permeability*		
Moisture Permeability ($g/m^2 \cdot 24$ hr)	7	90
High Purity		
Na^+, K^+, $NH4^+$, F^-, Cl^-, Br^-, NO_3^-, $SO_4^=$	< 1 ppm for each species listed	

*Measured by special methodology at 40° C and 90% RH

EP02-021-6 7/08

September 2000

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi

SHIN-ETSU SIFEL®

Product Descriptions

	SIFEL8070A/B
	Before curing properties
Appearance	Transparent Liquid, Pale Yellow
Viscosity 23°C	Part A: 20 Poise (2.0 Pa·s) Part B: 25 Poise (2.5 Pa·s)
Specific gravity 23°C	Part A: 1.9 Part B: 1.8
	After curing properties (150°C, 1hr)
Hardness, Penetration (ASTM D1403)	70

SIFEL 8070 should be mixed 1:1 by weight, not by volume

E902-627-8 7301

September 2000

Values listed are typical values and do not constitute a specification

Subject:	Updated: U204 Phantom Stall Meeting
Location:	TEE Conf. Rm. 2
Start:	Thu 3/21/02 2:00 PM
End:	Thu 3/21/02 3:00 PM
Show Time As:	Tentative
Recurrence:	Weekly
Recurrence Pattern:	every Thursday from 2:00 PM to 3:00 PM
Meeting Status:	Not yet responded
Required Attendees:	Altoonian, Don (D.J.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Dan Rothweiler; De Pena, Juan (J.E.); Diez, Timothy (T.P.); Duvall, Allen (A.W.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Goodwin, William (W.R.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hoshino, Jun (J.); Ishikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald; Jonas, Andy; Jordan, Donald (D.E.); Kanal, Shinji (S.); King, Robert (R.F.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Le, Dzung (D.H.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Mateos, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); McGee, Brett (B.L.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tom; Morishima, Shigeki (S.); Nayeed Khan; Nematollahi, Sonya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wetlach, Bill (B.); Williams, Les (LHW.); Young, Lem (.)

I extended the meeting notice a couple of more weeks. All other information remains the same.

Dial in: 1-877-870-3529 or Fordnet: 9-1-954-1144
International Participants # 1 (630) 693-1704
Passcode: 7673538#

EXHIBIT 827-8 8366

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TANDEX

Sample DPA, SEM and FA Reports

[redacted]

The Following links require Acrobat Reader to view.

- **Destructive Physical Analysis (DPA)** **Is the process of disassembling, testing, and inspecting a component for the purpose of determining conformance with applicable design and process requirements. This process of sample testing is used to ensure that a high reliability component or device is fabricated to the required standards. Destructive Physical Analysis is also used effectively to discover process defects for troublesome production lot problems.**

  DPA Processes include:

  - Bond Pull
  - Delidding
  - Internal Photos
  - External Photos
  - Scanning Electron Microscope
  - Energy Dispersive X-ray Analysis (EDXA)

- **Failure Analysis** **Capabilities of Tandex Test Labs are extremely important to support our in-house manufacturing efforts and are also available to analyze customer component and equipment problems. Techniques and equipment utilized in providing our Destructive Physical Analysis capability are also used effectively to analyze failures, determine failure causes, and recommend corrective actions. These failure analysis capabilities are exceptionally important in finding early solutions to troublesome production problems that show up as device or component failures.**

Request for Quotations with immediate responses

[redacted]

EX02-027-8 0132

TANDEX

TEST LABS, INC.
15849 Business Ctr Dr.
Irwindale, Ca. 91706-2053 U.S.A.
TOLL FREE 800.729.8378
Phone: 626.962.7166 Fax: 626.960.6896

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Legal Notice

ER82-627-B 9133

Freeland, Mark (M.)

From:	Plante, Paul (P.G.)
Sent:	Friday, March 22, 2002 11:46 AM
To:	Freeland, Mark (M.)
Subject:	RE: Towed In Vehicle Stalled While Driving (with no reported warning) on Freeway from GQRS

Thanks, I understand this CAN happen, but the question remains how to quantify it accurately. I can't believe the number of hours I have spent thinking and discussing this one...I know you have as well. Saga to continue...

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Thursday, March 21, 2002 7:00 PM
To:	Plante, Paul (P.G.)
Cc:	Maurer, James (J.B.); Awad, Mahmoud (M.I.)
Subject:	Towed In Vehicle Stalled While Driving (with no reported warning) on Freeway from GQRS

<< File: 3FAFP31361R103897.pdf >>

Note: AFTER the tow in for stall while driving on freeway, this one has had two further dPFE failures in quick succession after the first tow in, the second and third were not stalls and did have MIL lights.

Regards

Mark

EX62-627-S 9137

Freeland, Mark (M.)

From: Plante, Paul (P.G.)
Sent: Friday, March 22, 2002 11:38 AM
To: Freeland, Mark (M.); Maurer, James (J.B.)
Subject: RE: THERE ARE NO WIRING PROBLEMS!!!

Tell Me what you really think?

OK, see my next E Mail for issue resolution meeting.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Thursday, March 21, 2002 7:40 PM
To: Plante, Paul (P.G.)
Cc: Maurer, James (J.B.); Awad, Mahmoud (M.I.)
Subject: THERE ARE NO WIRING PROBLEMS!!!

Bull Shit!

GQRS Staller with Special Service Message 14747 with 3 no starts, 1 difficult start, 1 14401 (wiring) and 2 dPFE sensors

<< File: 1FAHP38391W107129.pdf >>

Mark

ER02-627-3 0138

Plante, Paul (P.G.)

From: Gates, Freeman (F.C.)
Sent: Monday, February 11, 2002 5:02 PM
To: Sturzenegger, Larry (L.W.); Danhoff, Gary (G.L.)
Cc: Johnson, Joe (J.H.); O'Neall, Jim (J.D.); Plante, Paul (P.G.); Awad, Mahmoud (M.I.); Gates, Freeman (F.C.); Giordano, Mike (M.A.)
Subject: TmDPFE MIL Verification

Larry/Gary,

We are in the process of trying to determine the following:

- The effectiveness of the OBD II system at turning on the MIL to detect a failed sensor
- The % of part returns we get due to MIL(s)

In order to make an approximate judgement call on this issue, we are proposing to obtain 50 random sensors from parts return center. Hopefully from 2001
Zetec Focus, 4.6L F Series Truck, 4.0L Explorer (2002) or 3.0L Escape . Gary, We would like to place these components on a vehicle that takes a TmDPFE and is equipped with an RCON. We do not necessarily need to light a light, but we do need to provide an indication of a fault counter incrementing which will eventually result in a light.

Gary, your help would greatly be appreciated. This type of test may be necessary in order to determine the magnitude and scope of a field action.
I can sit with both of you tommorrow and develop a plan to get data.

Thanks!!

Freeman Gates
Senior EGR Systems Technical Specialist
Tel (313)32-24807 Fax (313)39-04064
POEE Rm D-138 CM-173

Plante, Paul (P.G.)

From:	Plante, Paul (P.G.)
Sent:	Wednesday, June 26, 2002 3:40 PM
To:	Maurer, James (J.B.)
Cc:	Plante, Paul (P.G.)
Subject:	RE: Emission Info.

1) No need to talk with Jim D. unless he calls Me. Gordon Masura works for him and just returned from (3) weeks vacation (which is why I think Jim jumped in). Gordon is up on the issue and we exchanged E Mails this week already.

2) Stalls issue: Thanks for the follow up. I would like to close out this issue ASAP. Might have to do a review at CCRG, I think potential safety issue would support that. I want the answers first tho, otherwise we will get "help".

-----Original Message-----

From:	Maurer, James (J.B.)
Sent:	Wednesday, June 26, 2002 1:23 PM
To:	Plante, Paul (P.G.)
Subject:	Emission Info.

Paul,
We had a meeting with Jim Douglas concerning a strategy for informing the government about details with the DPFE sensor. I left him a copy of the paper I showed him, but sent him no other info. Did you hear anything back from him? I was going to send him the 14D, but I haven't yet. If you haven't heard from him, I will get in touch myself.

Also, there is an open stalls assignment to put failed sensors with low output on vehicles to see if they generate driveability symptoms. Cathy tested 20 sensors that were confirmed failures and got no adverse driveability symptoms, and also got a pending EGR diagnostic code in every case. After getting these results, I reviewed the OBD-II strategy, and it says that if an EGR fault is identified, the EGR system is disabled. This would account for the lack of driveability symptoms.

It appears that for a customer to get driveability symptoms, the sensor would have to be initially O.K., at least until after the OBD-II test, and then fail while the car is driving. If the sensor stayed failed, then it would be caught at the next drive cycle and EGR disabled.

In order to get the drive symptoms, a different test will have to be devised. Perhaps latching a good sensor deliberately while monitoring the output, or by clearing the pending code after the vehicle was running with the bad sensor. I will talk to Jim McCoy about the feasibility of this when the Focus that John Jahshan was using comes back from service.

Regards,
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

Results of St. Croix/St. Thomas Virgin Island Investigation of 3.0L Escape

Executive Summary

A total of **22** Concern Units were Inspected by Powertrain Field Quality {PFQS} Gil Pepitone from 6/15-6/25/02.

18% of inspected vehicles with certain key Service Actions applied and containing uncontaminated fuel were fully resolved for the "Stalling during Deceleration" Concern, as reported by Owners.

The vehicle population which had prior repair attempts, {55%} did not have TSB/Oasis SSM Service repairs fully applied for various reasons, including test data mis-interpretation, component ordering wait time, WDS test equipment procedures/hardware issues, and "Repair Holds" for pending Engineering visitation.

However, 67% Units had **contaminated fuel and restricted fuel filters**, which may have been a **contributor** to the unverified **Deceleration Stalling** issue.

A second Driveability Concern {which included Units that contained the latest calibration level} of **Hesitation during moderate engine temp** was listed as a Concern for 32% of the Units. The Hesitation Concern was then verified and data /reviewed or recorded by PFQS. However, resolution was not determined. Local fuel volatility and/or PCM calibration may root cause, but this is speculation. Further investigation is in progress.

An omission of a Diagnostic procedure in TSB 02-8-6 was found, involving the requirement for a drive cycle in order to prompt the start of the Purge Cycle for proper EVAP System evaluation.

The surface blistering of multiple MAF sensor's plastic case was reported, with a sample captured.
A second MAF related Issue of tight MAF retaining nuts resulted in airbox lid breakage.

A third MAF sensor related issue of missing Part Number imprint was found on two Units.

Idle Air Control (IAC) Duty Cycles were found in 27% Units to be on the high end of the spec. In some cases, IAC replacements did not reduce DC. Also, there is a need for multiple improved IAC diagnostic procedures for TSB
02-6-6.

PFQS recommendations are listed at the end of this report.

Background

PFQS was contacted in early June to inspect and resolve the reported Decell Stalling Concern on a minimum of 10 3.0L 2001/02 Escapes on the Islands of St. Croix and St. Thomas, U.S. Virgin Islands. Both dealerships use the same name of Metro Motors.

Figure 1 Metro Motors, St. Croix, VI

Figure 2 Burneta Matto, Service Manager

Figure 3 Isaac, Drivability Technician

Figure 4 Service area at Metro Motors

Figure 5 Service area, alternate view

A review of Service records and Oasis repair histories as compared to the actual PFQS inspection of the 22 Units, indicated that corrective Service procedures were only partially performed on 55% of Units.
However, 18% of Units had been fully serviced per the existing Service Communications.
The remaining percentile involved Units which had not been to the Dealership for the Decell Stalls Concern prior to the Inspection period.

Both Islands are small (St. Croix, the larger, is 28x7 miles). The terrain is very hilly, with some considerable grade angles. The

Concern of Decell Stall for 3.0L Escape is reported as most common in uneven topography as evidenced from a prior PFQS review of North American CQIS data.

Of the 22 Units inspected, 20 were at the St. Croix location, while two were done in St. Thomas. A total of four Units were originally scheduled for St. Thomas, but two were no-shows. The majority of this report's data stems from the St. Croix Dealership.

Investigation of Decell Stall

PFQS arrived on Saturday, 6/15. Basic inspection and VDR recorder Drive Testing began that day and throughout the weekend for the three high priority Units as designated by the Dealership.

PFQS's original plan was to first verify the Drive Concern, but soon realized that Concern replication was difficult.
None of the Units ever exhibited a Stall in any drive mode during PFQS use.

On 6/17, the Inspection worksheet,

Shortcut to St. Croix Escape Vehicle Inspection SheetLink

, was started to be used.

Over the course of the investigation, some Units {18%} had arrived to the Dealership that had been "Owner Determined" as **resolved** because of prior service actions performed by the St. Croix Metro Motors.
Being a small Island, word of the "Ford Rep" presence prompted some Owners to return to the Dealership for a "Health Check" on their prior resolved Units.

Only one Unit was found by PFQS with the known Concern of "spider web" EVAP line restriction.

As cited, some Units had only part of the necessary Service actions completed. Also, Interpretation of some data was either misunderstood, or the existing TSB diagnostics required additional

description. On this last point, details are provided throughout Sections below.

Fuel Quality Issues

The first priority Unit investigated was described as having a different Drive Concern of **"Hesitation after Cold Start"**.
Note that this Unit did **NOT** have the Concern of **Decell Stall** as part of the original listed complaint.

The heavy hesitation {lasting about 3 seconds} from a dead stop on a 30 degree upgrade acceleration, during a moderate engine temp range {approx 100F-160F} was replicated by PFQS. A fuel gauge had been installed along with a WDS VDR recorder. All parameters, including both fuel pressure and volume were confirmed as acceptable.
However, because this was a Returnless Fuel application, PFQS felt that his old method to check volume {filling 12oz bottle in 15 sec at idle} may not be valid.

As a result, the fuel filter was removed and blew backwards into a glass bottle:

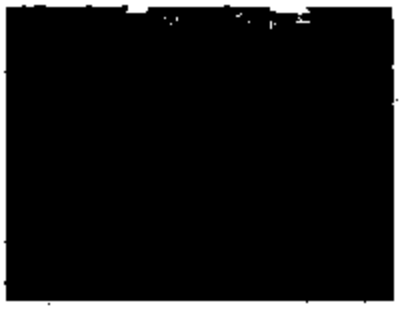

Figure 6 Contaminated fuel, after sitting overnight

Figure 7 Bottom view of the fuel sample-Nasty Stuff

Figure 6 This is the fuel sample after the bottle is shaken, not stirred. This is what it looks like after you blow out the fuel filter.

PFQE then realized that perhaps local fuel is a negative influence in the generation of Decell Stalls, as well as possibly contributing to the Hesitation Concern.

From that point on, every Unit was inspected for restricted fuel filter/dirty fuel. 67% of inspected Units had restricted fuel filters and dirty fuel.

However, **32%** of the Units which had "Complete Service Actions" {see below}, **PLUS** a new fuel filter, were **STILL** verified by PFQS **for the Hesitation Concern**.
Note that the latest PCM flash is included, and this includes some Units of which had the latest PCM Flash prior to PFQS visitation: the need for Adaptive Learning Strategy was NOT a factor for some of the repeatable **Hesitation** Concern Units.

It appears that the **replacement** of the restricted **fuel filter** did **not** resolve the **Hesitation** Concern.
However, **filter replacement** may be a **positive factor** in resolving the **Decell Stalls** Concern.

In defining "Complete Service Actions", PFQS includes a PCM Reflash to the latest available calibration level, the latest level EEC Relay, the latest level DPFE, a complete check of ALL grounds and connectors, proper evaluation of the EVAP Purge D.C. vs. FTP sensor voltage data and conformation of acceptable IAC D.C. values when observed during the PROPER conditions. Note that MAF replacement is not included unless the Owner cited a specific,

repetitive location during the Decell Stall event, implying local electrical "noise" generation (i.e. radio towers, etc).

New Concern of Moderate Engine Temp Hesitation discovered

PFQS then concluded: this repeatable Hesitation Concern could possibly be caused by one of two items, or perhaps both.

a. Local Fuel Quality (suspect volatility, not just the "dirt factor")
b. PCM Calibration

Please note that PFQS has no proof to indict either suspected root cause. PFQS is in communications with the St. Croix Service Manager for feedback of alternate fuel brand usage as recommended in an attempt to resolve those Units with the unresolved Hesitation Concern.
PFQS welcomes Engineering feedback on possible calibration issues and is willing to assist further.

In addition, a VDR recording was captured in this Hesitation drive mode on 6/25 on one Unit, which had all "Complete Service Actions" and a clean fuel filter. This data will be shared with Engineering in the very near future.

Procedural Omission in TSB 02-8-6
The Repairing Tech described the following prior repair effort.

The Tech stated that while following Step #4 of the above TSB, the EVAPVM (VMV Duty Cycle) percentage was not seen to change from Zero % at idle (as specified by the TSB) after a one hour idle.
PFQS was able to replicate this scenario on the same Unit and also for a second Unit. The fuel tanks were above ¼ full.
During discussions with Engineering during his visitation, it was suggested that the vehicle be driven to prompt the Purge Process. As a result, the purge cycle started to increase.

While Step #4 described Purge Cycle function over 84%, it's diagnostic do not describe what must be done if the value does not change from Zero% while at prolonged idle.

The Tech's interpretation of the lack of VMV Duty Cycle change from Zero % at idle resulted in the ordering of a VMV. The Tech mentioned that if VMV replacement did not prompt a purge cycle DC increase from Zero%, a PCM would have been considered for order. Potential TNI Warranty for both the VMV {9C915} and the PCM {12A650} exists.

MAF and Related Hardware Issues

Three different issues were experienced during this inspection. Pls note that none involved the actual FUNCTION of the MAF. DTCs were NOT set, nor were inappropriate MAF voltage values witnessed.

However, Warranty, TNI and Real, have been generated as a result.

Item #1: The Tech described prior MAF replacements based upon the observation of the blistering of the MAF's Sensor's Surface:

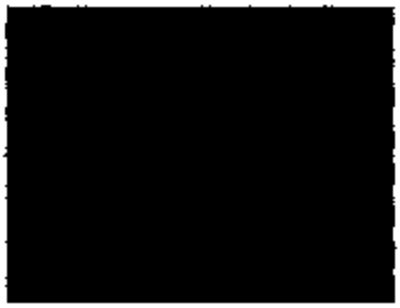

Figure 9 Blister on the MAF sensor's Case

Figure 10 Close up of the Blister

The Tech cited two replacements. The Parts Dept search only produced the one item photographed here. The Tech said the other one was "worst" with multiple blisters present.

Item #2: During PFQS inspection, one of the 3.0L Escapes MAF was found to be missing the imprinted part number on the sensor's plastic body:

Figure 11 MAF without a imprinted part number

A second Unit, a lone 2.0L Zetec Escape was presented for inspection. This Unit {which was not supposed to be part of the Study} was reviewed as a courtesy. It too did not have a PN imprinted on it. It was not replaced. However, the Tech felt it should be, because of the uncertainly of the level of the MAF component. This indicates that TNI Warranty may result for MAF due to the missing PN.

Item #3: During the removal of the MAF for one Unit for updates per the TSB {Owner reported Stalls in one particular location}, the retaining nuts were found very tight. Hand tools, not power tools were used.
During the attempted removal, the studs started to unscrew from the airbox lid. One of the plastic bosses of the airbox stud broke as a result:

Figure 12 Airbox lid that contains MAF retaining studs

Figure 13 As stud walked out, it broke the case's boss

Figure 14 This is the rear view of the case's boss

Figure 15 A second stud walked out, but the case did not break. The witness marks are pliers on the threads.

At first PFQS suspected the nuts as over torque. A subsequent inspection found "Lock Tite" substance on the fine thread end of the studs. It is possible the adhesive is too strong.

As these MAFs are being replaced per the TSB, it is possible Warranty will be generated for the YL8U-9643-BC Airbox Lid.

Intake Airflow Control (IAC) Solenoid Duty Cycle Value Results

As part of requested Engineering data, IAC Duty Cycle values were monitored per Step #1 of TSB 02-8-6. Note that awareness of proper

conditions to determine acceptable IAC D.C. were not understood by all repair Techs interviewed. While IACs had been replaced on some Units, those were probably changed mainly as part of a general repair attempt, and not necessarily due to data acquisition.

As a result, some repeat Concern Units {46%} required IAC and in some instances, Throttle Body {TB} replacement.
Pls note, however, TBs were not available at the Dealership, and Engineering shipment did not arrive during PFQS visitation. The Engineering shipment of IACs did arrive and most were used.

Idle Air Control {IAC} Duty Cycles were found in 27% Units to be on the high end {greater than 40%} of the allowable spec.

30% of Units with IAC replacement did NOT realize a substantial change {less than 1%} for IAC D.C. value.
Other Units {8%} realized a desired small decrease in D.C., but their final value was still above acceptable range of 40% per the TSB, which would then require a TB replacement.

The high airflow D.C. after IAC replacement indicts either initial throttle body airflow set and/or plate sludge build-up.
Mileage range for unchanging D.C. values after IAC replacement were 2K-18K.

If the pending shipment of TBs arrive at Metro Motors St. Croix, PFQS is to be contacted. Concern Units will be requested for return and their TB will be replaced and then sent to PFQS, who in turn will return same to Engineering.

Additional IAC Diagnostic Improvements are provided below in the Recommendations Section.

<u>Recommendations</u>

1. A Market directed "Info Only" Oasis Broadcast Message should be generated to emphasize fuel filter/fuel quality as part of routine inspection when diagnosing all Driveability Concerns. Locations could include the Caribbean Islands and other

Markets were local Service Facilities practices come into question.

2. A review of TSV 02-8-6, Step #4 should be conducted for consideration of the inclusion of a drive cycle prior to inspection of EVAP Purge VMV Duty Cycle values. This drive cycle would only be used for those Units which do not show an increase from 0% at idle. A time factor should be provided to aid the Tech on when he should perform the drive cycle.
   Also, if fuel tank level is an influencing factor for valid EVAP evaluation, an acceptable fill range should be included in any TSB revision.

3. The three issues cited which involve MAF should be investigated by Ford Engineering and Visteon. MAF Sensor blistering, missing MAF PNs, and tight MAF retaining nut on airbox studs are subject.

4. A review of TSB 02-8-6, step #1 should be conducted to clarify and emphasize the definition of "no purge flow". This subtle reference was overlooked by all Techs interviewed. Specific reference, similar to Step #4 wording, which involves a PID definition and values {I.e.: observe IAC D.C. while EVAPVM is Zero%} is necessary to enable ALL Techs to properly diagnose the true need for IAC replacement.
   If there is confusion, the part will be replaced on an assumption, and not the result of data acquisition.

   Also, the converse is true: some Units will quickly START the purge cycle, before IAC D.C. could be read under proper conditions. A work around can be done by shutting off Ignition and immediately restarting, and then waiting for all other conditions {RPM to return to 750} to be proper before reading IAC D.C. This additional procedure should be considered for inclusion to any TSB revision.

   A reference to the Catalyst Protection of a 50 RPM increase for a base idle of 800RPM should be included. Also, instructions to apply throttle briefly to reduce this RPM value to return to 750

RPM is necessary to allow the Techs to determine true IAC D.C. and is recommended for TSB revision inclusion.

5. A review for the need to spray insect/spider removal agent should be conducted. It is conceivable that the above TSB's Step #5 will temporarily remove a spider from the EVAP fresh air line, but there is nothing to prevent the return of another spider. Should we use something to stop the potential cycle of web build up?

   I will be calling into the "Escape Stalls Team" 2PM conference call on 6/27/02 to discuss my Inspection.

Gil Pepitone
Powertrain Field Quality Engineer in South Florida

gpepiton@ford.com
Office 954-753-9989
Cell 954-242-2066

From: Simmons, Paul (P.)
Sent: Monday, May 13, 2002 4:02 PM
To: Gokhale, Renuka (R.V.)
Cc: 'Tom Morgan (E-mail)'; Nematollahi, Sonya (S.); Cardone, Wesley (W.M.); 'Ali Hamieh (E-mail)'; O'Donohue, Garrett (G.M.); Jordan, Donald (D.E.); Los, Roman (R.J.)
Subject: RE: Cooling Fan Stall Protection

Hi Renuka, Did we get timing for the MY05 physical schematics from Lear?

Regards,

Paul Simmons

Supervisor ECAE-Truck
ECC, 2AH01, MD2
psimmons@ford.com <mailto:psimmons@ford.com>
(313)84-55501(Phone/Fax)
(313)402-5448(Cell Phone)

[redacted]
Simmons, Paul (P.).vcf

-----Original Message-----
From: Los, Roman (R.J.)
Sent: Thursday, May 09, 2002 3:13 PM
To: Jordan, Donald (D.E.); O'Donohue, Garrett (G.M.); 'Ali Hamieh (E-mail)'
Cc: 'Tom Morgan (E-mail)'; Gokhale, Renuka (R.V.); Nematollahi, Sonya (S.); Simmons, Paul (P.); Cardone, Wesley (W.M.)
Subject: RE: Cooling Fan Stall Protection

I have not received even a phone call or email about physical schematics. Please advise, it's been over another week since my last request, and 3 weeks since our meeting on the aforementioned issue.

Wes, could you please give the team approximate timing on the Cooling Fan models you're creating and/or if you need some other information.

Thank you

Roman Los (rlos) PH#: (313) 59-43845
Truck CAE Applications FAX#: (313) 39-05011
RVT-EESE, ECC Bldg., Cube#: 2BH03, Maildrop: 4
<mailto:rlos@ford.com>

-----Original Message-----
From: Los, Roman (R.J.)
Sent: Wednesday, May 01, 2002 2:23 PM
To: Jordan, Donald (D.E.); O'Donohue, Garrett (G.M.); 'Ali Hamieh (E-mail)'; 'reid.erickson@us.bosch.com'
Cc: 'Tom Morgan (E-mail)'; Gokhale, Renuka (R.V.)
Subject: RE: Cooling Fan Stall Protection

Reid dropped off 9 motor/fan assemblies this afternoon (thank you). I will obtain timing from Wes (our modeling guy) for creating the models.

I am still awaiting the physical schematics from Lear. Cecil posted logicals last Thursday. I sent him and Ali an email informing them that they are not physicals. I called Cecil on Monday. He informed me that Jack

Rowe had the physicals. I left a phone message with Jack yesterday. Jack called this morning durng our PMT meeting, that he needed clarification on which physicals, so I called back after lunch clarifying that it is current model. Jack's voice mail said he is out today, so I'm not sure who else to contact and or how to proceed further for current model physical schematic information.

Tom, All, If there is anybody else at Lear that can help expedite this, it would be greatly appreciated.

Thank you

Roman Los (rlos) PH#: (313) 59-43845
Truck CAE Applications FAX#: (313) 39-05011
RVT-EESE, ECC Bldg., Cube#: 2BH03, Maildrop: 4
<mailto:rlos@ford.com>

-----Original Message-----
From: Jordan, Donald (D.E.)
Sent: Thursday, April 18, 2002 4:03 PM
To: O'Donohue, Garrett (G.M.); Los, Roman (R.J.); Ali Hamieh (E-mail); 'reid.erickson@us.bosch.com'
Cc: Jordan, Donald (D.E.); Tom Morgan (E-mail); Gokhale, Renuka (R.V.)
Subject: Cooling Fan Stall Protection

- Review proposal to reduce the U204 engine cooling fan fuse ratings to enhance stall protection
- Determine the necessary steps to assess (and potentially implement) the lower rated fuses
- veh @16v what see @ fan
- Simulation(w/&wo resistor(drop in) /cr,
- 24v jmp start req
- CAE annalysis results

Minutes:
Attendees: Roman Los, Garrett O'Donohue, Reid Erickson, Ali Hasmieh, Don Jordan

Stall protection has been added to fan SDS(Future Model), but protect for 03MY....

U204 03MY:

CAE Analysis Info to Roman
Motor Modeling
1) Torque vs current & transient current data, either hardware or curves- Bosch(Reid)
2) Electrical schematics, Lear(All)
3) Considerations
a)Cooling system 3 to 2speed
current-inrush & Steady State change

Timing
As Soon As Possible!

Donald E. Jordan
U204 OPD E/E Systems & EDS
(313) 32-25147
Pager: T (djordan1) or 313-795-4342

EH62-827-8 18344

Results of St. Croix/St. Thomas Virgin Island Investigation of 3.0L Escape

Executive Summary

A total of 22 Concern Units were inspected by Powertrain Field Quality {PFQS} Gil Pepitone from 6/15-6/25/02.

18% of Inspected vehicles with certain key Service Actions applied and containing uncontaminated fuel were fully resolved for the "Stalling during Deceleration" Concern, as reported by Owners.

The vehicle population which had prior repair attempts, {55%} did not have TSB/Oasis SSM Service repairs fully applied for various reasons, including test data mis-interpretation, component ordering wait time, WDS test equipment procedures/hardware issues, and "Repair Holds" for pending Engineering visitation.

However, 67% Units had **contaminated fuel and restricted fuel filters**, which may have been a **contributor** to the unverified **Deceleration Stalling** issue.

A second Driveability Concern {which included Units that contained the latest calibration level} of **Hesitation during moderate engine temp** was listed as a Concern for 32% of the Units. The Hesitation Concern was then verified and data /reviewed or recorded by PFQS. However, resolution was not determined. Local fuel volatility and/or PCM calibration may root cause, but this is speculation. Further investigation is in progress.

An omission of a Diagnostic procedure in TSB 02-8-6 was found, involving the requirement for a drive cycle in order to prompt the start of the Purge Cycle for proper EVAP System evaluation.

The surface blistering of multiple MAF sensor's plastic case was reported, with a sample captured.
A second MAF related issue of tight MAF retaining nuts resulted in airbox lid breakage.

A third MAF sensor related issue of missing Part Number imprint was found on two Units.

Idle Air Control (IAC) Duty Cycles were found in 27% Units to be on the high end of the spec. In some cases, IAC replacements did not reduce DC. Also, there is a need for multiple improved IAC diagnostic procedures for TSB
02-8-6.

PFQS recommendations are listed at the end of this report.

Background

PFQS was contacted in early June to inspect and resolve the reported Decell Stalling Concern on a minimum of 10 3.0L 2001/02 Escapes on the Islands of St. Croix and St. Thomas, U.S. Virgin Islands. Both dealerships use the same name of Metro Motors.

Figure 1 Metro Motors, St. Croix, VI

Figure 2 Burnete Matto, Service Manager

Figure 3 Issac, Driveability Technician

Figure 4 Service area at Metro Motors

Figure 5 Service area, alternate view

A review of Service records and Oasis repair histories as compared to the actual PFQS inspection of the 22 Units, indicated that corrective Service procedures were only partially performed on 55% of Units.
However, 18% of Units had been fully serviced per the existing Service Communications.
The remaining percentile involved Units which had not been to the Dealership for the Decell Stalls Concern prior to the Inspection period.

Both Islands are small (St. Croix, the larger, is 28x7 miles). The terrain is very hilly, with some considerable grade angles. The

Concern of Decell Stall for 3.0L Escape is reported as most common in uneven topography as evidenced from a prior PFQS review of North American CQIS data.

Of the 22 Units inspected, 20 were at the St. Croix location, while two were done in St. Thomas. A total of four Units were originally scheduled for St. Thomas, but two were no-shows. The majority of this report's data stems from the St. Croix Dealership.

Investigation of Decell Stall

PFQS arrived on Saturday, 6/15. Basic inspection and VDR recorder Drive Testing began that day and throughout the weekend for the three high priority Units as designated by the Dealership.

PFQS's original plan was to first verify the Drive Concern, but soon realized that Concern replication was difficult.
None of the Units ever exhibited a Stall in any drive mode during PFQS use.

On 6/17, the Inspection worksheet,

Shortcut to St. Croix Escape Vehicle Inspection Sheet.lnk

, was started to be used.

Over the course of the Investigation, some Units (18%) had arrived to the Dealership that had been "Owner Determined" as resolved because of prior service actions performed by the St. Croix Metro Motors.
Being a small Island, word of the "Ford Rep" presence prompted some Owners to return to the Dealership for a "Health Check" on their prior resolved Units.

Only one Unit was found by PFQS with the known Concern of "spider web" EVAP line restriction.

As cited, some Units had only part of the necessary Service actions completed. Also, Interpretation of some data was either misunderstood, or the existing TSB diagnostics required additional

description. On this last point, details are provided throughout Sections below.

Fuel Quality Issues

The first priority Unit investigated was described as having a different Drive Concern of "**Hesitation** after Cold Start".
Note that this Unit did **NOT** have the Concern of **Decell Stall** as part of the original listed complaint.

The heavy hesitation {lasting about 3 seconds} from a dead stop on a 30 degree upgrade acceleration, during a moderate engine temp range {approx 100F-160F} was replicated by PFQS. A fuel gauge had been installed along with a WDS VDR recorder. All parameters, including both fuel pressure and volume were confirmed as acceptable.
However, because this was a Returnless Fuel application, PFQS felt that his old method to check volume {filling 12oz bottle in 15 sec at idle} may not be valid.

As a result, the fuel filter was removed and blew backwards into a glass bottle:

Figure 6 Contaminated fuel, after sitting overnight

Figure 7 Bottom view of the fuel sample-Nasty Stuff

Figure 8 This is the fuel sample after the bottle is shaken, not stirred. This is what it looks like after you blow out the fuel filter.

PFQE then realized that perhaps local fuel is a negative influence in the generation of Decell Stalls, as well as possibly contributing to the Hesitation Concern.

From that point on, every Unit was inspected for restricted fuel filter/dirty fuel. 67% of inspected Units had restricted fuel filters and dirty fuel.

However, **32%** of the Units which had "Complete Service Actions" {see below}, **PLUS** a new fuel filter, were **STILL** verified by PFQS for **the Hesitation Concern.**
Note that the latest PCM flash is included, and this includes some Units of which had the latest PCM Flash prior to PFQS visitation: the need for Adaptive Learning Strategy was NOT a factor for some of the repeatable Hesitation Concern Units.

It appears that the **replacement** of the restricted **fuel filter** did **not** resolve the **Hesitation** Concern.
However, **filter replacement** may be a **positive factor** in resolving the **Decell Stalls** Concern.

In defining "Complete Service Actions", PFQS includes a PCM Reflash to the latest available calibration level, the latest level EEC Relay, the latest level DPFE, a complete check of ALL grounds and connectors, proper evaluation of the EVAP Purge D.C. vs. FTP sensor voltage data and conformation of acceptable IAC D.C. values when observed during the PROPER conditions. Note that MAF replacement is not included unless the Owner cited a specific,

repetitive location during the Decell Stall event, implying local electrical "noise" generation {i.e. radio towers, etc}.

New Concern of Moderate Engine Temp Hesitation discovered

PFQS then concluded: this repeatable Hesitation Concern could possibly be caused by one of two items, or perhaps both.

a. Local Fuel Quality {suspect volatility, not just the "dirt factor"}
b. PCM Calibration

Please note that PFQS has no proof to indict either suspected root cause. PFQS is in communications with the St. Croix Service Manager for feedback of alternate fuel brand usage as recommended in an attempt to resolve those Units with the unresolved Hesitation Concern.
PFQS welcomes Engineering feedback on possible calibration issues and is willing to assist further.

In addition, a VDR recording was captured in this Hesitation drive mode on 6/25 on one Unit, which had all "Complete Service Actions" and a clean fuel filter. This data will be shared with Engineering in the very near future.

Procedural Omission in TSB 02-8-6
The Repairing Tech described the following prior repair effort.

The Tech stated that while following Step #4 of the above TSB, the EVAPVM {VMV Duty Cycle} percentage was not seen to change from Zero % at idle {as specified by the TSB} after a one hour idle.
PFQS was able to replicate this scenario on the same Unit and also for a second Unit. The fuel tanks were above ¼ full.
During discussions with Engineering during his visitation, it was suggested that the vehicle be driven to prompt the Purge Process. As a result, the purge cycle started to increase.

While Step #4 described Purge Cycle function over 84%, it's diagnostic do not describe what must be done if the value does not change from Zero% while at prolonged idle.

The Tech's interpretation of the lack of VMV Duty Cycle change from Zero % at Idle resulted in the ordering of a VMV. The Tech mentioned that if VMV replacement did not prompt a purge cycle DC increase from Zero%, a PCM would have been considered for order. Potential TNI Warranty for both the VMV {9C915} and the PCM {12A650} exists.

MAF and Related Hardware Issues

Three different issues were experienced during this inspection. Pls note that none involved the actual FUNCTION of the MAF. DTCs were NOT set, nor were inappropriate MAF voltage values witnessed.

However, Warranty, TNI and Real, have been generated as a result.

Item #1: The Tech described prior MAF replacements based upon the observation of the blistering of the MAF's Sensor's Surface:

Figure 9 Blister on the MAF' sensor's Case

Figure 10 Close up of the Blister

The Tech cited two replacements. The Parts Dept search only produced the one item photographed here. The Tech said the other one was "worst" with multiple blisters present.

Item #2: During PFQS inspection, one of the 3.0L Escapes MAF was found to be missing the imprinted part number on the sensor's plastic body:

Figure 11 MAF without a imprinted part number

A second Unit, a lone 2.0L Zetec Escape was presented for inspection. This Unit {which was not supposed to be part of the Study} was reviewed as a courtesy. It too did not have a PN imprinted on it. It was not replaced. However, the Tech felt it should be, because of the uncertainly of the level of the MAF component. This indicates that TNI Warranty may result for MAF due to the missing PN.

Item #3: During the removal of the MAF for one Unit for updates per the TSB {Owner reported Stalls in one particular location}, the retaining nuts were found very tight. Hand tools, not power tools were used.
During the attempted removal, the studs started to unscrew from the airbox lid. One of the plastic bosses of the airbox stud broke as a result:

Figure 12 Airbox lid that contains MAF retaining studs

Figure 13 As stud walked out, it broke the case's boss

Figure 14 This is the rear view of the case's boss

Figure 15 A second stud walked out, but the case did not break. The witness marks are pliers on the threads.

At first PFQS suspected the nuts as over torque. A subsequent Inspection found "Lock Tite" substance on the fine thread end of the studs. It is possible the adhesive is too strong.

As these MAFs are being replaced per the TSB, it is possible Warranty will be generated for the YL8U-9643-BC Airbox Lid.

Intake Airflow Control (IAC) Solenoid Duty Cycle Value Results

As part of requested Engineering data, IAC Duty Cycle values were monitored per Step #1 of TSB 02-8-6. Note that awareness of proper

conditions to determine acceptable IAC D.C. were not understood by all repair Techs interviewed. While IACs had been replaced on some Units, those were probably changed mainly as part of a general repair attempt, and not necessarily due to data acquisition.

As a result, some repeat Concern Units {46%} required IAC and in some instances, Throttle Body {TB} replacement.
Pls note, however, TBs were not available at the Dealership, and Engineering shipment did not arrive during PFQS visitation. The Engineering shipment of IACs did arrive and most were used.

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30% of Units with IAC replacement did NOT realize a substantial change {less than 1%} for IAC D.C. value.
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The high airflow D.C. after IAC replacement indicts either initial throttle body airflow set and/or plate sludge build-up.
Mileage range for unchanging D.C. values after IAC replacement were 2K-18K.

If the pending shipment of TBs arrive at Metro Motors St. Croix, PFQS is to be contacted. Concern Units will be requested for return and their TB will be replaced and then sent to PFQS, who in turn will return same to Engineering.

Additional IAC Diagnostic improvements are provided below in the Recommendations Section.

<u>Recommendations</u>

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   Also, if fuel tank level is an influencing factor for valid EVAP evaluation, an acceptable fill range should be included in any TSB revision.

3. The three issues cited which involve MAF should be investigated by Ford Engineering and Visteon. MAF Sensor blistering, missing MAF PNs, and tight MAF retaining nut on airbox studs are subject.

4. A review of TSB 02-8-6, step #1 should be conducted to clarify and emphasize the definition of "no purge flow". This subtle reference was overlooked by all Techs interviewed. Specific reference, similar to Step #4 wording, which involves a PID definition and values (i.e.: observe IAC D.C. while EVAPVM is Zero%) is necessary to enable ALL Techs to properly diagnose the true need for IAC replacement.
   If there is confusion, the part will be replaced on an assumption, and not the result of data acquisition.

   Also, the converse is true: some Units will quickly START the purge cycle, before IAC D.C. could be read under proper conditions. A work around can be done by shutting off ignition and immediately restarting, and then waiting for all other conditions (RPM to return to 750) to be proper before reading IAC D.C. This additional procedure should be considered for inclusion to any TSB revision.

   A reference to the Catalyst Protection of a 50 RPM increase for a base idle of 800RPM should be included. Also, instructions to apply throttle briefly to reduce this RPM value to return to 750

RPM is necessary to allow the Techs to determine true IAC D.C. and is recommended for TSB revision inclusion.

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   I will be calling into the "Escape Stalls Team" 2PM conference call on 6/27/02 to discuss my inspection.

Gil Pepitone
Powertrain Field Quality Engineer in South Florida

gpepitone@ford.com
Office 954-753-9989
Cell 954-242-2066

from EGR folder

From: Dalbo, Bob (R.J.)
Sent: Tuesday, June 18, 2002 4:41 PM
To: Sanders, Muriel (M.S.); Le, Dzung (D.H.)
Cc: Duvall, Allen (A.W.); Grewal, Bill (B.S.)
Subject: RE: Escape Stalling

Mr. Le,
Sorry I missed you. I was here from 11:25 until 12:46 when I mistakenly concluded you had been re-prioritized. We are extremely busy trying to resolve this issue and I unfortunately couldn't spare any more time, particularly after missing half of a 30 minute meeting.

I sent you the data provided by FCSD in a separate note. Hopefully you will find it helpful background until we can get together.

Muriel,
Please invite Mr. Le and Mr. Duvall to our Thursday meeting.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

----Original Message----
From: Le, Dzung (D.H.)
Sent: Tuesday, June 18, 2002 4:33 PM
To: Dalbo, Bob (R.J.)
Cc: Duvall, Allen (A.W.); Grewal, Bill (B.S.)
Subject: Escape Stalling

Bob:
Allen and I were at your desk for the meeting until 12:10 this afternoon. I am going to ask Bill set up another meeting which fit every one's schedule.

Regards;
Dzung Le

EN62-027-B 10026

From: Price, Martin (M.)
Sent: Wednesday, June 19, 2002 3:58 PM
To: Sanders, Muriel (M.S.)
Cc: Altoonian, Don (D.J.); Rothweiler, Daniel (D.); Dalbo, Bob (R.J.); Suarez, Rhae (R.)
Subject: vmv on time?

A fellow hotliner had a call where the tech was performing step 4 of the TSB and the vmv remained at 100% for 10 minutes+, the ftp remained at 1.6v during this time. No codes were stored. Is the vmv suppose to remain at 100% for so long? Is this a concern or considered normal?

Martil Price
Cleveland Engine Specialist, DSC I #353
1700 Fairlane Dr, Allen Park, MI 48101
mprice28@ford.com ph. (313)317-9133

EP02-827-B 18834

From: Sanders, Muriel (M.S.)
Sent: Wednesday, June 19, 2002 5:14 PM
To: Foumelle, Gilbert (G.); Bogema, John (P.)
Cc: Dalbo, Bob (R.J.)
Subject: Gil Peplone

I gave y'alls phone numbers to Gil since I will be in class Thursday and Friday. He wasn't sure how to get the KAM tables, but will try. FYI..he'll be in St. Thomas on Thursday and Friday instead of St. Croix.

Here is Gil's contact info:
cell: 954-242-2066
Dealer: 340-773-2121 (ask for Ernest Macco)

Muriel Sanders
U204 3.0L Calibration
Ford Motor Company
Phone: 313-32-27307
Fax: 313-32-31786
E-mail: msander6@ford.com

EN02-827-8 10625

From:	Sloan, Burt (B.E.)
Sent:	Wednesday, June 19, 2002 5:16 PM
To:	Klarr, Jerry (G.T.); Fascetti, Bob (R.J.); Dakhlallah, Hassan (H.A.); Dennis, Matt (M.A.); Ward, Sheila (S.A.); Whitehead, Joe (J.P.); Fournelle, Gilbert (G.); Boyk, Greg (G.J.); Adams, Kerry (K.N.); Matkovich, Dale (D.M.); Sabin, Scott (S.M.); Hansen, George (G.C.); Young, Dan (D.G.); Coffey, Dan (D.C.); Putney, Bill (W.); Kieliszewski, Mark (M.D.); King, Brian (B.M.); Mazzella, Gary (G.R.); Liller, David (D.J.); McIntee, Brian (B.E.); Gaynier, Larry (L.J.); Hille, Kevin (K.T.); Lewis, Marvin (M.A.); Turner, Donald (D.A.); Perlick, Don (D.A.); Gibson, Patrick (P.W.); Crowley, Pat (P.J.); Kosko, Jeff (J.R.); Newman, Chris (C.W.); Delaroderie, Jim (J.A.); Dalbo, Bob (R.J.); Squires, Mark (D.M.); Wettach, Bill (B.); Bogema, John (P.); Mandziuk, Roger (R.S.); Llimatta, Gary (G.D.)
Cc:	Hofman, Michael (M.V.); Corbett, Sandra (S.M.); Schmidt, Gregory (G.A.); Van Wiemeersch, John (J.R.)
Subject:	Outfitters & Ranger Engine Hesitation/Surge, Stall, and No Start Affinity Team Meetings

Outfitters & Ranger Affinity Team
Drivability
June 26, 2002
8:00 am to 9:30 am
TEE - Conference Rm 1

Call In Phone Number: 9-1-877-877-7126
Participant Code: 6341969 #

June 26, 2002 Meeting Agenda:

1) UP207 2002.5 Engine Stalls emerging issue discussion Review 17 CQIS Reports Discuss next steps	Kerry Adams Don Perlick
2) Throttle Body Report on agreement of Throttle Body Diagnostic and Service procedures	John Hedges
3) Non PCM PATs Investigation Status	Kevin Hille
4) Ranger PS Switch Testing Status on UP 207	Shiela Ward
5) U152 Stalls DOE, Report on follow up DOE preparations	Scott Sabin
6) Engine Stalls Health Chart Review populated Health Chart and discuss next steps	Team

June 19th Agreements & Assignments:

Throttle Body

A) John Hedges to meet with Gary Llimatta to agree on Throttle Body Diagnostic and Service procedures

B) Scott Sabin to schedule meeting at Rawsonville for next week to review progress on 6 Sigma

6002-827-B 18636

Project

Non PCM PATs Investigation Status
Kevin Hillie did not show up as scheduled

Ranger PS Switch Testing Status on UP 207
Shiela Ward reported testing is to start this week

From:	Sanders, Muriel (M.S.)
Sent:	Wednesday, June 19, 2002 5:43 PM
To:	Dalbo, Bob (R.J.)
Cc:	Fournelle, Gilbert (G.)
Subject:	Summary of St. Croix Vehicles

This is a summary of Gil's findings up to Wednesday, June 19.

- Only 1 out of the 13 St. Croix vehicles had the complete TSB and ISM preformed. All others had partial repairs.
- At the time of our conversation, Gil had looked at 9 vehicles.
- The 1 unit with all the repairs has not stalled with over 100 miles driven since the repairs.
- 3 of the 9 units had documentation saying they were re-flashed, but in fact they had not been.
- 6 of the 9 units had fuel contamination (1 other vehicle has a dirty filter, but not as bad as the other 6). The fuel filters were very dirty and in at least 1 of the vehicles the fuel was almost black.
- He is also experiencing a cold hesitation on some of the vehicles. It occurs when the engine is between 100 deg. F to 170 deg F. Some of these vehicles have been fixed with replacing the fuel filter, but at least 2 still hesitate after the filter is changed. It was unclear if he had preformed the TSB and ISM on these vehicles.

Muriel Sanders
U204 3.0L Calibration
Ford Motor Company
Phone: 313-32-27307
Fax: 313-32-31786
E-mail: msander6@ford.com

F982-827-B 10639

From:	Pepitone, Gil (J.)
Sent:	Friday, June 07, 2002 5:54 PM
To:	Johnson, Jim (J.S.); Blicki, John (J.R.); Fernandez, Ruben (R.)
Cc:	Wenzel, Thomas (T.D.); Benintende, Robert (R.F.); Amely, Felix (F.A.); DiAngelo, Renaldo (R.); Pepitone, Gil (J.); 'jannis@attglobal.net'; Dalbo, Bob (R.J.); Sanders, Muriel (M.S.)
Subject:	St. Croix Pending Visit/My Status/Are Parts-Tools Import Allowed?/How Many Units need repair?
Importance:	High

HI Jim: Great! I look forward to the opportunity to resolve these Units.

I take this opportunity to yield status and make my specific requests.

First, I have left a voice mail message on Mr. Fernandez's cell phone. I left my Office # of 954-753-9989 and my cell # of 954-242-2066. We should connect in the near future.

Secondly, I was part of yesterday's conference call (I do not know if it was a QRT) to discuss the game plan. Everyone sounds like they are on the same page.

Currently, my main concern are restrictions on my taking known good components into St. Croix. I was not allowed to take anything with me to the Bahamas 12/01. However, since this St. Croix is a USA protectorate, maybe it's allowed??
If anyone knows the answer, pls advise asap.

If I AM allow to take tools and parts, then I will make the following request for the specific components:

Vapor Management Valves (VMV)
Known Good "White Dot" DPFE sensors
EVAP "Flapper" Valves
Known good Idle Speed Control (ISC a.k.a IAC)) valves

Pls note that I used purals for my parts request. I do NOT know how many Units I will be inspecting. I would be nice to have multiple sets of the above parts in hand, or sent to Metro Motors directly before I arrive.
Would someone (Mr. Joe Annis??) pls advise?
I do not want to burn up Company $$ waiting for known good parts to arrive.

I intend to drive these Units in an attempt to not only verify the Stalls Concern, but also verify that I indeed fixed them. I guess I have a lot of driving to dot

Whoever can assist me in this effort, pls do so. I personaly am in no great rush, but I have the impression (based on my South Floda Field experience) that quick resolution for these many Units may prevent their Buy Back and would certainly increase Customer Loyality.

Feel free to contact me via voice anytime, day or nite, over this weekend, as you see fit. Always leave a message if I miss your calls. I also check Outlook on weekends...

Thank you,
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell # 954-242-2066

"With Warranty you are Paying for the Sins of the Past"

-----Original Message-----
From: Johnson, Jim (J.S.)
Sent: Friday, June 07, 2002 9:26 AM
To: Pepitone, Gil (J.)
Cc: Blickl, John (J.R.); Wenzel, Thomas (T.D.); Benintende, Robert (R.F.); Amely, Felix (F.A.)
Subject: RE: St. Croix Contact, vehicle stalls

Gil, your trip has been approved. Let me know if you need any help in contacting the dealer.

-----Original Message-----
From: Pepitone, Gil (J.)
Sent: Thursday, June 06, 2002 12:01 PM
To: Johnson, Jim (J.S.)
Cc: Blickl, John (J.R.); Pepitone, Gil (J.)
Subject: RE: St. Croix Contact, vehicle stalls

HI Jim: I called American express and based on departure date, of next weds, 6/12 returning tues 6/18, airfare will be $568.15.

FYI..
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Non-Text Beeper: 1888-375-1961
"With Warranty you are Paying for the Sins of the Past"

-----Original Message-----
From: Johnson, Jim (J.S.)
Sent: Thursday, June 06, 2002 10:58 AM
To: Pepitone, Gil (J.)
Cc: Blickl, John (J.R.)
Subject: RE: St. Croix Contact, vehicle stalls

Gil, what do you estimate the as the airfare cost.

-----Original Message-----
From: Blickl, John (J.R.)
Sent: Thursday, June 06, 2002 10:57 AM
To: Pepitone, Gil (J.)
Cc: Dalbo, Bob (R.J.); Fernandez, Ruben (R.); Benintende, Robert (R.F.); Johnson, Jim (J.S.); Berenter, Joel (J.R.)
Subject: RE: St. Croix Contact, vehicle stalls

Gil,

We believe it is in everyone's best interest if you plan a visit to St. Croix to analyze the 3.0L Escapes that exhibit the stall concern. Jim Johnson will be submitting a travel request to our upper management for approval, we do not feel there will be any difficulty getting approval. In the mean time please contact our Area Parts and Service Manager Ruben Fernandez (1-787-7825959) to work out the best dates to visit and any travel issues you may need to be aware of. Ruben can work out the details with the dealer (Metro Motors). Jim or I will advise once the travel request is approved.

Thanks for your assistance.

Regards,

John R. Blickl
(jblickl@ford.com)
Product Concern Supervisor
Customer Service-Worldwide Direct Market Operations

1555 Fairlane Drive, FBP 3, 142A, MD 74
Phone: 313/59-42672 Fax: 313/84-53817

—Original Message—
From: Peplone, Gil (J.)
Sent: Wednesday, June 05, 2002 3:47 PM
To: Sanders, Muriel (M.S.); Bilicki, John (J.R.)
Cc: Dalbo, Bob (R.J.); Peplone, Gil (J.); DiAngelo, Renaldo (R.)
Subject: RE: St. Croix Contact, vehicle stalls

Good afternoon Muriel: I have spoken with Mr. Bilicki recently and he has approved my pending visitation. He mentioned that his Dept will pay for my trip as was done for the recent Bahamas trip.

I have yet to make reservations for this trip. Also, I had told Mr. Bilicki that I would be in Northern Florida tomorrow returning Monday. However that trip has been cancelled.

I will be available from tomorrow-forward to accommodate the needs of FCSD and Engineering in this regard.

As for communicating with me when I do arrive in St. Croix, I guess the cleanest way to reach me would be via my cell # of 954-242-2066. Or just call the Dealership once I have contacted you informing you know I have arrived.

If you like, I can speak to you before I depart to get your briefing and also explain my game plan. Anytime after 9am tomorrow would be fine.

Hello Mr. Bilicki: would you please connect me with persons who could advise me on making my reservations? I need recommendations (hotels, airlines, etc) and practices to avoid (can I take Stuff w/ me? This would be similar to the briefing I had for the Bahamas trip in Dec/01) and would be greatly appreciated.

PS: how many Units/dealers are involved? Mr. Altoonian will provide one known good DPFE sensor when I pick him up from the airport tonight. I want to have components and test equipment with me, if this is allowed. Or else I have to have the Dealership(s) order parts as I perceive the need.

Thank you,
Gil Peplone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Non-Text Beeper: 1888-375-1961
"With Warranty you are Paying for the Sins of the Past"

—Original Message—
From: Sanders, Muriel (M.S.)
Sent: Wednesday, June 05, 2002 2:30 PM
To: Peplone, Gil (J.)
Cc: Dalbo, Bob (R.J.)
Subject: FW: St. Croix Contact, vehicle stalls

Hi Gil,

Bob Dalbo and I would like to set-up a phone conference with you while you are in St. Croix to discuss these vehicles. Please let me know when we can have the conference. Thanks.

Muriel Sanders
U204 3.0L Calibration
Ford Motor Company
Phone: 313-32-27307

EA02-827-B 18659

Fax: 313-32-31786
E-mail: msander6@ford.com

—Original Message—
From: Dalbo, Bob (R.J.)
Sent: Tuesday, June 04, 2002 6:51 PM
To: Sanders, Muriel (M.S.)
Subject: FW: St. Croix Contact, vehicle stalls

FYI - St. Croix is covered.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-64947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Altoonian, Don (D.J.)
Sent: Tuesday, June 04, 2002 9:19 AM
To: Dalbo, Bob (R.J.)
Subject: RE: St. Croix Contact, vehicle stalls

Bob, I have been talking to Gil Peplone on this issue. I am flying to Florida on Wed. to pickup a RAV and he is going to pick me up at the airport. I will review the TSB and ISM with him. I believe that he is going to St. Croix to look at the vehicles.

—Original Message—
From: Dalbo, Bob (R.J.)
Sent: Monday, June 03, 2002 5:21 PM
To: Moorhouse, Scott (S.R.); Sanders, Muriel (M.S.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.)
Subject: RE: St. Croix Contact, vehicle stalls

Did you all get Rhae Suarez's note about these vehicles? The TSB may in fact not have been performed.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-64947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Moorhouse, Scott (S.R.)
Sent: Friday, May 31, 2002 9:30 AM
To: Dalbo, Bob (R.J.); Sanders, Muriel (M.S.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.)
Subject: RE: St. Croix Contact, vehicle stalls

Note stream below describes three vehicles in St. Croix that would appear to have stalled after TSB.

Scott Moorhouse
U204 PTSE Resident Engineer
Kansas City Assembly Plant
(ph) 816-459-1965 (fax) 816-459-1728
smoorhou@ford.com

-----Original Message-----
From: Powers, Ken (K.W.)
Sent: Thursday, May 30, 2002 1:20 PM
To: Moorhouse, Scott (S.R.)
Subject: FW: St. Croix Contact

Ken Powers
Escape/Tribute PVT Manager, KCAP
Ph: 816-459-1729; Fax: -1726

-----Original Message-----
From: Johnson, Jim (J.S.)
Sent: Thursday, May 30, 2002 9:42 AM
To: Terzes, Laura (L.D.)
Cc: Linde, Peter (P.A.); Bradley, Joe (J.C.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Powers, Ken (K.W.); Sanders, Muriel (M.S.); Bifidi, John (J.R.)
Subject: RE: St. Croix Contact

Laura, the technician told me he has followed the TSB and SSM with on these units, road tested them and never experienced a stall. However customers continue to report intermittent stalling after the repair. The dealer has traded these three of the customers into new vehicles.

D. SCOTT 1FMYU04112KB06728, D. ILDGE 1FMYU04152KA70784, R. MAHARAJ 1FMYU03182KA32208

I just asked the technician to check the o ring gasket under the MAF on these three units based on a conversation I had with Muriel Sanders and will advise you of his findings.

-----Original Message-----
From: Terzes, Laura (L.D.)
Sent: Thursday, May 30, 2002 8:11 AM
To: Johnson, Jim (J.S.)
Cc: Linde, Peter (P.A.); Bradley, Joe (J.C.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Powers, Ken (K.W.)
Subject: FW: St. Croix Contact

Jim, I left you phone msg. regarding latest service fixes, and also recommended you get with Rhae Suarez for details. I understand you did speak with him yesterday, and may call in to the Escape stalls mtg. today. By copy of this note to Rhae, he will check build dates based on VINs and provide further direction on the fixes.

By copy of this note to Joe and Kim, they will be aware of legal issues.

-----Original Message-----
From: Linde, Peter (P.A.)
Sent: Wednesday, May 29, 2002 5:48 PM
To: Terzes, Laura (L.D.)
Cc: Powers, Ken (K.W.)
Subject: FW: St. Croix Contact

Should this go to Joe Bradley?

I'd prefer to have him or OGC be the point of contact.

Mike Hoffman (Powertrain Manager) should be the technical resource for this issue.

Pete Linde
ENGINEERING SUPERVISOR
ESCAPE/TRIBUTE PVT
8121 US HIGHWAY 69
CLAYCOMO, MO 64119
816-459-1865

816-459-1726 (FAX)

—Original Message—
From: Johnson, Jim (J.S.)
Sent: Wednesday, May 29, 2002 1:24 PM
To: Sanders, Muriel (M.S.); Linde, Peter (P.A.); Terzes, Laura (L.D.)
Subject: FW: St. Croix Contact

Below is a note from the dealer principal in St. Thomas regarding Escape stalling and a contact report from the Zone manager. The Consumer Affairs Director for St. Thomas & St. Croix said he wants to peruse a class action law suit on behalf of all customers in the USVI with a stall.

Please call me to discuss.

From: Joe Annis [mailto:jannis@attglobal.net]
Sent: Wednesday, May 29, 2002 9:41 AM
To: Fernandez, Ruben (R.)
Cc: Mark Weder; Felix Amely; Benintende, Robert (R.F.); Martin, Mike (M.S.)
Subject: VIN's your requested

Ruben

Below are the VIN;s for the four units that we have replaced both parts on. It is my understanding that you have these numbers from your trip of last week.

I have told you this morn that [redacted] and I have worked out a trade but she is driving her Escape as of now. The unit shut down on her about an hour ago and we sent a tech to the location and found no codes. This is our problem, I have a lot of units doing this and also some in St. Thomas. We must do something about this now. As you know some people stateside are having the same problem as us. Please advise as to the way Ford want to precede.

D. SCOTT 1FMYU04112KB06728

D. ILIDGE 1FMYU04152KA70784

C. EVANS 1FMYU03192KB06722

R. MAHARAJ 1FMYU03182KA32208

I am on my way to St. Croix today and will check to see if the list is true. I would like for you to send me via E-Mail the part numbers that Ford is wanting us to replace so I can be sure that we are doing as you requested. Most of all find a fix for the problem before it puts us out of business.

Any E-Mail you need to send me needs to go the one of the following, jannis@attglobal.net <mailto:jannis@attglobal.net> or jannis@viford.com <mailto:jannis@viford.com> Please add the correct address to your computer, the address you are using is not a good address.

Joe Annis

—Original Message—
From: Fernandez, Ruben (R.)
Sent: Wednesday, May 29, 2002 11:52 AM
To: Martin, Mike (M.S.)
Subject: St. Croix Contact

Attached contact for St. Croix. Joe sent you an e-mail with the vin numbers.

If you have any questions or comments please let me know.

<< File: Contact Sain Croix 52302.doc >>

Ruben Fernandez
Parts and Service Area Manager
Ford International Business Development Inc.
Puerto Rico District Office
Phone (787) 782-5959 Ext. 239
Fax (787) 781-8975
e-mail : rfema12@ford.com

From: Dalbo, Bob (R.J.)
Sent: Tuesday, June 04, 2002 6:50 PM
To: Grimes, Jeff (J.R.)
Subject: RE: Finned-Pintle IAC

We released calibrations for all 2003MY LHD and RHD that are compatible with the finned-pintle IACV. I don't know what Hofu plans to build with, however.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Grimes, Jeff (J.R.)
Sent: Tuesday, June 04, 2002 1:52 PM
To: Dalbo, Bob (R.J.)
Subject: RE: Finned-Pintle IAC
Importance: High

OK...

How about Tribute and RHD for the '03 pJ#1 action? Is Mazda ready from a calibration standpoint?

—Original Message—
From: Dalbo, Bob (R.J.)
Sent: Monday, June 03, 2002 5:20 PM
To: Grimes, Jeff (J.R.)
Subject: RE: Finned-Pintle IAC

The concern did not address past model; we plan to do such a release, but we want to bundle it with some other actions that will mature shortly.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Grimes, Jeff (J.R.)
Sent: Friday, May 31, 2002 9:30 AM
To: Dalbo, Bob (R.J.)
Subject: Finned-Pintle IAC

Bob, what are your thoughts on releasing the new IAC for past-model service...with a cal-flash...? I have to verify, but don't believe the concern addressed past model...

Jeff R.Grimes
Duratec Engine Programs
Ph: (313) 32-25237 Fax: (313) 59-47323
email: jgrimes1@ford.com

EP02-027-B 10696

From: Dalbo, Bob (R.J.)
Sent: Wednesday, May 08, 2002 11:17 AM
To: Grimes, Jeff (J.R.)
Subject: RE: May 23, CEP2 CTW Presentations

Jeff,
Gilbert sent you the Powerpoint presentation we made to Bob Himes. Is that OK for this meeting?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

-----Original Message-----
From: Grimes, Jeff (J.R.)
Sent: Friday, April 26, 2002 9:19 AM
To: Moore, Donald (D.R.); Mazzella, Brian (B.R.); Rose, Robert (R.S.); Arnold, James (J.A.); Dalbo, Bob (R.J.); Smaldone, Ronald (R.P.); Fougnier, Ray (R.J.); Lian, Ming-Der (M.D.); Choi, Michael (M.); Arant, Michael (M.P.); Beyer, Theodore (T.); Wineland, Richard (R.J.); Antonov, Simon (S.); Padar, Frank (F.); Peterson, Craig (C.); Sventickas, Ed (E.)
Cc: Gogate, Anil (A.B.); Hallauer, Julie (J.A.); Stanke, Jason (J.R.); Grimes, Jeff (J.R.)
Subject: May 23, CEP2 CTW Presentations
Importance: High

In preparation for the May 23, 2002 CTW at Cleveland Engine Plant #2, I am distributing the Generic Agenda, as well as topics selected by the Duratec management for review. The individuals next to each topic were identified by the team as best able to develop and present the material.

Each presentation should be no more than 10 minutes in length. I am also forwarding a 1-page document that I'm proposing goes into the CTW book, hopefully reducing the 4" binder we filled last time. I'd prefer that all presentation material be done in Powerpoint, although, if your material is already prepared in another format just give me call...We are not expecting "New" material to be developed...Please forward your presentations to me (after concurrence with your team), and I will work with the quality office to develop the books and distribute the material at the Meeting.

For those not familiar with CTW...It is an all-day, Corporate Vice-President level review covering design and manufacturing efforts to address (proactively and reactively) Customer Satisfaction/TGW/Warranty performance of a given commodity.

If you have any content questions please contact the Supervisor most associated with your topic. For material preparation and timing questions, please contact me.

The topics and presenters are:

U204 Stalls - Bob Dalbo
U204 Sticky Throttle - Ron Smaldone/Jeff Grimes
DEW98 Hard/No Start - Ray Fougnier
D169 Exhaust moan - Ming-Der Lian
Taurus Affinity Team - Mike Choi
RFF Start-up noise - Mike Arant
RFF head gasket - Ted Beyer
Crank Balance - Rich Wineland
Pilot bore - Simon Antonov
Bearing Fit/NVH - Matt Vance
'05 U204 NVH - Lem Yeung
DEW03 NVH - Matt Vance/Robert Rose
High mileage Oil Pan gasket - Frank Padar
'08 RFF Complexity - Ed Sventickas

The generic Agenda: << File: CTW agenda format.xls >>
The Summary Form << File: CTW.doc >>

Internal Reviews have been scheduled for May 2, and May 7. We would appreciate your support at each of these to insure timely completion of the material. << Message: CTW Review #2 >> << Message: CTW Review #3 >>

The Duratec team would like to thank each of you in advance for your support.

EN02-627-B 11673

Jeff R.Grimes
Duratec Engine Programs
Ph: (313) 32-25237 Fax: (313) 59-47323
email: jgrimes1@ford.com

E982-027-B 11874

From: Dalbo, Bob (R.J.)
Sent: Monday, April 29, 2002 5:17 PM
To: Grimes, Jeff (J.R.)
Cc: Gilbert Fournelle
Subject: RE: May 23, CEP2 CTW Presentations

Jeff,
Do you need the CTW form filled out for stalls, or can we just give you the Bob Himes presentation?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Grimes, Jeff (J.R.)
Sent: Friday, April 26, 2002 9:19 AM
To: Moore, Donald (D.R.); Mazzella, Brian (B.R.); Rose, Robert (R.S.); Arnold, James (J.A.); Dalbo, Bob (R.J.); Smaldone, Ronald (R.P.); Fougnier, Ray (R.J.); Lian, Ming-Der (M.D.); Choi, Michael (M.); Arant, Michael (M.P.); Beyer, Theodore (T.); Wineland, Richard (R.J.); Antonov, Simon (S.); Padar, Frank (F.); Peterson, Craig (C.); Sventickas, Ed (E.)
Cc: Gogate, Anil (A.B.); Hallauer, Julie (J.A.); Stanke, Jason (J.R.); Grimes, Jeff (J.R.)
Subject: May 23, CEP2 CTW Presentations
Importance: High

In preparation for the May 23, 2002 CTW at Cleveland Engine Plant #2, I am distributing the Generic Agenda, as well as topics selected by the Duratec management for review. The individuals next to each topic were identified by the team as best able to develop and present the material.

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If you have any content questions please contact the Supervisor most associated with your topic. For material preparation and timing questions, please contact me.

The topics and presenters are:

U204 Stalls - Bob Dalbo
U204 Sticky Throttle - Ron Smaldone/Jeff Grimes
DEW98 Hard/No Start - Ray Fougnier
D186 Exhaust moan - Ming-Der Lian
Taurus Affinity Team - Mike Choi
RFF Start-up noise - Mike Arant
RFF head gasket - Ted Beyer
Crank Balance - Rich Wineland
Pilot bore - Simon Antonov
Bearing Fit/NVH - Matt Vance
'05 U204 NVH - Lam Yeung
DEW03 NVH - Matt Vance/Robert Rose
High mileage Oil Pan gasket - Frank Padar
'06 RFF Complexity - Ed Sventickas

The generic Agenda: << File: CTW agenda format.xls >>
The Summary Form << File: CTW.doc >>

Internal Reviews have been scheduled for May 2, and May 7. We would appreciate your support at each of these to insure timely completion of the material. << Message: CTW Review #2 >> << Message: CTW Review #3 >>

6982-827-B 11333

The Duratec team would like to thank each of you in advance for your support.

Jeff R.Grimes
Duratec Engine Programs
Ph: (313) 32-25237 Fax: (313) 59-47323
email: jgrimes1@ford.com

From: Sanders, Muriel (M.S.)
Sent: Monday, March 18, 2002 10:14 AM
To: Attoonian, Don (D.J.); Amanda, Harry (H.F.); Baddley, Joel (J.K.); Bauer, Scott (S.C.); Bhotwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell; Chick, John (J.); Chih, Ming-Nhu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Dan Rothweiler; De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fasoetti, Bob (R.J.); Foumelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald; Jones, Andy; Jordan, Donald (D.E.); Kanal, Shirli (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Lushwen, Eric (E.A.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tom; Morishima, Shigeki (S.); Naveed Khan; Nematollahi, Sonya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Vecchio, Anne Marie (A.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.); Williamson, David (D.E.); Yeung, Lem (.)
Subject: U204 Phantom Stall Meeting 3/21/02

Here is the updated meeting information for this week. A meeting notice will follow.

New dial-in information.
Dial in: 1-877-870-3431 or Fordnet: 9-1-954-1143
International Participants # 1 (630) 693-1703
Passcode: 7865386#

For 3/21/2002 Only:
Location is TEE Conference Rm 1

Meeting time remains the same as Thursdays, 2-3pm.

Have a good day.

Muriel Sanders
U204 3.0L Calibration
Ford Motor Company
Phone: 313-32-27307
Fax: 313-32-31786
E-mail: msander6@ford.com

6R82-627-8 11536

From: Dalbo, Bob (R.J.)
Sent: Wednesday, March 06, 2002 1:37 PM
To: Altoonian, Don (D.J.)
Cc: Moorhouse, Scott (S.R.); Hofman, Michael (M.V.); Corbett, Sandra (S.M.)
Subject: RE: U204 stall vehicle in Tennessee

Don,
This sounds like a power relay issue (which it shouldn't be - should already have Hella) or a fuel supply issue (leaking regulator, intermittent fuel pump relay, bad fuel pump connection).
Let us know what you find.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

----Original Message----
From: Altoonian, Don (D.J.)
Sent: Tuesday, March 05, 2002 6:30 PM
To: Dalbo, Bob (R.J.)
Cc: Moorhouse, Scott (S.R.); Hofman, Michael (M.V.); Corbett, Sandra (S.M.)
Subject: RE: U204 stall vehicle in Tennessee

Bob, build date 1/18/02, complaint date 1/27/02, 60-70 miles, accelerating uphill it shut off. Started backup ok. I plan to look at the car on 3/21/02, and then go on to pick up our new RAV in Allentown Pa.
I talked to the customer tonight, I will call the dealer on Wed. This is another typical deal where the customer went 50 miles away to get the vehicle he wanted, and couldn't get one at his local dealer, and now he takes it back to his local dealer, and it sounds like he is getting a little run around. I will know more on Wed.

----Original Message----
From: Dalbo, Bob (R.J.)
Sent: Tuesday, March 05, 2002 9:56 AM
To: Altoonian, Don (D.J.); Hofman, Michael (M.V.); Moorhouse, Scott (S.R.)
Cc: Corbett, Sandra (S.M.)
Subject: RE: U204 stall vehicle in Tennessee

Don/Mike/Scott,
What are the particulars (build date, complaint date, mileage, etc.) on this vehicle? They would help focus the investigation.

Don,
When do you plan to leave?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

----Original Message----
From: Altoonian, Don (D.J.)
Sent: Tuesday, March 05, 2002 7:57 AM
To: Hofman, Michael (M.V.)
Cc: Dalbo, Bob (R.J.); Moorhouse, Scott (S.R.); Corbett, Sandra (S.M.)
Subject: RE: U204 stall vehicle in Tennessee

Mike, I could fit it in with picking up our new 2002 RAV in Penn. I can get a flight to Nashville, and then after checking out the car in Tn, flight on to Allentown,.Pa and pickup our new Rav and drive it back. I played around online , American Express, and got a $206 dollar fair. The one way from Detroit to Allentown is $497.00. The customer in Tn. is 45 miles from the dealer, I am trying to get it set up so he can get it to the local Ford dealer. If it is ok I will get Scott to send the required parts.

—Original Message—
From: Hofman, Michael (M.V.)
Sent: Monday, March 04, 2002 6:17 PM
To: Moorhouse, Scott (S.R.); Fascetti, Bob (R.J.); Delbo, Bob (R.J.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.)
Subject: RE: U204 stall vehicle in Tennessee

OK with me -

Bob / Bob - Do you have a preference in sending anyone from your team? (either with Don or solo - your call)

Don - Are you able to go?

Sandra - Info

Thanks - Mike

—Original Message—
From: Moorhouse, Scott (S.R.)
Sent: Monday, March 04, 2002 5:43 PM
To: Hofman, Michael (M.V.)
Subject: U204 stall vehicle in Tennessee

Mike, we have identified our first U204 stall vehicle in ICCD which had the calibration revisions for idle air robustness. KCAP was interested in this, of course. We didn't expect the calibration to correct everything, but wonder if it is not in the best interest to all if Altoonian reviewed this vehicle. What do you think?

From: Dalbo, Bob (R.J.)
Sent: Tuesday, March 05, 2002 9:58 AM
To: Altoonian, Don (D.J.); Hofman, Michael (M.V.); Moorhouse, Scott (S.R.)
Cc: Corbett, Sandra (S.M.)
Subject: RE: U204 stall vehicle in Tennessee

Don/Mike/Scott,
What are the particulars (build date, complaint date, mileage, etc.) on this vehicle? They would help focus the investigation.

Don,
When do you plan to leave?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31788
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

----Original Message----
From: Altoonian, Don (D.J.)
Sent: Tuesday, March 05, 2002 7:57 AM
To: Hofman, Michael (M.V.)
Cc: Dalbo, Bob (R.J.); Moorhouse, Scott (S.R.); Corbett, Sandra (S.M.)
Subject: RE: U204 stall vehicle in Tennessee

Mike, I could fit it in with picking up our new 2002 RAV in Penn. I can get a flight to Nashville, and then after checking out the car in Tn, flight on to Allentown,.Pa and pickup our new Rav and drive it back. I played around online , American Express, and got a $206 dollar fair. The one way from Detroit to Allentown is $497.00. The customer in Tn. is 45 miles from the dealer, I am trying to get it set up so he can get it to the local Ford dealer. If it is ok I will get Scott to send the required parts.

----Original Message----
From: Hofman, Michael (M.V.)
Sent: Monday, March 04, 2002 6:17 PM
To: Moorhouse, Scott (S.R.); Peacott, Bob (R.J.); Dalbo, Bob (R.J.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.)
Subject: RE: U204 stall vehicle in Tennessee

OK with me -

Bob / Bob - Do you have a preference in sending anyone from your team? (either with Don or solo - your call)

Don - Are you able to go?

Sandra - Info

Thanks - Mike

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everything, but wonder if it is not in the best interest to all if Altoonian reviewed this vehicle. What do you think?

Current Limiting for Stepping Motors

Part 4 of Stepping Motors by Douglas W. Jones

Introduction

Small stepping motors, such as those used for head positioning on floppy disk drives, are usually driven at a low DC voltage, and the current through the motor windings is usually limited by the internal resistance of the winding. High torque motors, on the other hand, are frequently built with very low resistance windings; when driven by any reasonable supply voltage, these motors typically require external current limiting circuitry.

There is good reason to run a stepping motor at a supply voltage above that needed to push the maximum rated current through the motor windings. Running a motor at higher voltages leads to a faster rise in the current through the windings when they are turned on, and this, in turn, leads to a higher cutoff speed for the motor and higher torques at speeds above the cutoff.

Microstepping, where the control system positions the motor rotor between half steps, also requires external current limiting circuitry. For example, to position the rotor 1/4 of the way from one step to another, it might be necessary to run one motor winding at full current while the other is run at approximately 1/3 of that current.

The remainder of this section discusses various circuits for limiting the current through the windings of a stepping motor, starting with simple resistive limiters and moving up to choppers and other switching regulators. Most of these current limiters are appropriate for many other applications, including limiting the current through conventional DC motors and other inductive loads.

Resistive Current Limiters

~~The simplest understood current limiter is a series resistor.~~ Most motor manufacturers recommended this approach in their literature up until the early 1980's, and most motor data sheets still give performance curves for motors driven by

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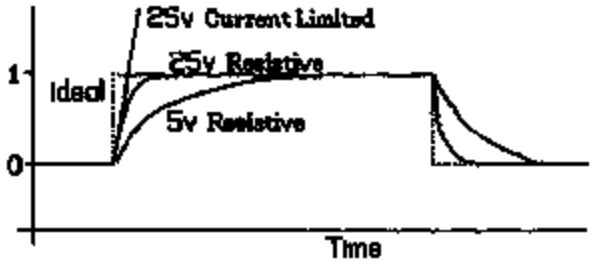
bit of power. For example, if the motor windings have a resistance of 5 ohms and a rated current of 1 amp, and a 25 volt power supply is used, T_1 plus R_1 will dissapate, between them, 20 watts! The circuits discussed in the following sections avoid this waste of power while retaining the performance advantages of the circuit given here.

When an H-bridge bipolar drive is used with a resistive current limiter, as shown in Figure 4.1, the resistor R_2 was not needed because current could flow backwards through R_1. When a transistorized current limiter is used, current cannot flow backwards through T_1, so a separate current path back to the positive supply must be provided to handle the decaying current through the motor windings when the switches are opened. R_2 serves this purpose here, but a zener diode may be substituted to provide even faster turn-off.

The performance of a motor run with a current limited power supply is noticably better than the performance of the same motor run with a resistively limited supply, as illustrated in Figure 4.4:

Figure 4.4



With either a current limited supply or a resistive current limiter, the initial rate of increase of the current through the inductive motor winding when the power is turned on depends only on the inductance of the winding and the supply voltage. As the current increases, the voltage drop across a resistive current limiter will increase, dropping the voltage applied to the motor winding, and therefore, dropping the rate of increase of the current through the winding. As a result, the current will only approach the rated current of the motor winding asymptotically

In contrast, with a pure current limiter, the current through the motor winding will increase almost linearly until the current limiter cuts in, allowing the current to reach the limit value quite quickly. In fact, the current rise is not linear; rather, the current rises asymptotically towards a limit established by the resistance of the motor winding and the resistance of the sense resistor in the current limiter. This maximum is usually well above the rated current for the motor winding.

Open Loop Current Limiters

Both the resistive and the linear transistorized current limiters discussed above automatically limit the current through the motor winding, but at a considerable cost, in terms of wasted heat. There are two schemes that eliminate this expense, although at some risk because of the lack of feeback about the current through the motor.

Use of a Voltage Boost

If you plot the voltage across the motor winding as a function of time, assuming the use of a transistorized current limiter such as is illustrated in Figure 4.3, and assuming a 1 amp 5 ohm motor winding, the result will be something like that illustrated in Figure 4.5:

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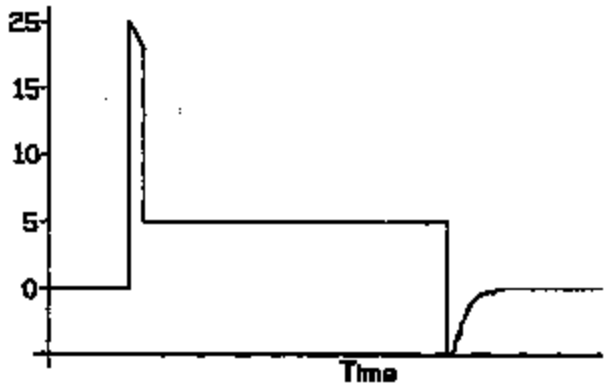
Figure 4.5



As long as the current is below the current limiter's set point, almost the full supply voltage is applied across the motor winding. Once the current reaches the set point, the voltage across the motor winding falls to that needed to sustain the current at the set point, and when the switches open, the voltage reverses briefly as current flows through the diode network and R_2.

An alternative way to get this voltage profile is to use a dual-voltage power supply, turning on the high voltage for as long as it takes to bring the current in the motor winding up to the rated current, and then turning off the high voltage and turning on the sustaining voltage. Some motor controllers do this directly, without monitoring the current through the motor windings. This provides excellent performance and minimizes power losses in the regulator, but it offers a dangerous temptation.

If the motor does not deliver enough torque, it is tempting to simply lengthen the high-voltage pulse at the time the motor winding is turned on. This will usually provide more torque, although saturation of the magnetic circuits frequently leads to less torque than might be expected, but the cost is high! The risk of burning out the motor is quite real, as is the risk of demagnitizing the motor rotor if it is turned against the imposed field while running hot. Therefore, if a dual-voltage supply is used, the temptation to raise the torque in this way should be avoided!

The problems with dual voltage supplies are particularly serious when the time intervals are under software control, because in this case, it is common for the software to be written by a programmer who is insufficiently aware of the physical and electrical characteristics of the control system.

Use of Pulse Width Modulation

Another alternative approach to controlling the current through the motor winding is to use a simple power supply controlled by *pulse width modulation* (PWM) or by a *chopper*. During the time the current through the motor winding is increasing, the control system leaves the supply attached with a 100% duty cycle. Once the current is up to the full rated current, the control system changes the duty cycle to that required to maintain the current. Figure 4.6 illustrates this scheme:

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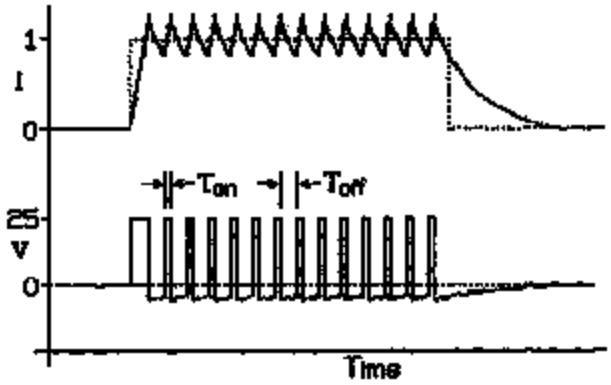

Figure 4.6

For any chopper or pulse width modulator, we can define the duty-cycle D as the fraction of each cycle that the switch is closed:

$$D = T_{on} / (T_{on} + T_{off})$$

Where

T_{on} -- time the switch is closed during each cycle
T_{off} -- time the switch is open during each cycle

The voltage curve shown above indicates the full supply voltage being applied to the motor winding during the on-phase of every chopper cycle, while when the chopper is off, a negative voltage is shown. This is the result of the forward voltage drop in the diodes that are used to shunt the current when the switches turn off, plus the external resistance used to speed the decay of the current through the motor winding.

For large values of T_{on} or T_{off}, the exponential nature of the rise and fall of the current through the motor winding is significant, but for sufficiently small values, we can approximate these as linear. Assuming that the chopper is working to maintain a current of I and that the amplitude is small, we will approximate the rates of rise and fall in the current in terms of the voltage across the motor winding when the switch is closed and when it is open:

$$V_{on} = V_{supply} - I(R_{winding} + R_{on})$$
$$V_{off} = V_{diode} + I(R_{winding} + R_{off})$$

Here, we lump together all resistances in series with the winding and power supply in the on state as R_{on}, and we lump together all resistances in the current recirculation path when the switch(es) are open as R_{off}. The forward voltage drops of any diodes in the current recirculation path have been lumped as V_{diode}; if the off-state recirculation path runs from ground to the power supply (H-bridge fast decay mode), the supply voltage must also be included in V_{diode}. Forward voltage drops of any switches in the on-state and off-state paths should also be incorporated into these voltages.

To solve for the duty cycle, we first note that:

$$dI/dt = V/L$$

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Where

I -- current through the motor winding
V -- voltage across the winding
L -- inductance of the winding

We then substitute the specific voltages for each phase of operation:

$$I_{ripple} / T_{off} = V_{off} / L$$
$$I_{ripple} / T_{on} = V_{on} / L$$

Where

I_{ripple} -- the peak to peak ripple in the current

Solving for T_{off} and T_{on} and then substituting these into the definition of the duty cycle of the chopper, we get:

$$D = T_{on} / (T_{on} + T_{off}) = V_{off} / (V_{on} + V_{off})$$

If the forward voltage drops in diodes and switches are negligable, and if the only significant resistance is that of the motor winding itself, this simplifies to:

$$D = I R_{winding} / V_{supply} = V_{running} / V_{supply}$$

This special case is particularly desirable because it delivers all of the power to the motor winding, with no losses in the regulation system, without regard for the difference between the supply voltage and the running voltage.

The AC ripple I_{ripple} superimposed on the running current by a chopper can be a source of minor problems; at high frequencies, it can be a source of RF emissions, and at audio frequencies, it can be a source of annoying noise. For example, with audio frequency chopping, most stepper controlled systems will "squeal", sometimes loudly, when the rotor is displaced from the equilibrium position. To find the ripple amplitude, first recall that:

$$I_{ripple} / T_{off} = V_{off} / L$$

Then solve for I_{ripple}:

$$I_{ripple} = T_{off} V_{off} / L$$

Thus, to reduce the ripple amplitude at any particular duty cycle, it is necessary to increase the chopper frequency. This cannot be done without limit because switching losses increase with frequency. Note that this change has no significant effect on AC losses; the decrease in such losses due to decreased amplitude in the ripple is generally offset by the effect of increasing frequency.

The primary problem with use of a simple chopping or pulse-width modulation control scheme is that it is completely open loop. Design of good chopper based control systems requires knowledge of motor characteristics such as inductance that are frequently poorly documented, and as with dual-voltage supplies, when motor performance is

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marginal, it is very tempting to increase the duty-cycle without attention to the long-term effects of this on the motor. In the designs that follow, this weakness will be addressed by introducing feedback loops into the low level drive system to directly monitor the current and determine the duty cycle.

One-Shot Feedback Current Limiting

The most common approach to automatically adjusting the duty cycle of the switches in the stepper driver involves monitoring the current to the motor windings; when it rises too high, the winding is turned off for a fixed interval. This requires a current sensing system and a one-shot, as illustrated in Figure 4.7:

Figure 4.7

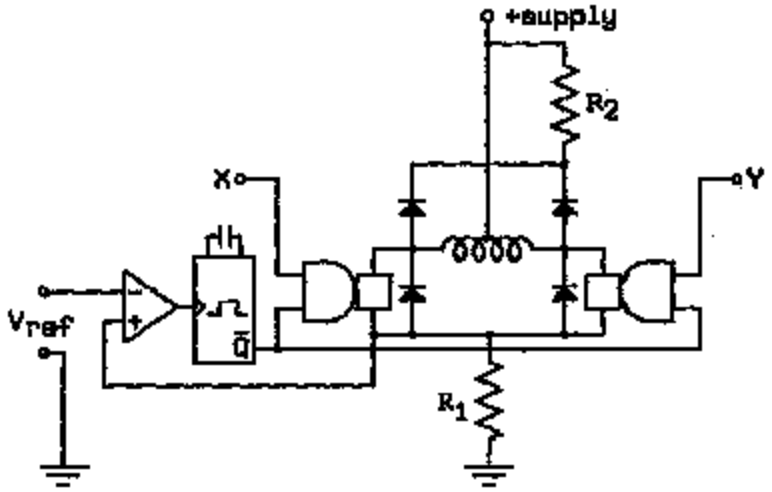

Figure 4.7 illustrates a unipolar drive system. As with the circuit given in Figure 4.3, R_1 should be as small as possible, limited only by the requirement that the sense voltage provided to the comparator must be high enough to be within its operating range. Note that when the one-shot output ($\overline{Q}$) is low, the voltage across R_1 no-longer reflects the current through the motor winding. Therefore, the one-shot must be insensitive to the output of the comparator between the time it fires and the time it resets. Practical circuit designs using this approach involve some complexity to meet this constraint!

Selecting the value of R_2 for the circuit shown in Figure 4.7 poses problems. If R_2 is large, the current through the motor windings will decay quickly when the higher level control system turns off this motor winding, but when the winding is turned on, the current ripple will be large and the power lost in R_2 will be significant. If R_2 is small, this circuit will be very energy efficient but the current through the motor winding will decay only slowly when this winding is turned off, and this will reduce the cutoff speed for the motor.

The peak power dissipated in R_2 will be I^2R_2 during T_{off} and zero during T_{on}; thus, the average power dissipated in R_2 when the motor winding is on will be:

$$P_2 = I^2R\,T_{off} / (T_{on} + T_{off})$$

Recall that the duty cycle D is defined as $T_{on}/(T_{on}+T_{off})$ and may be approximated as V_{motor}/V_{supply}. As a result, we can approximate the power dissipation as:

$$P_2 = I^2 R_2 (1 - V_{running}/V_{supply}).$$

Given the usual safety margins used in selecting power resistor wattages, a better approximation is not necessary.

When designing a control system based on pulse width modulation, note that the cutoff time for the one-shot determines T_{off}, and that this is fixed, determined by the timing network attached to the one-shot. Ideally, this should be set as follows:

$$T_{off} = L\, I_{ripple} / V_{off}$$

This presumes that the inductance L of the motor winding is known, that the acceptable magnitude of I_{ripple} is known, and that V_{off}, the total reverse voltage in the current recirculation path, is known and fixed.

Note that this scheme leads to a variable chopping rate. As with the linear current limiters shown in Figure 4.3, the full supply voltage will be applied during the turn-on phase, and the chopping action only begins when the motor winding reaches the current limit set by V_{ref}. This circuit will vary the chopping rate to compensate for changes in the back EMF of the motor winding, for example, those caused by rotor motion; in this regard, it offers the same quality of regulation as the linear current limiter.

The one-shot current regulator shown in Figure 4.7 can also be applied to an H-bridge regulator. The encoded H-bridge shown in Figure 3.13 is an excellent candidate for this application, as shown in Figure 4.8:

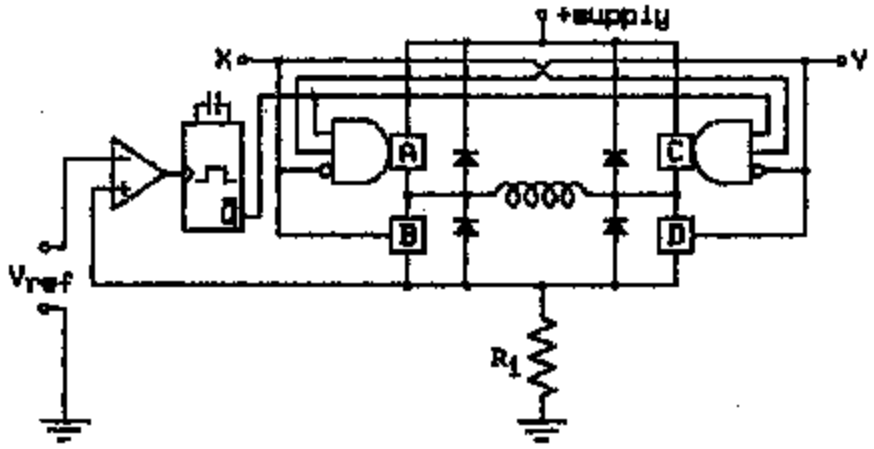

Figure 4.8

Unlike the circuit in Figure 4.7, this circuit does not provide design tradeoffs in the selection of the resistance in the current decay path; instead, it offers the same selection of decay paths as was available in the original circuit from Figure 3.13. If the X and Y control inputs are held in a running mode (01 or 10), the current limiter will alternate between that running and slow decay modes, maximizing energy efficiency. When the time comes to turn off the current through the motor winding, the X and Y inputs may be set to 00, using fast decay mode to maximize the cutoff speed, while if the damping effect of dynamic braking is needed to control resonance, X and Y may be set to 11.

Note that the current recirculation path during dynamic braking does not pass through R_1, and as a result, if the motor generates a large amount of power, burnt out components in the motor or controller are likely. This is unlikely to cause problems with stepping motors, but when dynamic braking is used with DC motors, the current limiter should be

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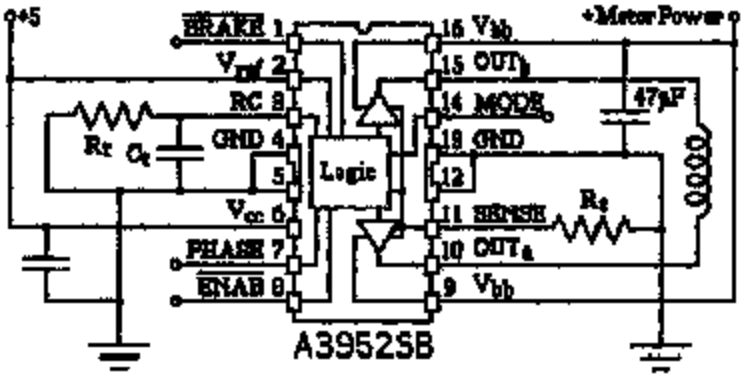
arranged to remain engaged while in braking mode!

Practical Examples

SGS-Thompson (and others) L293 (1A) and L298 (2A) dual H-bridges are designed for easy use with partial feedback current limiters. These chips have enable inputs for each H-bridge that can be directly connected to the output of the one-shot, and they have ground connections for motor-power that are isolated from their logic ground connections; this allows sense resistors to be easily incorporated into the circuit.

The 3952 H-bridge from Allegro Microsystems can handle up to 2-amps at 50 volts and incorporates all of the logic necessary for current control, including comparators and one-shot. This chip is available in many package styles; Figure 4.9 illustrates the DIP configuration wired for a constant current limit:

Figure 4.9



If R_t is 20 Kohm, and C_t is 1000pF, T_{off} for the pulse-width modulation will be fixed at 20 (±2) microseconds. The 3952 chip incorporates a 10 to 1 voltage divider on the V_{ref} input, so attaching V_{ref} to the 5 volt logic supply sets the actual reference voltage to 0.5 V. Thus, if the sense resistor R_s is 0.5 ohms, this arrangement will attempt to maintain a regulated current through the load of 1 A.

Note that all power switching chips are potentially serious sources of electromagnetic interfence! The 47µF capacitor shown between the motor power and ground should be as close to the chip as possible, and the path from the SENSE pin through R_s to ground and back to a ground pin of the chip should be very short and with a very low resistance.

On the 5 volt side, because V_{ref} is taken from V_{cc}, a small decoupling capacitor should be placed very close to the chip. It may even be appropriate to isolate the V_{ref} input from V_{cc} with a small series resistor and a separate decoupling capacitor. If this is done, note that the resistance from the V_{ref} pin to ground through the chip's internal voltage divider is around 50 Kohms.

One of the more dismaying features of the 3952 chip, as well as many of its competitors, is the large number of control inputs. These are summarized in the following table:

$\overline{\text{BRAKE}}$	$\overline{\text{ENABLE}}$	PHASE	MODE	OUT_a	OUT_b	Notes
0	-	-	0	0	0	Brake

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0	-	-	1	0	0	Limited Brake
1	1	-	0	-	-	Standby
1	1	-	1	-	-	Sleep
1	0	0	0	0	1	Reverse, Slow
1	0	0	1	0	1	Reverse, Fast
1	0	1	0	1	0	Forward, Slow
1	0	1	1	1	0	Forward, Fast

In the forward and reverse running modes, the mode input determines whether fast or slow decay modes are used during T_{off}. In the dynamic braking modes, the mode input determines whether the current limiter is enabled. This is of limited value with stepping motors, but use of dynamic braking without a current limiter can be dangerous with DC motors.

In sleep mode, the power consumption of the chip is minimized. From the perspective of the load, sleep and standby modes put the load into fast decay mode (all switches off) but in sleep mode, the chip draws considerably less power, both from the logic supply and the motor supply.

Hysteresis Feedback Current Limiting

In many cases, motor control systems are expected to operate acceptably with a number of different stepping motors. The one-shot based current regulators illustrated in Figures 4.7 to 4.9 have an accuracy that depends on the inductance of the motor windings. Therefore, if fixed accuracy is required, any motor substition must be balanced by changes to the RC network that determines the off-time of the one-shot.

This section deals with alternative designs that eliminate the need for this tuning. These alternative designs offer fixed precision current regulation over a wide range of load inductances. The key to this approach is arrange the recirculation paths so that the current-sense resistor R_s is always in the circuit, and then turn the switches on or off depending only on the current.

The usualy way to build this type of controller is to use a comparator with a degree of hysteresis, for example, by feeding the output of the comparator back into one of its inputs through a resistor network, as illustrated in Figure 4.10:

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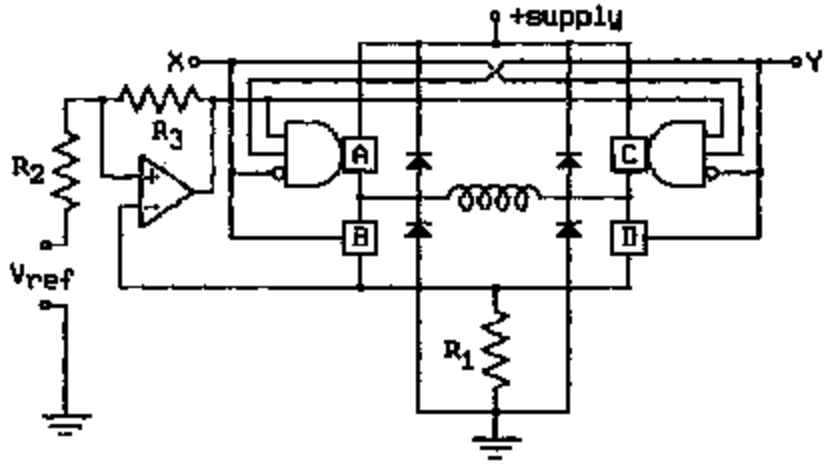

Figure 4.10

To compute the desired values of R_2 and R_3, we note that:

$$V_{ripple} \geq V_{hysteresis}$$

Where:

$$V_{ripple} = I_{ripple} R_1$$

I_{ripple} – the maximum ripple allowed in the current

and:

$$V_{hysteresis} = V_{swing} R_2 / (R_2 + R_3)$$

V_{swing} – the voltage swing at the output of the comparator

We can solve this for the ratio of the resistances:

$$R_2 / (R_2 + R_3) \leq I_{ripple} R_1 / V_{swing}$$

For example, if R_1 is 0.5 ohms and we wish to regulate the current to within 10 milliamps, using a comparator with TTL compatable outputs and a voltage swing of 4 volts, the ratio must be no greater than .00125.

Note that the sum $R_2 + R_3$ determines the loading on V_{ref}, assuming that the input resistance of the comparator is effectively infinite. Typically, therefore, this sum is made quite large.

One problem with the circuit given in Figure 4.10 is that it does not limit the current through the motor in dynamic braking or slow decay modes. Even if the current through the sense resistor vastly exceeds the desired current, switches B and D will remain closed in dynamic braking mode, and if the reference voltage is variable, rapid drops in the reference voltage will not be enforced by this control system.

The designers of the Allegro 3952 chip faced this problem, and passed the solution back to the user, providing a MODE input to determine whether the chopper alternated between running and fast decay mode or running and slow

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decay mode. Note that this chip uses a fixed off-time set by a one-shot, and therefore, switching between the two decay modes will change the precision of the current regulator. Given that such a change in precision is acceptable, we can modify the circuit from Figure 4.10 to automatically thrown the system into fast-decay mode if the running or dynamic braking current exceeds the set-point of the comparator by too great a margin. Figure 4.11 illustrates how this can be done using a second comparator.

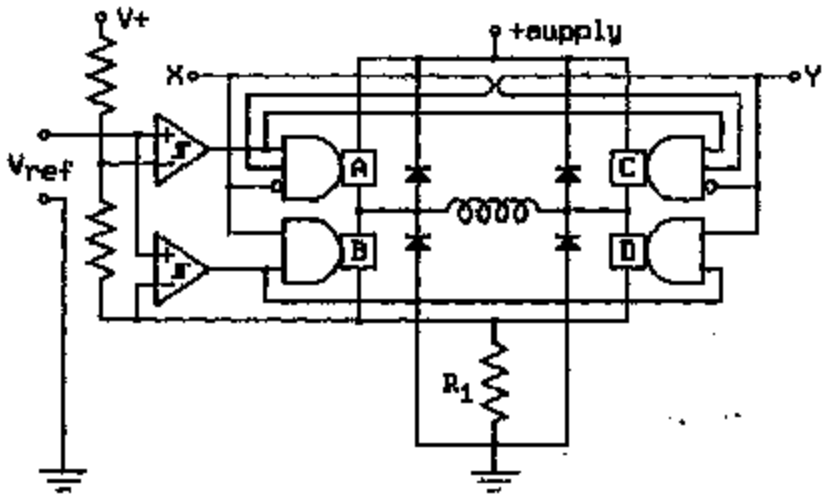


Figure 4.11

As shown in Figure 4.11, the lower comparator directly senses the voltage across R1, while the upper comparator senses a higher voltage, determined by a resistor network. This network should hold the negative inputs of the two comparators just far enough apart to guarantee that, as the voltage across R1 rises, the top comparator will always open the top switches before the bottom comparator opens the bottom switches, and as the voltage across R1 falls, the bottom comparator will always close the bottom switches before the top comparator closes the top switches.

As a result, this system has two basic steady-state running modes. If the motor winding is drawing power, one of the bottom switches will remain closed while the opposite switch on the top is used to chop the power to the motor winding, alternating the state of the system between running and slow-decay mode.

If the motor winding is generating power, the top switches will remain open and the bottom switches will do the chopping, alternating between fast-decay and slow-decay modes as needed to keep the current within limits.

If the two comparators have accuracies on the order of a millivolt with hysteresis on the order of 5 millivolts, it is reasonable to use a 5 millivolt difference between the top and bottom comparator. If we use the 5 volt logic supply as the pull-up supply for the resistor network, and we assume a nominal operating threshold of around 0.5 volts, the resistor network should have a ratio of 1:900; for example, a 90k resistor from +5 and a 100 ohm resistor between the two comparator inputs.

Practical Examples

The basic idea described in this section is also applicable to unipolar stepping motor controllers, although in this context, it is somewhat easier to apply if the reference voltage is measured with respect to the unregulated motor power supply. Figure 4.12 illustrates a practical example, using the forward voltage drop across an ordinary silicon diode as the reference voltage.

2002-827-8 11886

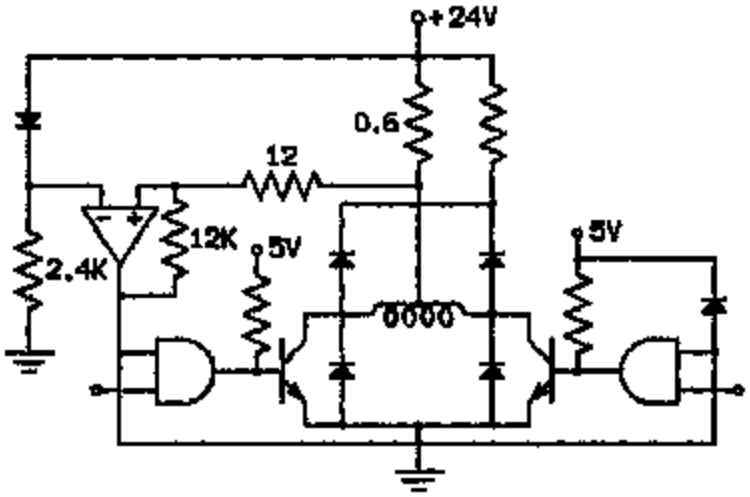


Figure 4.12

The circuit shown in Figure 4.12 uses a 2.4K resistor to provide a bias current of 10ma to the reference diode. A small capacitor should be added across the reference diode if the motor power supply is minimally regulated.

The 0.6 ohm value used for the current sensing resistor sets the regulator to 1 amp, assuming that the reference voltage is 0.6 volts. The 1000 to 1 ratio on the feedback network around the comparator sets the allowed ripple in the regulated current to around 8 ma.

The comparator shown in Figure 4.12 can be powered from the minimally regulated motor power supply, but only if it is able to operate with the inputs very close to its positive supply voltage. Although I have not tried it, the Mitsubishi M5249L comparator appears to be ideally suited to this job; it can work from a positive supply of up to 40 volts, and the input voltages are allowed to slightly exceed the positive supply voltage! The output of this comparator is open collector, so the hysteresis network shown in the figure also acts as a pull-up network, providing a pull-up current of a few milliamps. The diode to +5 shown in the figure clamps the comparator output to the logic supply voltage, protecting the and gate inputs from overvoltage.

Other Current Sensing Technologies

The feedback loops of all of the current limiters given above use the voltage drop across a small resistor to measure the current. This is an excellent choice for small motors, but it poses difficulties for large high-current motors! There are other current sensing technologies appropriate for such settings, most notably those that deliver only a fraction of the motor current to the sensing resistor, and those that measure the current by sensing the magnetic field around the conductor.

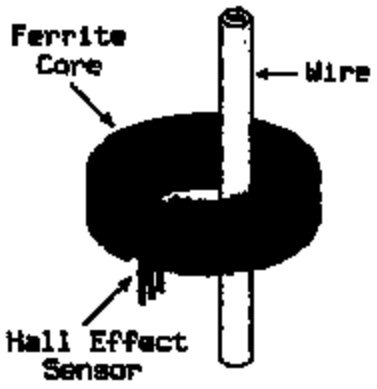
National Semiconductor had incorporated a very clever current sensor into a number of their H-bridges. This delivers a current to the sense resistor that is proportional to the current through the motor winding, but far lower. For example, on the LMD18200 H-bridge, the sense resistor receives exactly 377 microamps per ampere flowing through the motor winding.

The key to the current sensing technology used in the National Semiconductor line of H-bridges is found in the internal structure of the DMOS power switching transistors they use. These transistors are composed of thousands of small MOSFET transistor cells wired in parallel. A small but representative fraction of these cells, typically 1 in 4000, is used to extract the sense current while the remainder of the cells control the motor current. The data sheet for the National LMD18245 H-bridge contains an excellent writeup on how this is done.

8982-827-8 11696

When very high currents are involved, precluding use of an integrated H-bridge, an appealing and well established current sensing technology involves the use of a split ferrite core and a hall effect sensor, as illustrated in Figure 4.13:

Figure 4.13



Simple linear Hall effect sensors require a small regulated bias current between two of their terminals, and they generate a DC voltage proportional to the magnetic field on a third terminal. The magnetic field across the gap sawed in the ferrite core is proportional to the current through the wire, and therefore, the voltage reported by the Hall effect sensor will be proportional to the current.

Allegro Microsystems and others make a full lines of Hall effect sensors, but pre-calibrated hall effect current sensors are available; these include the split core, the hall effect sensor, and auxiliary components, all mounted on a small PC board or potted as a unit. Newark Electronics lists a few sources of these, including Honeywell, F. W. Bell and LEM Instruments.

An intriguing new current sensor is just becoming available, as of 1998, based on a thin-film magnetoresistive sensor; the sensitivity of this technology eliminates the need for the ferrite core and the result is a very compact current sensor. The NT series sensors made by F. W. Bell use this technology.

EX02-027-8 11697

O'Neall, Jim (J.D.)

From: Koszewnik, John (J.J.)
Sent: Sunday, August 11, 2002 3:52 PM
To: 'btackman@attglobal.net'
Cc: rhubbard@kavlico.com; kpark@kavlico.com; smurphy@kavlico.com; O'Neall, Jim (J.D.); Fsadnl, Frank (F.); Porosky, Sue (S.E.)
Subject: RE: RE: Framework For Ford/Kavlico Cooperation

Bruce,

Great! Thanks for the feedback. I'm sure we can work together successfully on this.

Separately, I sent Kyong a note confirming that I concur in his suggestions.

I will certainly notify your secretary with details for the meeting. As for now, I'll tell you that it's going to be held in our Product Development Center in Conference Room PDC #6. That's near our Design Showroom off of Oakwood Blvd. I'll make sure we send you detailed directions prior to the meeting.

As an aside, if you're arriving in Dearborn Monday night, I'd be pleased to take Rick and you to dinner Monday evening or lunch Tuesday. Hopefully, one of these will fit into your calendar. Just let me know.

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V-Engine Engineering
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jkoszewn@ford.com

-----Original Message-----
From: btackman@attglobal.net [mailto:btackman@attglobal.net]
Sent: Friday, August 09, 2002 12:33 PM
To: jkoszewn@ford.com
Cc: rhubbard@kavlico.com; kpark@kavlico.com; smurphy@kavlico.com
Subject: re:RE: Framework For Ford/Kavlico Cooperation

Dear John,

I have reviewed your summarization of our last meeting and agree with the joint understand.

The framework for our Joint efforts looks good. I know that Kyong responded back to you on two issues; having to do with the paralyene and the back-side PRT approach.

EXHIBIT 11696

Both Rick and I agree with Kyong's comments on these two approaches. The team can discuss it further during the kick off meeting.

Rick and I will see you on the 27th at Ford for the meeting that you have set up. Would you either call me or email my assistant, Sue Murphy as to the location of the meeting?

Thanks for your assistance and cooperation.

Bruce

EA82-827-5 11899

APPENDIX 9:

DICTIONARY OF TERMS

Auger – Electron beam based instrument for characterization of surface and thin film elemental composition. Capable of ion sputtering to remove material, allowing characterization of underlying layers.

CMOS – Complementary Metal-Oxide Semiconductor

DM – Dash Mount

DPFE – Delta Pressure Feedback EGR

EESE – Electric/Electronic Systems Engineering

EMC – Electro-Magnetic Compatability

FIB – Focused Ion Beam

FQE – Ford Quality Engineer

FRL – Ford Research Lab

IC – Integrated Circuit

PCM – Powertrain Control Module

PRT – Piezoelectric Resistive Technology

RVT – Research Vehicle Technology

SCR – Silicon-Controlled Rectifier

SEM – Scanning Electron Microscope

WAP – Wayne Stamping and Assembly Plant

Services

- Decapsulation/Delid
- Emission Microscopy
- FIB and Dual-FIB
- Quick-Turn Packaging
- SEM and FE-SEM / EDX
- AES and FE-AES
- E-Beam Probing
- Flip Chip FIB
- Real Time X-Ray
- TXRF-300mm
- SIMS and Quad-SIMS
- Turn-Key Failure Analysis
- XRD and XRR
- XPS and ESCA
- Deprocessing
- AFM
- CIVVA

Services : Failure Analysis

What is Failure Analysis?

"Failure Analysis" is not easily defined. The broad scope of issues addressed through various failure analysis techniques depends on many factors. A failure analysis job may take several different courses depending upon the type and nature of the sample as well as the specific objectives requested.

Root cause analysis or defect identification are often the goals of the failure analyst. As geometries become smaller and smaller, the demands on the failure analyst are increasingly complex.

Failure analysis is not only valuable in determining ongoing issues, but also in preventing and evaluating potential and future issues. Here failure analysis branches into construction and competitive analysis respectively. Ultimately, quality, performance, process, and reliability are of utmost concern

Failure Analysis at Accurel

As an independent lab, Accurel is focused on your needs. Accurel's wide range of technological and analytical experience and expertise is the foundation of our failure analysis lab. Chances are, if you have a problem, we have already seen it.

Accurel's broad range of tools and techniques allow us to tailor our analysis to your specific needs. Accurel's turnkey, analytical capabilities assure quality on every step of your project.

Accurel can provide professional, bound reports, customized to fit your needs, including images and detailed analysis.

Charged Induced Voltage Variation Analysis (CIVVA) capabilities allow us to localize open conductors on passivated or unpassivated IC's resulting from stress voiding, electromigration, design, or process defects.

We can decapsulate or delid ceramic, plastic and BGA packages as well as modules or C.O.B. (Chip On Board). Using either fuming nitric or sulfuric acid, the exposed die is left functional, contamination free, and ready for subsequent inspection.

Accurel has the facilities and expertise to perform both Mechanical and E-Beam Probing. We are able to locate and / or characterize a physical fail site with Mechanical Probing. Electron Beam Probing, or E-Beam Probing, probes internal nodes on your IC while exercising the device with our testers. For design verification and characterization of your products, we can perform IC diagnostics and repair using E-Beam probing in conjunction with our FIB (Focused Ion Beam) capability.

Our full chem lab includes wet and dry etch Deprocessing facilities to systematically delayer your sample down to silicon, leaving defects and features exposed for further failure analysis.

Failure Analysis:

- What is Failure Analysis?
- Failure Analysis at Accurel
- Main Applications
- Specifications

Table of Figures:

Failure Analysis Figure 1:
IC cross-section: Hillock in metal caused high stress in passivation and lead to cracks and partial popping of top layer.
(Click for a larger image)

Failure Analysis Figure 2:
Deprocessed IC
(Click for a larger image)

- RBS
- SAM
- TEM

Our Baseline Configuration Analysis (BCA), includes a customized report, quality inspections and / or tests, materials analysis, as well as construction details.

Use our expertise to solve your technological challenges and enjoy the quality service our customers count on

Main Applications

- Root cause analysis
- Defect identification
- Package level analysis
- Fault localization
- Characterization and documentation
- Construction analysis
- Competitive analysis

Specifications

- Professional reports
- Charged Induced Voltage Variation Analysis (CIVVA)
- Decapsulation/ Delid
  - Ceramic
  - Plastic
  - Modules
  - C.O.B. (Chip On Board)
- Probing
  - Electron Beam
  - Mechanical
- Electrical characterization
- Deprocessing
  - Full chem lab
  - Systematic delayering down to silicon
  - Wet etch
  - Dry etch
  - Sample decoration
  - Expose defects and features for FIA
- Metallurgical Laboratory
- Baseline Configuration Analysis
  - Customized report to fit your needs
  - Quality inspections / tests
  - Material analysis
  - Construction details, and more ...

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29111 9-427-8 [illegible]

Surface Measurements on Silicon Wafers

What Is SurfaceSIMS?

SurfaceSIMS is a high precision technique that provides accurate quantitative measurement of surface metals on silicon wafers. SurfaceSIMS has a detection limit of approximately 10^9–10^{10} atoms/cm^2 which makes it a viable analysis tool for surface metal detection to the year 2012 (1997 NTRS). With the impending sub-100 nm IC design era approaching, SurfaceSIMS will be an invaluable tool for evaluating critical surface metals on starting materials and after surface preparation.

Features of SurfaceSIMS

- ASTM F 1617 approved method for measuring Na, Al, K, and Fe contamination on silicon and epi substrates.
- Accurate surface quantification.
- Can detect any elements and isotopes.
- Has a detection limit of approximately 10^8–10^9 atoms/cm^2 for most metals.
- Provides both areal densities (atoms/cm^2) and surface/energetic contamination information.
- Small area detection (~50 x 50 µm^2) for device characterization.

Quantification

SurfaceSIMS, using an oxygen flood and specialized protocols, allows near-surface quantification to be made. This is illustrated in Figure 1. The flat silicon signal of SurfaceSIMS indicates that the ion yield is essentially constant at the surface. With conventional SIMS, the ion yield of silicon is not constant until a depth of about 15 nm. It is the constant ion yield in the 0-25 nm region that allows SurfaceSIMS to be quantitative.

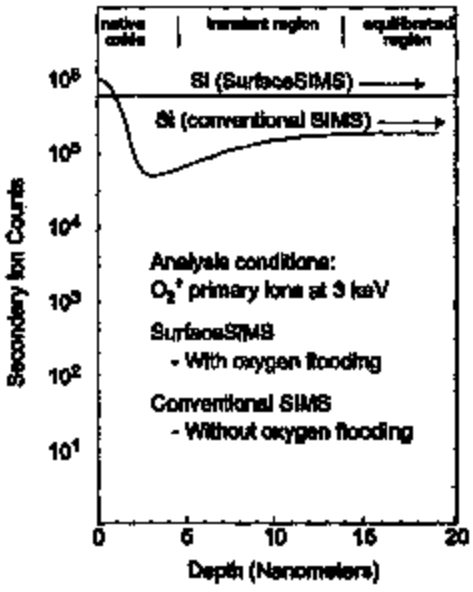

Figure 1: Silicon Depth Profiles by SurfaceSIMS and Conventional SIMS

Detection Limit

The mass resolution capability of SurfaceSIMS ($M/\Delta m \leq 8{,}000$) enables species with the same nominal masses to be resolved. For example, ^{27}Al can be resolved from $^{11}B^{16}O$ or ^{29}Fe from $^{28}Si_1$. SurfaceSIMS detection limits are typically one order of magnitude below TXRF (Total Reflection X-ray Fluorescence). In fact, SurfaceSIMS detection limits (Table 1) are well within the 1997 NTRS requirements of starting materials and for pre-gate surface preparation to the year 2012.

Calibration

The conversion of measured secondary ion counts to concentration is performed using relative sensitivity factors (RSFs). The RSF values for each element are calculated from SurfaceSIMS depth profiles of spin-coated standards, uniformly doped bulk standards, or low energy ion implant standards. Measurements calibrated on an "in-load" basis using a Consensus Reference Standard, defined by ASTM F 1569, have a precision of 5-7% RSD within an analysis load of samples (Table 2). Long-term (≤1 year) reproducibility of about 10% RSD is observed for samples that are carefully stored. The depth of the analytical crater is determined either by stylus profilometry or atomic force microscopy measurements, or by using an internal standard for in-situ depth calibration (Table 3).

Table 1: SurfaceSIMS Detection Limits of Selected Elements

Li	0.001	V	0.01
B	0.1	Cr	0.05
C	100*	Fe	0.08
N	300	Ni	0.5
F	40	Cu	0.5
Na	0.01	Zn	0.5
Mg	0.05	As	1
Al	0.05	Mo	0.1
P	1	Rh	0.7
S	2	Sb	0.1
Cl	20	Sn	0.1
K	0.01	Ta	1
Ca	0.05	W	0.2
Ti	0.1		

** Carbon is best measured by Quadrupole SIMS, DL ~5 x 10^{16} at/cm²*

Table 2: Typical SurfaceSIMS Precisions With an "In-Load" Reference Standard

Short term (high precision procedure)	2-3% RSD
Short term (standard procedure)	5-7% RSD
Long term	6-10% RSD (depends on areal density)

Table 3: Estimate Precision for Various Depth Scale Calibration Methods

Stylus profilometry (<50 nm)	5% RSD
AFM (<50 nm)	3% RSD
Internal standard (<50 nm)	5% RSD

Distribution

SurfaceSIMS has an important advantage over TXRF and VPD/AAS or VPD/ICPMS, in that it can provide distribution information as well as areal density values of the metal contaminants. Contaminants that reside ≥50 nm from the sample surface, generally referred to as *energetic contaminants*, are monitored using Dynamic SIMS. Contaminants that are at or near (≤50 nm) the surface, referred to as *surface contaminants*, are best measured using SurfaceSIMS. SurfaceSIMS can distinguish between these two types of contaminant.

A SIMS artifact is observed from "knock-on," a momentum transfer process between the bombarding SIMS primary ions and the impurity atoms, that redistributes the contaminant to a deeper depth during the analysis. SurfaceSIMS can distinguish an energetic contaminant from a "knock-on" artifact by comparison with a known control sample with surface contamination only (see Figure 2).

The combination of SurfaceSIMS and Dynamic SIMS best determines the areal density of an energetic contaminant. The total areal density of a contaminant is calculated from the SurfaceSIMS (0-20 nm) and dynamic SIMS (≥20 nm) areal densities (Table 4).

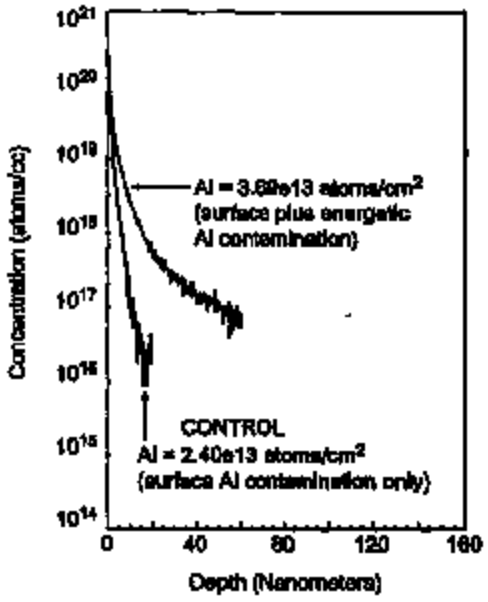

Figure 2: SurfaceSIMS Depth Profiles of Surface and Energetic Aluminum

Table 4: An Example of Total Areal Densities of Energetic Contaminants Introduced During Ion Implantation

Al	6.1×10^{12}	3.6×10^{9}	6.1×10^{12}
Mo	6.6×10^{11}	2.5×10^{12}	3.2×10^{12}
P	2.1×10^{14}	3.7×10^{13}	2.5×10^{14}
Fe	8.3×10^{9}	7.8×10^{8}	9.1×10^{9}

In addition to "knock-on" effects, the depth resolution of SIMS profiles can be degraded by chemical segrega-tion. Transition metals such as Fe, Cr, Ni, and Cu segregate to beneath the sputtered surface during the SurfaceSIMS measurement. This results in an exponential decay tail that can extend to several hundreds of angstroms (Figure 3). Although the distribution of the transition metal is not true, the integrated areal density in atoms/cm² is accurate.

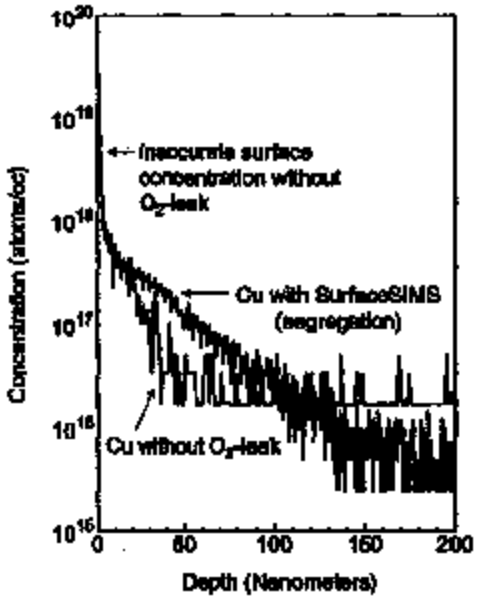

Figure 3: Depth Profiles of Copper (2.4×10^{12} atom/cm²) on Silicon

Useful References

1 Annual Book of ASTM Standards, Vol 10.05, ASTM Designation: F1617-95, 1998, pp. 638–642. (Note: the current edition is F1617-98 which was revised to include measurement of iron and published July, 1998)

2 S.P. Smith, V.K.F. Chia, and M.H. Yang, "Ion Implanter Diagnostics Using SurfaceSIMS," in IEEE Proceedings of the 11th Int'l Conference on Ion Implantation Technology, Austin, TX., Vol 1, Issue 1, pp. 512–515, 1996.

3 S.P. Smith and J. Metz, "Understanding the correlation of SurfaceSIMS and TXRF measurements of surface metal contamination on silicon wafers," in Science and Technology of Semiconductor Surface Preparation, ed. G.S. Higashi, M. Hirose, S. Raghavan, and S. Verhaverbeke, Material Research Society Symposium Proceedings, Vol 477, (Materials Research Society, Pittsburgh) pp. 305–310, 1997.

4 S.P. Smith, "Measurement of surface metal contamination on silicon," in Secondary Ion Mass Spectrometry (SIMS X), edited by A. Benninghoven, B. Hagenhoff, and H.W. Werner, (John Wiley & Sons, Chichester) pp. 485–488, 1997.

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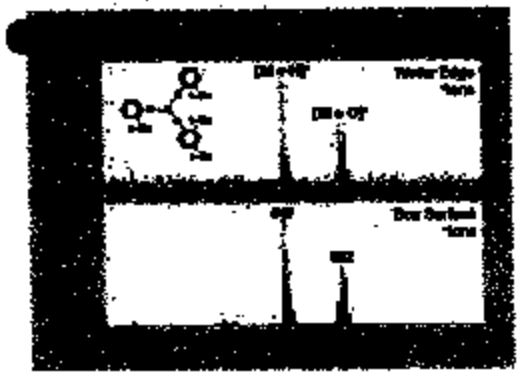
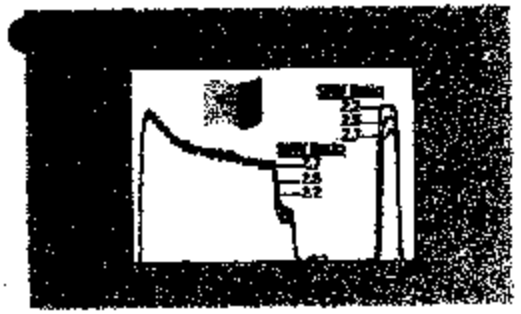
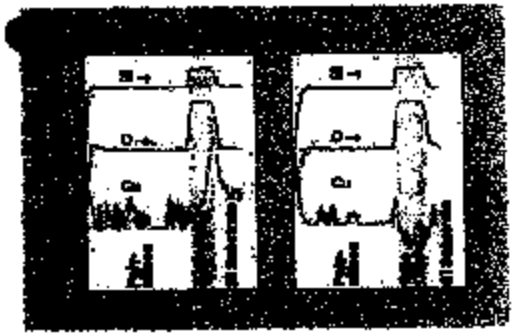
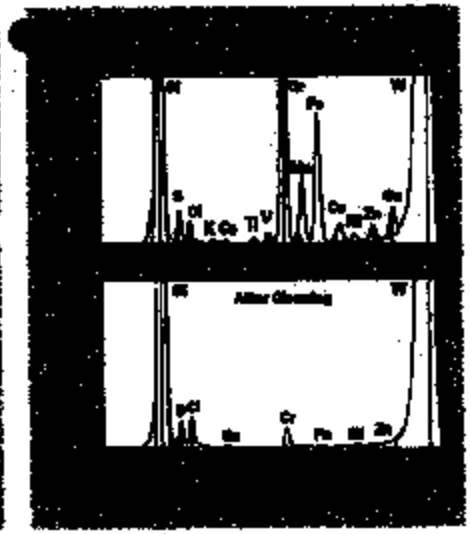
Semiconductor

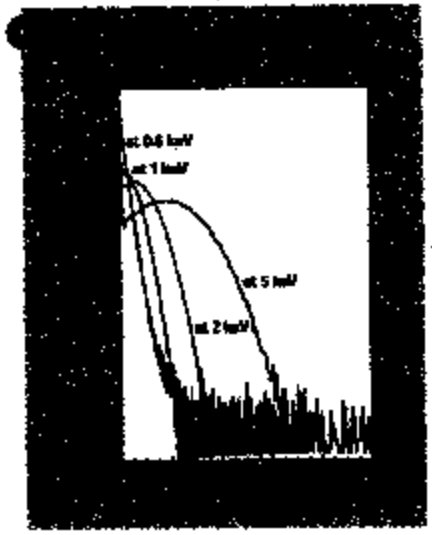
Measurements & Process Controls

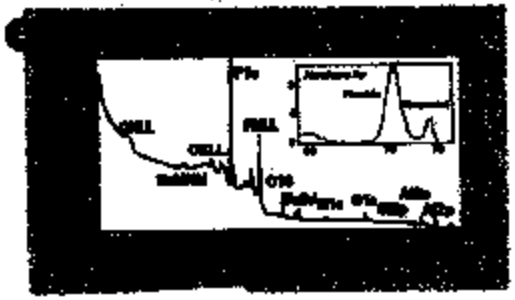












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CONTRACT ANALYTICAL SERVICES — APPLICATION BRIEF

Measurement	Analytical Technique	Comments
Total dose	Secondary Ion Mass Spectrometry (SIMS)	Depth profile analysis (10^{11}–1 x 10^{16} at/cm^2)
Boron (low energy)	Quadrupole Mass Spectrometer Nuclear Reaction Analysis (NRA)	Low energy SIMS (≤250 eV), oxygen flooding ≥1 x 10^{15} at/cm^2
Arsenic (low energy)	Quadrupole/Magnetic Sector Mass Spectrometer RBS	Medium/high mass resolution, oxygen flooding ≥5 x 10^{13} at/cm^2
Phosphorus (low energy)	Magnetic Sector Mass Spectrometer RBS	HMR, oxygen flooding ≥1 x 10^{15} at/cm^2
Dose/Profile Matching	Secondary Ion Mass Spectrometry (SIMS)	High precision implant characterization (HIPIC), ≤1% RSD precision
Peak Depth (R_p)	Secondary Ion Mass Spectrometry (SIMS)	Depth profile analysis (100 eV to MeV implants)
Junction Depth (X_j)	Secondary Ion Mass Spectrometry (SIMS) Scanning Capacitance Immersion Lens Secondary Ion Electron Imaging	SIMS primary ion energy depends on implant energy Under development Under development
Boron (low energy)	Quadrupole SIMS	Low energy SIMS, oxygen flooding
Arsenic (low energy)	Quadrupole SIMS	Low energy SIMS, cesium ion bombardment, oxygen flooding
Phosphorus (low energy)	Magnetic Sector Mass Spectrometer	Detection limit of 1 x 10^{16} at/cm^3
Energy Contamination	Quadrupole and Magnetic SIMS	Technique depends on ion implant species and implant energy

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CONTRACT ANALYTICAL SERVICES — SPECIFICATION DATA

Physical Property	Analysis Technique	Comments
Roughness		
Front and backside	Atomic Force Microscopy (AFM)	Nominal 1–2 nm lateral and 0.01 nm vertical resolution
Oxide Thickness	X-ray Photoelectron Spectroscopy (XPS/ESCA)	Surface oxide protocol, 0–10 nm
Junction Formation	Transmission Electron Microscopy (TEM) Scanning Resistance Probe (SRP)	High precision cross-section or plan view Electrically active depth profiles
Crystal Damage	Rutherford Backscattering Spectrometry (RBS), Field Emission SEM	Channeling

Contaminants	Analysis Technique	Comments
Metals		
Aluminum	SurfaceSIMS*	High mass resolution analysis, DL ~ 0.05×10^{10} at/cm^2
Sodium	SurfaceSIMS*	DL ~ 0.01×10^{10} at/cm^2
Lithium	SurfaceSIMS	DL ~ 0.001×10^{10} at/cm^2
Carbon	Quadrupole SIMS	Near-surface measurement, DL ~ 5×10^{10} at/cm^2
Iron	SurfaceSIMS*	High mass resolution analysis, DL ~ 0.08×10^{10} at/cm^2
Chromium	SurfaceSIMS	High mass resolution analysis, DL ~ 0.01×10^{10} at/cm^2
K to W	Total Reflection X-ray Fluorescence** (TXRF)	Elemental survey, DL ~ 0.5–5 $\times 10^{10}$ at/cm^2
Stain/Residue		
	Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS)	Elemental survey, organic/elemental mapping
	Fourier Transform Infrared Spectroscopy (μ-FTIR)	Surface identification of inorganics/ organics. Film >0.1 μm
	X-ray Photoelectron Spectroscopy (XPS/ESCA)	Chemical states, organic/inorganic, DL ~ 0.01–1 at%
	Atomic Force Microscopy (AFM)	Etch haze, microroughness, texture, ≥5 μm peak to peak
Particles		
≥10 nm	Field Emission Auger Electron Spectroscopy (FE-AES)	Elemental identification and mapping (0.1–1 at%)
≥1 μm	Energy Dispersive X-ray Spectroscopy (EDS) Micro Raman Spectroscopy (μ-Raman)	Elemental survey (0.1–1 at%)
≥0.1 μm	Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS)	Elemental survey, organic/elemental mapping

Evaluating Bond Pad Performance

Oxide thickness on aluminum bond pads is of critical importance in evaluating pad performance. Typical oxide layers on well functioning bond pads range from 25 to 50 Å. Thicker layers result in weak wire bonding and low or no electrical conductivity. Measuring oxide thickness provides a way to understand bond pad failure and to predict pad performance. The detection of other elements (e.g. fluorine) can provide insight into other problems, such as bond pad corrosion.

Figure 1 shows a FE-AES (Field Emission-Auger Electron Spectroscopy) depth profile into a well functioning bond pad. The oxide thickness was estimated to be ~45 Å. A similar profile for a failed bond pad, shown in Figure 2, gives an oxide thickness of ~120 Å.

Figure 3 shows a surface survey spectrum of a failed bond pad with carbon, oxygen, fluorine and aluminum present. The high levels of fluorine are observed through the oxide layer of the bond pad, suggesting that corrosion observed on the pad is catalyzed by fluoride ions.

Figure 1. Depth Profile Into a Well Functioning Bond Pad

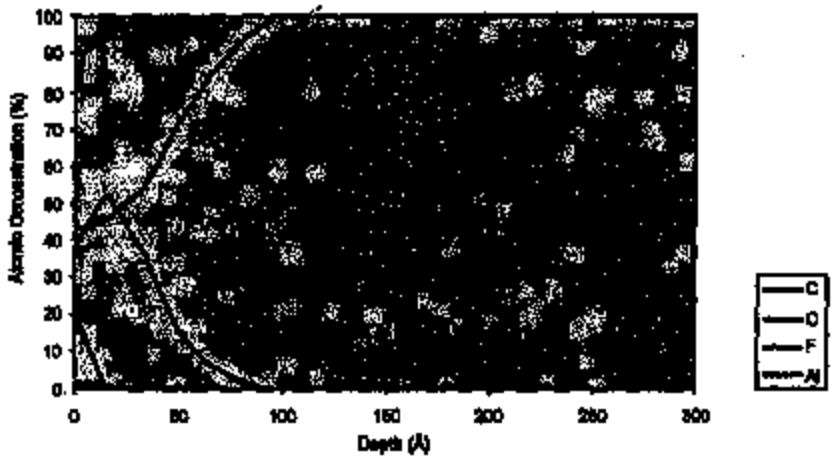


Figure 2. Depth Profile Into a Failed Bond Pad

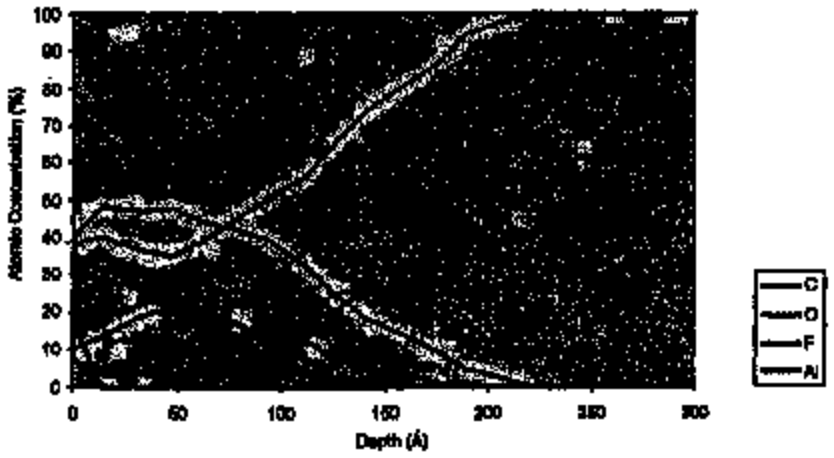
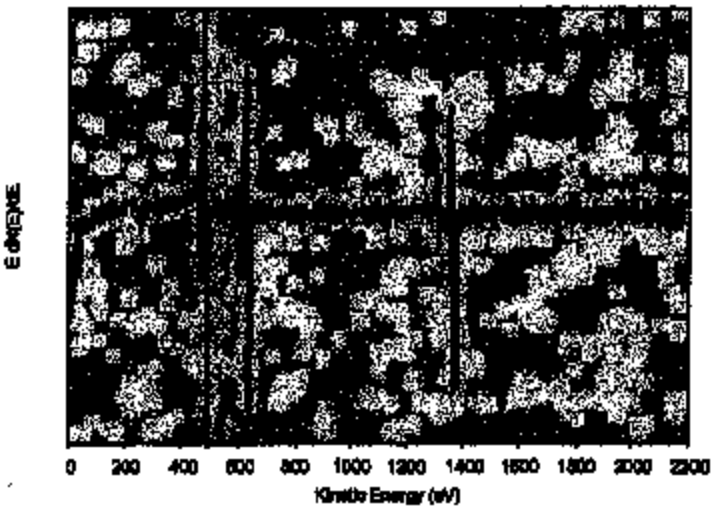


Figure 3. Surface Survey Spectrum of a Failed Bond Pad



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APPLICATION NOTE

Choosing the Appropriate Analytical Technique

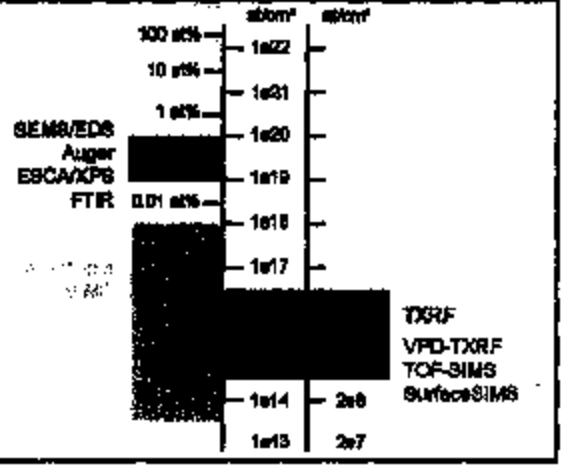
Which Analytical Technique?

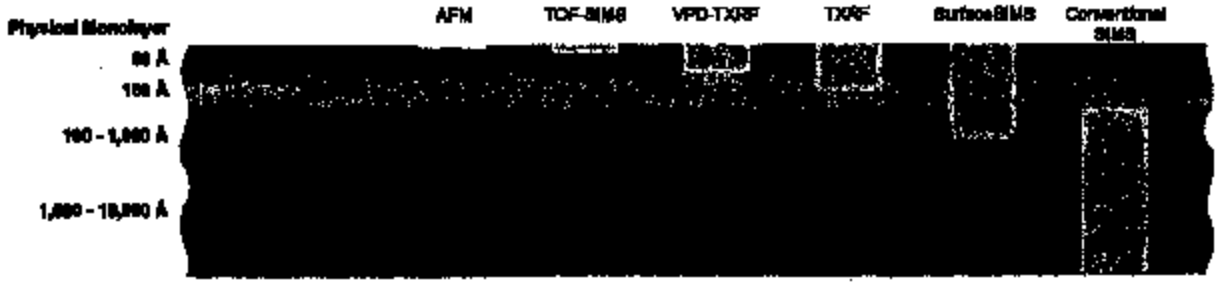
The appropriate analytical techniques must be used to determine the cause of problems such as processing failures or low yields. This is important to minimize the costly down time associated with troubleshooting. The choice of analytical technique depends on the contaminant:

- type: particulate, organic, or non-organic
- distribution within the sample
- size and surface area
- concentration

In general, a survey analysis is recommended as the first procedure in troubleshooting. This provides an overview of the possible contaminants that may be present. For example, TXRF provides a quantitative survey of transition and heavy metals through the native oxide and 30-50 Å below a wafer surface. TOF-SIMS provides a qualitative survey of organic and inorganic contaminants in the top monolayers of a surface. With this information, process engineers can identify culprit contaminants responsible for the processing and yield problems. Further evaluation and quantification of the contaminants can be provided by other techniques. For Example, SurfaceSIMS can probe the silicon wafer with greater specificity and provide additional depth distribution information of the contaminant. Our experienced staff of analysts can help you determine the best approach to solving your contamination problem. Contact your local EAG laboratory for assistance.

VPD-TXRF	whole wafer	whole 300mm wafer
TXRF	10 mm	whole 300mm wafer
Lifetime	1 mm	whole 200mm wafer
ESCA/XPS	10 µm	2"
SIMS	20µm	1-2"
µ-ESCA/XPS	10µm	whole 200mm wafer
FTIR	5µm	whole 300mm wafer
SEM/EDS	0.5µm	whole 200mm wafer
TOF-SIMS	2000Å	whole 200mm wafer
Auger	1000Å	1"
FE Auger	150Å	2"
AFM	50Å	whole 300 wafer





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- highly trained and experienced technical staff
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- B and C bulk analysis in Si
- Thin SiOx gate dielectrics
- MIC and thin coatings

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Raman Spectroscopy measures the intensity of light inelastically scattered off a sample as a function of wavelength. As incident laser source chemical bonds in the sample in gain or lose characteristic amounts of energy that correspond to different vibrational modes in the bonds. With our advanced attachment, we can analyze areas as small as 1 μm. We use Raman to determine the structural properties of inorganic and organic compounds - particularly carbon, crystalline materials, polymers, and lithography.

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DIMENSION 3100 AND 5000

We have a wide assortment of supporting tools to perform AFM/STM (contact), magnetic capacitance, and tapping mode SPM analyses. Our AFM can accept full 200 mm (8-inch) wafers. The primary purpose of these instruments is to quantitatively measure surface roughness with vertical 1.5-4 Å rms interest and 0.1 Å vertical resolution on all types of samples. Typical applications include measuring the surface roughness of semiconductor wafers, optical components, and hard disk drives.

TOF-SIMS — PHI TRI I (TWO, ONE WITH COLD STAGE)
PHI TRIFT II™ (TWO, ONE WITH 300 MM STAGE)
PHI 6600/TOF WITH COLD STAGE

The TOF-SIMS instruments offer high mass resolution and mass accuracy for monolayer identification of organic compounds and inorganic elemental contamination on surfaces. TOF-SIMS analyses over a mass range of 1-10,000 amu and provides information about the distribution of chemical species with an optimum spatial resolution of 100 nm. The cold stage permits the analysis of volatile organic components. The TRIFT II™ sample stage accepts full 200 mm wafers and is also equipped with state-of-the-art primary ion sources that can be used for depth profiling and for high-sensitivity measurements of elemental contamination. Other applications include evaluation of surface contamination, defect identification, and determination of surface treatment uniformity.

XPS/ESCA — PHI QUANTUM 2000 SCANNING ESCA MICROPROBE (TWO)
PHI MODEL 5500 (TWO) AND PHI MODEL 5600
BOTH WITH ZALAR™ ROTATION; PHI MODEL 5700
LAST WITH 300 MM SAMPLE CAPABILITY

XPS/ESCA is a versatile tool capable of providing quantitative elemental and chemical state analysis on virtually any vacuum compatible surface. Our complete set of complementary analytical instruments gives unsurpassed insight over the widest range of applications. The Quantum 2000 Scanning ESCA Microprobe offers practical analysis on features as small as 10 μm, making it useful for a range of applications such as bond pad analysis. The Model 5600/5800 offers unique sensitivity for detection and quantification of low level contaminants, the highest spectral resolution the superior chemical state specialties, and powerful depth profiling capabilities for tantalizing and confusing samples. The Model 5700/5800 features a 300 mm sample introduction system and a minimum analytical area of 50 μm. Powerful data analysis routines complement superior instrument performance to produce unique capabilities in data interpretation and chemical quantitation.

AES — PHI MODEL 670 (TWO), 680 (THREE), ALL THIN EMISSION WITH PHI MODEL 6600 AND 680 WITH ZALAR™ ROTATION, PHI SUMMIT 2000

The Model 670 and 680 feature a thermal field emitter for exceptional spatial resolution. Spatial resolution of 10 nm is routinely achieved with this instrument for elemental analysis of particles and very small features found on semiconductor, metals, electronic devices, and other materials. An in-house gold fracture stage for the 670 allows fracturing to be studied without atmospheric contamination. The Model 680 features spatial resolution of better than 500 nm, a Duoplasmatron stage, and Zalar Rotation for high resolution depth profiling. The Model 6300 has Zalar Rotation and is configured for high depth resolution (1 nm) profiling. Post processing of data using PHI AUTLAB® Target Factor Analysis (TFA) allows the excellent quantitation of TiN, TiO_2, SiO_2, and Cl in Al, etc.

TEMP — TECNAI® TF30 G²UT (TWIN)

The G²UT is the advanced instrument from Tecnai featuring both TEM and STEM modes to cover a wider elemental range (Z to U), with excellent detection limits. It is designed for EDS, EELS, EFTEM, and can even be used to analyze other similar pieces of optically flat materials. Detection limits have been improved to 4 x 10⁻⁴ g/cm² for Fe, for example. This instrument is used primarily to measure trace levels of surface contaminants on semiconductor wafers and optically flat glass components.

TECNAI® TF30 G²UT

The TWIN G²UT is the first 300 kV TEM outside of Japan. As with the FEG, it has both TEM and STEM modes to cover a wide range of elements. It automatically loads 200 mm wafers from standard SEMI-wafer cassettes. Detection limits are optimized in the STEM (above).

XRF — KEVEX OMICRON

X-ray fluorescence is a non-destructive technique that can identify and quantify elemental constituents of solids, liquids, and thin films. XRF is sensitive to elements with atomic numbers from sodium to uranium and concentrations from tens of ppm to 100 wt %. X-rays that a fluorescent X-ray take excite atoms in the sample and cause them to emit X-rays with energies characteristic of the atoms. With appropriate reference materials, accurate quantification of the elemental composition of both solid and liquid samples can be performed.

RBS/PIXE — PHI 5415-400 ERD STATION WITH RBC & 8kV ACCELERATOR

Rutherford Backscattering Spectrometry (RBS) is a non-destructive technique available for quantitatively measuring thickness/composition of thin films on samples up to about 2 μm in depth. Particle Induced X-ray Emission (PIXE) measures X-rays in conjunction with RBS to give more detailed information about heavy elements. Typical materials analyzed with RBS include chemical, temperature, and barrier films in semiconductor devices, high temperature superconductor (HTSC), optical/glass coatings, and magnetic media. RBS/PIXE/HFS spectra are analyzed using PHI's RUMP software.

HFS — PHI 5415-400 ERD STATION WITH RBC & 8kV ACCELERATOR

Hydrogen Forward Scattering (HFS) is a non-destructive technique used to quantitatively measure H & D in thin layers. HFS can analyze H to a depth of 800 nm with 10 nm depth resolution and is often used to measure the amount of H in CVD oxide and nitride films, and the amorphous content layer of hard disk media.

FIB — FEI 611A 823A 8yx WITH LIGHT ELEMENT EDS

This versatile tool has a 200 mm stage, 3 mm Z height, 7 mm Y/X height, defect review software, gain plus available, metal deposition, selective oxide etch, sidewalls etch, probe etch and image manipulation. Cross section and thin section sample preparation of difficult materials is the top use of this tool.

HI RES TEM — JEOL 4000EX (TWIN), 4000

These high resolution TEMs (TEM/STEM) feature a single crystal <310> tungsten cold cathode for 1.5 eV resolution at 80 kV and enhanced contrast at least 10% secondary electron and backscatter imaging capability. These instruments are best suited for imaging precision polished cross sections of integrated circuits with very high spatial resolution. One 4000EX additionally has a digital image system used for CD Metrology. A 200 mm wafer capability, and a symmetric channel plate electron detector. Another 4000EX is fitted with EDS.

HI RES TEM — JEOL 4000 & HITACHI H-9000NAR (HIGH-RESOLUTION LENS)

In the JEOL 4000, the sample resides in the final lens of the electron column, which provides a unique compact mechanism for dramatically enhanced image resolution. This instrument is used primarily for imaging lube films, such as FCA layers, and nanometer scale features, such as the core structure of rubber and polymers. A transmitted electron detector allows for high resolution STEM imaging as well. The Hitachi H-9000 combines the high resolution of the transmission lens design with the flexibility of a 150 mm stage.

SEM/EDS — JEOL 5300, 5900LV, 6400, 6460
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These general purpose SEMs feature image resolution of 4.5 nm and full analytical capability. The 5900 functions are configured with atmospheric vide chamber to extend the elemental range down to Be. The 5900 SEMPLE can handle 200 mm wafers (LVmode shielding), 2 cm image non-conductive, uncoated samples (some wet samples) at pressures up to several torr. EDS 5400 has an EDAX/DX4 system.

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Our FTIRs have attenuated capability with the NicPlan microscope which can analyze areas as small as 10 μm. The IRs are capable of analyzing samples in transmission, reflectance, and total attenuated reflectance modes. The instruments are used for bulk and surface identification of organic materials, including films, thin films, particles, and liquids. An extensive library of reference spectra makes this technique particularly useful for identifying organic materials, and more inorganic materials.

GC/MS — VG TRIO 2000
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GC/MS is the industry standard technique for identifying and quantifying trace organic components in solvents. GC/MS combines gas chromatography, which separates various components in a mixture according to their relative affinity for the column coating, and mass spectrometry, which obtains mass spectra of components as they exit the GC. We also have the capability to analyze samples introduced into the mass spectrometer with a direct probe or a pyrolysis probe. An important application of GC/MS is outgassing analysis.

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- **Destructive Physical Analysis (DPA)** **Is the process of disassembling, testing, and inspecting a component for the purpose of determining conformance with applicable design and process requirements. This process of sample testing is used to ensure that a high reliability component or device is fabricated to the required standards. Destructive Physical Analysis is also used effectively to discover process defects for troublesome production lot problems.**

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- **Failure Analysis** **Capabilities of Tandex Test Labs are extremely important to support our in-house manufacturing efforts and are also available to analyze customer component and equipment problems. Techniques and equipment utilized in providing our Destructive Physical Analysis capability are also used effectively to analyze failures, determine failure causes, and recommend corrective actions. These failure analysis capabilities are exceptionally important in finding early solutions to troublesome production problems that show up as device or component failures.**

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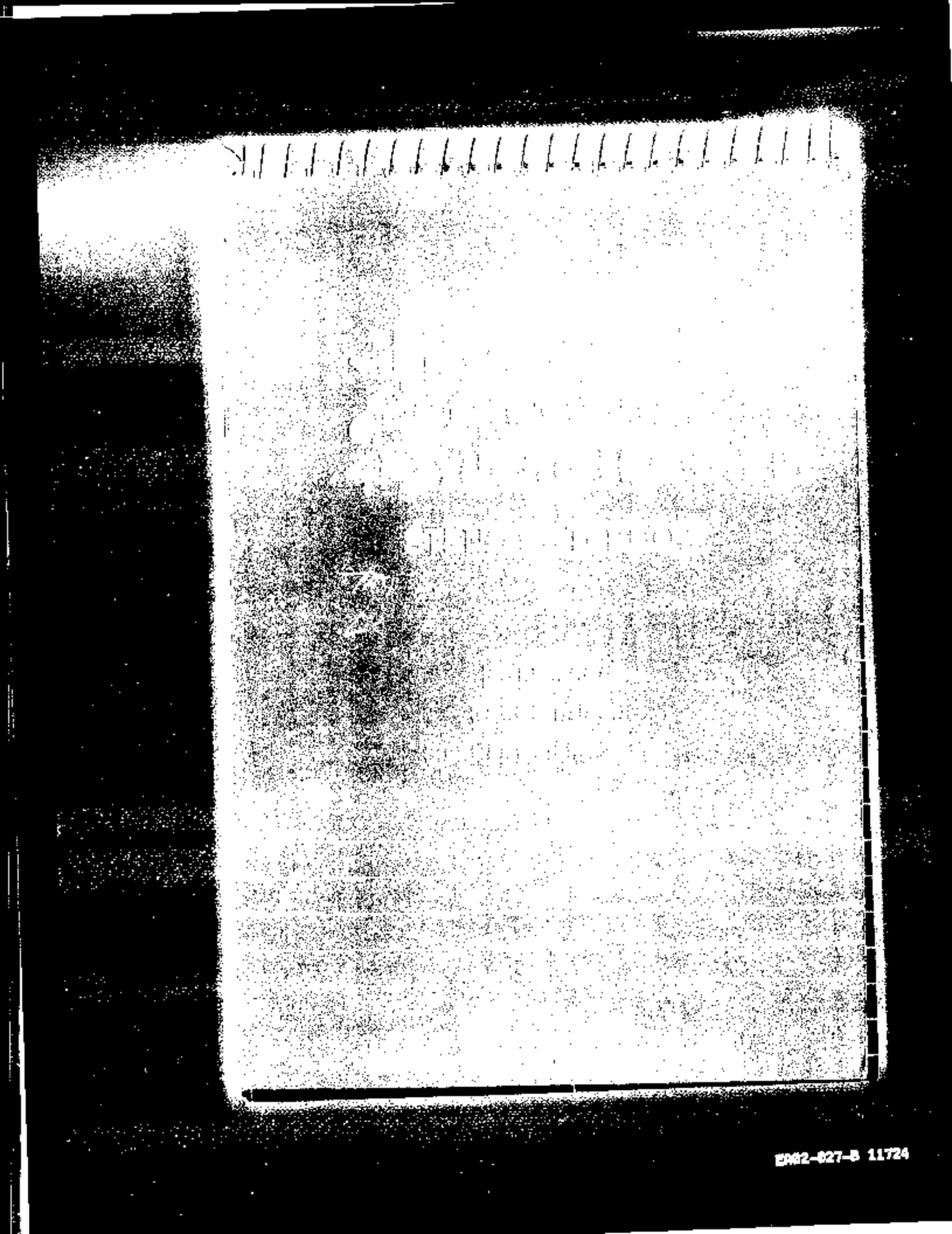

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ZARLINK SEMICONDUCTOR

Application Note MSAN-107
Understanding and Eliminating Latch-Up In CMOS Applications

ISSUE 1 July 1993

Contents

Introduction

The purpose of this Application Note is to assist both those designers who are familiar with the use of CMOS devices as well as those considering CMOS designs for the first time.

Attracted by the many advantages offered by CMOS devices, designers using them for the first time are often unaware of, or are overly sensitive to the phenomenom of latch-up. Understanding a few facts will resolve both of these situations. Basically speaking, any analog or digital device fabricated in one of the many CMOS processes available, can be made to latch-up if stressed severely enough. However, when properly applied, CMOS devices are quite insensitive to actual conditions that exist in most systems. Further, if a few simple precautions are taken at the design stage, then latch-up can be completely avoided.

Latch-up is defined as the creation of a low impedance path between the power supply rails by the triggering of parasitic, four-layer bipolar structures (SCR's) inherent in CMOS input and output circuitry. In this note, details of these SCR structures are examined in the context of Zarlink's ISO-CMOS technology. By developing an understanding of the aspects of circuit and system design related to the triggering of these SCR's, design methods and guidelines can be acquired to greatly reduce the probability of latch-up occurrence. By implementing the suggested techniques and circuitry, the designer can gain the advantages of CMOS circuitry without major concern about latch-up related problems.

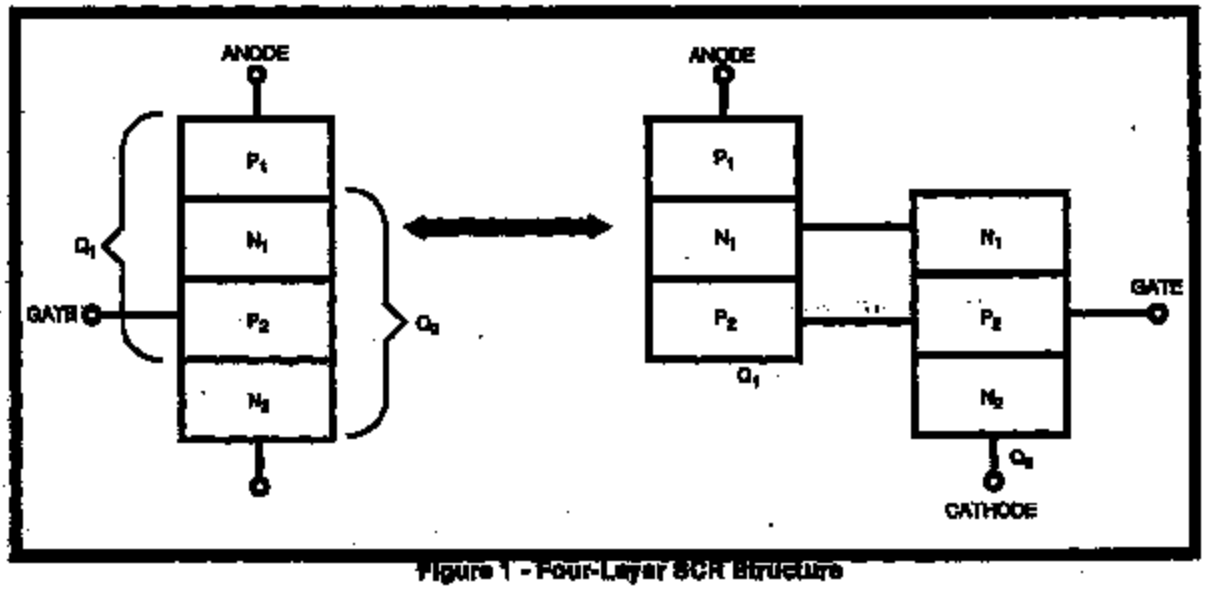

Figure 1 - Four-Layer SCR Structure

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Semiconductor Device Considerations

Background on SCR's

Prior to discussing latch-up in CMOS devices, it is advantageous to briefly review the basic theory of SCR operation. This will be helpful in developing an understanding of the relationships between external circuit and system conditions and the resultant triggering of latch-up in CMOS devices. The basic SCR structure is that of a four-layer device as shown in Fig. 1. The device has three terminals: Anode, Cathode and Gate. Fig. 2 shows how the SCR can be modelled with two bipolar transistors, one NPN and one PNP. In the normal mode of operation, the SCR is turned on by injecting sufficient current into the base of Q_2 to turn this transistor on. When this is done, Q_2 begins to draw collector current via the base-emitter junction of Q_1. As a result Q_1 also turns on, injecting additional current into Q_2's base. This in turn causes Q_2 to turn on harder, supplying more base current to Q_1. This positive feedback arrangement sustains conduction, and ensures that the SCR continues to conduct even if the gate current is interrupted.

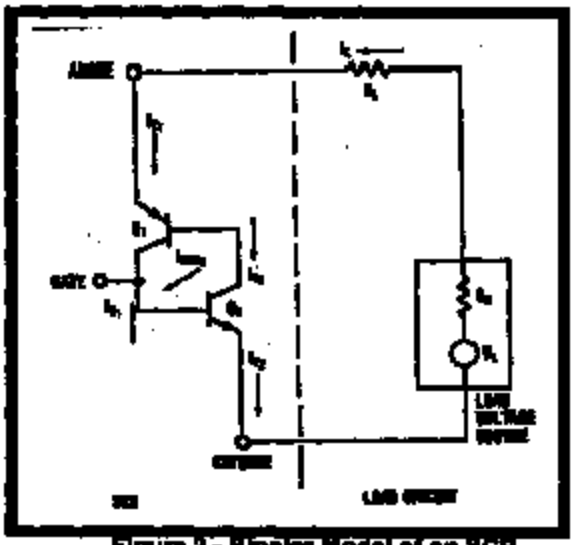

Figure 2 - Bipolar Model of an SCR

The device will remain in this latched state indefinitely. To turn the SCR off, one of two things can be done. If the voltage applied across the SCR is reduced to the point where Q_1's base-emitter junction turns off (V_{Sus}), then Q_2 will be starved of base current and the SCR will turn off. Alternatively, if the current through the SCR is reduced below its holding current then it will also turn off. The holding current is the minimum current required to sustain conduction and is a function of the physical dimensions of the device and the transistor gains (Fig. 3). As mentioned, this is the way that the SCR is controlled in normal applications. There are various other ways that an SCR may be triggered. These must be examined as they are directly related to latch-up problems.

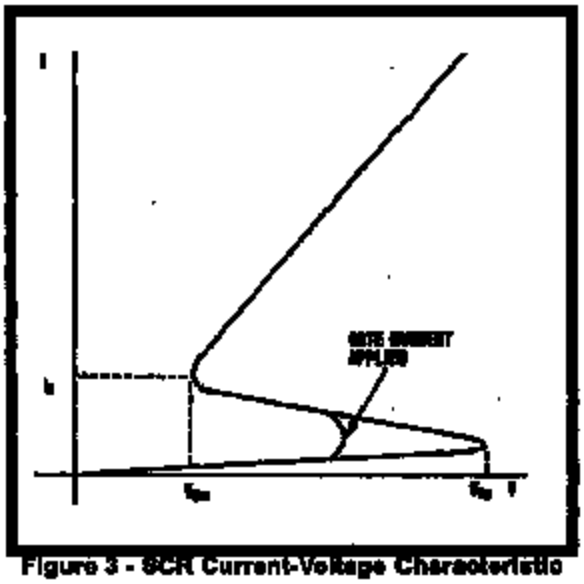

Figure 3 - SCR Current-Voltage Characteristic

Looking at Fig. 2, it can be seen that the load current and the two emitter currents of Q_1 and Q_2 are all equal. Also the load current is equal to the sums of the two collector currents and a leakage current from Q_2's collector to its base (I_{CBO2}). It can be shown (refer to Appendix) that:

$$I_L = I_{CBO2}\left[\frac{(1+B_1)(1+B_2)}{(1-B_1B_2)}\right] \quad (1)$$

Where B_1 and B_2 are the current gains of Q_1 and Q_2 respectively.

Normally, with no base current supplied to Q_2, the load current will be small since the leakage I_{CBO2} is small, as are the current gains (B_1, B_2) at this low value of collector current. If however, the current gains increase to the point where the product, B_1 B_2, approaches unity, then the load current will become very large, limited only by the load impedance, the series impedance of the SCR, and source impedance of the power supply.There are various applied conditions that will cause this to happen. Increasing the load voltage beyond the breakover voltage, V_{BO}, will have this effect. As the anode-cathode voltage across the SCR increases, the collector-emitter voltages of Q_1 and Q_2 also increase. This corresponds to increases in the collector-base reverse biases. The collector-base junctions of the two transistors are physically the same area, the N_1-P_2 junction (Fig. 1). As the

reverse bias increases, the energy of the minority carriers increases causing more carriers to be dislodged, which in turn pick up energy. This continues until the junction undergoes an avalanche breakdown resulting in an increase in the collector currents of Q_1 and Q_2. The resulting increase in B_1 and B_2 cause the SCR to latch on.

A very rapid change in the anode to cathode voltage of an SCR can also cause it to trigger. This is known as the "dV/dt" effect. The N_1-P_2 junction, being reversed biased, exhibits a capacitance. This capacitance varies with the reverse bias voltage applied across the junction. Hence the current through the capacitor is described by:

$$\frac{d(C_j V_{AK})}{dt} \qquad (2)$$

$$= \frac{C_j dV_{AK}}{dt} + \frac{V_{AK} dC_j}{dt} \qquad (3)$$

The junction capacitance, C_j decreases with increasing reverse bias and hence the second term of equation (3) is negative. If, however, the rate of change of applied voltage is large enough, the first term of equation (3) will dominate and the current through the SCR will increase. If the current increases sufficiently to cause the B_1B_2 product to approach unity, then the SCR will latch on.

The effects of temperature must also be noted at this point. Increasing temperature will cause an increase in both the leakage current through the SCR and in the current gains B_1 B_2 of the two bipolar transistors. As such, the magnitude of the driving force required to turn the SCR on will decrease with increasing temperature. In other words, the SCR will be more easily triggered as temperature increases for any of the triggering mechanisms described.

Corollaries exist between each of the three methods of turning an SCR on as described, and the ways in which the parasitic SCR structures of CMOS devices are triggered. The normal mode of triggering an SCR is by injecting current into its gate terminal. This corresponds to forcing current into the inputs or outputs of a CMOS device by applying voltages that go outside of the power supply rails. This is by far the most common form of latch-up triggering. The avalanche breakdown mechanism described also applies directly to CMOS devices, although its occurrence is far less prevalent. Excessive voltage on the power supply pins, whether continuous or transient, may result in latch-up occurrence. It is also theoretically possible to trigger parasitic SCR devices by the dV/dt method as a result of high speed transients on the supply rails. However, this will rarely happen in a real application. Each of these triggering methods will be examined in the next section in the context of the ISO-CMOS topology for both the output and input structures.

Parasitic Bipolar Structures in the ISO-CMOS Topology

As with any CMOS technology, ISO-CMOS contains certain parasitic bipolar structures associated with its output devices and input protection circuitry. These parasitic transistors are interconnected in such a way as to form four-layer devices. As such, SCR devices are present at both the inputs and outputs of ISO-CMOS circuits. These devices are normally in their off state and will remain off as long as the absolute maximum ratings of the devices are not exceeded.

Output SCR Structures

A typical ISO-CMOS output driver contains one N-channel MOSFET with its source tied to V_{SS} and one P-channel MOSFET with its source tied to V_{DD}. The drains of the two transistors are connected together to form the output and the gates are commoned to form the input (Fig. 4). The fabrication of these transistors in close proximity results in the formation of a parasitic SCR connected directly across the power supply rails. When triggered, this SCR presents a low impedance to the power supply causing excessive current to flow. This situation is potentially destructive, resulting in damage to bond wires or metal supply tracks on the die due to localized overheating. The SCR is formed as follows. A vertical NPN transistor results from the fabrication of the N-channel device. The N- substrate serves as the collector and is biased at V_{DD}. The P- well acts as the base and the source and drain N- diffusions are the emitters of the transistor. One emitter is tied to V_{SS} and the other to the output. A wide base lateral PNP transistor is formed when a P-channel device is located close to a N-channel transistor. The P-channel source and

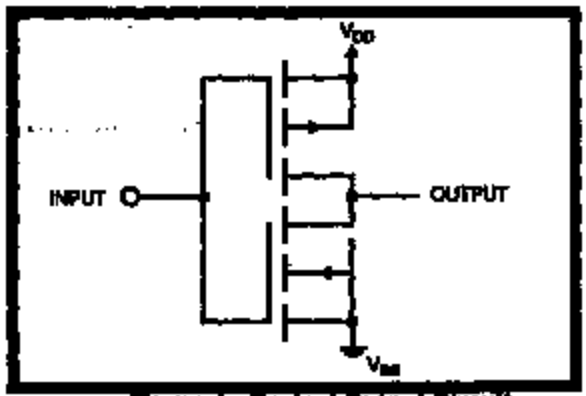

Figure 4 - Typical Output Circuit

drain diffusions are two emitters of the transistor: one tied to V_{DD} and the other to the output. The N- substrate acts as the base and hence, is in common with the collector of the vertical NPN. The P- well is the collector of the PNP which is also base of the NPN. Due to the shared diffusions, the vertical NPN and lateral PNP transistors are effectively connected as an SCR (Fig. 5). This parasitic SCR is connected directly across the supply rails. Hence, when triggered, it can cause excessive current to flow. The SCR is normally turned off for nominal operating supply voltages and with all output voltages within the power supply limits. This SCR may be externally triggered causing the output structure to latch-up. The triggering mechanism can be any one of those mentioned in the previous section.

Output voltages being forced outside of the power supply limits is the most common cause of output latch-up. Two parameters are defined at this point for use in subsequent discussions. These are I_{LU} and V_{LU}. I_{LU} is the current which must flow through the output structure to cause latch-up to occur. V_{LU} is the voltage excursion outside of the power supply rails at the output pin that results in I_{LU} flowing through the output structure. In other words I_{LU} and V_{LU} are the conditions at the output pin that will result in latch-up triggering. These same parameters also apply to input latch-up (see next section). Consider first an output voltage which goes below V_{SS} by more than V_{LU}. This causes the P- well to output base-emitter junction of the vertical NPN transistor to become forward biased. Since this acts as the SCR gate, triggering occurs. Current is pulled from V_{DD} through the lateral PNP and is injected into the P- well, causing a localized drop across this diffusion. This voltage drop will forward bias the base-emitter junction of the NPN which is referenced to V_{SS}. Once this occurs, latch-up will be sustained and a low impedance path is created from V_{DD} to V_{SS}.

A note must be taken here in regard to the amount of over-voltage required to trigger latch-up. In the above paragraph, it was mentioned that voltages exceeding the supply rails by more than V_{LU} will cause a current I_{LU} to flow and hence trigger latch-up. The guaranteed values quoted in the data sheet are 0.3V and 10mA respectively for these parameters. These limits are used in production testing and hence, appear in the Absolute Maximum Ratings for Zarlink devices. In practice, it is more likely to require from 0.6V to 2V of over-voltage and from 50 to several hundred milliamps of current to cause output latch-up to occur. For input latch-up to occur, it can take several volts of over-voltage and similar currents to induce latch-up due to the series resistance of the input protection circuitry (Fig. 6).

When the V_{DD} supply rail is exceeded by a voltage greater than V_{LU}, a similar set of events occurs. In this case, the output to substrate base-emitter junction of the lateral PNP becomes forward biased. Collector current from this transistors injected into the P- well, again causing a lateral voltage drop. This voltage drop causes the P- well to V_{SS} referenced base-emitter junction of the NPN to become forward biased. This transistor's collector current, pulled from the substrate, causes a lateral voltage drop across the substrate. This voltage drop, in turn, will forward bias the V_{DD} to substrate base-emitter junction of the PNP. Thus, latch-up will be sustained even if the output over-voltage condition is removed and a low impedance path again exists between V_{DD} and V_{SS}.

There are two other causes of output latch-up that are less likely to occur, but nonetheless must be noted. The first of these is the result of over-voltages on the power supply pins. Excessive voltage between V_{DD} and V_{SS} (i.e., greater than the absolute maximum rating) can cause an avalanche breakdown of the reverse biased substrate to P- well collector base junction of the bipolar transistors.

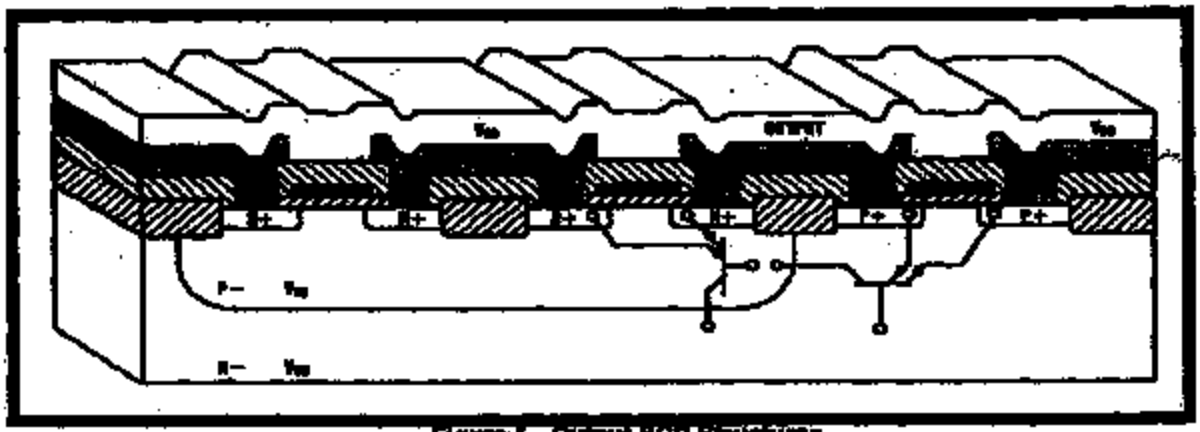

Figure 5 - Output SCR Structures

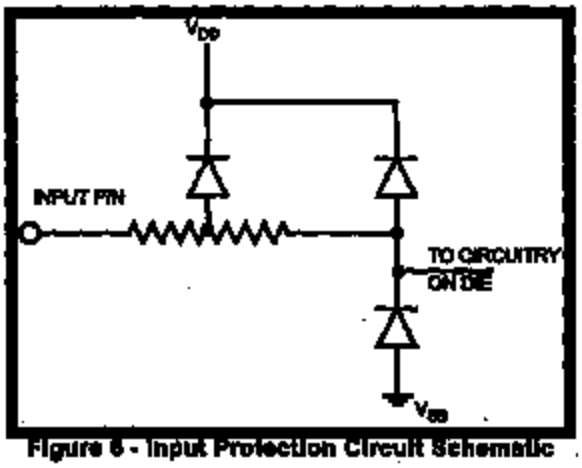

Figure 6 - Input Protection Circuit Schematic

This will cause the SCR to trigger as outlined in the previous section. The second triggering mechanism will be apparent in very few systems. Very fast voltage spikes on the power supply rails can induce a "dV/dt" triggering of the SCR, also as outlined earlier. This can potentially result in circuit damage by transients which in themselves would not have sufficient energy to cause damage due to localized power dissipation. Once triggered, the SCR may remain latched on until the supply voltage is reduced below its sustaining voltage or if the current is reduced below its holding current.

Input SCR Structures

Parasitic SCR structures can also result due to the fabrication of CMOS input protection circuitry. The ISO-CMOS input protection circuit schematic is shown in Fig. 6. As shown, there is a distributed diode connected to V_{DD} and another diode to V_{SS}. The series resistor is primarily intended for static protection, but also provides latch-up protection. The diodes are connected together at the input node. An SCR structure results when the V_{DD} referenced diode is fabricated in close proximity to an N-channel transistor (Fig. 7) or when the V_{SS} referenced diode is located close to a P-channel device. (Fig. 8).

It is important to note here the difference between input and output SCR structures. The output SCR was connected directly between V_{DD} and V_{SS}, and hence, is more likely to be destructive once triggered. The input SCR structure is connected from the input node to one of the supply rails. Thus, for an input to remain latched, the circuitry driving the input must be capable of supplying the sustaining current of the SCR. For this latch-up to be destructive, the input driver must be capable of supplying large amounts of current. A potentially more dangerous situation occurs when a complimentary transistor, to the one forming the SCR, is located nearby. A secondary SCR structure results from this and it is connected across the supply rails (Figs. 7 and 8).

Consider the V_{SS} referenced diode situation first. The source and drain diffusions of the P-channel transistor form the emitters of a lateral PNP transistor. The substrate acts as the base and the P-diffusion of the diode is the collector. This diode, with the substrate, forms a vertical NPN transistor. The two transistors are interconnected as an SCR due to common diffusion areas. If an applied input voltage is below V_{SS} by more than V_{LU}, then the gate-cathode junction of the SCR will become forward biased and turn the SCR on. This latch-up condition will continue as long as this input condition persists or if the input circuitry can supply the minimum holding current. As mentioned, a potentially more hazardous situation can develop if an N-channel transistor is also located nearby. The P-well of this transistor serves as a second collector of the lateral PNP transistor. When the input voltage goes negative, the gate of the SCR is turned on as mentioned. However, this second collector now injects current into the P- well causing a second SCR

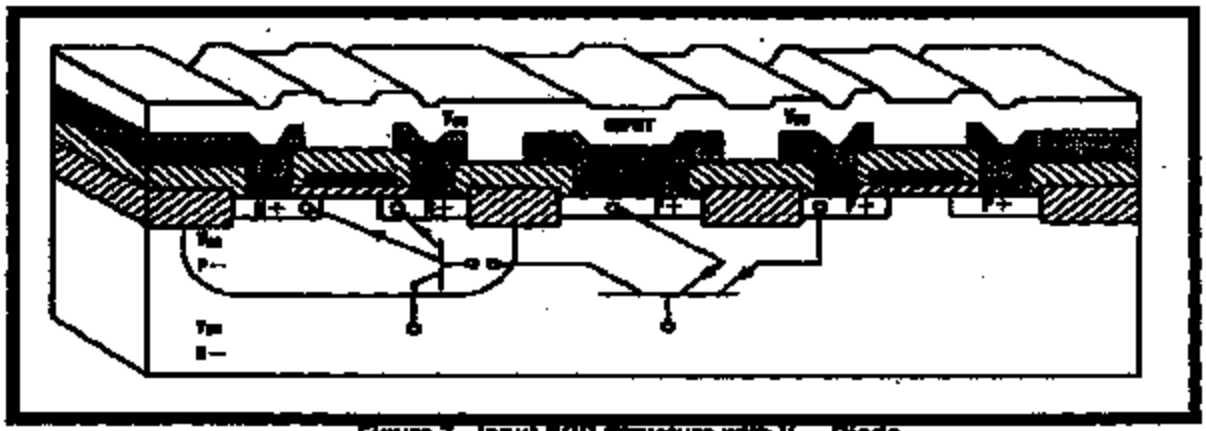

Figure 7 - Input SCR Structure with V_{DD} Diode

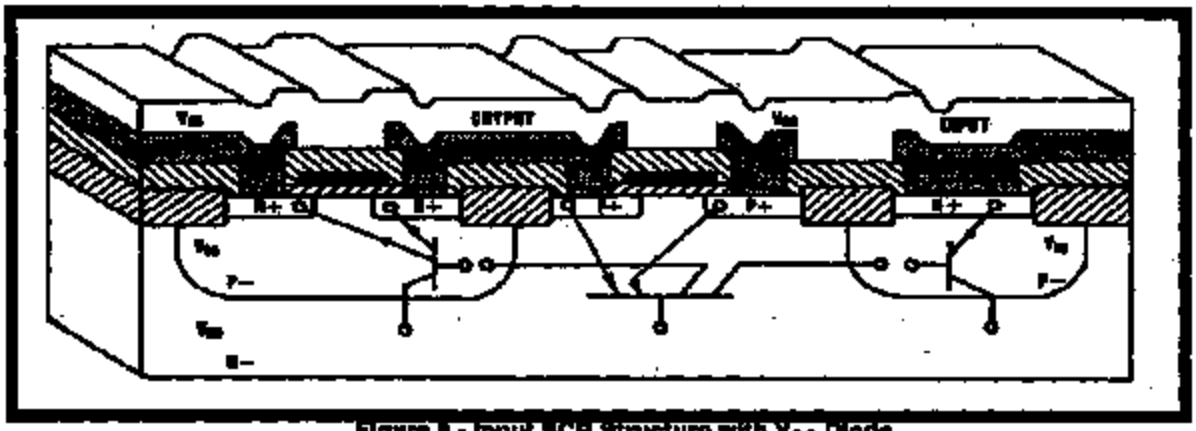

Figure 8 - Input SCR Structure with V_{SS} Diode

Forced I/O Condition	Latch-Up Inducing Conditions	
	V_{LU} (Volts)	I_{LU} (mA)
Outputs above V_{DD}	1.9	200
Outputs below V_{SS}	1.0	90
Inputs above V_{DD}	1.9	80
Inputs below V_{SS}	25.0	25

Table 1. MD74SC540AC Latch-up Inducing Voltages and Currents

structure to latch on. This device is connected across the power supply rails and hence, can be destructive. This same situation can result with the V_{DD} referenced protection diode. In this case, SCR structures will be triggered by voltages which exceed V_{DD} by more than V_{LU}.

As was mentioned earlier, the actual values of V_{LU} and I_{LU} are typically much greater than the 0.3V and 10mA limits on the data sheets. Table 1 shows some of the numbers pertaining to the current production version of the MD74SC540AC, one of Zarlink's Octal Interface devices. As can be seen it requires voltages from 1.0V to 1.9V and currents from 90 to 200mA to trigger output latch-up. On the input side, it requires 1.9V for V_{LU} and 80mA for I_{LU} in the V_{DD} case. For the V_{SS} case, I_{LU} is only 25mA, but V_{LU} is 25V and hence this situation would virtually never exist in a system. It has been empirically determined that if a device exhibits values of I_{LU} exceeding a few volts, then this device will be extremely insensitive to latch-up in the majority of circuits and systems. A severe system fault would be required to induce latch-up in such devices.

System and Circuit Considerations

In the majority of systems and circuits using CMOS devices, latch-up should not be a major cause for concern. Being aware of the sources of latch-up problems will aid the designer in even further reducing the probability of latch-up damage to his circuits. Implementing some of the precautionary measures suggested in the following sections will ensure a trouble-free system.

The aspects of system and circuit design that can result in latch-up occurrence will be examined in the context of a "worst case" system example. In other words, systems containing combinations of the attributes of the example system will be more likely to experience latch-up problems. The relationships between these systems aspects and the resultant latch-up triggering mechanisms will be described. Suggestions will be made intent upon reducing the risk of triggering the parasitic SCR's through careful design techniques. The protection circuits, which will be illustrated, should help in preventing circuit damage in case latch-up occurs. It should be noted at this point, that in systems where the input and output pins of the CMOS devices never go outside of the power supply rails either during power-up or in continuous operation, latch-up is not likely to ever occour. The first step, then, is to define a system which contains various components that qualify it for a "worst case" rating in a latch-up sense.

A "Worst Case" System

A circuit or system which has all of the following attributes and/or capabilities is more likely to experience latch-up problems. This is not to say that latch-up is inevitable in systems containing many of these attributes, only that the designer must be aware of potential problems and take steps at the design stage to avoid them. The following list summarizes the system aspects most likely to be associated with latch-up problems:

1) System operation/maintenance procedures allow insertion or removal of printed circuit cards with system power applied.

2) The system is powered by multiple supply voltages (e.g. ± 12V, + 5V, and Gnd) or has a multi-supply at same voltage (e.g. +5V regulated, +5V unregulated).

3) Circuits utilize complex capactive decoupling techniques particularly associated with multiple power supply voltages.

4) Integrated circuits on one system PCB drive other devices on different PCB's via a backplane, ribbon cable, etc.

5) Devices drive high capacitive loads such as long data or address busses.

6) System contains high speed address and/or data buses of sufficient length to cause their inductive properties to become significant at the frequencies in question (ribbon cables are a prime example).

7) System has electronic inputs that are directly accessible by the end user of the system.

8) Digital devices are driven from analog devices powered from higher supply voltages, utilizing input diodes for clamping.

Each of the above entries will now be examined in terms of its potential for triggering latch-up. The first four items are very interdependent. While each of these will be given consideration in separate sections, cross referencing will be extensive. The remaining items are relatively independent and thus, will be looked at in relative isolation.

Insertion/Removal of System PBC's "Live"

Inserting or removing printed circuit cards from a powered-up system can trigger latch-up in several different ways if certain precautions are not taken. One potential hazard that can occur is for an input or output edge terminal to make contact before the power supply pins are connected. If driven by a device on another circuit card, this input/output pin could have a voltage applied to it with no supply voltage to the device. Even if this situation exists for only a short period of time, then latch-up may be triggered when the power supply pin is connected. It is important to note that three-state outputs are also vulnerable in this situation. Such output drivers only present a high impedance to voltages within the device supply rails. Voltages on these outputs exceeding the supply can indeed trigger latch-up.

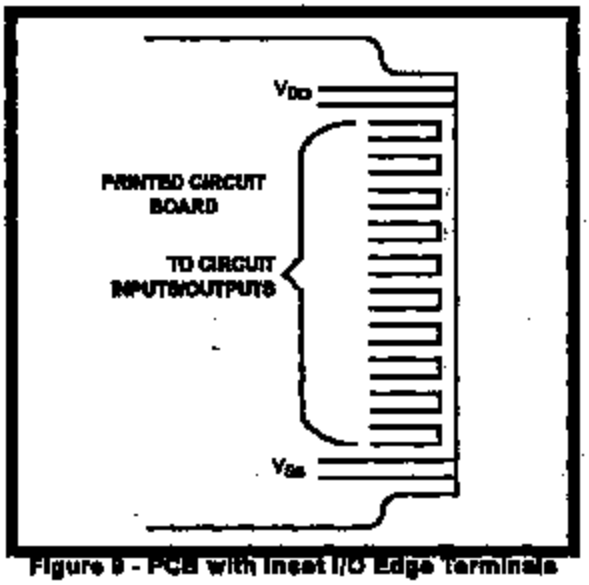

Figure 9 - PCB with Inset I/O Edge Terminals

One solution to this problem is to slightly extend the power supply terminals with respect to the remaining edge terminals on the PCB (Fig. 9). This will ensure that power supply connections are the first made and last broken on insertion and removal of the PCB respectively.

Plugging a circuit card live into a system with multi-power supply voltages can result in the application of power supply over-voltages to certain devices. Consider the local decoupling scheme shown in Fig. 10. If a PCB containing such decoupling was plugged into a system live, then the following situation could result. Assume that all capacitors are discharged and that C_1 is much greater than C_2. It is possible that when the PCB is inserted, the +12V terminal makes connection first, then the ground, and lastly the +5V connection is made. In this situation, C_1 and C_2 are momentarily connected in series. The +12 volts applied to C_1 causes the voltage at the ground point to increase in

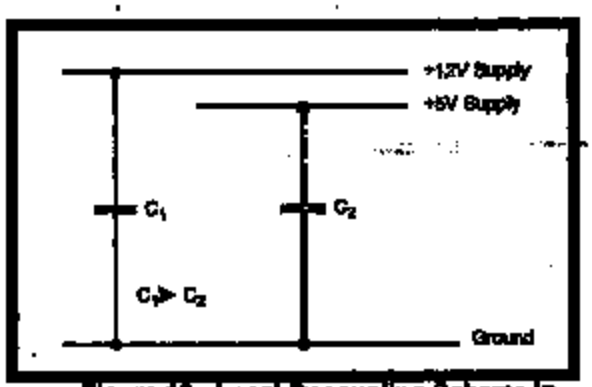

Figure 10 - Local Decoupling Scheme in Multi-Supply System

accordance with the charge sharing between C_1 and C_2. This voltage could approach 12 volts since $C_1 \gg C_2$. When the ground terminal makes connection, the voltage at the nominal 5V rail will jump up by the amount of voltage initially present at the ground point (i.e. almost 12V). This results in an over-voltage condition being applied to the devices supplied by the 5V rail. If the applied voltage exceeds the absolute maximum rating for these devices then latch-up may be triggered by the avalanche breakdown mechanism described in an earlier section. This problem is more likely to be evident in systems with power supplies differing greatly in magnitude since potential over-voltages can become quite large. A prime example is a telephone switching system which would typically contain a -48V supply as well as +5V and other supply voltages.

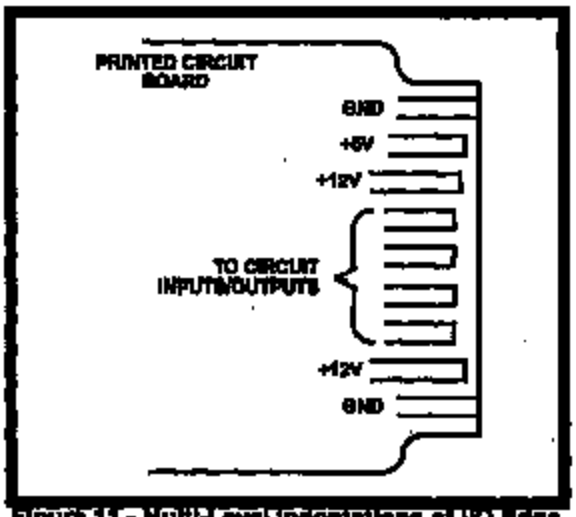

Figure 11 - Multi-Level Indentations of I/O Edge Terminals

This problem can also be overcome by indenting the edge terminals on PCB's. In this case, there must be more than one level of indentation to ensure that the power supply connections are made in a sequence that will alleviate this problem. The safest way to accomplish this is to have power supply connections made in the order of ascending voltage magnitude (Fig. 11). For example, in a system with a +5V supply and±12V supplies, the ground line should make connection first, the +5V supply next and finally, the +12V and -12V supplies at the same time. This ascending order of magnitudes ensures that no over-voltages occur even if one of the power supplies pulls the other through the decoupling capacitors. The ground line should always make connection first to ensure that a positive supply does not pull a negative one or vice versa. Connecting opposing power supplies (e.g. ±12V) at the same time will ensure cancellation of the effects of their connection.

In systems which have large number of power supplies to contend with, it may not be feasible to provide the required number of indentations on the PCB. In this case, a careful analysis of the decoupling used must be done to establish potential problem areas. Where possible, decoupling capacitors on different supplies should be of equal magnitude. This will tend to minimize over-voltages dues to equal charge sharing between the capacitors. If after all possible precautions have been taken, there is still a possibility of power supply over-voltages occurring, then it may be necessary to provide some form of current limiting or local regulation to prevent circuit damage.

The simplest form of protection is to connect a resistor in series with the power supply (V_{DD} or V_{SS}) pin of the devices in question (Fig. 12a). The size of this resistor can be chosen to either prevent latch-up from occurring or to prevent circuit damage when latch-up does occur. If latch-up is to be prevented then the minimum resistor value is chosen as follows:

$$R = \frac{V_{Supply} - V_{DD\,Max}}{I_{DD_{Max}}}$$

where V_{Supply} = Maximum Supply Voltage Generated

V_{DDMax} = Absolute Maximum Rating for V_{DD}

I_{DDMax} = Supply Current at V_{DDMax}

This will ensure that V_{DDMax} is never exceeded at the device.

To simply prevent damage due to latch-up, the resistor is chosen to limit the supply current to a few hundred milliamps at the maximum applied voltage. There are a few factors which must be taken into consideration when the maximum value for this resistor is selected. The source impedance of the power supply will be increased by the amount of the added resistance. This will result in a decrease in the current sourcing .or sinking capacity of the device, depending on whether the resistor is in the V_{DD} or V_{SS} line respectively. There is also a corresponding increase in the output propagation delay, proportional to product of the protection resistor and the load capacitance. Finally there is a decrease in the noise immunity of the device proportional to the product of this resistor and the total instantaneous supply current (including the output currents). For devices such as the MD74SCXXX, it is recommended that this resistor be placed in the V_{DD} line as there is more available noise immunity for high level outputs (when driving TTL or other MD74SCXXX devices).

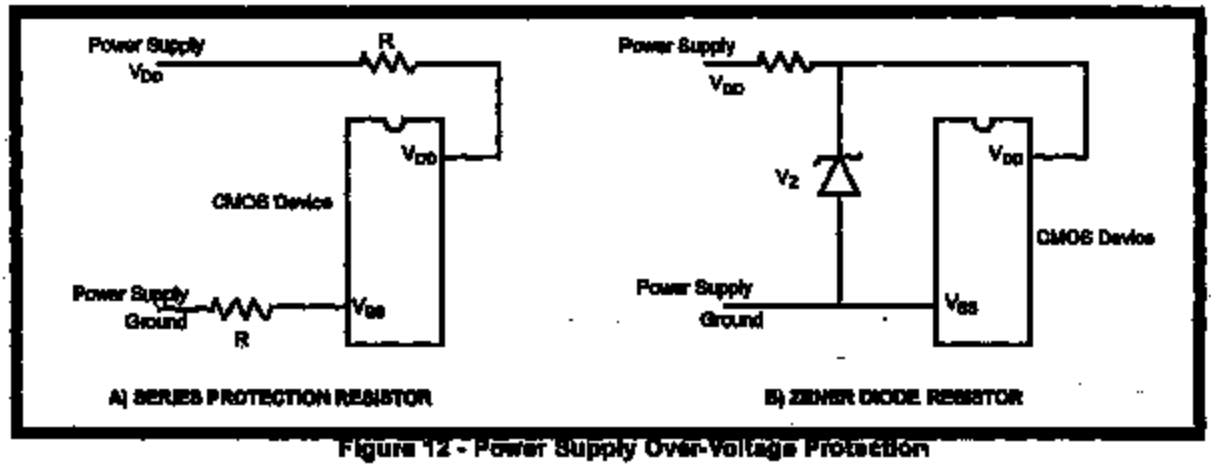

Figure 12 - Power Supply Over-Voltage Protection

If a current-limiting resistor cannot be used due to constraints on output drive, speed or noise immunity, then the alternative is to connect a zener diode between V_{DD} and V_{SS} to prevent over-voltages across the device (Fig. 12b). A current-limiting resistor may still be necessary, but its value can be very small, limited only by the power handling capacity of the zener diode.

There is one last potential hazard that can develop due to "live" insertion of PCB's. On boards with little local decoupling, plugging the card in can result in an extremely fast transient on the power supply leads of devices on the board. These transients could theoretically result in triggering latch-up due to the dV/dt effect described earlier. This problem can be avoided by decoupling the power supply on the board with sufficiently large capacitors to slow down the power supply ramp up when the board is plugged in. These capacitors must be chosen to be compatible with the overall decoupling scheme to prevent the over-voltage problem just described.

Similar transients on the power supply can be generated due to switching of high speed, high current devices such as ECL and Schottky TTL circuits driving heavy DC current loads. Also, back EMF generated by opening of inductive loads such as relays can induce nasty voltage spikes. Adequate high frequency decoupling will usually remedy the problem. A 0.01 to 0.1μF ceramic capacitor connected as close to the device as possible across the power supply pins will shunt most of this high frequency energy to ground (Fig. 13). Connection of flyback diodes around inductive loads is also recommended to limit back EMF surges.

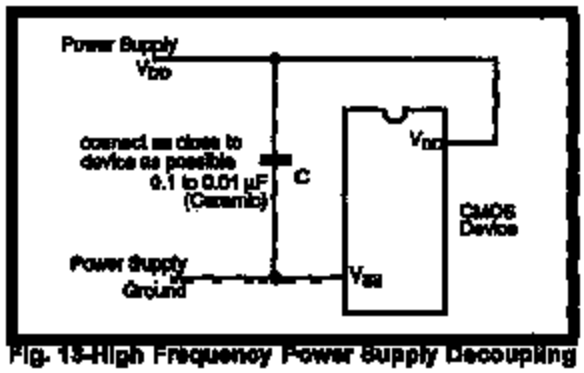

Fig. 13-High Frequency Power Supply Decoupling

Problems Associated with Multi-Power Supply Voltages and Associated Decoupling Circuitry

In systems that have more than one independent power supply, care must be taken to ensure correct sequencing during power-up and power-down cycles. This is required to prevent input and output over-voltage conditions from developing. Consider, for example, a device powered from a +5V supply that has its outputs connected to a device powered from a +7V supply. Under steady state conditions, the output levels from the 5V devices would lie well within the supply voltage of the 7V device. However, if during power-up the 5V supply was to exceed the 7V supply, then the output voltage of the 5V device could exceed the instantaneous supply voltage of the 7V device (Fig. 14). This over-voltage could cause the 7V device to latch-up. A similar situation can occur between two devices powered by separate supplies of equal magnitude such as 5V regulated and 5V unregulated supplies. In this case there is the added concern when three-state outputs are tied together. These outputs are also subject to over-voltage triggering of latch-up. Such outputs present a high impedance only to signals lying within the power supply voltages. It must be stressed that

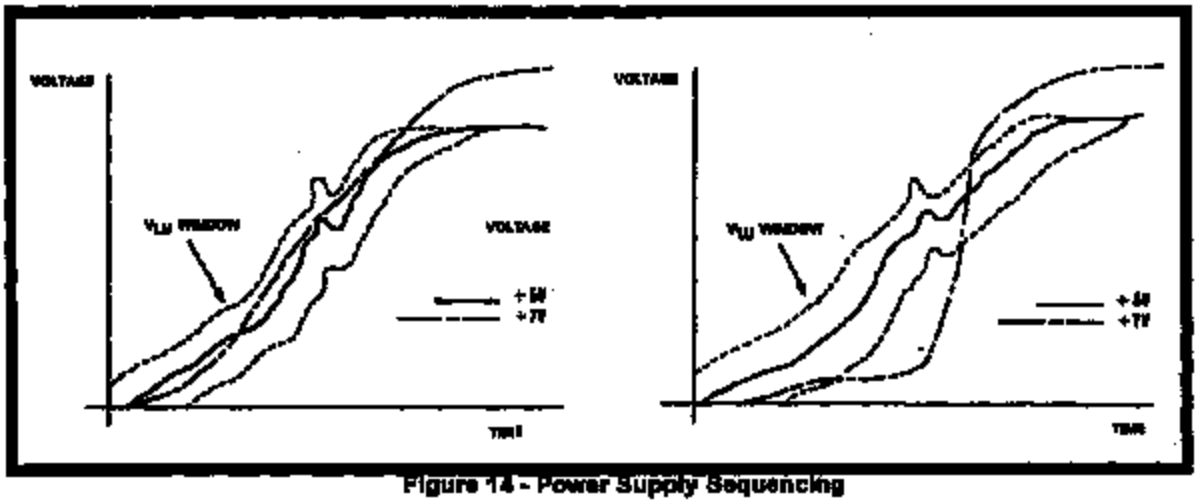

Figure 14 - Power Supply Sequencing

these over-voltage conditions need only exist for a very brief period of time to trigger latch-up. Thus, even transient over-voltages during power-up may pose a problem.

To ensure proper power supply sequencing, careful attention must be paid to the selection of decoupling components both at the initial design stage and when design revisions are done. This applies to both main power supply decoupling as well as local board decoupling. While proper sequencing may be evident at main distribution points, local sequencing can be altered by large capacitors on individual boards. Boards which have a large DC power requirement are likely to have such decoupling and hence, must be looked at carefully.

One way of ensuring that power supplies track when turning on or off is to connect a diode from the lower supply voltage to the higher one in the case of unequal supplies (Fig. 15). This will cause the supplies to track within one diode drop until they attain proper levels. In the case of two equal supplies, two diodes can be connected back to back, forcing supplies to track, independent of which supply comes up first.

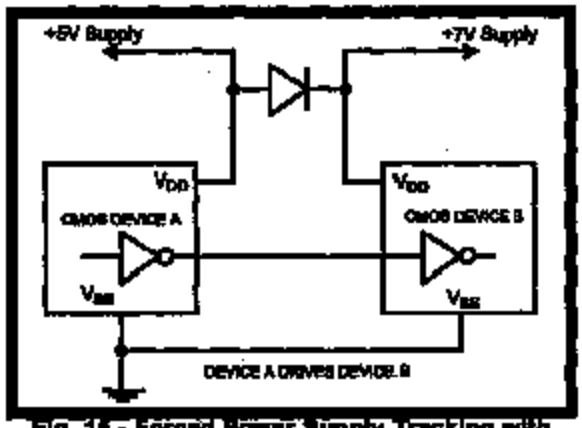

Fig. 15 - Forced Power Supply Tracking with Clamping Diode

Devices Driving Others on Separate PCBs

When integrated circuits in a system drive other devices on separate PCB's (via a backplane for example), then the considerations given in the previous two sections must be applied globally to the system. This was already mentioned in the section on plugging in PCB's "live". That is, when a PCB is plugged into a backplane with the system power applied, there is the danger that an input or output pin will contact an active line on the backplane before the power supply connection is made. The solution to this problem, as mentioned, lies in indenting the I/O edge terminations with respect to power supply terminals on the PCB.

Power supply sequencing should be given special attention in systems with devices that drive off-board. The same criteria applies here as was described for multi-supply systems. However, care must also be taken in single supply systems. In this case, large amounts of local decoupling can cause the supply voltages on some boards in the system to ramp up slower than on others. Devices on boards whose power supply ramps up quickly, can impress an over-voltage on devices on other boards. If this over-voltage is large enough, then latch-up may be triggered.

Whenever possible, local decoupling should be equalized on all boards within the system to minimize these effects. In systems where all off-board drivers are three-state devices, a simple

solution exists. All outputs should be kept in a high impedance state during power-up and power-down. Thus, no current will be available to trigger latch-up even if differential supply voltages develop from board to board. Alternatively, current limiting resistors can be connected in series with any inputs or outputs that may be subjected to over-voltages. These resistors are sized to limit current to less than 10mA:

$$R = \frac{(V_{Diff} - 0.3V)}{10mA}$$

where V_{Diff} = maximum instantaneous voltage differential between power supplies

The side effects of connecting these resistors are the same as mentioned previously for power supply over-voltage protection. There will be reductions in current drive from outputs, in speed, and in noise immunity on outputs driving DC loads through these resistors.

Devices Driving Long Address or Data Buses

Long address and data buses can exhibit quite large capacitances. Devices which drive such buses or have their inputs tied to one, can be subjected to over-voltage conditions. This is especially true if large DC current loads are switched on the same PCB (e.g. a group of LED's during a lamp test). Over-voltages can develop as follows. The change in the power supply current causes a localized voltage drop on the supply pins of the devices near to the device drawing the load current. This is a result of the finite resistance of the power supply tracks and contact resistance of any connectors. At the same time, the bus capacitance tends to hold the voltage on the inputs and outputs connected to the bus at the full supply voltage. If a sufficient voltage differential develops between the bus and the local power supply, then the bus capacitance will discharge via the input and output structures. This current can attain a magnitude of tens of milliamps and hence trigger latch-up (Fig. 16).

Various precautions can be taken to reduce the chances of this problem occurring. Reducing the power supply resistance and bus capacitances can be done at the time of initial design. Wide power supply tracks and low contact resistance connectors should be used whenever possible. Buses should be kept as short as possible and have the largest possible spacings between the lines. If this problem still results due to system restraints on PCB layout, then the connection of a decoupling capacitor across the power supply pins of the devices latching-up should help (Fig. 17). The size of the capacitor depends upon the magnitude of the local current and the local resistance of the power supply. Normally a 10µF capacitor will clear up such problems and should not interfere with the local power supply sequencing on most PCB's.

There is one other way in which an input/output over-voltage can occur on long buses. There exists, on such buses, intertrack capacitance as well as capacitance to ground. When two adjacent tracks are at opposite logic levels (one at 5V, the other at ground), this capacitance charges to the full supply voltage. When the track initially at ground potential suddenly goes high, the signal is coupled through the capacitor to the other track. The voltage on this track increases from its initial value of 5V, impressing over-voltages on any devices connected to this track.

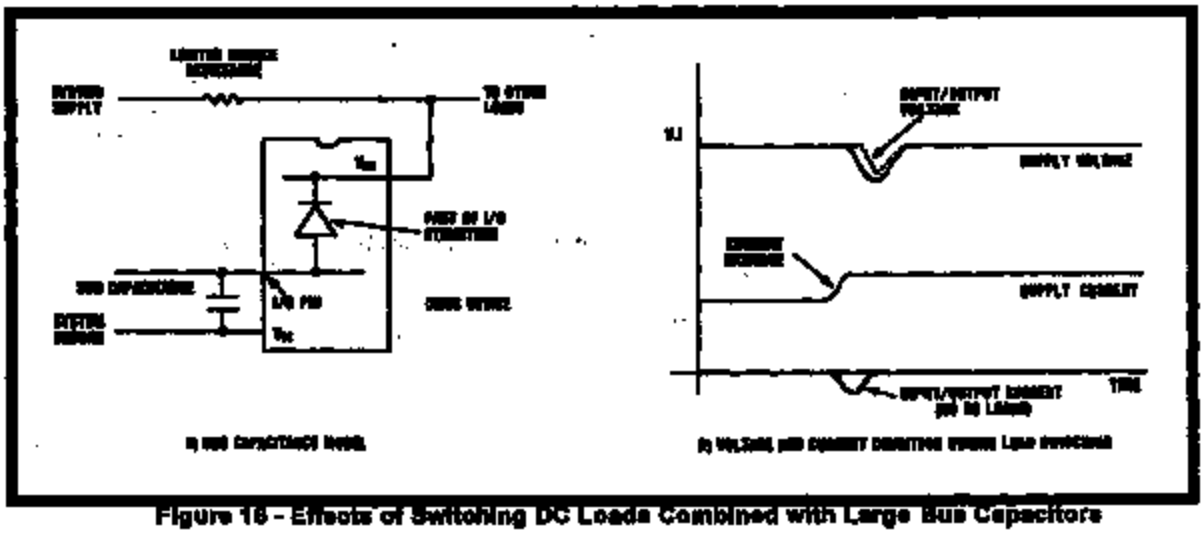

Figure 16 - Effects of Switching DC Loads Combined with Large Bus Capacitors

Minimizing intertrack capacitance by interleaving signal and ground tracks should be done wherever board space permits. Alternatively, external clamping diodes can be connected on tracks exhibiting these voltage excursions. The diodes may need be Schottky diodes if regular ones do not clamp soon enough toprevent current flow through

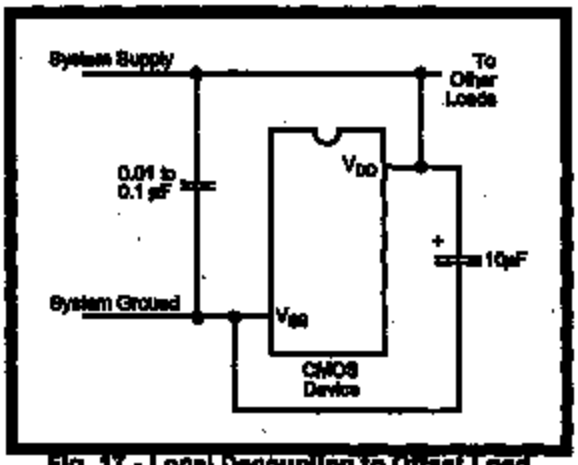

Fig. 17 - Local Decoupling to Offset Lead Switching Effects

I/O structures. Regular silicon diodes may still be used if they are referenced to voltages inset by 0.7V from the supply rails. The clamping circuit shown in Fig. 18 should be quite effective, but as can be seen, this circuit will dissipate power. This may or may not be a problem depending on the overall system requirements. The decoupling capacitors help to absorb the high frequency energy. The resistor values shown are selected for a 5V supply and should be scaled for other supply voltages.

Ribbon Cables - A Special Case

A ribbon cable is a special case of long bus structure. The problems mentioned in the previous section also apply here. However, if the ribbon cable is of sufficient length, then its inductive properties become significant. The distributed inductance and capacitance form a second order circuit which can "ring" when driven by fast, digital signals. The result is the generation of damped oscillations centered about the positive and negative supply rails (Fig. 19). The positive and negative excursions outside of the supply rails impress over-voltages on inputs and outputs connected to the ribbon cable. If of sufficient amplitude, these over-voltages may trigger latch-up.

Solving the problem can be as simple as terminating each end of such cables with resistors to reduce the ringing voltages. However, these resistors will dissipate extra power. An alternative is to connect external protection diodes as shown in Fig. 20.

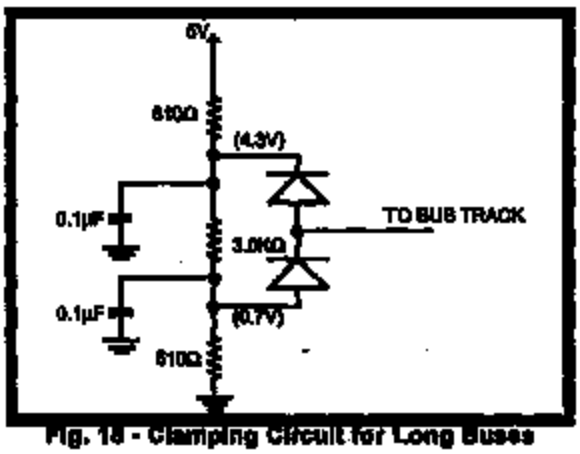

Fig. 18 - Clamping Circuit for Long Buses

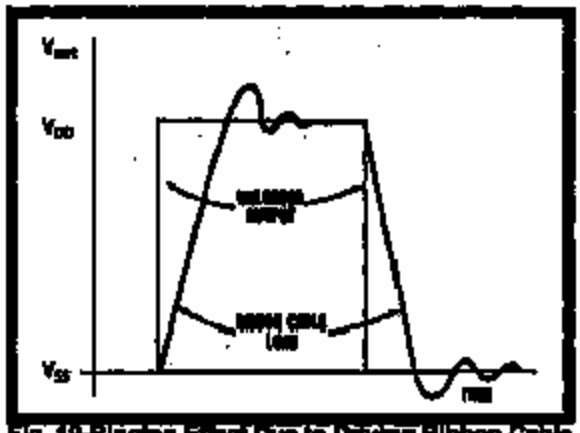

Fig. 19-Ringing Effect Due to Driving Ribbon Cable

These diodes will clamp any generated over-voltages. If the problem persists, it may be necessary to use Schottky diodes to ensure that the external diodes conduct before the input/output structures do.

Systems with End-User Accessible Inputs/ Outputs

An extreme condition of input/output over-voltage can develop in systems which have end user accessible I/O ports. The user may apply signals to these ports when the system power supply is not turned on. Devices in the system connected to these ports are likely to latch-up when the power is turned on due to the current flowing through the I/O structures. Resistors can be connected in series with these I/O's to limit the current during these periods. As mentioned, these resistors will have direct effect on the speed and noise performance of these ports. Latch-up may also be triggered if the end user applies voltages to the I/O ports which exceed the system power supply voltages. The protection resistors suggested above may provide adequate protection against this hazard as well.

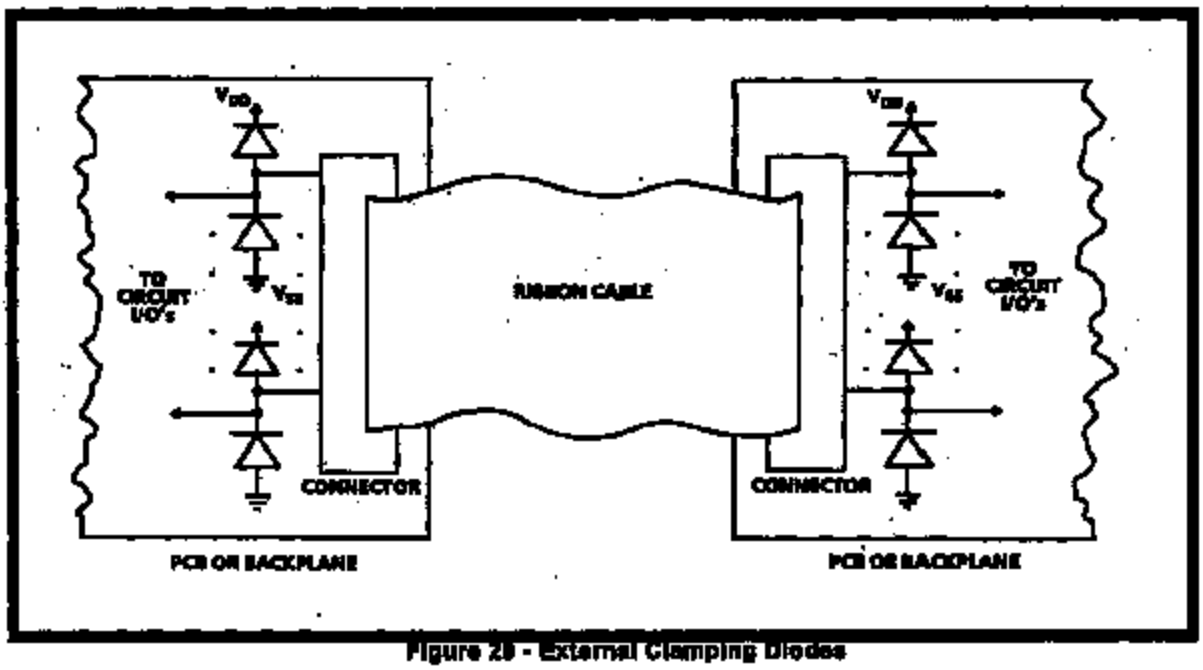

Figure 20 - External Clamping Diodes

However, performance constraints on the port may be such that the current-limiting resistors chosen are too small to protect against severe faults such as accidental connection of the AC mains supply. Protection against such faults can be provided by connection of external clamping diodes in the manner outlined for ribbon cables. Again, Schottky diodes may be required.

If fault conditions are likely to be very severe, it may be necessary to reference external clamping diodes to voltages inset by 0.7V from the power supply (Fig. 21). These diodes will conduct before the input/output structures of the device on the port whenever an over-voltage condition exists. Thus, no current will flow to trigger latch-up. The reference voltages are inset by 0.7V to allow the use of regular, low-cost diodes. Due to the potentially large currents flowing through the protection diodes, a clamping circuit similar to the one in Fig. 18 is not feasible. The output resistance in this case needs to be substantially lower.

Digital and Analog Devices in Same System

In systems which have digital and analog devices powered by different supply voltages, there is the

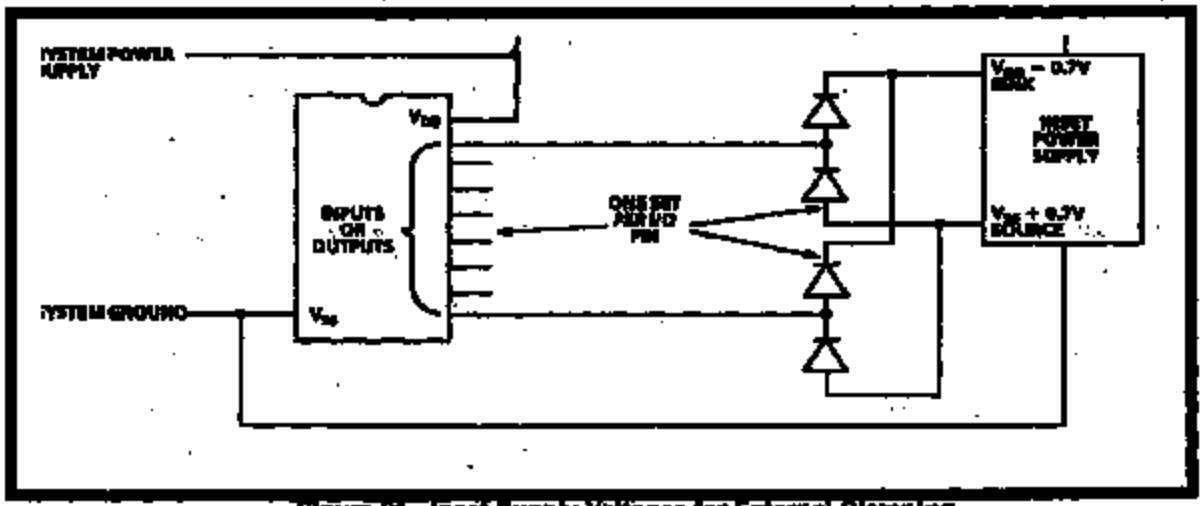

Figure 21 - Inset Supply Voltages for External Clamping

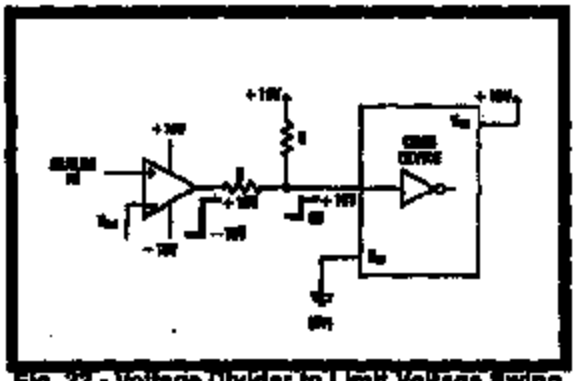

Fig. 22 - Voltage Divider to Limit Voltage Swing on CMOS Input

potential hazard of over-voltage conditions developing. Consider, for example, the case of an analog comparator powered from ±10V driving a digital device powered from a +10V supply. When the comparator output goes low, it will approach -10V and pull the digital input below V_{SS} (0V). If the comparator can pull enough current, then latch-up may be triggered. Putting a resistor in series with the input will limit the current and prevent latch-up. However, it is not a recommended procedure to use the input diodes as clamping circuits. A more advisable solution is to use a resistive divider as shown in Fig. 22. When the comparator output goes low, the divider will have 20V across it. Half of this voltage will be dropped across each resistor so that the digital input sits at 0V. When the comparator output goes high, no current flows through the divider so that the digital input sits at V_{DD}. Since the CMOS input has an extremely high input impedance, the value of these resistors can be very large (>100K) to minimize power consumption.

Conclusion

In the vast majority of circuits and systems employing CMOS devices, latch-up will not be a major concern. When simply applied according to manufacturers' recommendations, CMOS devices are not overly sensitive to the normal circuit conditions that exist within a system. What has been attempted in this application note is to develop an understanding of the latch-up phenomenon and its causes to assist designers in avoiding potential pitfalls caused by a simple lack of knowledge.

Having briefly reviewed the basic theory of SCR operation in general, and as it applies to CMOS input and output structures, an understanding of the mechanism of latch-up was developed. Taking a close look at various aspects of system and circuit design has revealed that various precautionary measures taken at the design stage can greatly reduce the risk of latch-up occurrences. In cases where system performance or features create potentially hazardous situations beyond the designer's control, the implementation of simple protection circuitry will again minimize problems.

Through the use of careful design practices, augmented by protection circuitry when needed, the designer can use CMOS analog and digital integrated circuits extensively. System and circuit reliability will no longer be a function of latch-up related problems.

Reference

1. S.B. Dewan and A. Straughen, "Power Semiconductor Circuits", pp. 77-84, John Wiley and Sons, 1975.

Appendix

The following is a derivation of equation (1) of the main text. Fig. 2 is referenced for this purpose.

The collector and emitter currents of Q_1 and Q_2 are related by:

$$I_{C_1} = \alpha_1 I_{E_1} \qquad I_{C_2} = \alpha_2 I_{E_2}$$

Looking at Fig. 2, it can be seen that the load current and the emitter currents of Q1 and Q2 are all equal. Also the load current is equal to the sums of the two collector currents and a leakage current from Q_2's collector to its base (I_{CBO2}). Therefore:

$$\begin{aligned} I_L &= I_{C_1} + I_{C_2} + I_{CBO_2} \\ &= \alpha_1 I_{E_1} + \alpha_2 I_{E_2} + I_{CBO_2} \\ &= (\alpha_1 + \alpha_2) I_L + I_{CBO_2} \\ &= \frac{I_{CBO_2}}{1 - (\alpha_1 + \alpha_2)} \end{aligned}$$

The collector-emitter current gains (α_1, α_2) can be expressed in terms of the collector-base current gains (B_1, B_2) as:

$$\alpha_1 = \frac{B_1}{1+B_1} \qquad \alpha_2 = \frac{B_2}{1+B_2}$$

Substituting these into the equation above yields:

$$I_L = \frac{I_{CBO_2}}{1 - \left(\frac{B_1}{1+B_1} + \frac{B_2}{1+B_2} \right)}$$

$$I_L = I_{CBO_2} \left[\frac{(1+B_1)(1+B_2)}{1 - B_1 B_2} \right]$$

Freeland, Mark (M.)

From: Plante, Paul (P.G.)
Sent: Friday, June 07, 2002 10:05 AM
To: Freeland, Mark (M.)
Subject: RE: Media Reports of Focus Stalling

I think the message on NHTSA concerns for stalls is already out there. This one is interesting, but not engine related.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, June 07, 2002 9:47 AM
To: Plante, Paul (P.G.)
Subject: FW: Media Reports of Focus Stalling

Paul,
Should we forward this to the team for r information.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Simko, Steven (S.J.)
Sent: Friday, June 07, 2002 9:02 AM
To: Freeland, Mark (M.); Mangas, Jon (.)
Subject: Media Reports of Focus Stalling

Mark,

I heard on the radio today that NHTSA is opening two investigations on Focus, one for engine stalls. The radio report quoted Clarence Ditlow, from the Center for Auto Safety, a plaintiff's attorney's clearing-house for lawsuits concerning auto safety. He is extremely good at stirring up negative publicity in auto safety cases. I checked the clipsheet this morning looking for more information about NHTSA's investigation and found the following article. It suggests plugged fuel lines as the cause for stalling (see highlighted region). I just thought you should know this information.

Steve Simko

Government opens new safety investigations into Ford Focus over engine, suspension

Associated Press Newswires 06/06/02
author: Nedra Pickler
Copyright 2001. The Associated Press. All Rights Reserved.

WASHINGTON (AP) -- Safety officials have opened two new investigations into the Ford Focus, this time amid complaints the engine can suddenly stall and the front suspension can collapse.

The government has begun six investigations into the popular subcompact this year. Tim Hurd, a spokesman for the National Highway Traffic Safety Administration, said Thursday he cannot recall the government's ever having as many investigations into one vehicle at the same time.

Seventy-two people told NHTSA that the Focus stalled while they were driving, including seven who crashed. Seven people reported the front suspension control arm fractured while they were driving, leading to six crashes.

The investigation into engine stall involves 574,700 cars from the 2000 and 2001 model years, the first two years of production. The suspension investigation also includes the 2002 model year.

The Focus is the country's fifth-best-selling car, trailing only the Honda Accord, Toyota Camry, Ford Taurus and Honda Civic. But it has been plagued with safety problems, already having been recalled eight times for problems ranging from faulty seat latches and windshield wipers to a throttle that can stick open.

Two of NHTSA's other open investigations involve possible air bag malfunctions, while the remaining were prompted by reports the rear wheel bearings could fail and the engine could catch fire.

NHTSA investigators said the alleged engine stall problem may be caused by debris accumulating in the gas tank, blocking fuel from being delivered to the engine.

NHTSA also is stepping up its investigation into nearly half a million General Motors Corp. vehicles after 28 crashes were blamed on a possible steering problem. More than 1,200 people have complained that the steering rack and pinion suddenly locked up while they were driving.

The investigation involves the 1998 Oldsmobile Intrigue and 1997 models of the Pontiac Grand Prix, Pontiac Tran Sport, Chevrolet Venture, Chevrolet Malibu, Oldsmobile Silhouette and Oldsmobile Cutlass.

The problem can cause the driver to lose steering control. GM reported six crashes in which eight people were hurt, but no injuries or deaths were reported in the other 22 crashes.

NHTSA opens any investigation with a preliminary inquiry, in which the agency and the manufacturer exchange paperwork. That is the stage of the Focus investigations.

The agency can upgrade the case to an engineering analysis if it wants to examine the vehicle in detail for a possible safety defect. The GM investigation is in this stage.

NHTSA's investigations can lead to a recall, but many are dropped.

Spokesmen for Ford and General Motors would not comment on the investigations except to

say the companies are cooperating with the agency.

NHTSA also opened a preliminary investigation into about 75,000 Toyota T100 pickups from the 1993 through 1998 model years. Fourteen people have complained to the agency that

.ne

clutch pedal mounting bracket or the firewall where it attaches will fracture while driving.

The problem would stop the clutch from disengaging when the pedal is pressed and could cause the vehicle to move unintentionally, the engine to stall or stopping distances to

increase.

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Sent: Friday, June 07, 2002 9:47 AM
To: Plante, Paul (P.G.)
Subject: FW: Media Reports of Focus Stalling

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Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

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From: Simko, Steven (S.J.)
Sent: Friday, June 07, 2002 9:02 AM
To: Freeland, Mark (M.); Hangas, Jon (.)
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Associated Press Newswires 06/06/02
author: Nedra Pickler
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The problem would stop the clutch from disengaging when the pedal is pressed and could

cause the vehicle to move unintentionally, the engine to stall or stopping distances to increase.

5/02

Park, Kyong
From: McDaniel, Scott
Sent: Monday, April 29, 2002 3:50 PM
To: Park, Kyong
Cc: Davies, Brady
Subject: Updated Latch-up test results and photo pages.

Message Flag: Follow up
Flag Status: Flagged

Here is an updated matrix with the additional samples added and the observations on their failure mode. Also are photo pages of the various samples (Sample #'s 2, 4, 6, 8 & 10).

Scott


SW-Solid-State-Latch.x ls


Latch up part photo SW 10.doc


Latch up part photo SW 2.doc


Latch up part photo SW 4.doc


Latch up part photo SW 6.doc


Latch up part photo SW 8.doc


Latch up part photo SW 10.doc...


Latch up part photo2 SW 2.doc


Latch up part photo2 SW 4.doc


Latch up part photo2 SW 6.doc

Park, Kyong
From: Houston, Roger
Sent: Tuesday, May 21, 2002 10:14 AM
To: Park, Kyong
Subject: RE: TMDP MOV

AVX
0805 SIZE MOV
VC080505A150, A 5.6 VWM

-----Original Message-----
From: Park, Kyong
Sent: Tuesday, May 21, 2002 9:47 AM
To: Houston, Roger
Subject: RE: TMDP MOV

Roger,
Do know their part number?
Thanks.

-----Original Message-----
From: Houston, Roger
Sent: Tuesday, May 21, 2002 9:46 AM
To: Park, Kyong
Subject: TMDP MOV

THIS IS THE MANUFACTURER USED, AVX.

http://www.avxcorp.com/

Freeland, Mark (M.)

From: Hangas, Jon (.)
Sent: Thursday, April 18, 2002 5:07 PM
To: Freeland, Mark (M.); Gates, Freeman (F.C.); Maurer, James (J.B.); Planta, Paul (P.G.)
Subject: Accurel answer to legal question

Accurel has not done any consulting on litigation involving Ford.
Jon

-----Original Message-----
From: Jennifer Taylor [mailto:jennifert@accurel.com]
Sent: Thursday, April 18, 2002 1:16 PM
To: Hangas, Jon (.)
Subject: RE: Legal question

Good Morning Jon,

In response to your e-mail below, I have verified in our database and as well confirmed with our directors, and we cannot find any evidence that we have performed litigation work for Ford. Please feel free to contact me should you have any other questions or concerns.

Regards,

Jennifer L. Taylor
Customer Relations Specialist
Accurel Systems International Corp.
ph: 408.737.3892 ext. 168
fax: 408.737.3916
jennifert@accurel.com
www.accurel.com

-----Original Message-----
From: Hangas, Jon (.) [mailto:jhangas@ford.com]
Sent: Wednesday, April 17, 2002 2:30 PM
To: 'jennifert@accurel.com'
Cc: Xiuhongh Han (E-mail)
Subject: Legal question

Hi Jennifer,

The legal question posed by the team leader is:

"Has Accurel or any of your employees ever acted as a litigation consultant in a lawsuit or even a
pre-litigation product evaluation in which Accurel reviewed Ford's products, either for the defense or the plaintiff?"

Please circulate this among your legal and administrative staff. Although my original email asked about FIB, the entire project will involve several other analysis capabilities which Accurel has.

I look forward to your response so that I can start discussing technical matters further with Xiuhongh.

EH02-027-B 12568

Regards,
Jon Hangas
Ford Motor Co.
Scientific Research Lab.
313-323-1068

EH82-027-8 12588

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	April 25, 2002
Time:	1-3:00 p.m.
Location:	POEE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	April 30, 2002, Core Team Meeting May 2, 2002, Core Team Meeting
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EPSE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmood Awad	Sherran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Pianto		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda –4/25/02

Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated
1. Introductions		All	5 minutes
2. Update on Body and Assembly plant failures	I3, A3	Don Ayers, Mark Freeland	10 minutes
3. PCM update on how much current it takes to stall vehicle	I3, A5	Brian Perry	10 minutes
4. Outside Lab – Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Jim Maurer	10 minutes
5. Update on "In Process" acid tested parts	I5, A6	Freeman Gates	10 minutes
6. Update on installing "lab induced" failed sensors in vehicles	I6, A1	Jim Maurer (Larry Sturz)	10 minutes
7. Update on obtaining high-mileage parts for FRL analysis	I6, A6	Jim Maurer (John Piru)	10 minutes
8. Update on obtaining buy-back vehicles and parts for testing	I6, A5	John Piru	10 minutes
9. Update on PV Failures	I12, A10	Patrice White-Johnson	10 minutes
10. Status of Supplier order for field service parts	I16, A4	Bill McCarty	5 minutes
11. Walk-ins		All	10 minutes
12. Next Meeting Agenda Items		All	5 minutes

Proposed Next Meeting Agenda 4/30/02	Person(s) Responsible	Time Estimated

Notes

Bring handouts (paper copies) for all presentations
Provide electronic copies of presentations to CPANARET **(no later than 1 hour prior to the meeting)**
Please be on time as we have a full agenda

Jim Maurer/cp: 4/25/02
Kavlico dPFE Sensor Core Team

FOR OGC

Freeland, Mark (M.)

From: Muter, Doreen (D.J.)
Sent: Wednesday, March 20, 2002 8:05 AM
To: Verner, Carol (C.J.); Mercier, Julie (J.A.)
Cc: Muter, Doreen (D.J.); Maurer, James (J.B.); Freeland, Mark (M.); Akins, Mary (M.); Plante, Paul (P.G.); Esch, Becky (B.)
Subject: RE: 14D Vehicles Affected Update

Julie, if you can, would you please pull 2002 volumes with the information for the vehicles listed below. I have not seen an update 14D since 12/3/01, so this is all we have to work with. This is for the dPFE issue.

Caorl, as we discussed yesterday, in order to pull accurate volumes for this program we need the 14D updated with all of the vhelcle lines, engines, model year, assy. plants and production date ranges affected by the TM dPFE. If Julie can pull the volumes they will be inaccurate until the listed information is provided by engineering, thank you.

NOTE: It is imparitive that we receive a copy of the 14D as it is updated, please forward the lasted version to Becky Esch.

Doreen J. Muter
Recall & Service Programs---FCSD
Diagnostic Service Center II, Cube 793
Phone #:313-248-9391
dmuter@ford.com

----Original Message----
From: Verner, Carol (C.J.)
Sent: Tuesday, March 19, 2002 3:53 PM
To: Muter, Doreen (D.J.)
Subject: 14D Vehicles Affected Update

Doreen,

Per our conversation here is the information I am requesting to update the 14D Vehicles affected list for the John Kos review on Friday:

1) Moder Year: 2002, complete volume for this year up to right now (As you recommended I will note that thie is volume from Job 1 to now)

2) Vehicles/Engine Code:

CARS:
* Cougar/ L
* Taurus/Sable/U (Vulcan Engine)
* Taurus/Sable/S (Duratec Engine)
*Mustang/4
*Crown Vic/W
*Grand Marquis/W
*Town Car/W
*Focus/3

Trucks:
*Escape/B
*Tribute/B

ER02-627-B 13613

*Escape/1
*Tribute/1
*Windstar/4
*Explorer&Mountaineer/E
*Explorer Sport/E
*Explorer Sport Trac/E
*Explorer Postal Stripped Chassis/K
*Ranger/E
*Econoline/2
*F150 Series/2
*F150 Series/W
*F150 Series/6
*Explorer&Mountaineer/W
*Expedition/W

Thanks
Carol Any questions, 313-390-7180

After the tech review on 3/26/02, I would like to meet with you to discuss your proposal of a more detailed approach for gathering this information. I will contact you to set up a meeting.

ANALYTICAL SOLUTIONS, INC.
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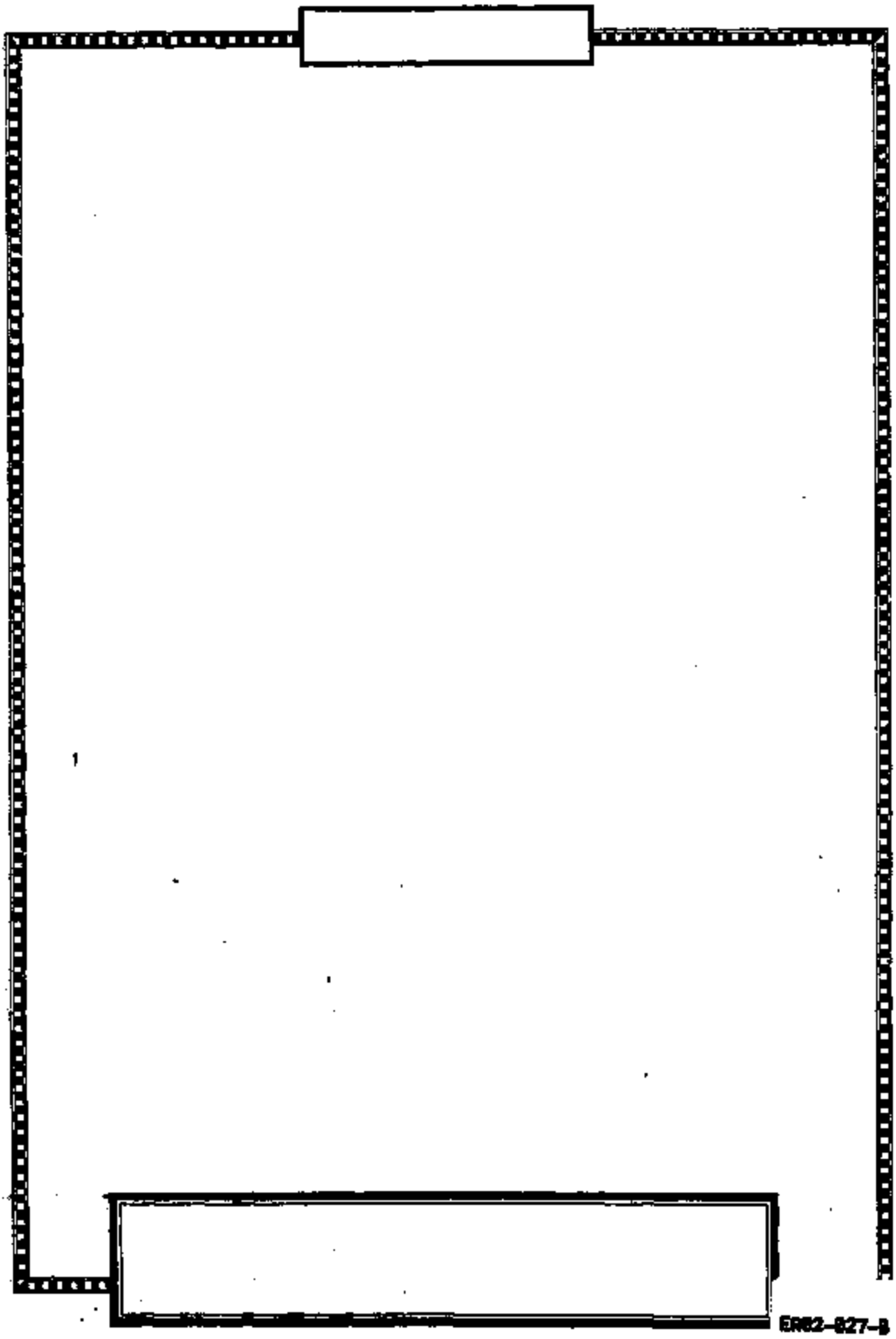


ER82-827-B 13184

4/28/02

Focus

1FAFP38301

W196354

failure to start

approx mileage = 17259

~~start~~ disconnected EGR sensor

SAL 302

EMG-827-9 13168

Freeland, Mark (M.)

From: Plante, Paul (P.G.)
Sent: Tuesday, May 21, 2002 11:04 AM
To: 'Park, Kyong'
Cc: Freeland, Mark (M.); Maurer, James (J.B.); Gates, Freeman (F.C.); Janda, Jon (J.M.); Plante, Paul (P.G.)
Subject: RE: Hussein Bina's Focus failed it's DPFE again

Kyong, I have established the Monday afternoon meeting to resolve Vehicle Issues just like this. This item was discussed at yesterday's meeting. I am not blaming Kavlico for this failure. I will pursue testing this car. We can not ship the car to Kavlico because Ford does not own it. It belongs to one of our Ford Engineers. We discussed instramenting it and testing it here in Dearborn and returning to H. Bina. Your local reps or yourself are welcome to assist in those tests in Dearborn.

Your note on this should go only to Jim Maurer, Mark, Freeman and myself. The other people are affected but not directly, I believe the E Mail distribution is too large. Thanks for your comments. Ford wil pursue this car.

-----Original Message-----
From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Tuesday, May 21, 2002 10:52 AM
To: Jahshan, John (J.H.); Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auiler, Jim (J.E.); Awad, Mahmoud (M.I.); Ayers, Don; Bandoske, Pete (P.F.); Bansek, Catherine (C.K.); Bersuder, Lee (L.C.); Bissi, Gerry (G.); Bronni, Mark (M.J.); Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.); Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates, Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hangas, Jon (.); Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerezi, Karen (K.J.); Koszewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.); Nielsen, Christian (C.A.); O'Neall, Jim (J.D.); Oswalt, Greg (G.G.); Park, Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.); Poma, Amy (A.); Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Rossi, Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro, Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); White-johnson, Patrice (P.); Williamson, Richard (E.)
Cc: Tackman, Bruce; Hubbard, Rick; Davies, Brady
Subject: RE: Hussein Bina's Focus failed it's DPFE again

Very easy to blame DPFE!
Kavlico is very interested in this car. Please, ship to Kavlico. Kavlico likes to work on this car.

> -----Original Message-----
> From: Jahshan, John (J.H.) [SMTP:jjahshan@visteon.com]
> Sent: Monday, May 20, 2002 7:30 AM
> To: Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auiler, Jim (J.E.); Awad, Mahmoud (M.I.); Ayers, Don; Bandoske, Pete (P.F.); Bansek, Catherine (C.K.); Bersuder, Lee (L.C.); Bissi, Gerry (G.); Bronni, Mark (M.J.); Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.); Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates, Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hangas, Jon

DMB-627-A 13118

> (.); Jahshan, John (J.H.); Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerezi,
> Karen (K.J.); Koszewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon
> (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.);
> Nielsen, Christian (C.A.); O'Neall, Jim (J.D.); Oswalt, Greg (G.G.); Park,
> Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.);
> Poma, Amy (A.); Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Rossi,
> Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro,
> Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); White-johnson,
> Patrice (P.); Williamson, Richard (E.)
> Subject: FW: Hussein Bina's Focus failed it's DPFE again
>
> Any interest in this vehicle?
>
> John H. Jahshan
> POEE Resident Engineer
> PCM Applications
> jjahshan@visteon.com
> Phone & Fax: (313) 722-1638 or (313) 390-4854
> Pager: (313) 795-8068
> http://www.myairmail.com/
> "WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE
> RIGHT"
>
>
>
> -----Original Message-----
> From: Matysiewicz, Edwin (E.J.) [mailto:ematysie@ford.com]
> Sent: Monday, May 20, 2002 9:58 AM
> To: Grant, Kathleen,Kathy (K.A.)
> Cc: Perry, Brian (B.J.); Sebold, Lynn (L.A.); 'jjahshan@visteon.com';
> Huck, Dave (D.E.); Stump, Steven (S.M.)
> Subject: Hussein Bina's Focus failed it's DPFE again
>
>
> Kathy
>
> I just went out into the parking lot, dumped codes, and got a P401 code on
> Hussein's 2001 Zetec Focus.
>
> His DPFE is stuck at 0.11 VDC all the time.
>
> This is his second DPFE failure on his car.
>
> Ed

John Josaan

Ford

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	April 18, 2002
Time:	1-3:00 p.m.
Location:	POBE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	April 23, 2002, Core Team Meeting April 25, 2002
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EHSE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda –4/18/02

Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated
1. Introductions		All	5 minutes
2. Update on Body and Assembly plant failures	I3, A3	Terry Tamashiro	10 minutes
3. Update on Wiring Harness Root Causes / findings	I3, A4	Sheran Alles, Robert Rossi	15 minutes
4. Update on FRL testing / evaluation of UPAD parts	I3, A2	Mark Freeland	15 minutes
5. Investigation of Stalls – Update on Pareto, Parser Report data	I3, A9	Mahmoud Awad, Mary Akins	15 minutes
6. Outside Lab – Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Jim Maurer	15 minutes
7. Update on analyzing acid tested parts vs. warranty UPAD parts	I5, A6	Freeman Gates	10 minutes
8. Status of Concern to commonize parts	I16, A2	Jon Janda	5 minutes
9. Status of Supplier order for field service parts	I16, A4	Bill McCarty	5 minutes
10. Walk-ins		All	15 minutes
11. Next Meeting Agenda Items		All	10 minutes

Proposed Next Meeting Agenda 4/23/02	Person(s) Responsible	Time Estimated

Notes

Bring handouts (paper copies) for all presentations
Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
Please be on time as we have a full agenda

Jim Maurer/cp: 4/18/02
Kavlico dPFE Sensor Core Team

E802-827-8 13218

From: Bodnar, Les (L.R.)
Sent: Thursday, March 28, 2002 11:01 AM
To: Amro, Zaid (Z.); Fournelle, Gilbert (G.)
Cc: Hermann, Thomas (T.J.); Diez, Timothy (T.P.)
Subject: RE: Info Needed - U204 2003MY DVP&R

Importance: High

Zaid/Gilbert, was this MAFS received by Tim Diez?

Regards,

Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

—Original Message—
From: Amro, Zaid (Z.)
Sent: Tuesday, March 26, 2002 8:40 AM
To: Diez, Timothy (T.P.)
Cc: Gokhale, Renuka (R.V.); Nematollahi, Sonya (S.); Bodnar, Les (L.R.); Hermann, Thomas (T.J.)
Subject: RE: Info Needed - U204 2003MY DVP&R

Tim,
Gilbert Fournelle has a correct new MAF sensor available by his desk, please contact him and get that part ASAP and then continue your test... Please let me know if you have any question or concern. Thanks!

Best Regards,

Zaid Amro
U204 E/E Systems & EDS
(313) 59-43064
zamro@ford.com
PDC: 2D-G02

—Original Message—
From: Diez, Timothy (T.P.)
Sent: Monday, March 25, 2002 4:46 PM
To: Amro, Zaid (Z.)
Cc: Gokhale, Renuka (R.V.); Nematollahi, Sonya (S.); Bodnar, Les (L.R.); Hermann, Thomas (T.J.)
Subject: RE: Info Needed - U204 2003MY DVP&R

Zaid, Renuka, Sonya,

Les has been kept up to date as to the contents of this note. The 2003MY U204 testing is still "Work in Progress", and I have a call into the supervisor as to when it is expected to be complete. I requested testing to be complete 3-22-02. One factor that slowed testing down is that last week the MPG chamber was out of commission due to an instrument failure.

Also, as reported when I received the vehicle, I requested a note confirming all the parts were production representative. The MAF sensor was not production representative and, as a result, there were engine stalls in the 7-10MHz band and 20-23MHz band. This is the same issue we worked on last Summer and Fall. I have requested from Les the updated MAF sensor that improves the engine performance in these RF bands. The updated MAF sensor needs to be installed in the vehicle to confirm it

E992-627-B 13252

improves the performance for the 03MY vehicle. This will require additional time as well.

By COB tomorrow, I will send out a note projecting when the testing on this vehicle will be complete.

Later last week, an I4 engine Escape was shipped to Romeo with the new Motorola DPFE sensor. I will also need to inquire of MPG staff when this vehicle is expected to be complete.

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1692
e-mail: tdiez@ford.com

---Original Message---
From: Amro, Zaid (Z.)
Sent: Monday, March 25, 2002 3:57 PM
To: Diez, Timothy (T.P.); Mohammed, Noorulla (N.S.)
Cc: Golchala, Renuka (R.V.); Hematollahi, Sonya (S.); Bodnar, Les (L.R.)
Subject: Info Needed - U204 2003MY DVP&R

Tim / Noorulla,

I'm still waiting to recieve your DVP /or report (test result) for your test on 2003MY CP vehicle. Please send me your information ASAP or a target date! Thanks!

Best Regards,

Zaid Amro
U204 E/E Systems & EDS
(313) 59-43064
zamro@ford.com
PDC: 2D-G02

ER02-827-8 11253

From: Fournelle, Gilbert (G.)
Sent: Thursday, March 28, 2002 11:44 AM
To: Bodnar, Les (L.R.); Amro, Zaid (Z.)
Cc: Hermann, Thomas (T.J.); Diez, Timothy (T.P.)
Subject: RE: Info Needed - U204 2003MY DVP&R

Tim Picked up the MAF sensor on Tuesday.

Sincerely,

Gilbert Fournelle
V6 U204 Calibration Engineering
1AE27 Truck Engine Engineering (TEE)
Phone:(313)3904968 Fax:(313)3231786

—Original Message—
From: Bodnar, Les (L.R.)
Sent: Thursday, March 28, 2002 11:01 AM
To: Amro, Zaid (Z.); Fournelle, Gilbert (G.)
Cc: Hermann, Thomas (T.J.); Diez, Timothy (T.P.)
Subject: RE: Info Needed - U204 2003MY DVP&R
Importance: High

Zaid/Gilbert, Was this MAFS received by Tim Diez?

Regards,
Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

—Original Message—
From: Amro, Zaid (Z.)
Sent: Tuesday, March 26, 2002 8:40 AM
To: Diez, Timothy (T.P.)
Cc: Gokhale, Renuka (R.V.); Nematollahi, Sonya (S.); Bodnar, Les (L.R.); Hermann, Thomas (T.J.)
Subject: RE: Info Needed - U204 2003MY DVP&R

Tim,
Gilbert Fournelle has a correct new MAF sensor available by his desk, please contact him and get that part ASAP and then continue your test... Please let me know if you have any question or concern. Thanks!

Best Regards,

Zaid Amro
U204 E/E Systems & EDS
(313) 59-43064
zamro@ford.com
PDC: 2D-G02

—Original Message—
From: Diez, Timothy (T.P.)

6982-627-9 13284

Sent: Monday, March 25, 2002 4:46 PM
To: Amro, Zaid (Z.)
Cc: Goldsale, Renuka (R.V.); Nematollahi, Sonya (S.); Bodnar, Les (L.R.); Hermann, Thomas (T.J.)
Subject: RE: Info Needed - U204 2003MY DVP&R

Zaid, Renuka, Sonya,

Les has been kept up to date as to the contents of this note. The 2003MY U204 testing is still "Work In Progress", and I have a call into the supervisor as to when it is expected to be complete. I requested testing to be complete 3-22-02. One factor that slowed testing down is that last week the MPG chamber was out of commission due to an instrument failure.

Also, as reported when I received the vehicle, I requested a note confirming all the parts were production representative. The MAF sensor was not production representative and, as a result, there were engine stalls in the 7-10MHz band and 20-23MHz band. This is the same issue we worked on last Summer and Fall. I have requested from Les the updated MAF sensor that improves the engine performance in these RF bands. The updated MAF sensor needs to be installed in the vehicle to confirm it improves the performance for the 03MY vehicle. This will require additional time as well.

By COB tomorrow, I will send out a note projecting when the testing on this vehicle will be complete.

Later last week, an I4 engine Escape was shipped to Romeo with the new Motorola DPFE sensor. I will also need to inquire of MPG staff when this vehicle is expected to be complete.

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

—Original Message—
From: Amro, Zaid (Z.)
Sent: Monday, March 25, 2002 3:57 PM
To: Diez, Timothy (T.P.); Muhammed, Noorulla (N.S.)
Cc: Goldsale, Renuka (R.V.); Nematollahi, Sonya (S.); Bodnar, Les (L.R.)
Subject: Info Needed - U204 2003MY DVP&R

Tim / Noorulla,

I'm still waiting to recieve your DVP /or report (test result) for your test on 2003MY CP vehicle. Please send me your information ASAP or a target date! Thanks!

Best Regards,

Zaid Amro
U204 E/E Systems & EDS
(313) 59-43064
zamro@ford.com
PDC: 2D-G02

From: Amro, Zaid (Z.)
Sent: Tuesday, March 26, 2002 2:01 PM
To: Fournelle, Gilbert (G.)
Cc: Bodnar, Les (L.R.); Gokhale, Renuka (R.V.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Hello Gilbert,
I'm just wondering why 2003MY CP vehicles have this old MAF sensor? & When did the new sensor go to production?! Thanks!

Best Regards,

Zaid Amro
U204 E/E Systems & EDS
(313) 59-43064
zamro@ford.com
PDC: 2D-G02

-----Original Message-----
From: Fournelle, Gilbert (G.)
Sent: Tuesday, March 26, 2002 9:04 AM
To: Dalbo, Bob (R.J.); Bodnar, Les (L.R.); Boels, Sandra (S.L.); Williamson, David (D.E.)
Cc: Diez, Timothy (T.P.); Amro, Zaid (Z.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

I have a correct new part at my desk. Whoever needs it can come by at any time to pick it up.

Sincerely,

Gilbert Fournelle
V6 U204 Calibration Engineering
1AE27 Truck Engine Engineering (TEE)
Phone:(313)3904968 Fax:(313)3231786

-----Original Message-----
From: Dalbo, Bob (R.J.)
Sent: Monday, March 25, 2002 5:12 PM
To: Bodnar, Les (L.R.); Boels, Sandra (S.L.); Williamson, David (D.E.); Gilbert Fournelle
Cc: Diez, Timothy (T.P.); Amro, Zaid (Z.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Sandy,
Do you have a part for this test?

Gilbert,
Do we?

Bob Dalbo
3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

-----Original Message-----

6982-827-B 13256

From: Bodnar, Les (L.R.)
Sent: Monday, March 25, 2002 2:45 PM
To: Boals, Sandra (S.L.); Dalbo, Bob (R.J.); Williamson, David (D.E.)
Cc: Diez, Timothy (T.P.); Amro, Zaid (Z.)
Subject: ACT REQ: RE: Escape MAF sensor engine failure
Importance: High

NEED PRIORITY PLACED ON PROCURRING THIS SENSOR. COMPLETION OF TESTING IS BEING DELAYED UNTIL A NEW SENSOR IS UPDATED ON THE VEHICLE. (WE DON'T WANT TO PULL IT OUT OF THE CHAMBER AND GET IT PLACED BACK IN THE QUE.)

Regards,

Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

-----Original Message-----
From: Diez, Timothy (T.P.)
Sent: Monday, March 25, 2002 8:58 AM
To: Bodnar, Les (L.R.); Dalbo, Bob (R.J.); Boals, Sandra (S.L.); Williamson, David (D.E.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Team,

Apparently, we had the wrong MAF sensor in there. Would someone please deliver to me an updated MAF?

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

-----Original Message-----
From: Kern, Bob (R.S.)
Sent: Monday, March 25, 2002 6:52 AM
To: Diez, Timothy (T.P.)
Cc: Bodnar, Les (L.R.); Dalbo, Bob (R.J.); Williamson, David (D.E.); Boals, Sandra (S.L.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Prefix is XF2F. Sorry for the omission.

-----Original Message-----
From: Diez, Timothy (T.P.)
Sent: Friday, March 22, 2002 4:47 PM
To: Kern, Bob (R.S.)
Cc: Bodnar, Les (L.R.); Dalbo, Bob (R.J.); Williamson, David (D.E.); Boals, Sandra (S.L.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Bob,

Is there a prefix to this MAF?

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

----Original Message----
From: Dalbo, Bob (R.J.)
Sent: Friday, March 22, 2002 4:46 PM
To: Diez, Timothy (T.P.); Williamson, David (D.E.); Boals, Sandra (S.L.)
Cc: Bodnar, Les (L.R.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Without the prefix from Romeo it's unwise to conclude this is the correct sensor. We should confirm this first.

In any case, the sensor itself may not be responsible for the DTC.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31766
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

----Original Message----
From: Diez, Timothy (T.P.)
Sent: Friday, March 22, 2002 9:23 AM
To: Williamson, David (D.E.); Boals, Sandra (S.L.)
Cc: Dalbo, Bob (R.J.); Bodnar, Les (L.R.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Team,
Before getting me the new MAF, the number given to me by the Romeo engineer seems to match the number provided by Bob Dalbo.

Number on vehiloe: MAFS part number(s): 12B579AA
1K90-2
6163538

Updated number provided by Bob Dalbo: **1L2F-12B579-AA**

Will you guys confirm?

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

----Original Message----
From: Williamson, David (D.E.)
Sent: Friday, March 22, 2002 8:25 AM
To: Boals, Sandra (S.L.)
Cc: Diez, Timothy (T.P.); Dalbo, Bob (R.J.); Bodnar, Les (L.R.)
Subject: RE: ACT REQ: RE: Escape MAF sensor engine failure

Sandra, can you get Tim a MAFS sensor from Visteon? Thanks.

----Original Message----
From: Bodnar, Les (L.R.)
Sent: Thursday, March 21, 2002 5:39 PM
To: Williamson, David (D.E.); Dalbo, Bob (R.J.)
Cc: Diez, Timothy (T.P.); Kern, Bob (R.S.)
Subject: ACT REQ: RE: Escape MAF sensor engine failure
Importance: High

FORD-627-B 13258

Bob/Dave, how quickly can we get a new MAFS to Tim for our EMC vehicle currently going through testing?

Regards,
Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-P34

-----Original Message-----
From: Diez, Timothy (T.P.)
Sent: Thursday, March 21, 2002 5:16 PM
To: Kern, Bob (R.S.); Bodnar, Les (L.R.)
Cc: Williamson, David (D.E.); Dalbo, Bob (R.J.)
Subject: RE: INFO NEEDED: RE: Escape MAF sensor engine failure

Bob,

Would you please tell me the part number on the MAF.

Lee,

I recognize the test characteristics of the MAF on the vehicle. Will you get underway in obtaining the updated one for me?

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

-----Original Message-----
From: Bodnar, Les (L.R.)
Sent: Thursday, March 21, 2002 5:12 PM
To: Dalbo, Bob (R.J.); Diez, Timothy (T.P.)
Cc: Williamson, David (D.E.)
Subject: RE: INFO NEEDED: RE: Escape MAF sensor engine failure
Importance: High

Bob, thanks.

Tim, updated MAFS p/n is below. Does this match?

Regards,
Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-P34

-----Original Message-----
From: Dalbo, Bob (R.J.)
Sent: Thursday, March 21, 2002 4:38 PM
To: Williamson, David (D.E.)
Cc: Bodnar, Les (L.R.)
Subject: RE: INFO NEEDED: RE: Escape MAF sensor engine failure

P1100 is intermittent MAFS. Updated MAFS P/N: **1L2F-12B579-AA**

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Williamson, David (D.E.)
Sent: Thursday, March 21, 2002 11:14 AM
To: Dalbo, Bob (R.J.)
Cc: Bodnar, Les (L.R.)
Subject: FW: INFO NEEDED: RE: Escape MAF sensor engine failure
Importance: High

—Original Message—
From: Bodnar, Les (L.R.)
Sent: Thursday, March 21, 2002 11:09 AM
To: Williamson, David (D.E.)
Cc: Gokhale, Renuka (R.V.); Diez, Timothy (T.P.); Jordan, Donald (D.E.)
Subject: INFO NEEDED: RE: Escape MAF sensor engine failure
Importance: High

Dave, EMC Testing recorded an engine code (see notes below). Can you please verify the part number and if our vehicle has the upgraded MAF sensor as described below? Thanks.

Regards,

Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

—Original Message—
From: Diez, Timothy (T.P.)
Sent: Wednesday, March 20, 2002 2:16 PM
To: Bodnar, Les (L.R.); Jordan, Donald (D.E.)
Cc: Gokhale, Renuka (R.V.); Diez, Timothy (T.P.)
Subject: FW: Escape MAF sensor engine failure

Les,

I believe code P1100 is MAF sensor intermittent. Please confirm.
Please also obtain for me the updated MAF sensor that we upgraded from the 01MY U204 to fix the EMC portion of the engine issue.

Don,

Is the number provided below the old MAF? (I hope so)

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications

313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

—Original Message—
From: Kern, Bob (R.S.)
Sent: Wednesday, March 20, 2002 1:45 PM
To: Diez, Timothy (T.P.)
Subject: RE: Escape

In the data highlighted in light green background with black bold text are the engine codes that were recorded. (I.e. PCM CODE: P1100 (CLEARED)).

MAFS part number(s): 12B579AA
1K30-2
6169538

—Original Message—
From: Diez, Timothy (T.P.)
Sent: Wednesday, March 20, 2002 11:56 AM
To: Kern, Bob (R.S.)
Subject: Escape

Would you please tell me if any trouble codes were set during the engines stall observed while RI testing?

Also, would you please send me the MAF number? Thanks.

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

From:	Sloan, Burt (B.E.)
Sent:	Wednesday, June 19, 2002 5:16 PM
To:	Klarr, Jerry (G.T.); Fasoetti, Bob (R.J.); Dakhlallah, Hasaan (H.A.); Dennis, Matt (M.A.); Ward, Sheila (S.A.); Whitehead, Joe (J.P.); Fournelle, Gilbert (G.); Boyk, Greg (G.J.); Adams, Kerry (K.N.); Matkovich, Dale (D.M.); Sabin, Scott (S.M.); Hansen, George (G.C.); Young, Dan (D.G.); Coffey, Dan (D.C.); Putney, Bill (W.); Kieliszewski, Mark (M.D.); King, Brian (B.M.); Mazzella, Gary (G.R.); Liller, David (D.J.); McIntee, Brian (B.E.); Gaynier, Larry (L.J.); Hille, Kevin (K.T.); Lewis, Marvin (M.A.); Turner, Donald (D.A.); Perlick, Don (D.A.); Gibson, Patrick (P.W.); Crowley, Pat (P.J.); Kosko, Jeff (J.R.); Newman, Chris (C.W.); Delaroderie, Jim (J.A.); Dalbo, Bob (R.J.); Squires, Mark (D.M.); Wettach, Bill (B.); Bogema, John (P.); Mandziuk, Roger (R.S.); Limatta, Gary (G.D.)
Cc:	Hofman, Michael (M.V.); Corbett, Sandra (S.M.); Schmidt, Gregory (G.A.); Van Wiemeersch, John (J.R.)
Subject:	Outfitters & Ranger Engine Hesitation/Surge, Stall, and No Start Affinity Team Meetings

Outfitters & Ranger Affinity Team
Drivability
June 26, 2002
8:00 am to 9:30 am
TEE - Conference Rm 1

Call In Phone Number: 9-1-877-877-7126
Participant Code: 6341969

June 26, 2002 Meeting Agenda:

1) UP207 2002.5 Engine Stalls emerging issue discussion Review 17 CQIS Reports Discuss next steps	Kerry Adams Don Perlick
2) Throttle Body Report on agreement of Throttle Body Diagnostic and Service procedures	John Hedges
3) Non PCM PATs Investigation Status	Kevin Hille
4) Ranger PS Switch Testing Status on UP 207	Shiela Ward
5) U152 Stalls DOE, Report on follow up DOE preparations	Scott Sabin
6) Engine Stalls Health Chart Review populated Health Chart and discuss next steps	Team

June 19th Agreements & Assignments:

Throttle Body

A) John Hedges to meet with Gary Limatta to agree on Throttle Body Diagnostic and Service procedures

B) Scott Sabin to schedule meeting at Rawsonville for next week to review progress on 6 Sigma

EM2-627-B 13272

Project

Non PCM PATs Investigation Status
Kevin Hille did not show up as scheduled

Ranger PS Switch Testing Status on UP 207
Shiela Ward reported testing is to start this week

EX02-827-B 13273

---Original Message---
From: Pepitone, Gil (J.)
Sent: Tuesday, June 11, 2002 3:27 PM
To: Pepitone, Gil (J.); Johnson, Jim (J.S.); Blicki, John (J.R.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.); Fernandez, Ruben (R.)
Cc: Moorhouse, Scott (S.R.)
Subject: RE: Escape stall in St. Croix

HI once again, everyone. Whew....

Mr. Scoot Moorhouse contacted me with an offer to supply the needed parts.

I'm now all set thanks to the Team.
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"
---Original Message---
From: Pepitone, Gil (J.)
Sent: Tuesday, June 11, 2002 1:28 PM
To: Johnson, Jim (J.S.); Blicki, John (J.R.); 'jarvis@attglobal.net'; Corbett, Sandra (S.M.); Altoonian, Don (D.J.); Fernandez, Ruben (R.)
Cc: Pepitone, Gil (J.)
Subject: RE: Escape stall in St. Croix
Importance: High

Hello again, everyone: **Please cease your search for the request parts.**

I have good news. I appears that will be able to obtain nearly all requested parts locally. While I will not able to prevent it incurring a cost (I was hoping for vendor freebees), at least I will show up prepared this Saturday.

One of my local Dealers have 115 DPFEs in stock!!! This gives you a since of the scope of the problem with that part...
I will sort thru the batch this afternoon and obtain 15 pieces.

As for the VMV and IAC, I will take one of each and rotate onto Units as necessary.

The flapper valve, however, is another story: Since it comes as part of an entire EVAP canister assembly, it would be wasteful to order one since I only need the small flapper viv in it's center. Instead, I will check for potential spider web restrictions, clean out as needed and confirm the flapper viv itself is not too far off it's seat.
If I find any that are really off center, I will swap a good one from another Unit and redrive.

I would then ask the Dealership to order that entire assembly once I confirm that it's fixed..

It looks like all the pieces to the puzzle and now together.
Thank you,
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"
----Original Message----
From: Pepitone, Gil (J.)
Sent: Tuesday, June 11, 2002 1:01 PM
To: Bilicki, John (J.R.); 'jannis@attglobal.net'; Corbett, Sandra (S.M.); Altoonian, Don (D.J.)
Cc: Johnson, Jim (J.S.); Fernandez, Ruben (R.); Pepitone, Gil (J.)
Subject: RE: Escape stall in St. Croix
Importance: High

HI John: thanks for trying. I'm hoping Don Altoonian and his Supervisor, Sandy Corbett will come thru in the 11th hr.

I have not asked Mr. Annis for any ordering since I assumed there was no guarantee that he would receive known good parts, in particular the DPFEs, which I see the most critical if I do not find any physical evidence {{i.e. low TB airflows, restricted EVAP line-read spider's webs, etc}.

I will call Joe right now and ask him to order the DPFEs and take my chances.

Unless, of course, some else comes to the rescue...
Helppppp.....
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"
----Original Message----
From: Bilicki, John (J.R.)
Sent: Tuesday, June 11, 2002 12:46 PM
To: Pepitone, Gil (J.)
Cc: Johnson, Jim (J.S.); Fernandez, Ruben (R.)
Subject: RE: Escape stall in St. Croix

Gil,

So far no luck on the parts request. Do you know if Joe Annis was asked to order any parts from the service depot? If not, we may want to pursue this course of action as well. I am not sure what is in the depot but I think at this point it is or best bet.

Regards,

John R. Bilicki
(jbilicki@ford.com)
Product Concern Supervisor
Customer Service-Worldwide Direct Market Operations
1555 Fairlane Drive, FBP 3, 142A, MD 74
Phone: 313/59-42672 Fax: 313/84-53817

----Original Message----
From: Pepitone, Gil (J.)
Sent: Tuesday, June 11, 2002 11:32 AM
To: Corbett, Sandra (S.M.); Altoonian, Don (D.J.)
Cc: Pepitone, Gil (J.); Bilicki, John (J.R.); Johnson, Jim (J.S.)
Subject: RE: Escape stall in St. Croix
Importance: High

Hi Sandra and Don: NOPE! I do not have the parts I need... I may be involved with 15 UNITS. The DPFEs are the most critical, and I would for-go the other stuff at this point. But the more that I have, the better chances of getting ALL these fixed, the better..

Any help would get great. Timing is really tight.... I will be at the airport this Saturday at 630 am.

Pls continue to push...
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"
----Original Message----
From: Corbett, Sandra (S.M.)
Sent: Tuesday, June 11, 2002 10:33 AM
To: Altoonian, Don (D.J.)
Cc: Pepitone, Gil (J.)
Subject: FW: Escape stall in St. Croix
Importance: High

Does Gil have the requested parts?

Sandy Corbett
Escape Powertrain QRT
Phone/Fax: (313)59-44351
Product Development Center 2H-E66

-----Original Message-----
From: Terzes, Laura (L.D.)
Sent: Monday, June 10, 2002 6:09 PM
To: Hofman, Michael (M.V.); Corbett, Sandra (S.M.)
Subject: FW: Escape stall in St. Croix
Importance: High

I did not see your names on this note.

-----Original Message-----
From: Pepitone, Gil (J.)
Sent: Monday, June 10, 2002 4:40 PM
To: Bilicki, John (J.R.); 'jannis@attglobal.net'; Johnson, Jim (J.S.)
Cc: DiAngelo, Renaldo (R.); Dalbo, Bob (R.J.); Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Benintende, Robert (R.F.); Moorhouse, Scott (S.R.); Terzes, Laura (L.D.); Linde, Peter (P.A.); Pepitone, Gil (J.); Bradley, Joe (J.C.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Powers, Ken (K.W.); Terzes, Laura (L.D.); Fernandez, Ruben (R.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Amely, Felix (F.A.)
Subject: RE: Escape stall in St. Croix
Importance: High

Good afternoon Everyone: I have confirmed my air reservations as cited below. I have secured hotel reservations as well.

Mr. Annis: please arrange to have Ms. Matto meet me at American Airlines, Flight # 5288 from San Juan at 1PM this Saturday, June 15th.
I wish to then go directly to your Dealership to start my work. Hopefully, some of the Concern Units will be available then so I may start the Process.

<u>The last item to be addressed are my request for the necessary components, as outlined in my prior notes.</u>

Would anyone wish to step forward to assist me my efforts to acquire these parts? I would not mind having the parts shipped directly to my home and take them to St. Croix. This will save the Company shipping cost to St. Croix and also ensure that the parts have arrived on time.
See the note directly below which lists quantity and type of items.
My address is:
10775 NW 5th Place
Coral Springs, Fla, 33071

Please advise: the timing is now very tight and above all, I would really like to have the "good" DPFEs w/ the white dot and/or a build date of 2A07 or later.

Pls advise asap...
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"
-----Original Message-----
From: Pepitone, Gil (J.)
Sent: Monday, June 10, 2002 11:30 AM
To: Blickl, John (J.R.); 'jannis@attglobal.net'; Johnson, Jim (J.S.)
Cc: DiAngelo, Renaldo (R.); Dalbo, Bob (R.J.); Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Pepitone, Gil (J.); Benintende, Robert (R.F.); Moorhouse, Scott (S.R.); Terzes, Laura (L.D.); Linde, Peter (P.A.); Bradley, Joe (J.C.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Powers, Ken (K.W.); Terzes, Laura (L.D.); Fernandez, Ruben (R.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Amely, Felix (F.A.)
Subject: RE: Escape stall in St. Croix
Importance: High

Good morning everyone: I just got off the phone with Mr. Joe Annis. I asked the projected number of Units which will need my inspection/resolution. **He guesstimated 15 Units. The potential for even more Units is possible.**

I am formally requesting that 15 sets of the know good parts (In particular, DPFEs with either a White Dot or a BD date code from 2A07 on is requested) be sent directly to Metro Motors this week.

I **tentatively** have the following flight schedule. I have NOT made formal reservations yet, as I am awaiting approval from Mr. Johnson, per my note sent yesterday:
Arrive on American Airline Jun 15h (this Sat) in St. Croix at 1pm
Depart St. Croix on Jun 25th (Tues) at 10:30am.

Mr. Annis has agreed to have the Service Manager, Ms. Bette Matto pick me up at the Airport this Saturday, once I have confirmed these flight times to him, via e-mail.

I am asking for conformation of the requested Part Send.
I am requesting final approval of the time span suggested for this trip.

Pls advise asap: I want to ensure I get those flights at the great rate ($486.40) and also get the low hotel rate for the place recommended to me.
Thank you,
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"

-----Original Message-----
From: Bilicki, John (J.R.)
Sent: Monday, June 10, 2002 10:42 AM
To: Altoonian, Don (D.J.)
Cc: DiAngelo, Renaldo (R.); Dalbo, Bob (R.J.); Sanders, Muriel (M.S.); Pepitone, Gil (J.); Johnson, Jim (J.S.)
Subject: RE: Escape stall in St. Croix

Don,

Gil Pepitone has requested the following parts to support his trip to St. Croix:

Vapor Management Valves (VMV)
Known Good "White Dot" DPFE sensors
EVAP "Flapper" Valves
Known good Idle Speed Control (ISC a.k.a IAC) valves

Gil and I are not sure if ALL parts in service stock are at the latest quality level. Please advise if we should pursue known good parts from an alternate source or should current service stock be adequate? If need be can you provide known good parts?

Regards,

John R. Bilicki
(jbilicki@ford.com)
Product Concern Supervisor
Customer Service-Worldwide Direct Market Operations
1555 Fairlane Drive, FBP 3, 142A, MD 74
Phone: 313/59-42672 Fax: 313/84-53817

-----Original Message-----
From: Pepitone, Gil (J.)
Sent: Saturday, June 08, 2002 9:06 PM
To: Johnson, Jim (J.S.); 'jannis@attglobal.net'; Bilicki, John (J.R.)
Cc: Pepitone, Gil (J.); DiAngelo, Renaldo (R.); Fernandez, Ruben (R.); Benintende, Robert (R.F.); Dalbo, Bob (R.J.); Sanders, Muriel (M.S.)
Subject: RE: Phone Numbers
Importance: High

Hi Joe: great info. I will do as I think you suggest. Firstly, I will request to those cc'ed for the parts below be shipped directly to your Dealership.

However, I'm a little confused on your reply concerning the tools handling. Here's a repaste:
When leaving the main land into St. Croix you will not go through customs with your checked luggage. Leaving St. Croix is another story. Your luggage will go through customs but you should not have any problems with tools and such as long as they are check..

Do I understand you correctly: I should carry my tools with me (My NGS, DVOM, flashlight, small drill/bits) since I will not be going thur Customs on my way into St. Croix.
But when LEAVING St, Croix, I should put tools in my checked luggage. Would I then tell them about the tools, thus I would get them "checked"?
Is this correct?? Sorry for any misunderstanding on my part...I do not want to be delayed..

Hi Jim/John: would/could you arrange/request to have the list of components sent directly to the Dealership? That list was provided on a prior note, but I will repaste for your convenience:

Vapor Management Valves (VMV)

Known Good "White Dot" DPFE sensors

EVAP "Flapper" Valves

Known good Idle Speed Control (ISC a.k.a IAC) valves

Pls note that I used plurals for my parts request. I do NOT know how many Units I will be inspecting. I would be nice to have multiple sets of the above parts in hand, or sent to Metro Motors directly before I arrive.

Would someone (Mr. Joe Annis??) pls advise? I do not want to burn up Company $$ waiting for known good parts to arrive.

Pls note my reference for knowing in advance the Number of Units involved, so I may not only know how many "sets" of the above parts to have delivered, but also so I may know how long to may my stay for: obviously, the more cars to fix, the longer the stay.
Joe: would you be able to advise us on the number of cars I will be involved with??

Thank you,
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Non-Text Beeper: 1888-375-1981
"With Warranty you are Paying for the Sins of the Past"
-----Original Message-----
From: Joe Annis [mailto:jannis@vtford.com]
Sent: Friday, June 07, 2002 6:27 PM
To: Pepitone, Gil (J.); Johnson, Jim (J.S.)
Cc: Pepitone, Gil (J.); DiAngelo, Renaldo (R.)
Subject: Re: Phone Numbers

Hi Gil

When leaving the main land into St. Croix you will not go through customs with your checked luggage. Leaving St. Croix is another story. Your luggage will go through customs but you should not have any problems with tools and such as long as they are check.

If you are shipping small parts, etc. it is best to have them shipped to the dealership via US Mail, using the over night service. If you are flying in with checked luggage, you should be able to bring tools with you. Any thing you need shipped back we can do from the dealership. Give me a call if I can be of any help. Best number to use is my cell 340 690 2406.

Thanks
Joe Annis

---- Original Message ----

From: Pepitone, Gil (J.)

To: Johnson, Jim (J.S.) ; 'jannis@attglobal.net'

Cc: Pepitone, Gil (J.) ; DiAngelo, Renaldo (R.)

Sent: Friday, June 07, 2002 6:49 PM

Subject: RE: Phone Numbers

Hi Jim: I will take your direction regarding making the reservations at the Buccaneer Hotel. However, am I correct in understand that I may make then directly, and not thru the Ford Travel Website? Pls advise.

Hi Joe: I intend on calling you Monday afternoon. I'm waiting till then so I may know if my prior note's request regarding the importing of Parts and my tools is a Go.

Based on the pending timing of shipment of known good parts, I will make my flight reservations.

Unless, Jim, you would want me to leave BEFORE parts are sent out. Please advise. I'm way flexible...

As for my personal transportation, I agree with the approach that I should drive the Concern Units. I want to load the WDS VDR and record the Stalls, If I'm lucky enough to have them Stall for me..

Thank you,

Gil Pepitone
Powertrain Field Quality Specialist-"PFQS"
Answering Machine: 954-753-9989
Cell # 954-242-2066

"With Warranty you are Paying for the Sins of the Past"

-----Original Message-----
From: Johnson, Jim (J.S.)
Sent: Friday, June 07, 2002 3:09 PM
To: Pepitone, Gil (J.)
Subject: FW: Phone Numbers

-----Original Message-----
From: Joe Annis [mailto:jannis@attglobal.net]
Sent: Friday, June 07, 2002 12:43 PM
To: Johnson, Jim (J.S.)
Subject: Re: Phone Numbers

Jim

If he need a car we could let him drive an Escape the time he is here. I have two that are on our list and I think we have done the TSB on them. Just let me know his flights and we will have him picked up at the Air Port and go from there.

Thanks

Joe

----- Original Message -----

From: Johnson, Jim (J.S.)

To: 'Joe Annis' ; Pepitone, Gil (J.)

Cc: Benintende, Robert (R.F.)

Sent: Friday, June 07, 2002 2:23 PM

Subject: RE: Phone Numbers

Joe, sorry for the confusion, Gil is going to St. Croix. Do you recommend Gil rent a car? Please advise.

Gil, Joe Annis (The dealer Principal) recommends the Buccaneer Hotel, phone 340-773-2100 he has a preferred rate of approximately $100.00 per night vs. the rack rate of $200.00. You have to tell them your working on Ford Motor Company business at Metro Motors and request the Metro Motors rate.

Also please forward your flight details when you get a chance. Joe will meet you at the airport.

-----Original Message-----
From: Joe Annis [mailto:jannis@attglobal.net]
Sent: Friday, June 07, 2002 10:09 AM
To: Johnson, Jim (J.S.)
Subject: Phone Numbers

Jim

My cell number is 340 690 2406 my home number in St. Thomas is 340 714 1905 and in St. Croix the home is 340 773 9559 I think. In your note you said that the person would be going to St. Thomas. We have a lot of Escapes in St. Croix and a much better service department to work in.

Thanks

Joe

Thur. Jan. 30. 2003

Technical Data Sheet

Dynasolve 210/220/225/230

SOLVENTS FOR DISSOLVING CURED SILICONES

Dynasolve 210 was developed to fill a widespread need for a solvent that would dissolve RTV silicones and silicone conformal coatings effectively at room temperature. Dynasolve 210 dissolves silicones quickly and effectively, but it contains methylene chloride, and may attack other polymers or coatings, such as epoxies and urethanes. Dynasolve 220, 225, and 230, while not quite as fast as Dynasolve 210, contain no chlorinated solvents and are more selective. In most cases, Dynasolve 230 is fastest, followed by Dynasolve 225, and then Dynasolve 220. All of the 200 series, when not contaminated by water, will not attack metal or metal components, with the exception of aluminum. however, aluminum may be etched after extended immersion in these Dynasolves. Contamination of these Dynasolves with water will result in the formation of acids that can attack most metals and other substrates. Test data shows the mu-metal was untouched after a 24-hour immersion in Dynasolve 210. Dynasolve 220, 225, and 230 will not attack acrylic or polycarbonate.

APPLICATIONS:

Dynasolve 210, 220, 225, and 230, effective in dissolving the following silicones, are expected to effectively dissolve any similar silicones manufactured by other companies

RTV's	Dow Corning 3110, 3112, 3140, 3-6548, 3-6550, Silastic E, L, 737, GE 12, 21, 31, 103, 112, 159, 162, 511, 630, 700, 8111.
Sealants	Rhone-Poulenc Rhodorsil 3B, 5C, 6B, Loctite Nuva-Sil 76, 84, 88, 91
Encapsulants	Dow Corning 96-082, Emerson & Cuming Amicon SC-215
Elastomers	Dow Corning Sylgard 170, 184, 577, Q3-6605
Liquid Silicone Rubbers	Dow Corning Silastic 599-HC, GE LIM 2500, 2600, 2700, SH640
Adhesives	Emerson & Cuming Amicon SC 1047
Varnishes	Dow Corning 996
Dielectric Gels	Dow Corning Sylgard 527, Q3-6575
Conformal Coatings	Dow Corning 1-2577, Hipec 648, Hipec Q1-4939, GE SR 900, Chemtronics Konform, Conap CE-1181, Emerson &

Phone:

EM2-627-B 14633

800.669.5709

Fax:
800.671.9583

Postal address:
P.O. Box 33609
1910 S. State Avenue
Indianapolis, IN 46203

Curing Agent SC-120 [illegible]

TYPICAL PROPERTIES:

	Dynasolve 210	Dynasolve 220	Dynasolve 225	Dynasolve 230
Color:	Amber	Amber	Amber	Amber
Specific Gravity:	1.27	0.83	0.81	0.71
Boiling Point:	104°F	>320°F	>235°F	>202°F
Flash Point:	None	110°F	52°F	16°F
pH:	2.1	1.7	1.6	1.3

DIRECTIONS FOR USE:

1. BY IMMERSION: use a dry stainless steel or glass container. Cover to minimize evaporation. Make sure part to be stripped is water-free. Immerse the part into solution and allow to stand at room temperature until silicone has dissolved or can be easily brushed off. Time will vary depending on the type of silicone, the thickness and surface area exposed. Typically, RTV's at a thickness of ¼" will dissolve in 2-12 hours. Coatings of .030" will dissolve within 5 minutes. The use of agitation or ultrasonics will also reduce dissolving time. It may be necessary to suspend the component in solution so that the material removed will settle to the bottom of the container and not redeposit onto the component. After dissolving is complete, rinse part with alcohol then with water.
2. BY BRUSHING: Brush evenly onto silicone coatings or sealants. Let stand for 10-30 minutes; reapply as necessary to keep surface wet. Remove loose silicone with scraper or brush. Repeat if necessary. Rinse surface with alcohol, then with water.
3. FOR SPOT REMOVAL: Saturate a cloth or Q-tip and apply to surface. Let stand for 10-30 minutes, reapply as necessary to keep surface wet. Rub with saturated cloth or Q-tip until silicone is removed. Rinse surface with alcohol, then with water.

CAUTION:

Dynasolve 210, 220, 225, and 230 are corrosive liquids. Dynasolve 225 and 230 are also flammable liquids. Keep away from contact with water. Keep away from heat, sparks, or open flame. Refer to MSDS before use or disposal.

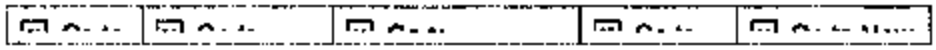
AVAILABILITY AND TERMS:

Dynasolve 210, 220, 225, and 230 are packaged in pints (not 210), quarts, 9-pint containers, 5-gallon pails, and 55-gallon drums. They are stock items and can be shipped by UPS, truck or air freight. Terms are Net 30 days. FOB shipping point. Prices are subject to change without notice.

Dynaloy, Inc. takes every precaution in the manufacture of its products. The information in this sheet is based upon our own research and is considered accurate. However, no warranty is expressed or implied regarding accuracy and results to be obtained, since operating conditions in your plant are beyond our control.

For additional information on our products and services, just click on any links or bottom categories, or call, fax or E-mail us. We look forward to working with you.

EM02-627-8 14834



General Information: info@dynaloy.com Webmaster: webmaster@visionpublishing.com

Site last updated: February 7, 2000

EXHIBIT 14535

Thur. Jan. 30, 2003

Technical Data Sheet

Dynasolve 700 Series

FOR DISSOLVING CURED URETHANES, SILICONES, ANHYDRIDE EPOXIES, PHOTO RESIST FILMS

Dynasolve 700, 710, 711, and 750 are reactive solvents developed as companion products to the Uresolve HF, Plus, Plus SG and Plus 500. Dynasolve 700 series, however, uses glycol ethers based upon propylene oxide, while the Uresolve series uses glycol ethers based upon ethylene oxide. The 700 series was designed to dissolve cured urethanes, RTV silicones, anhydride epoxies, and cured photo resist films.

APPLICATIONS:

1. These solvents can be used to clean a variety of parts and equipment including molds, molding equipment, mixing & metering equipment, pouring equipment, and other types of industrial machinery having contact with polymers.
2. They will dissolve and remove cured urethanes, silicones, anhydride epoxies, and cured photo resist films.
3. They will swell or dissolve vinyl, polystyrene, Lucite, and plexiglass. This unique chemical system will not cause discoloration or chemical attack on the following materials.

Plastics: Molding compounds such as certain phenolics, amine cured epoxy, neoprene, polyethylene, Teflon, Kel-F.

Metals: Dynasolve 700 Series will not attack magnesium and magnesium alloys, carbon, steel, nickel, electroless nickel plate, silver, gold, beryllium alloys, stainless steel or chromium, copper, brass, and bronze.

For aluminum or aluminum alloys, use Dynasolve 711 only.

3. They will dissolve the following materials:

Silicones: Transfer Molded Dow Corning 307, 306, 305, 304. Silicone varnishes 643, 644, 646, RTV elastomers Dow Corning 3140, 3145, 3110, 3112, 3120, 589: General Electric 600 Series: General Electric 11, 21, 30, 411, 80, 77.

Phone:

E982-627-B 14836

800.669.5709

Fax:
800.671.9583

Postal address:
P.O. Box 33609
1910 S. State Avenue
Indianapolis, IN
46203

Urethanes: Furane 87310, Glidden-Durkee Urethanes.

4. They will dissolve partially cured or gelled urethanes from the inside of a Kenics static mixer.

TYPICAL PROPERTIES:

Dynasolve:	700	710	711	750
Uresolve Companion:	HF	PLUS	PLUS SG	PLUS 500
Boiling Point:	248°F	248°F	248°F	248°F
Specific Gravity:	0.97	0.99	0.99	1.00
Color:	Blue	Blue	Blue	Blue
Flash Point (CC):	95°F	105°F	106°F	105°F

DIRECTIONS FOR USE:

1. Small parts may be immersed in the Dynasolve 700 series until all cured material is dissolved. Many urethanes will dissolve at room temperature. RTV silicones, silicone molding compounds, anhydride epoxies and cured photo resist films will require heating the solvent to 200-250°F. If heating is required use explosion proof heaters and exhaust hoods.
2. Use of ultrasonic cleaners, or mechanical mixing of the Dynasolve will speed up the dissolving rate.
3. After the polymer has been completely dissolved, wash in water or alcohol to remove excess solvent and dissolved polymer. If the surface of the component is milky after washing, the polymer has not been completely removed. Return the component to the Dynasolve solution and allow to remain for an additional amount of time. Repeat the washing cycle.
Note: Dynasolve 700 series will absorb moisture when left open to the atmosphere; keep container closed when not in use.
4. It may be necessary to suspend the component in solution so that the material removed will settle to the bottom of the container and not redeposit onto the component.

CAUTION:

Dynasolve 700 series in general has a relatively low degree of acute toxicity and does not present any serious health hazards under normal handling conditions. Single dose oral toxicity is low and only mild adverse effects have been shown for skin and eye contact. However, as a matter of safe practice, ingestion, eye contact, and prolonged skin contact should be avoided. Prolonged inhalation of vapors should also be avoided and adequate ventilation provided. A Threshold Limit Value of 100 ppm has been established by the American Conference of Governmental Industrial Hygienists for the propylene glycols.

AVAILABILITY AND TERMS:

Dynasolve 700, 710, 711, and 750 are packaged in pints, quarts, gallons, 5-gallon pails, and 55-gallon drums. They can be shipped by UPS (ground or air), truck or air freight. Terms are Net 30 days, FOB shipping point. Prices are subject to change without notice.

For additional information on our products and services, just click on any links or bottom categories, or call, fax or E-mail us. We look forward to working with you.

EXHIBIT 14037

General Information: info@dynaloy.com Webmaster: webmaster@visionpublishing.com

Site last updated: February 7, 2000

5982-827-0 14636

ShinEtsuMicroSi®

SHIN-ETSU SIFEL™

SIFEL

The Evolution of Fluoroelastomers

EM02-027-B 1M/00

June 2000

[redacted]

ShinEtsuMicroSi® SHIN-ETSU SIFEL™

What is SIFEL?

- **A new class of fluoroelastomer**
- **Available in paste or liquid form**
- **Cures into a resilient elastomer**
- **Highly versatile**
  - **Fluororubber for liquid injection molding**
  - **Adhesive**
  - **Coating**
  - **Potting gel**

SMZ-027-0 1AM0

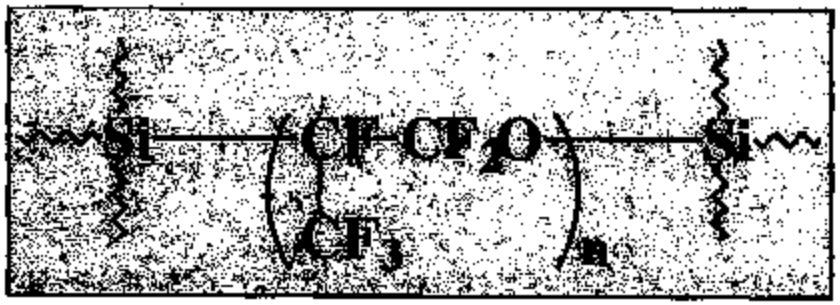
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL™

Structure

The combination of a Perfluoropolyether backbone with a terminal silicone crosslinking group



results in a novel fluoroelastomer with outstanding performance

SMS-027-B 1/01

June 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL™

Features

- **Liquid or paste**
- **Resistant to solvents, fuels and oils**
- **Low temperature flexibility**
- **Excellent electrical insulation properties**
- **Nonflammable**
- **Chemical resistance**
- **Heat resistance**
- **Low moisture permeability**

0002-0271-9 1/9/2

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL™

Many Applications

- **Molding parts**
- **Adhesive**
- **Coating**
- **Potting (Gel form)**

For many industries:

- **Automobile**
- **Aerospace**
- **Electronics/Semiconductor**
- **Chemical plant**
- **Instrument**
- **Others**

sheet 6-LZS-2003

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL™

Operating Information

- Contamination Control
  - Tool, devices, equipment, jigs and many other objects which will come in contact with SIFEL should be cleaned. No moisture, oil, dirt, dust or debris are allowed.
  - When SIFEL products contact with materials such as sulfur, phosphorus, nitrogen containing compounds or organometallic salts, curing reaction may be inhibited. Avoid any possibility of contamination.
- Storage
  - Seal containers tightly and keep them in a cool and dark place. Exposure to heat, sun, light, moisture or chemicals may cause quality changes.
- For Your Safety
  - Keep containers tightly closed when not in use.
  - Harmful gases may be generated when the product is heated to more than 200°C.
  - Use only where an adequate ventilation system is available to exhaust vapor.
  - Do not inhale evolved vapor.
  - Do not contact with acidic, basic or oxidizing materials.
  - Do not smoke cigarettes which have come into contact with the product.
  - To avoid eye and skin contact, use with safety glasses and safety gloves.
  - Do not swallow.
  - Wash thoroughly after handling.
  - Keep out of reach of children
  - For more information, refer to the relevant MSDS.

SME-427-6 1/01

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi® SHIN-ETSU SIFEL™

Operating Information

- While every effort has been made to ensure the accuracy of all information and data presented here, the user is requested to conduct his own thorough testing prior to use to ensure that the product performs satisfactorily under specific conditions.
- Discussion of particular uses here does not imply any patent or license for those uses.
- Just as catalogues are subject to revision as new products and applications are developed, these materials are subject to change without notice.
- SHIN-ETSU™ is developed for industrial use only and is not suitable for any device or product designed to be inserted inside human beings and may not be suitable for other medical applications.

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New Functional Materials Dept.
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http://www.microsi.com

June 2000

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9902-621-8 14945

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- 3M™ Fluorinert™ Electronic Liquid FC-87
- 3M™ Fluorinert™ Electronic Liquid FC-3283

3M™ Fluorinert™ Electronic Liquids

A family of perfluorinated liquids offering unique properties ide to the demanding requirements of electronics manufacturing, h transfer and other specialized applications.

MAKE A SELECTION

3M™ Fluorinert™ Electronic Liquid FC-40

This fully-fluorinated liquid is ideal for use in many single-phase heat transfer applications · semiconductor manufacturing industry - and is widely used in testing applications.

3M™ Fluorinert™ Electronic Liquid FC-43

A unique combination of properties makes Fluorinert liquid FC-43 ideal for many electronics including heat transfer, vapor phase reflow soldering, and many electronic quality and relia

3M™ Fluorinert™ Electronic Liquid FC-70

A unique combination of properties and a high boiling point (215 deg C) makes this liquid k electronics applications, including high temperature heat transfer, vapor phase reflow solde electronic quality and reliability tests.

3M™ Fluorinert™ Electronic Liquid FC-72

Thermally and chemically stable, Fluorinert liquid FC-72 is an ideal choice for low temperatu applications. Its properties also make it useful in selected electronic testing applications.

3M™ Fluorinert™ Electronic Liquid FC-77

The wide liquid range of Fluorinert liquid FC-77 (-110 deg C to 97 deg C) allows its use in h applications in the semiconductor industry, and also makes it useful in electronics testing.

3M™ Fluorinert™ Electronic Liquid FC-84

With high thermal conductivity and excellent chemical stability, Fluorinert liquid FC-84 is id electronics applications, including heat transfer and electronic reliability testing.

3M™ Fluorinert™ Electronic Liquid FC-87

Thermally and chemically stable, nonflammable, compatible with sensitive materials and pr Fluorinert liquid FC-87 is an ideal fluid for many electronics applications, including thermal

3M™ Fluorinert™ Electronic Liquid FC-3283

This fully-fluorinated liquid is ideal for use in many single-phase heat transfer applications, semiconductor manufacturing industry.

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E982-627-B 14946

3M

Fluorinert™
Electronic Liquid FC-77

Product Information

Introduction

3M™ Fluorinert™ Electronic Liquid FC-77 is a thermally stable, fully-fluorinated liquid that has long been used as a heat transfer fluid in a variety of industries.

The inertness of Fluorinert liquid FC-77 permits its use as a direct contact single and two-phase coolant in supercomputers and sensitive military electronics. Its high dielectric strength and electrical resistivity are ideal for applications in high voltage transformers and power electronics.

In the semiconductor manufacturing industry, its wide liquid range makes Fluorinert liquid FC-77 ideal for cooling ion implanters, dry etchers and CVD machines. Its low pour point also permits its use in thermal shock and test equipment.

Physical Properties

Not for specification purposes

All values determined at 25°C unless otherwise specified

Properties	FC-77
Appearance	Clear, colorless
Average Molecular Weight	416
Boiling Point (1 atm)	97°C
Pour Point	-110°C
Calculated Critical Temperature	495 K
Calculated Critical Pressure	1.58×10^6 pascals
Vapor Pressure	5.62×10^3 pascals
Latent Heat of Vaporization (at normal boiling point)	89 J/g
Liquid Density	1780 kg/m³
Kinematic Viscosity	0.72 centistokes
Absolute Viscosity	1.3 centipoise
Liquid Specific Heat	1100 J kg⁻¹ °C⁻¹
Liquid Thermal Conductivity	0.063 W m⁻¹ °C⁻¹
Coefficient of Expansion	0.00138 °C⁻¹
Surface Tension	13 dynes/cm
Refractive Index	1.28
Water Solubility	13 ppmw
Solubility in Water	<5 ppmw
Ozone Depletion Potential	0

3M™ Fluorinert™ Electronic Liquid FC-77 Electrical Properties

Properties	FC-77
Dielectric Strength	40 kV, 0.1" gap
Dielectric Constant	1.9
Electrical Resistivity (ASTM D-257)	1.9×10^{13} ohm cm

Heat Transfer Properties

The following formulas can be used to calculate the specific heat, thermal conductivity and density of 3M™ Fluorinert™ Electronic Liquid FC-77 at various temperatures.

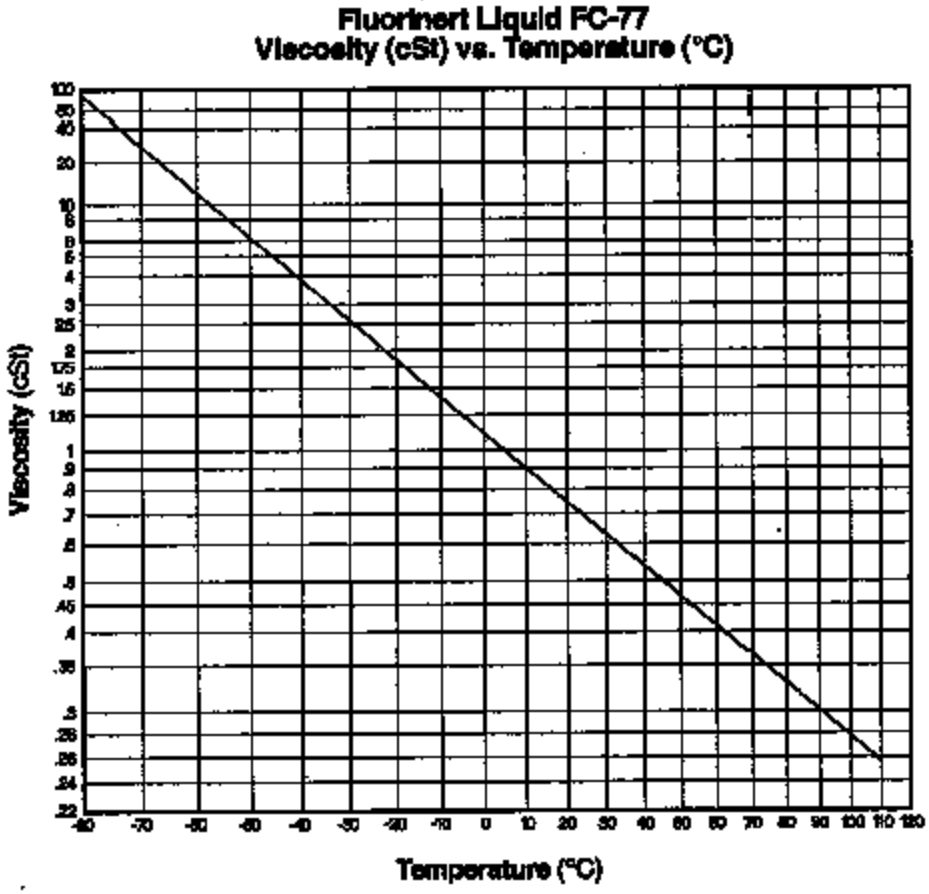
Specific Heat ($J\,kg^{-1}\,°C^{-1}$) = 1014 + 1.554 (T, °C)

Thermal Conductivity ($W\,m^{-1}\,°C^{-1}$) = 0.065 – 0.00008 (T, °C)

Density (kg/m^3) = 1838 – 2.45 (T, °C)

Log_{10}(Vapor Pressure (pascals)) = 10.216 – (1928/(T, K))

The following graph can be used to determine the viscosity of Fluorinert liquid FC-77 over the indicated temperature range.



3M Fluorinert Electronic Liquid FC-77 Materials Compatibility

3M™ Fluorinert™ Electronic Liquid FC-77 is compatible with most metals, plastics and elastomers.

Toxicity Profile

Fluorinert liquid FC-77 is non-irritating to the eyes, minimally irritating to the skin, and is practically non-toxic orally and dermally. The product also demonstrates very low acute and sub-chronic inhalation toxicity. It is not a mutagen (ames) or skin sensitizer. A Material Safety Data Sheet is available upon request.

Safety and Handling

Before using this product, please read the current product Material Safety Data Sheet (available through your 3M sales or technical service representative) and the precautionary statement on the product package. Follow all applicable precautions and directions. Fluorinert liquid FC-77 is nonflammable, and is highly resistant to thermal breakdown and hydrolysis in storage and during use. Recommended handling procedures are given in the Material Safety Data Sheet.

Environmental Properties

Fluorinert liquid FC-77 has zero ozone depletion potential. The material is not defined by the U.S. EPA, nor is it regulated, as a volatile organic compound (VOC). FC-77 liquid does not contribute to ground-level smog formation.

Fluorinert liquid FC-77, a perfluorocarbon (PFC), has a high global warming potential and a long atmospheric lifetime. As such, its use should be carefully managed to minimize emissions.

3M recommends that users of Fluorinert liquid FC-77 further limit emissions by employing good conservation practices, and by implementing recovery, recycling and/or proper disposal procedures. 3M offers a program for used fluid return.

Environmental Policy

3M will recognize and exercise its responsibility to:

- prevent pollution at the source wherever and whenever possible
- develop products that will have a minimal effect on the environment
- conserve natural resources through the use of reclamation and other appropriate methods
- assure that its facilities and products meet and sustain the regulations of all Federal, State and local environmental agencies
- assist, wherever possible, governmental agencies and other official organizations engaged in environmental activities

3M™ Fluorinert™ Electronic Liquid FC-77 Used Fluid Return Program

3M offers a program for free pickup and return of used 3M Specialty Materials in the U.S. through Safety-Kleen Corporation. A pre-negotiated handling agreement between users and this service provider offers users broad protection against future liability for used 3M product. The fluid return program is covered by independent third-party financial and environmental audits of treatment, storage and disposal facilities. Necessary documentation is provided. A minimum of 30 gallons of used 3M Specialty Materials is required for participation in this free program.

Safety-Kleen Corporation has a network of 156 branch service centers in the U.S. This large fleet will provide timely, economical fluid disposal service.

For additional information on the 3M Used Fluid Return Program, contact Safety-Kleen Corporation at this toll-free line: 1.888.932.2731.

Resources

3M™ Fluorinert™ Electronic Liquid FC-77 customers are supported by global sales, technical and customer sales resources, with fully staffed technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues.

For other 3M global offices and additional information on Fluorinert electronic liquid FC-77 in the U.S., call 3M Performance Materials, 800.833.5045, or visit our web site at: www.3m.com/fluids

Important Notice to Purchaser: The information in this publication is based on tests that we believe are reliable. Your results may vary due to differences in test types and conditions. You must evaluate and determine whether the product is suitable for your intended application. Since conditions of product use are outside of our control and vary widely, the following is made in lieu of all express or implied warranties (including the warranties of merchantability or fitness for a particular purpose): 3M's only obligation and your only remedy is replacement of product that is shown to be defective when you receive it. In no case will 3M be liable for any special, incidental, or consequential damages based on breach of warranty or contract, negligence, strict tort, or any other theory.

3M

Specialty Materials

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1501 8-429-5969

---------- 4. REACTIVITY DATA ----------
---------- STABILITY: Stable INCOMPATIBILITY - MATERIALS/CONDITIONS TO AVOID: Finely divided active metals, Alkali and alkaline earth metals. HAZARDOUS POLYMERIZATION: Hazardous polymerization will not occur. HAZARDOUS DECOMPOSITION PRODUCTS: See Health Hazard Data section. ----------
---------- 5. ENVIRONMENTAL INFORMATION ----------
---------- SPILL RESPONSE: Observe precautions from other sections. In accordance with good industrial practice, provide exhaust ventilation for large spills or in confined spaces. Collect spilled material with an absorbent. Place in an approved container. RECOMMENDED DISPOSAL: As a disposal alternative, incinerate in the presence of a combustible material in an industrial or commercial facility capable of handling halogenated waste. Reclaim if feasible. For information on product return, contact your distributor. ENVIRONMENTAL DATA: SUPPORTING DATA: Biodegradation: Chemical Oxygen Demand (COD): Nil 20-Day Biochemical Oxygen Demand (BOD20): Nil Aquatic toxicity: Fathead minnow (Pimephales promelas) 96-Hr. LL50: >1000 mg/L Water flea (Daphnia magna) 48-Hr. EL50: >1500 mg/L REGULATORY INFORMATION: Volatile Organic Compounds: N/A. VOC Less H2O & Exempt Solvents: N/A. Since regulations vary, consult applicable regulations or authorities before disposal. U.S. Clean Water Act, Section 307, Toxic Pollutants = None. U.S. EPA Hazardous Waste Number = None (Not U.S. EPA Hazardous). The components of this product are in compliance with the chemical registration requirements of: TSCA, EINECS, CDSL, AICS, MITI. ----------
---------- Abbreviations: N/D - Not Determined N/A - Not Applicable CA - Approximately

---------- 5. ENVIRONMENTAL INFORMATION (continued) ----
---------- OTHER ENVIRONMENTAL INFORMATION: EPCRA 311/312 Reportable Quantity = Not Reportable. Transportation Information: Not regulated, all transportation modes. This substance is resistant to biodegradation and is therefore likely to persist in the environment. This compound is completely fluorinated (perfluorinated), or it contains perfluorinated portions. Perfluoroalkyl groups resist degradation in most natural environments. This low-solubility substance has insignificant toxicity to aquatic organisms (Lowest LL50 or EL50 is >1000 mg/L). LL50 (Lethal Level) and EL50 are similar to LC50 and EC50, but tests the water phase from incompletely-miscible mixtures. Bioassays have been run on organisms from less than three phyla. Organisms from taxa that were not tested may show greater sensitivity. No data are available on the toxicity effects of this substance on wastewater treatment system organisms. EPCRA HAZARD CLASS: FIRE HAZARD: No PRESSURE: No REACTIVITY: No ACUTE: No CHRONIC: No ----------
---------- 6. SUGGESTED FIRST AID ----------
---- EYE CONTACT: Immediately flush eyes with large amounts of water. Get immediate medical attention. SKIN CONTACT: Wash affected area with soap and water. INHALATION: If signs/symptoms occur, remove person to fresh air. If signs/symptoms continue, call a physician. IF SWALLOWED: No need for first aid is anticipated. OTHER FIRST AID INFORMATION: This product is not expected to be irritating to the eyes, skin or respiratory system at room temperature conditions. This assessment does not account for contaminants from product use. The suggested ----
---------- Abbreviations: N/D - Not Determined
N/A - Not Applicable CA - Approximately MSDS: FC-77 FLUORINERT Brand Electronic Liquid July 08, 1999 PAGE 5 ---------- 6. SUGGESTED FIRST AID (continued) ----------
-- first aid measures are basic first aid measures for removal of foreign materials from the skin and/or eyes. ---------- 7. PRECAUTIONARY INFORMATION ---------- EYE PROTECTION: As a good industrial hygiene practice: Wear safety glasses with side shields. SKIN

EMD-027-B 14882

PROTECTION: Gloves are not required. RECOMMENDED VENTILATION: As a good industrial hygiene practice: For those situations where the fluid might be exposed to extreme overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation sufficient to maintain levels of thermal decomposition products below their exposure guidelines (SEE SECTION 8). RESPIRATORY PROTECTION: Avoid prolonged breathing of vapors. If thermal decomposition occurs: Avoid breathing of thermal decomposition products. Select one of the following NIOSH approved respirators based on airborne concentration of contaminants and in accordance with OSHA regulations: half-mask supplied air respirator, full-face supplied air respirator. PREVENTION OF ACCIDENTAL INGESTION: Not an expected route of exposure. RECOMMENDED STORAGE: Store under normal warehouse conditions. FIRE AND EXPLOSION AVOIDANCE: Nonflammable. OTHER PRECAUTIONARY INFORMATION: No smoking: Smoking while using this product can result in contamination of the tobacco and/or smoke and lead to the formation of the hazardous decomposition products mentioned in the Reactivity Data section of this MSDS. ---------- Abbreviations: N/D - Not Determined N/A - Not Applicable CA - Approximately MSDS: FC-77 FLUORINERT Brand Electronic Liquid July 08, 1999 PAGE 6 ---------- 7. PRECAUTIONARY INFORMATION (continued) ---------- HMIS HAZARD RATINGS: HEALTH: 0 FLAMMABILITY: 0 REACTIVITY: 0 PERSONAL PROTECTION: X (See precautions, section 7.) EXPOSURE LIMITS INGREDIENT VALUE UNIT TYPE AUTH SKIN* ---------- PERFLUORO COMPOUNDS, (PRIMARILY COMPOUNDS WITH 8 CARBONS)..... NONE NONE NONE NONE * SKIN NOTATION: Listed substances indicated with 'Y' under SKIN refer to the potential contribution to the overall exposure by the cutaneous route including mucous membrane and eye, either by airborne or, more particularly, by direct contact with the substance. Vehicles can alter skin absorption. SOURCE OF EXPOSURE LIMIT DATA: - NONE: None Established ---------- 8. HEALTH HAZARD DATA ---------- EYE CONTACT: Contact with the eyes during product use is not expected to result in significant irritation. SKIN CONTACT: Contact with the skin during product use is not expected to result in significant irritation. INHALATION: Health effects from inhalation are not expected unless the product is over heated and decomposition occurs. IF SWALLOWED: Ingestion is not a likely route of exposure to this product. OTHER HEALTH HAZARD INFORMATION: If the product is exposed to extreme condition of heat from misuse or equipment failure, toxic decomposition products that include hydrogen fluoride and perfluoroisobutylene can occur. Hydrogen fluoride has an ACGIH threshold limit value of 3 parts per million parts of air, ppm, of fluoride as a ceiling limit and an OSHA PEL of 3 ppm of fluoride as an eight hour time-weighted average and 6 ppm of fluoride as a Short Term Exposure Limit. Perfluoroisobutylene has an ACGIH threshold limit value of 0.01 parts per million parts of air as a ceiling limit or 0.082 milligrams per cubic meter as a ceiling limit. ---------- Abbreviations: N/D - Not Determined N/A - Not Applicable CA - Approximately MSDS: FC-77 FLUORINERT Brand Electronic Liquid July 08, 1999 PAGE 7 ---------- 8. HEALTH HAZARD DATA (continued) ---------- A 3M Product Toxicity Summary Sheet is available. EXPOSURE ROUTE SUMMARY OF TOXICITY FINDINGS Oral Practically Non-Toxic Dermal Minimally Irritating Eye Practically Non-Irritating Inhalation Practically Non-Toxic ---------- SECTION CHANGE DATES ---------- HEADING SECTION CHANGED SINCE May 07, 1999 ISSUE ---------- Abbreviations: N/D - Not Determined N/A - Not Applicable CA - Approximately ---------- The information in this Material Safety Data Sheet (MSDS) is believed to be correct as of the date issued. 3M MAKES NO WARRANTIES,

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EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR COURSE OF PERFORMANCE OR USAGE OF TRADE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's method of use or application. Given the variety of factors that can affect the use and application of a 3M product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for user's method of use or application. 3M provides information in electronic form as a service to its customers. Due to the remote possibility that electronic transfer may have resulted in errors, omissions or alterations in this information, 3M makes no representations as to its completeness or accuracy. In addition, information obtained from a database may not be as current as the information in the MSDS available directly from 3M.

EHQ-027-0 14024

Material Safety Data Sheet
1,1,2-Trichloro-1,2,2-Trifluoroethane

ACC# 26370

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,1,2-Trichloro-1,2,2-Trifluoroethane
Catalog Numbers: S71216, S71216-1, S71217, IEAT178 4A, IEA T1784, T1784LC, T180 20, T180 200, T180 4, T180-20, T180-200, T180-4, T18020, T180200, T1804, T1804LOT013
Synonyms: Freon 113, Fluorocarbon 113, 1,1, 2-Trichlorotrifluoroethane
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
76-13-1	1,1,2-trichloro-1,2,2-trifluoroethane	100	200-936-1

Hazard Symbols: XN N
Risk Phrases: 20/22 59

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless. **Caution!** May cause eye irritation. Vapor reduces oxygen available for breathing. Dangerous to the environment. May cause central nervous system effects. May cause respiratory and digestive tract irritation. May cause cardiac disturbances. May cause dermatitis.
Target Organs: Heart, central nervous system.

Potential Health Effects

Eye: Contact produces irritation, tearing, and burning pain. May cause conjunctivitis.
Skin: May cause skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.
Ingestion: Ingestion of large amounts may cause gastrointestinal irritation. Expected to be a low ingestion hazard.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Vapor reduces oxygen available for breathing. May cause respiratory tract irritation. May cause heart disturbances, possibly leading to cardiac arrest and death. May cause narcotic effects in high concentration.

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Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration.
Notes to Physician: Causes cardiac sensitization to endogenous catelcholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

Section 5 - Firefighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Vapors may be flammable in vessels of adequate size. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use water spray, dry chemical, carbon dioxide or chemical foam. Use extinguishing media most appropriate for the surrounding fire. Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with skin and eyes. Avoid ingestion and inhalation.
Storage: Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Keep containers tightly closed. Do not store in aluminum containers.

E982-827-8 14958

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Good general ventilation should be sufficient to control airborne levels. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,1,2-trichloro-1,2,2-trifluoroethane	1000 ppm; 1250 ppm STEL	1000 ppm TWA; 7600 mg/m3 TWA 2000 ppm IDLH	1000 ppm TWA; 7600 mg/m3 TWA

OSHA Vacated PELs: 1,1,2-trichloro-1,2,2-trifluoroethane: 1000 ppm TWA; 7600 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: ethereal odor - weak odor
pH: Not available.
Vapor Pressure: 273 mm Hg @20C
Vapor Density: 6 (air=1)
Evaporation Rate:0.45 (acetone=1)
Viscosity: Not available.
Boiling Point: 45.8 deg C
Freezing/Melting Point:-36.4 deg C
Decomposition Temperature: Not available.
Autoignition Temperature: 680 deg C (1,256.00 deg F)
Flash Point: None.
NFPA Rating: (estimated) Health: 1; Flammability: 0; Reactivity: 0
Explosion Limits, Lower: Not available.
Upper: Not available.
Solubility: 0.023%
Specific Gravity/Density:1.6 @ 25C
Molecular Formula:C2Cl3F3
Molecular Weight:187.3542

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

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Conditions to Avoid: Incompatible materials, ignition sources, metals, strong oxidants.
Incompatibilities with Other Materials: Incompatible with alkali or alkaline earth metals such as sodium,potassium, aluminum, barium, lithium, samarium, sodium-potassium alloy, titanium, zinc, magnesium, and beryllium.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, hydrogen fluoride.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 76-13-1: KJ4000000
LD50/LC50:
CAS# 76-13-1:
Oral, rat: LD50 = 43 gm/kg;
Carcinogenicity:
CAS# 76-13-1:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Not available.
Environmental Fate: Has very limited solubility in water and is highly volatile. Expected to be eventually conveyed to the atmosphere. Has some potential to perturb stratospheric ozone.
Physical/Chemical: Not available.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 76-13-1 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 76-13-1: Effective Date: April 13, 1989; Sunset Date: December 19 , 1995
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 76-13-1: acute, chronic.
Section 313
This material contains 1,1,2-trichloro-1,2,2-trifluor (CAS# 76-13-1, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. CAS# 76-13-1 is listed as a Class 1 ozone depletor with an ODP = 0.8; GWP = 5000; commodity code 2903.43.0000 This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 76-13-1 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN N
Risk Phrases:
R 20/22 Harmful by inhalation and if swallowed. R 59 Dangerous for the ozone layer.

E963-427-9 14999

Safety Phrases:
S 44 If you feel unwell, seek medical advice (show the label where possible). S 9 Keep container in a well-ventilated place.
WGK (Water Danger/Protection)
CAS# 76-13-1: 2
Canada
CAS# 76-13-1 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D2B.
CAS# 76-13-1 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 76-13-1: OEL-AUSTRALIA:TWA 1000 ppm (7600 mg/m3);STEL 1250 ppm OEL-BELGIUM:TWA 1000 ppm (7670 mg/m3);STEL 1250 ppm OEL-DENMARK:TWA 500 ppm (3800 mg/m3) OEL-FINLAND:TWA 1000 ppm (7600 mg/m3);STEL 1250 ppm OEL-FRANCE:TWA 1000 ppm (7600 mg/m3);STEL 1250 pp OEL-GERMANY:TWA 500 ppm (3800 mg/m3) OEL-HUNGARY:STEL 40 mg/m3 OEL-JAPAN:TWA 500 ppm (380 mg/m3) OEL-THE NETHERLANDS:TWA 1000 ppm (7600 mg/m3) OEL-THE PHILIPPINES:TWA 1000 ppm (7600 mg/m3) OEL-RUSSIA:TWA 500 ppm;STEL 5000 mg/m3 OEL-SWEDEN:TWA 500 ppm (4000 mg/m3);STEL 750 ppm (6000 mg/m3) OEL-SWITZERLAND:TWA 500 ppm (3800 mg/m3) OEL-TURKEY:TWA 1000 ppm (7600 mg/m3) OEL-UNITED KINGDOM:TWA 1000 ppm (7600 mg/m3);STEL 1250 ppm OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #3 Date: 8/02/2000
The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

PRESS RELEASE
For immediate release

Shin-Etsu Chemical to enter the fluoropolymer business succeeds in mass production of liquid fluoroelastomer for the first time in the world.

Shin-Etsu Chemical (Headquarters: Tokyo; President: (Chihiro Kanagawa) will commence new operations in the area of fluoropolymers. The company has led the world in the development of a liquid fluoroelastomer (product name: Shin-Etsu Sifel) that combines the superior characteristics of silicone and fluorine and softens into a rubbery texture simply when heated. Mass production technology has also been developed and the product will be commercialized from spring this year. Facilities for mass production were completed in the company's Gunma Plant (Annaka City, Gunma Prefecture) in October 1998 and will be further expanded based on demand. The company targets an annual sales turnover of 5 billion yen in three years.

Shin-Etsu Chemical established a "Z Committee" with Mr. Kanagawa as chairman in 1991 with the objective of creating new business towards the 21st century. Development work focused on specific research themes and liquid fluoroelastomer is one example of the result of such work. Through the work of the Z Committe, 2 semiconductor related products, photoresist (photosenaltive material) and pellicle (dust cover for photomasking), were commercialized in December 1997.

Shin-Etsu Sifel consists of the binding of minute levels of silicon atoms on reactive perfluoroether polymer that internalizes a radically different concept from legacy substances. Fully fluorinated polyether that is chemically highly stable is used as the basic structure of the polymer and the product was realized through development of ultrahigh polymerization technology. To date, 70 related patents have been obtained.

In recent years, fluoropolyether has been ranked highest among synthetic rubbers for functionality and demand has developed significantly as the only available material that exhibits durability in such new environments of use as automobiles, aircraft and semiconductors. However, in order to respond to recent demands for higher performance, compliance with environmental regulations, safety and reliability, even fluoroelastomer did not provide sufficient performance. In particular, the development of a new material that maintains the softness of rubber and with resistance to oil, solvents and chemicals was awaited.

The most important feature of Shin-Etsu Sifel is the fact that it is hybrid material with high performance that exhibits the superior features of silicone and fluorine with characteristics at low temperature and oil, solvent and chemical resistance that complement the weaknesses of both material and solves the problems internalized in legacy products. Product applications including molding material, functional adhesive with self-adhesion properties, coating materials for surface refining and potting gel foam for protecting electronic parts.

Samples of the products have been delivered to several companies to date with highly positive feedback such as "product design has become easier" and "reliability of products has increased exponentially". As material that with potential of becoming key to the resolution of such issues of the age as

E982-627-8 14981

preservation of the environment, energy saving and high performance products, application to such area as automobiles, aircraft, electronic equipment, semiconductors, chemical plants and optics is foreseen.

Shin-Etsu MicroSi contact: Mike Bonsaver, Product Sales Manager, (480) 893-8898 x101 mbonsaver@microsi.com or Tom Brown, Technical Director (480) 893-8898 x114, tbrown@microsi.com.

Shin-Etsu Chemical Co., Ltd. homepage www.shinetsu.co.jp

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Thur. Jan. 30, 2003

DEPOTTING OF

SILICONES

The products below are for the removal of cured silicones.

Phone:
800.669.5709

Fax:
800.671.9583

Postal address:
P.O. Box 33609
1910 S. State Avenue
Indianapolis, IN 46203

Product Name	*Solvent Base*	*Flashpoint*	*Speed*	*Selectivity*
Dynasolve 210	Methylene Chloride	NA	Superior	Fair
Uresolve Plus 500	Ethylene Glycol Ether	135°F	Excellent	Fair
Dynasolve 750	Propylene Glycol Ether	105°F	Excellent	Fair
Dynasolve 230	Hydrocarbon	18°F	Excellent	Fair
*Uresolve Plus SG	Ethylene Glycol Ether	135°F	Good	Good
Dynasolve 225	Hydrocarbon	52°F	Good	Good
*Dynasolve 711	Propylene Glycol Ether	105°F	Good	Good
Uresolve 411	Methanol	52°F	Good	Good
Dynasolve 190	Methanol	65°F	Good	Excellent
Dynasolve 220	Hydrocarbon	110°F	Fair	Excellent

***Can be used in contact with aluminum**

For additional information on our products and services, just click on any links or bottom categories, or call, fax or E-mail us. We look forward to working with you.

General Information: info@dynaloy.com Webmaster: webmaster@visionpublishing.com

Site last updated: February 7, 2000

EXH 1 4-27-2003

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

SIFEL

Adhesive and Coating Compound

Sept 2000

[redacted]

M0911 6-127-9 1/99A

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Adhesive and Coating Compound

- SIFEL offers adhesion and coating flexibility for applications in harsh environments
  - Die-attach
  - Conformal coatings
  - Sealing of electronic components

ESMO-6718-0 1/98

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Adhesive and Coating Compound

- Resistant to:
  - Solvents
  - Fuels
  - Oils
  - Chemicals
- Nonflammable
- High purity
- One component

E3002-627-8 14000

Sept 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Adhesive and Coating Compound

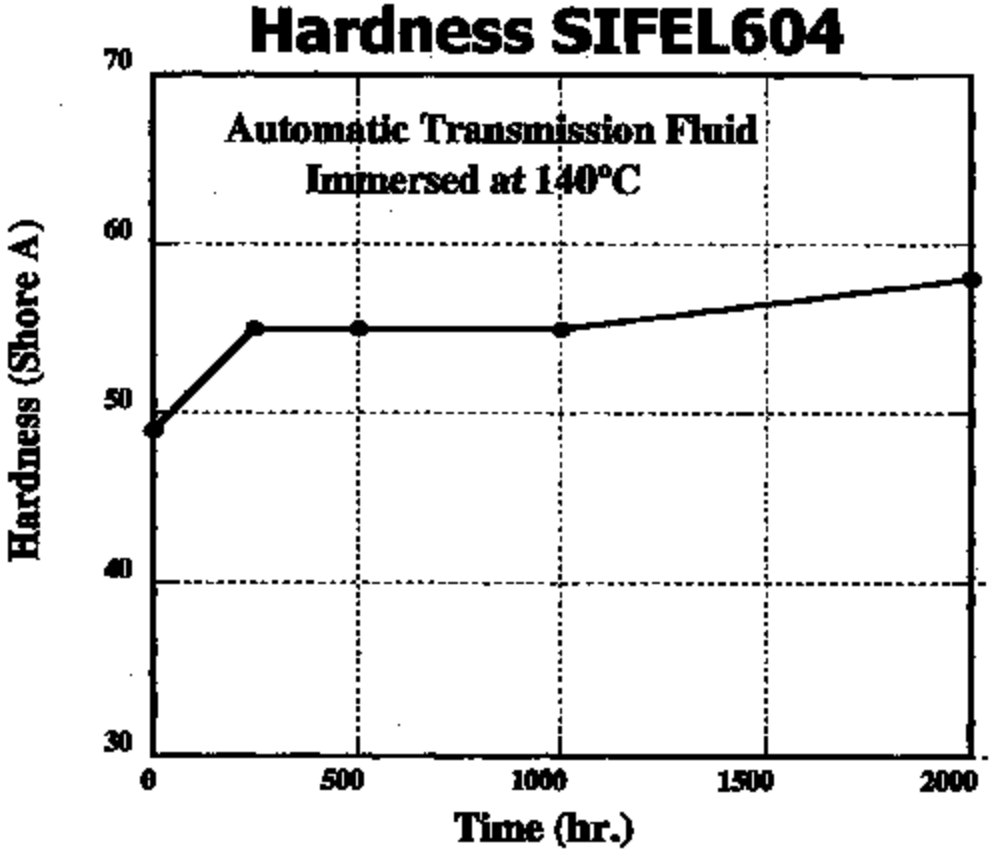
- SIFEL also provides
  - Self priming adhesion
  - Heat resistance
  - Low moisture permeability
  - Electrical insulation

ESH2-4627-B 14681

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance



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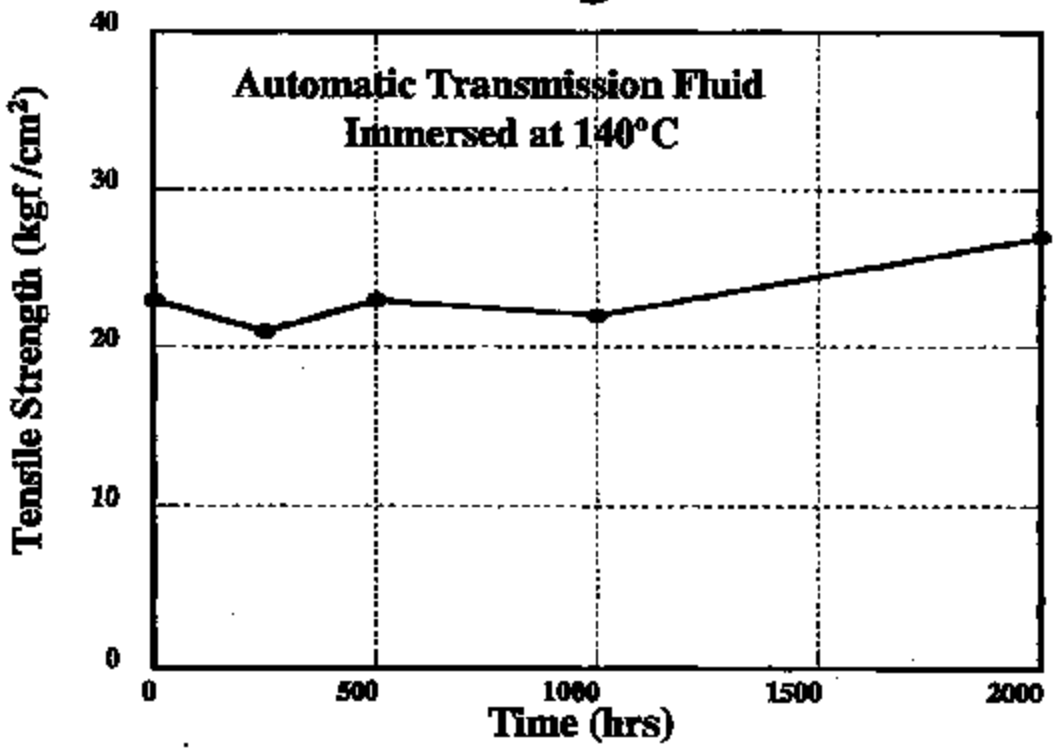
ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance

Tensile Strength SIFEL604



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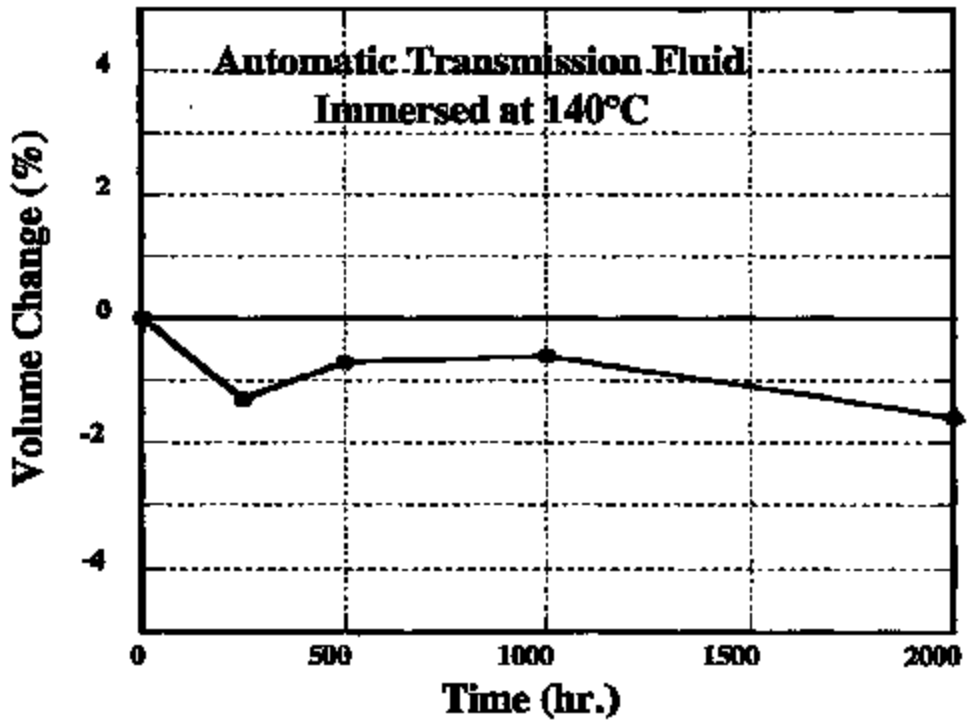
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance

Volume Change SIFEL604



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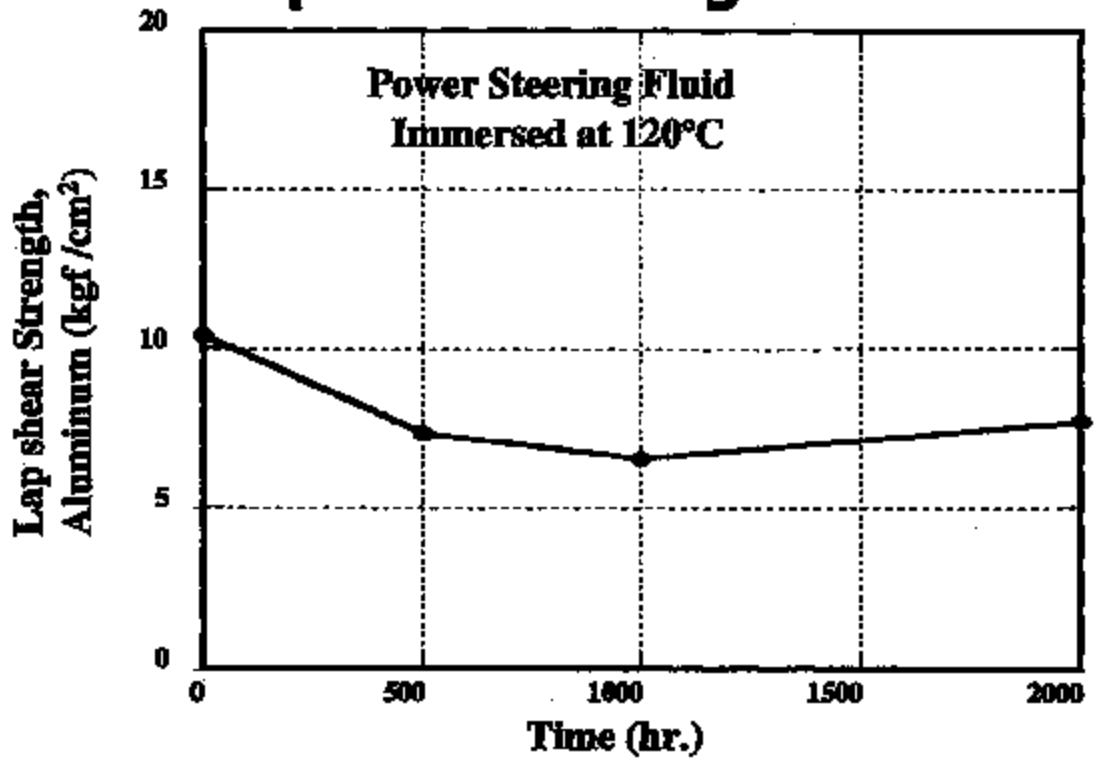
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance

Lap Shear Strength SIFEL604



Test Substrate: Al

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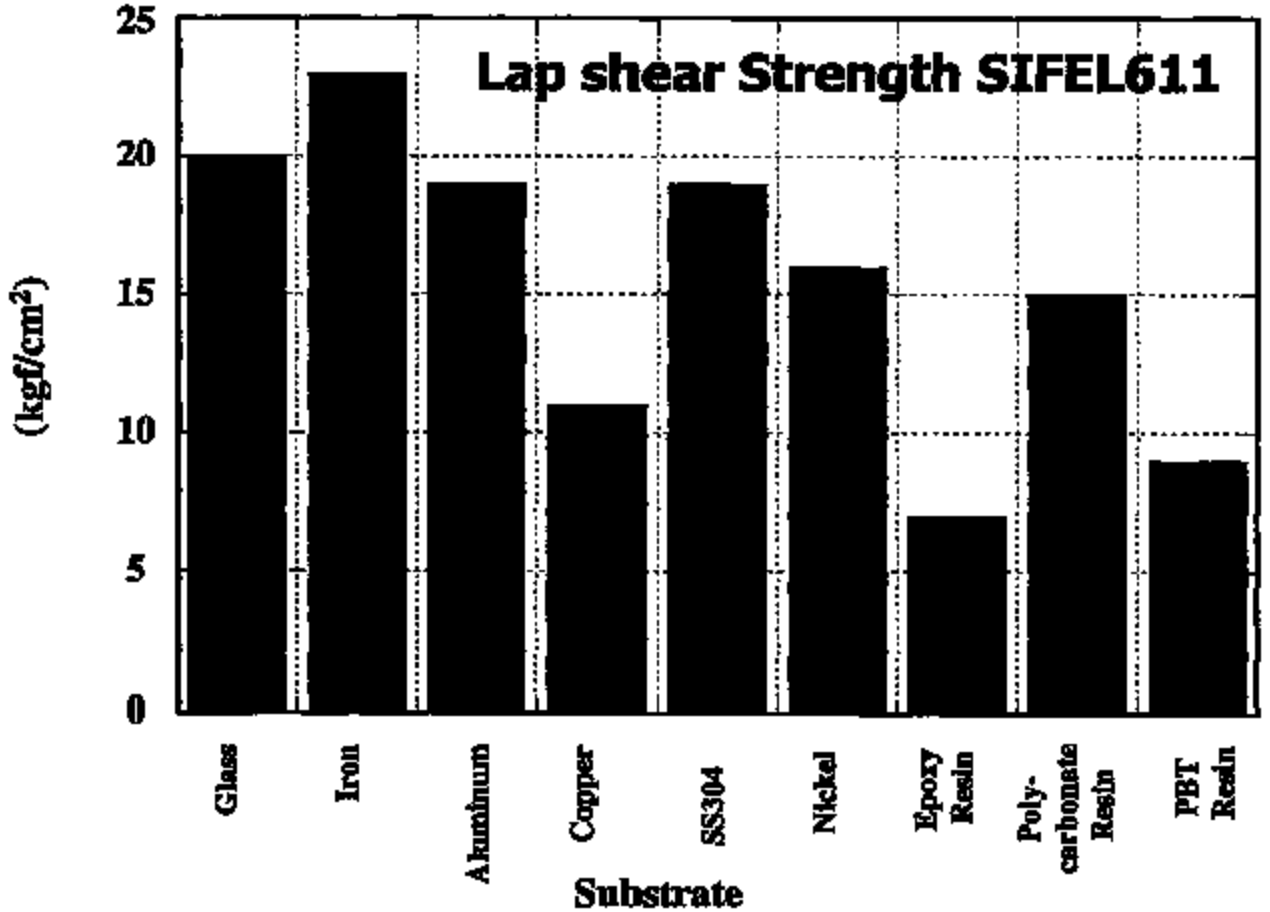
Self Priming Adhesion Properties



Values listed are typical values and do not constitute a specification

Sept 2000

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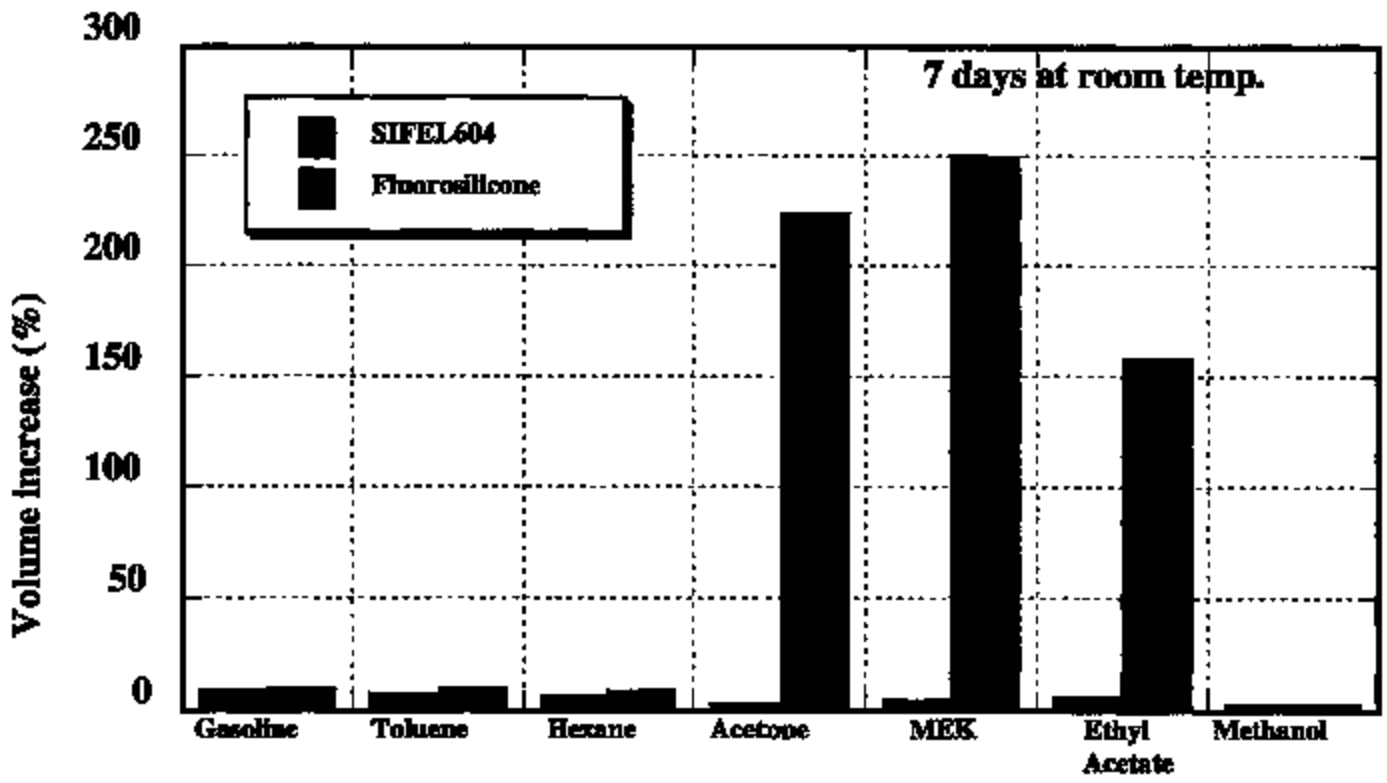
ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Solvent Resistance



Sept 2000

Values listed are typical values and do not constitute a specification

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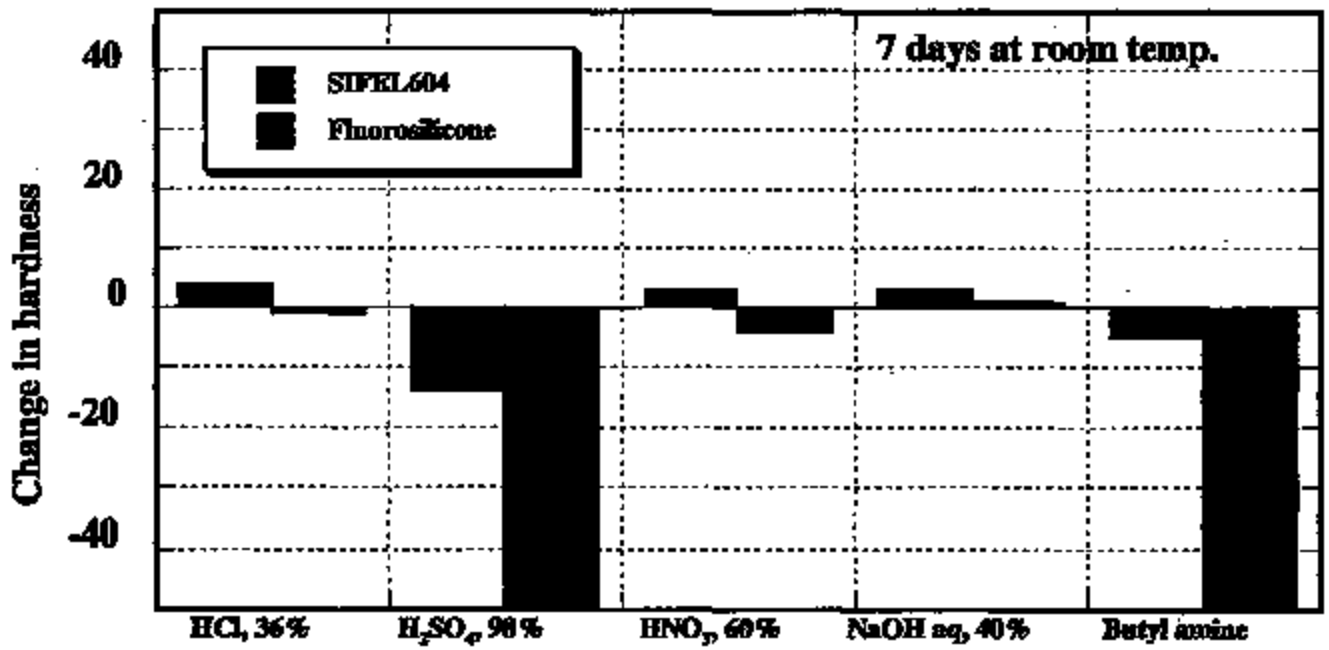
ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Chemical Resistance

Numerical Change in Shore A Hardness



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Values listed are typical values and do not constitute a specification

Sept 2000

SS02-021-3 1/07A

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Properties

Electrical Insulation Properties	SIFEL604	Fluorosilicone
Volume Resistivity (Ω-cm)	$1x10^{15}$	$1x10^{11}$
Dielectric Strength (kV/mm)	30	20
Dielectric Constant (50Hz)	2.9	6
Dielectric Dissipation Factor (50 Hz)	$5x10^{-3}$	$2x10^{-2}$
Low Moisture Permeability		
Moisture Permeability ($g/m^2 \cdot 24$ hr)	5	50
High Purity		
Na^+, K^+, NH_4^+, F^-, Cl^-, Br^-, NO_3^-, SO_4^{--}	< 1 ppm for each species listed	

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Product Listing - I

	SIFEL610	SIFEL611	SIFEL614	SIFEL660	X-71-6001
Features	Liquid	Liquid	Liquid, Improved adhesion to PPS	Viscous liquid	Viscous liquid, Improved adhesion to PPS
	Before curing properties				
Appearance	Milky white liquid	Milky white liquid	Milky white liquid	Milky white viscous liquid	Milky white viscous liquid
Viscosity 23°C	27 Poise (2.7 Pa s)	150 Poise (15 Pa s)	250 Poise (25 Pa s)	1600 Poise (160 Pa s)	1200 Poise (120 Pa s)
	After curing properties (150°C, 1hr)				
Specific gravity 23°C	1.75	1.84	1.85	1.86	1.84
Hardness (Shore A)	34	26	25	37	34
Tensile strength	9 kgf/cm^2 (0.9 MPa) (128 psi)	9 kgf/cm^2 (0.9 MPa) (128 psi)	11 kgf/cm^2 (1.1 MPa) (156 psi)	20 kgf/cm^2 (2.0 MPa) (284 psi)	21 kgf/cm^2 (2.1 MPa) (299 psi)
Elongation (%)	120	200	220	200	280
Lapshear strength Aluminum [bond line]	20 kgf/cm^2 (2.0 MPa) (284 psi) [0.08mm]	20 kgf/cm^2 (2.0 MPa) (284 psi) [0.08mm]	20 kgf/cm^2 (2.0 MPa) (284 psi) [0.08mm]	8 kgf/cm^2 (0.8 MPa) (114 psi) [1mm]	16 kgf/cm^2 (1.6 MPa) (228 psi) [1mm]
Lapshear strength PPS [bond line]	-	-	15 kgf/cm^2 (1.5 MPa) (213 psi) [0.08mm]	-	15 kgf/cm^2 (1.5 MPa) (213 psi) [1mm]

Sept 2000

Values listed are typical values and do not constitute a specification

DOC-027-8 14MTG

Shin-Etsu MicroSi®

SHIN-ETSU SIFEL®

Product Listing - II

	SIFEL604	SIFEL603	SIFEL620	SIFEL640
Features	Paste	Paste, Improved adhesion to PPS	Paste, Thermally conductive	Paste, Electrically semiconductive
	Before curing properties			
Appearance	Milky white paste	Milky white paste	White paste	Pale blue paste
Viscosity 23°C	38000 Poise (3800 Pa s)	33000 Poise (3300 Pa s)		
	After curing properties (130°C, 1hr for SIFEL604; 150°C, 1hr for others)			
Specific gravity 23°C	1.85	1.85	3	2.9
Hardness (Shore A)	46	46	90	65
Tensile strength	28 kgf/cm^2 (2.7 MPa) (398 psi)	24 kgf/cm^2 (2.4 MPa) (341 psi)	35 kgf/cm^2 (3.4 MPa) (498 psi)	26 kgf/cm^2 (2.6 MPa) (370 psi)
Elongation (%)	180	200	40	90
Lapshear strength Aluminum [bond line]	17 kgf/cm^2 (1.7 MPa) (242 psi) [2mm]	15 kgf/cm^2 (1.5 MPa) (213 psi) [1mm]	15 kgf/cm^2 (1.5 MPa) (213 psi) [2mm]	15 kgf/cm^2 (1.5 MPa) (213 psi) [2mm]
Lapshear strength PPS [bond line]	-	11 kgf/cm^2 (1.1 MPa) (156 psi) [1mm]	-	-
Thermal conductivity (W/m C)			0.8	
Volume resistivity (Ω-cm)				5x10^4

Sept 2000

Values listed are typical values and do not constitute a specification

ESM2-021-A 1/4TT

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

SIFEL

Fluoroelastomer Molding Compound

[redacted]

Sept 2000

[redacted]

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Fluoroelastomer Molding Compound

- Millable form of SIFEL
  - Based on liquid injection molding technology
  - Can be processed in a manner similar to conventional fluoroelastomers (roll milling)
  - Cures into a resilient rubber product
  - Designed for compression molding

EM02-421-1 1M/TD

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Fluoroelastomer Molding Compound

- Inherits the benefits of existing Fluoroelastomers
  - Nonflammable
  - Heat resistant
  - Low moisture permeability
  - Oil and chemical resistant

8002-627-8 1A80

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Fluoroelastomer Molding Compound

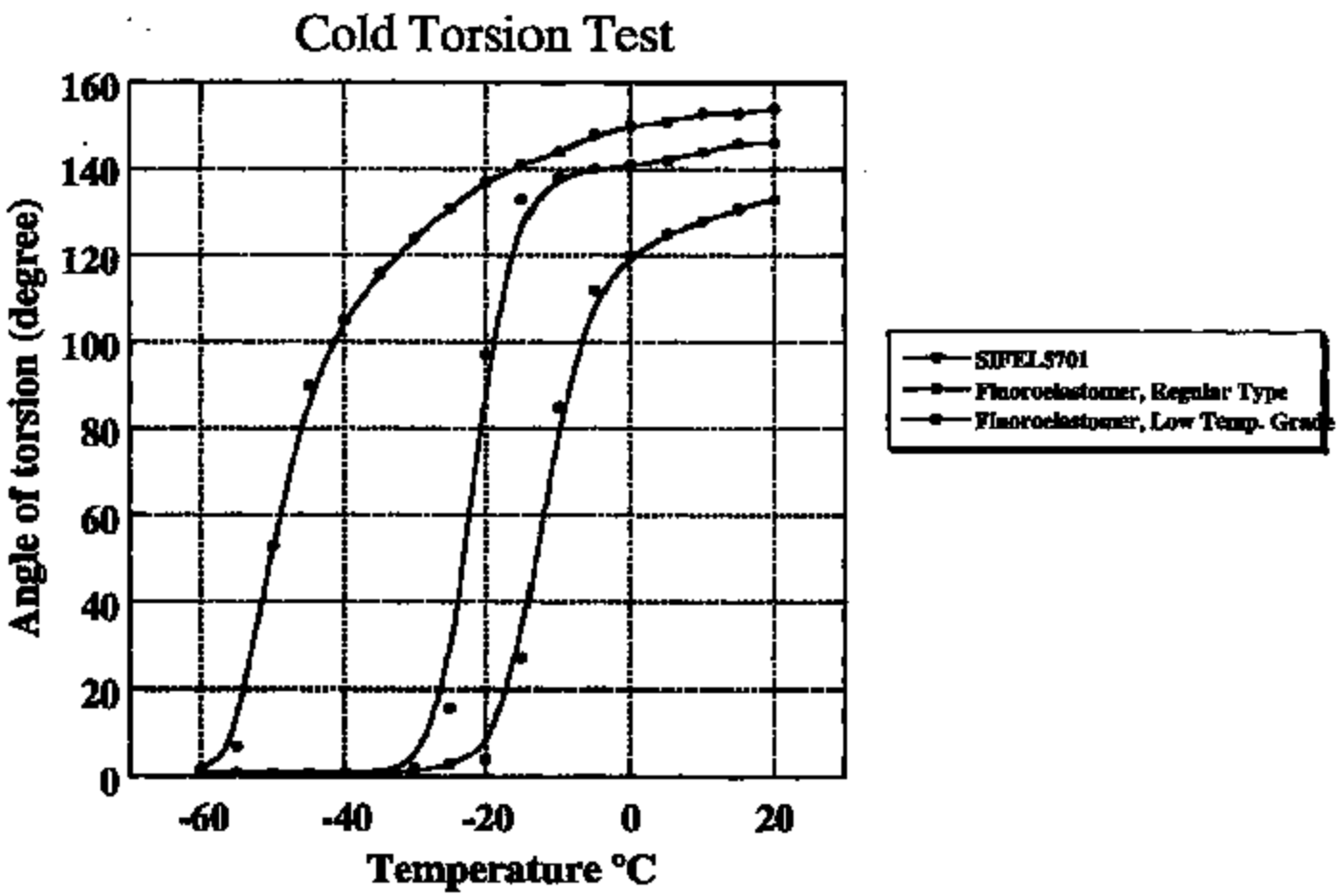
- Additional benefits
  - Flexible at low temperatures
  - Resistant to solvents, fuels and amines
  - Electrically insulating
  - Properties similar to SIFEL for liquid injection molding

ENG-627-9 10/01

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Flexibility at Lower Temperatures



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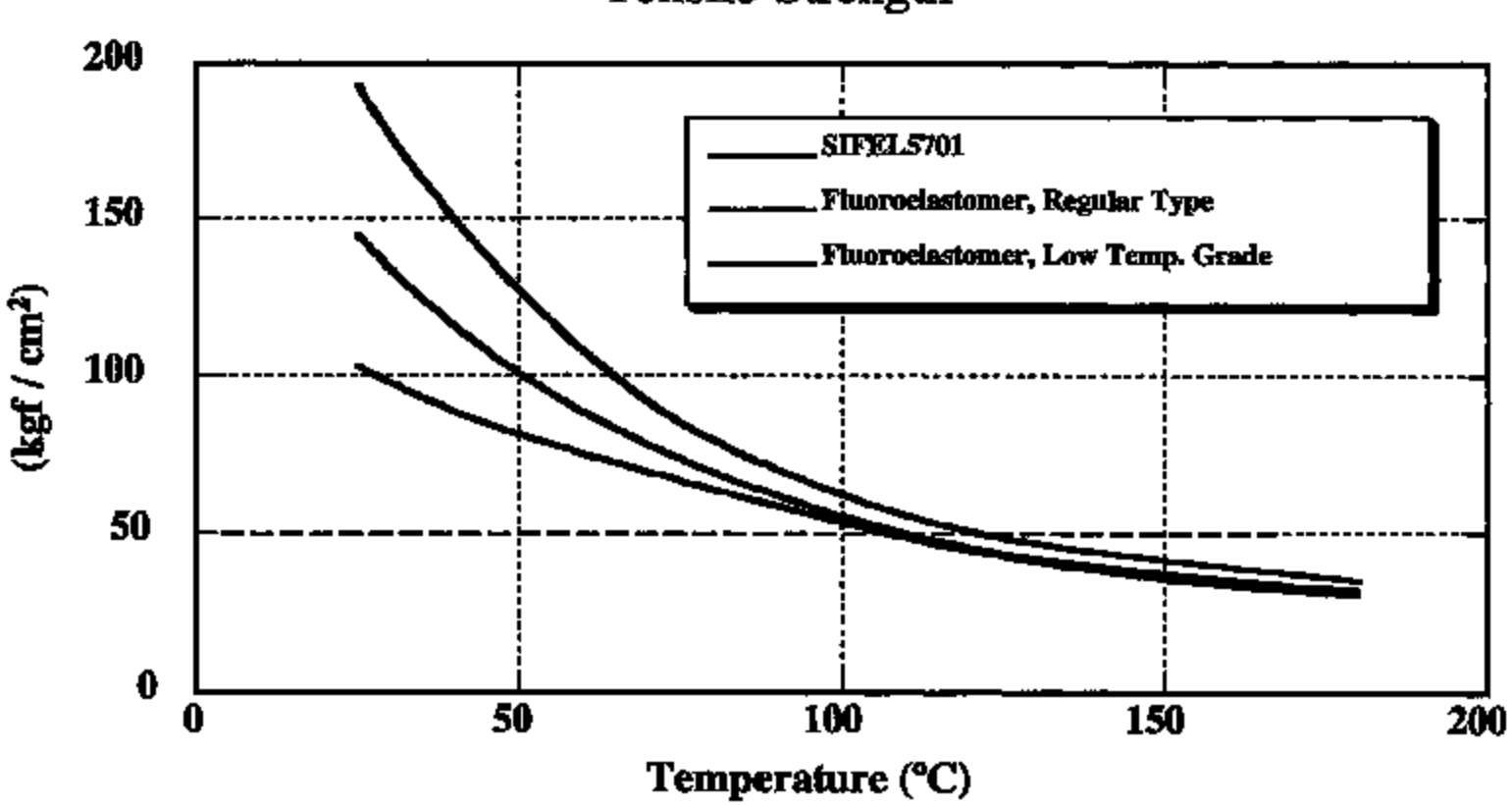
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Strength Retention at Higher Temperatures



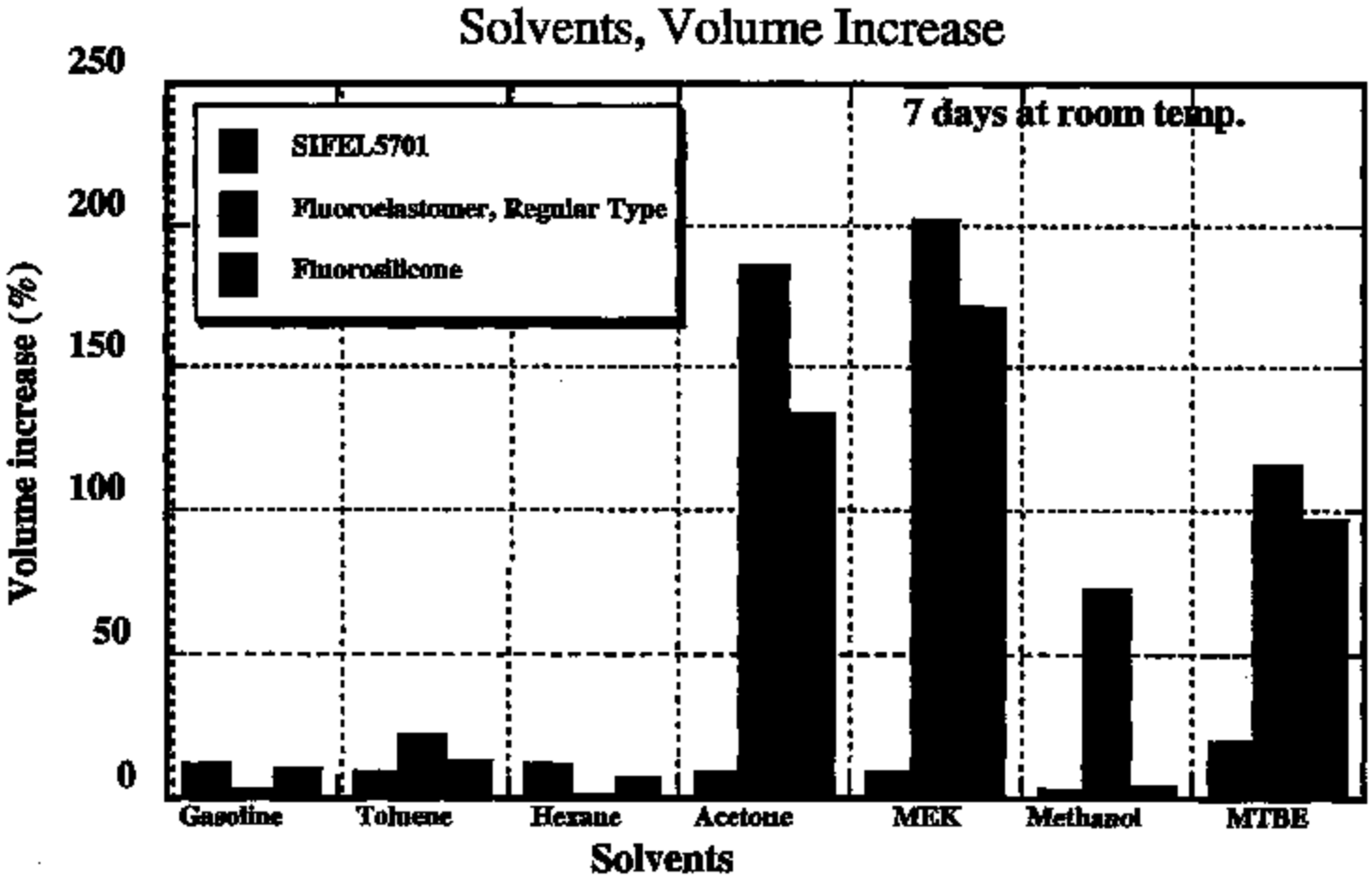
Sept 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Solvent Resistance



Values listed are typical values and do not constitute a specification

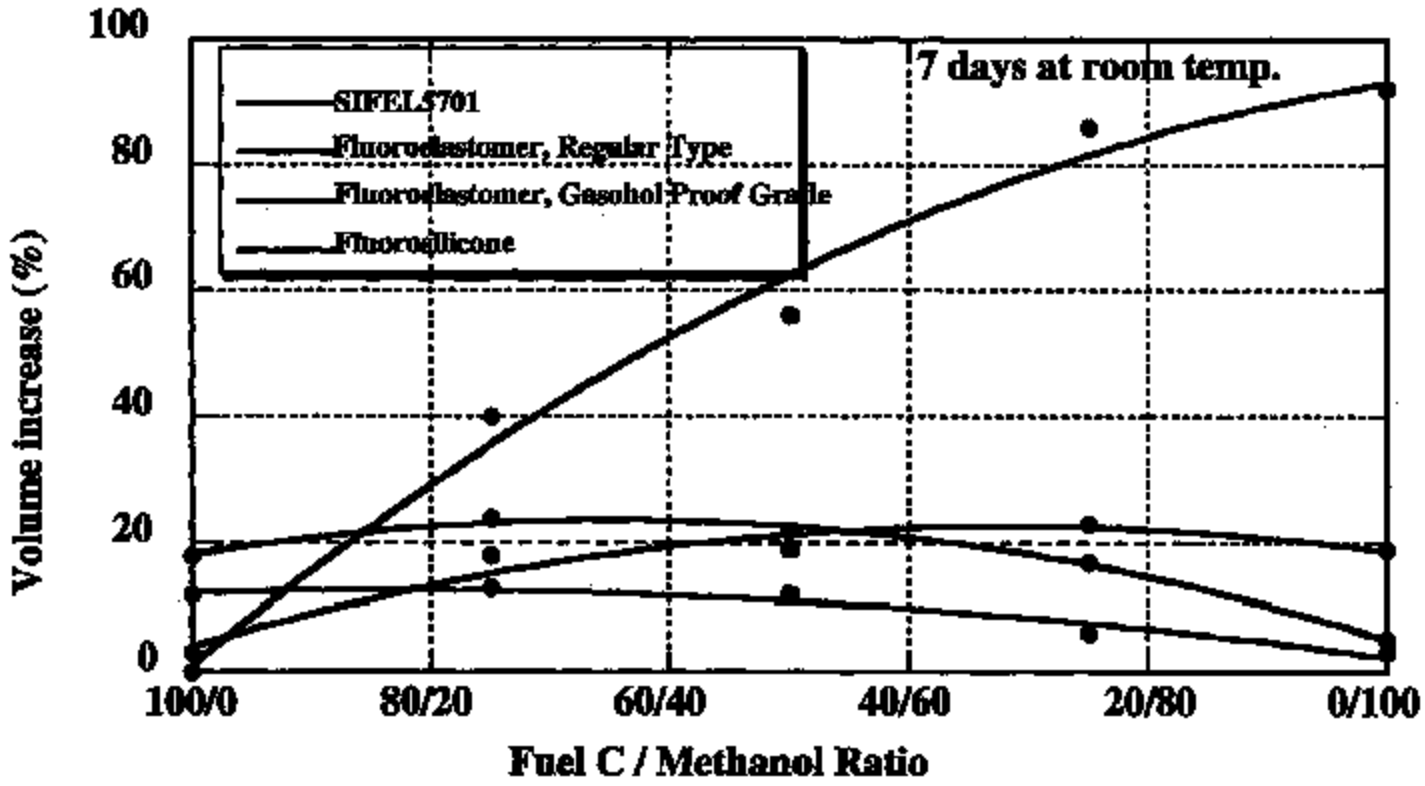
Sept 2000

SS02-027-B 14994

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Solvent Resistance

Gasohol, Volume Increase



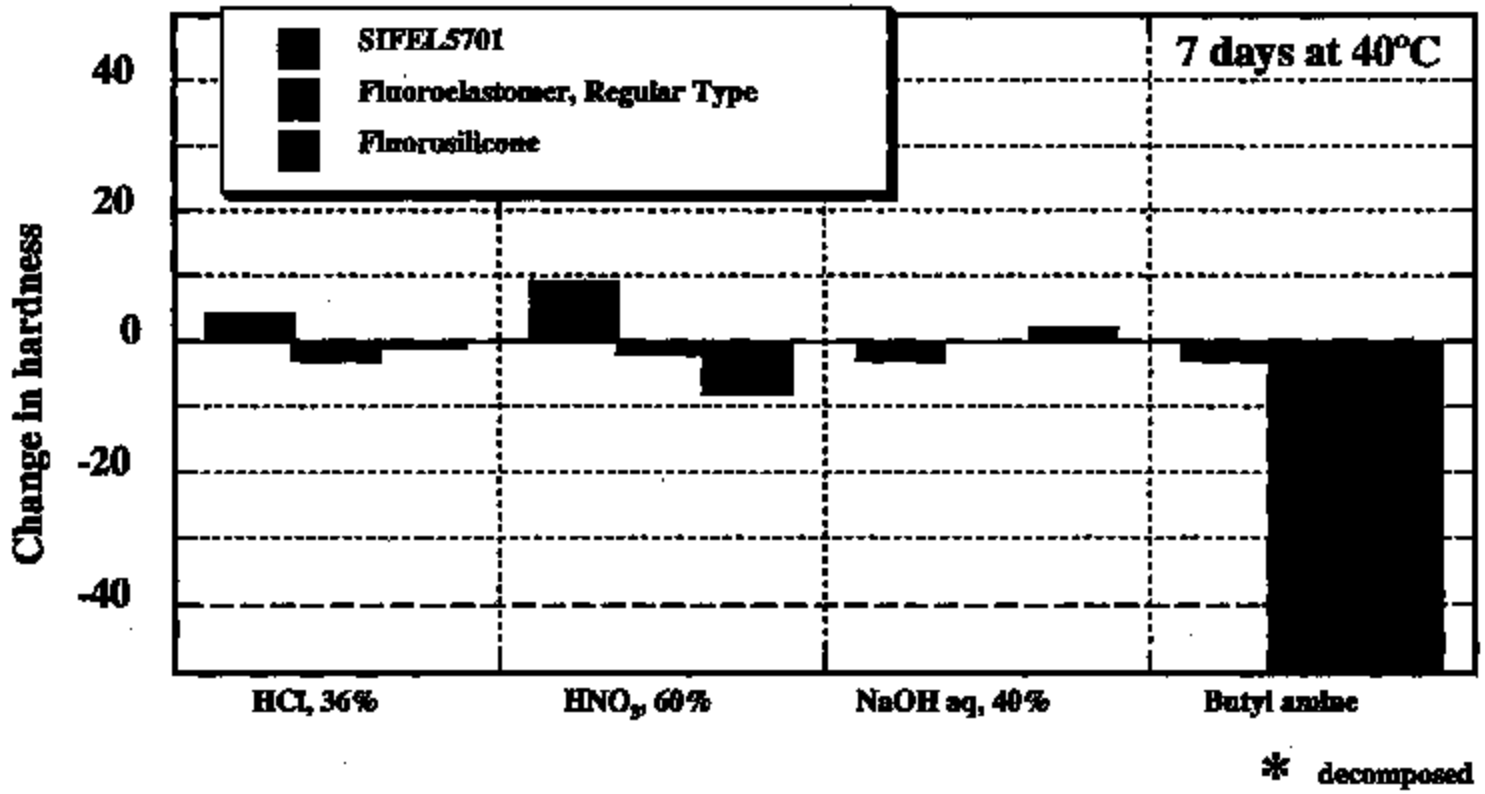
Sept 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Chemical Resistance

Numerical Change in Shore A Hardness



Sept 2000

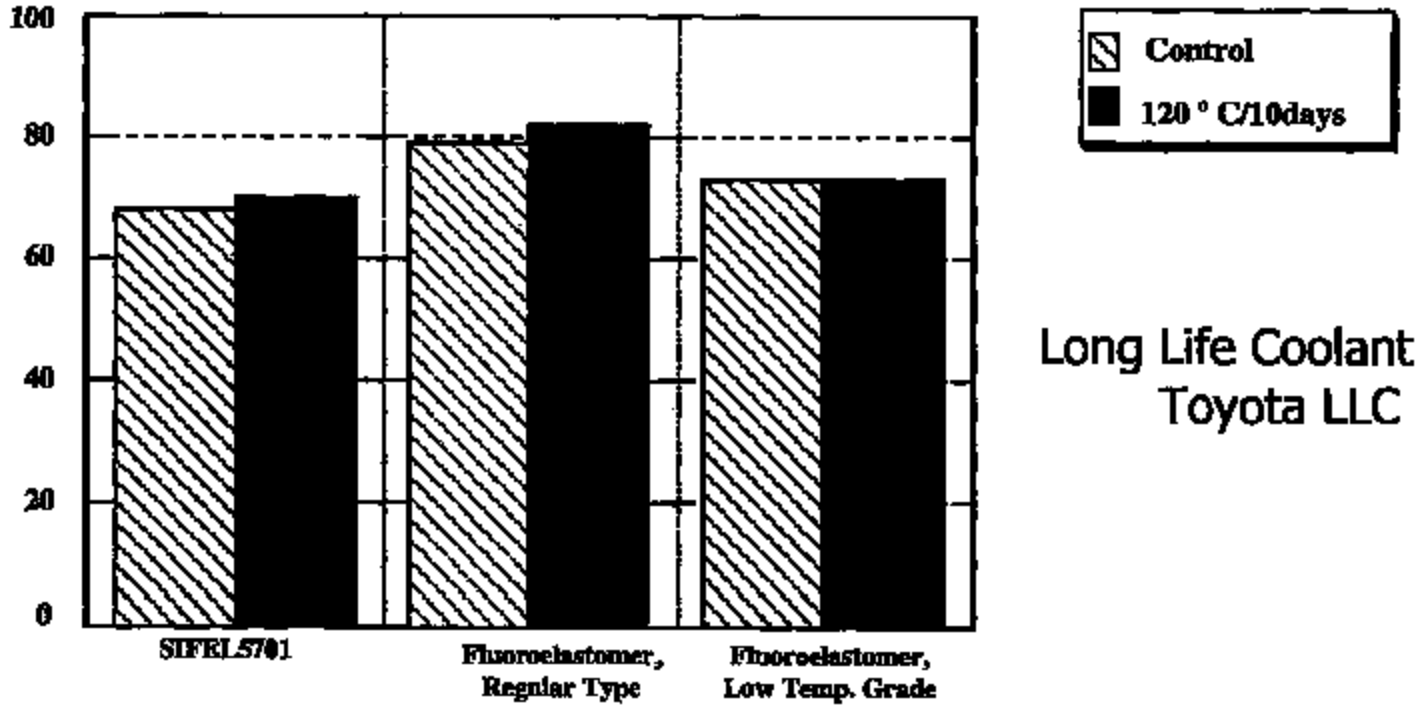
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Oil Resistance

Hardness (Shore A)



Long Life Coolant Test
Toyota LLC

Sept 2000

Values listed are typical values and do not constitute a specificati

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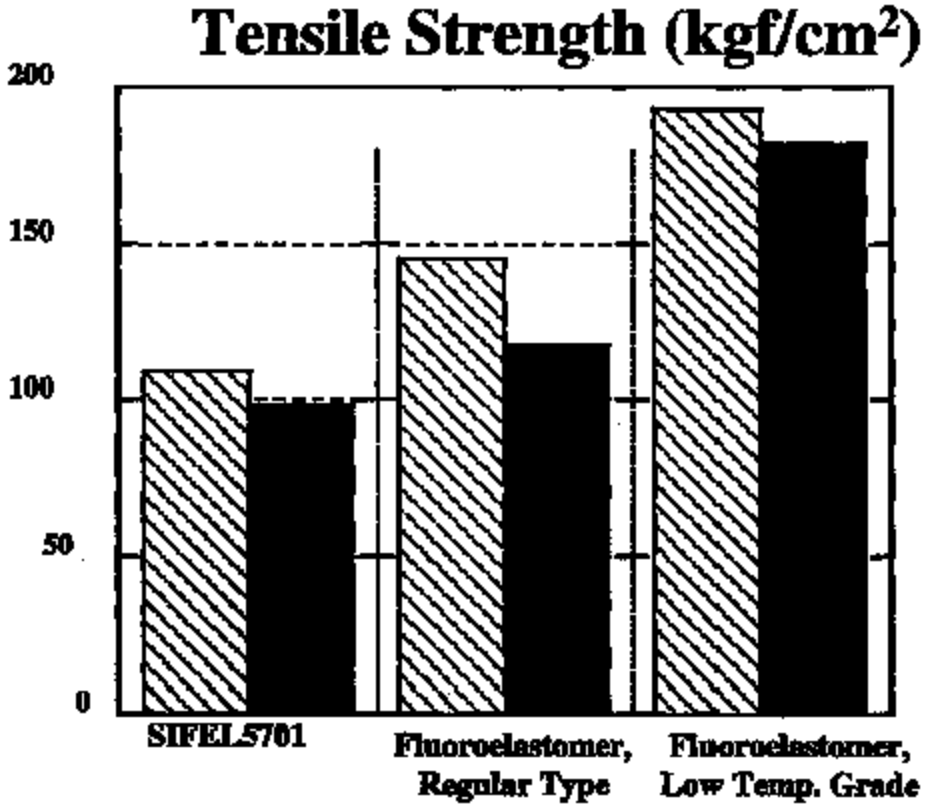
SHIN-ETSU SIFEL®

Oil Resistance



Long Life Coolant Test
Toyota LLC

Sept 2000

Values listed are typical values and do not constitute a specificatio

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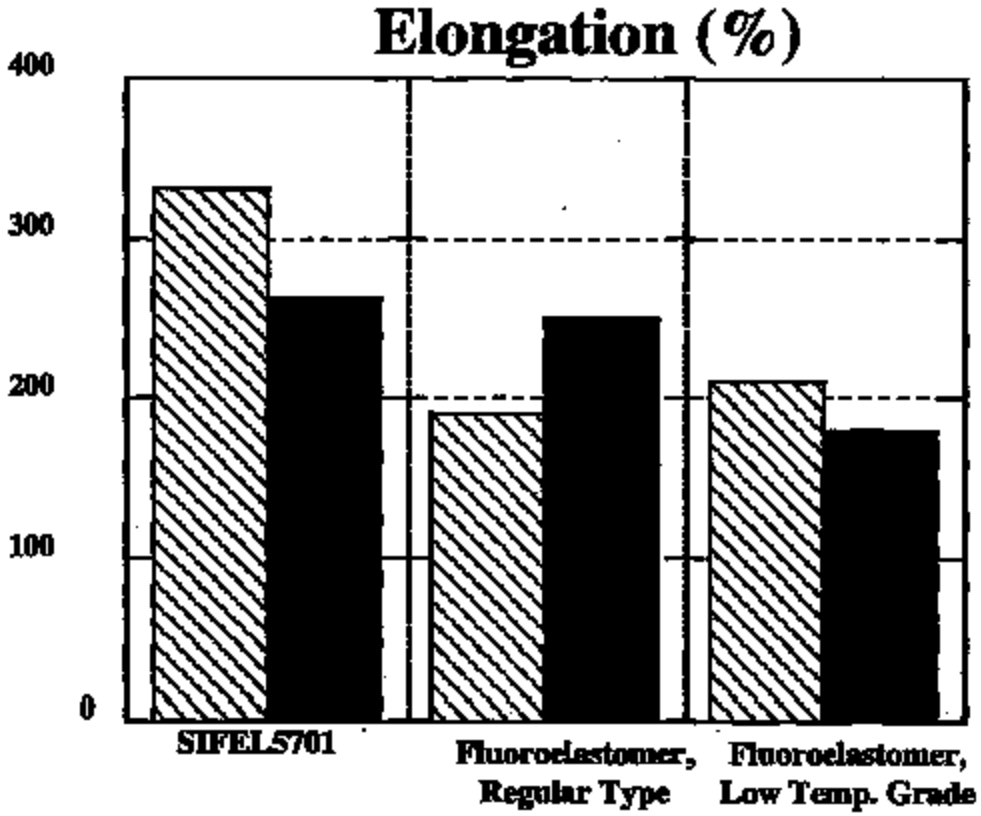
SHIN-ETSU SIFEL®

Oil Resistance



Long Life Coolant Test
Toyota LLC

DM2-627-6 1/98

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi® SHIN-ETSU SIFEL®

Properties

Electrical Insulation Properties	SIFEL5701	Fluoroelastomer	Fluorosilicone
Volume Resistivity (Ω-cm)	$3x10^{15}$	$3x10^{12}$	$4x10^{14}$
Dielectric Strength (kV/mm)	23	24	20
Dielectric Constant (50Hz)	3.1	11	6
Dielectric Dissipation Factor (50 Hz)	$7x10^{-3}$	$3x10^{-1}$	$3x10^{-3}$
Low Moisture Permeability*			
Moisture Permeability ($g/m^2 \cdot 24$ hr)	5	4	50

* Conditions: 40ºC, 90% RH

ISO2-827-0 14000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Description

	SIFEL5701	SIFEL5800
Features	70 Hardness	80 Hardness
	Before curing properties	
Appearance	Black compound	Black compound
	After curing properties (Press cure 150°C, 10min and post cure 200°C, 4hr)	
Specific gravity 23°C	1.87	1.88
Hardness (Shore A)	71	83
Tensile strength	103 kgf/cm^2 (10 MPa) (1460 psi)	88 kgf/cm^2 (8.6 MPa) (1250 psi)
Elongation (%)	270	180
Tear strength	18 kgf/cm (18 kN/m) (101 ppi)	20 kgf/cm (20 kN/m) (112 ppi)
Compression set (%) 200°C, 24hr	19	-

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Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Mixing Instructions

	SIFEL5701	SIFEL5800
SIFEL5701 base compound	100 parts	
SIFEL5800 base compound		100 parts
CA-CP-3 crosslinker	1.8 parts	1.8 parts
PLF-2 catalyst	1.0 parts	0.3 parts

[illegible]

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Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi SHIN-ETSU SIFEL®

SIFEL

Fluoroelastomer for Liquid Injection Molding (LIM)

[redacted]

September 2000

ShinEtsuMicroSi SHIN-ETSU SIFEL®

Features of Fluoroelastomer for LIM

- Has the same features and benefits of existing Fluoroelastomer compounds
  - Nonflammable
  - Chemical and oil resistance
  - Heat resistance
  - Low moisture permeability

9001 ©-ISO-9002

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Features of Fluoroelastomer for LIM

- Has additional features and benefits
  - Available in either liquid or paste
  - Shorter curing time and lower curing temperature provides improved productivity.
  - Improved low temperature flexibility
  - Resistance to solvents and amines
  - Resistance to steam
  - Excellent electrical properties

SMSE-0271-9 1/98

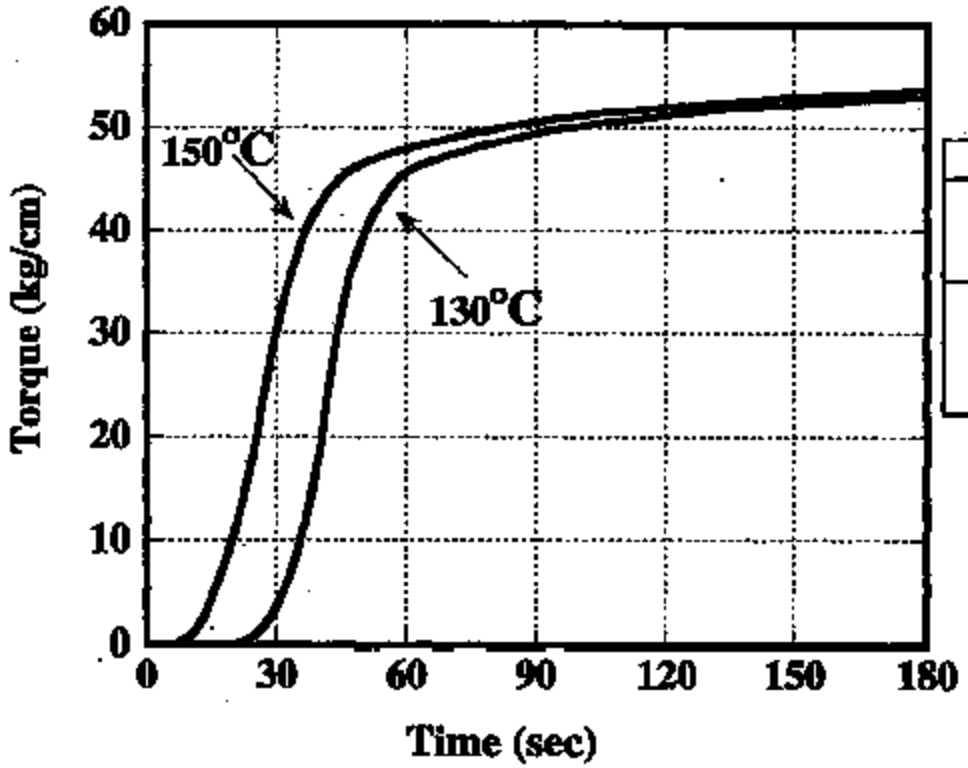
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Cure Speed

Curing Profile of SIFEL3701



Required Cure Conditions

	Press Cure	Post Cure
SIFEL (LIM)	150°C/ < 1 min.	200°C for 4 hr
Standard Fluoroelastomer (Comp. Molding)	170°C/15 min.	230°C for 24 hr

Shorter curing time and lower curing temperature means higher productivity

E0902-027-9 1/1998

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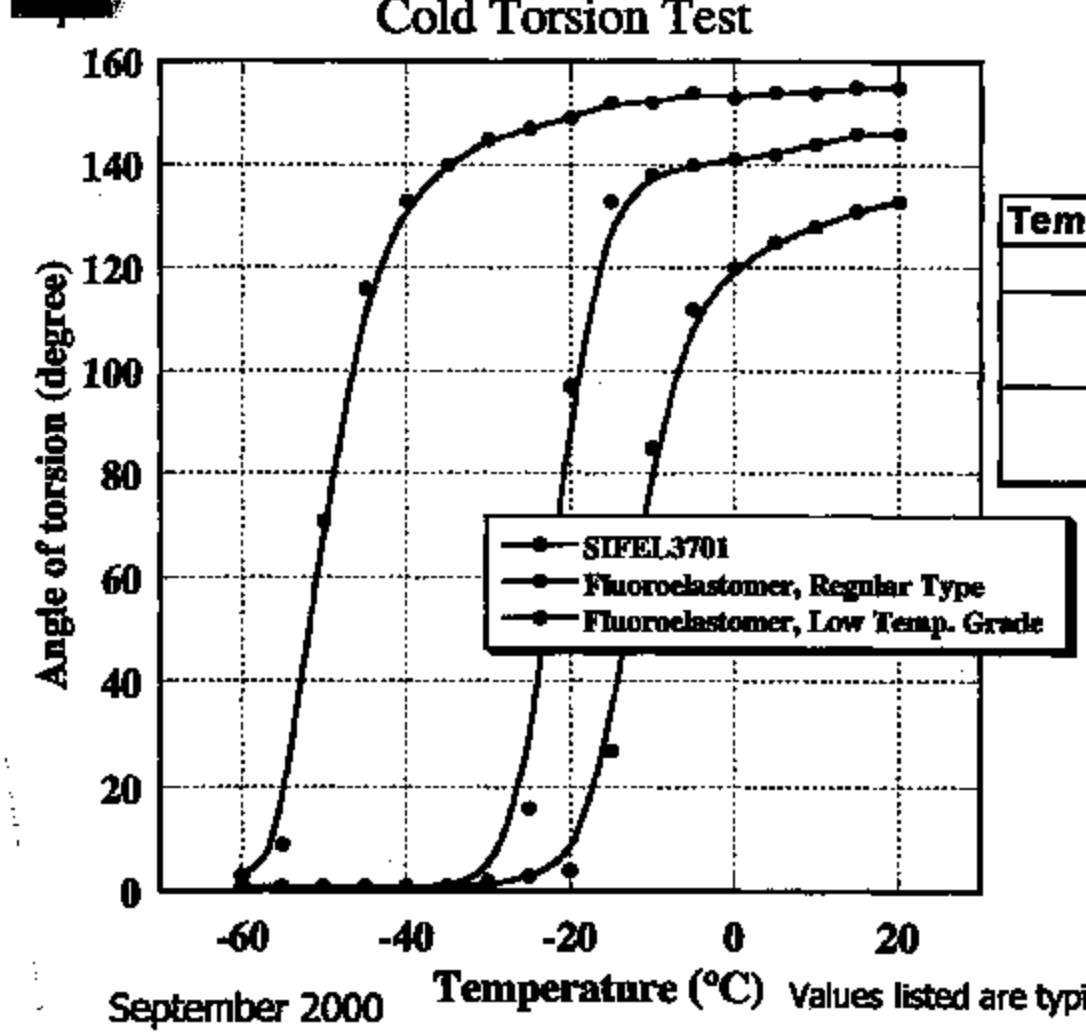
Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi® SHIN-ETSU SIFEL®

Low Temperature Flexibility



Temperature of Retraction	TR-10 (°C)
SIFEL3701	-50
Fluoroelastomer Regular Type	-17
Fluoroelastomer Low Temp. Grade	-30

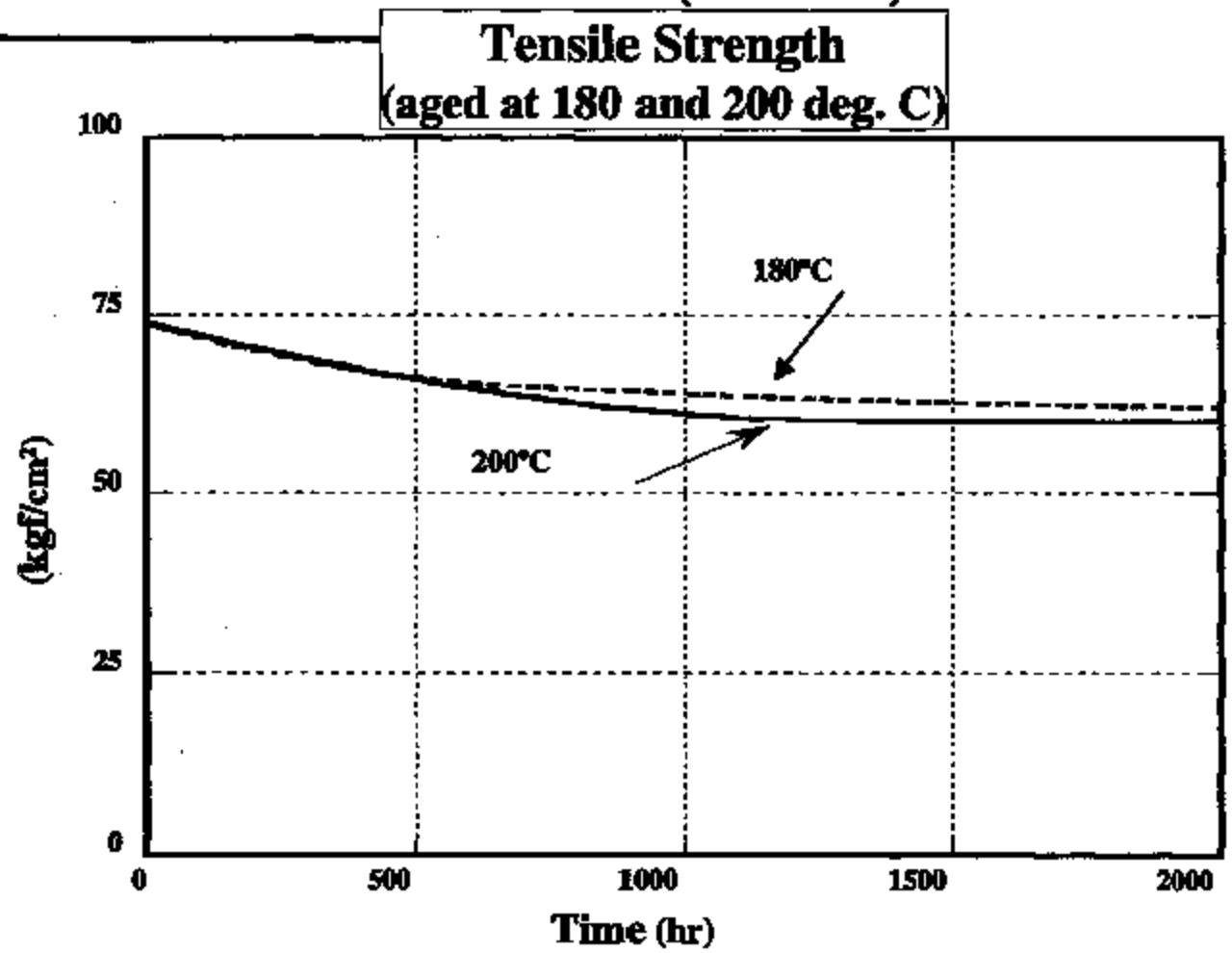
September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Resistance to Heat (SIFEL3701)

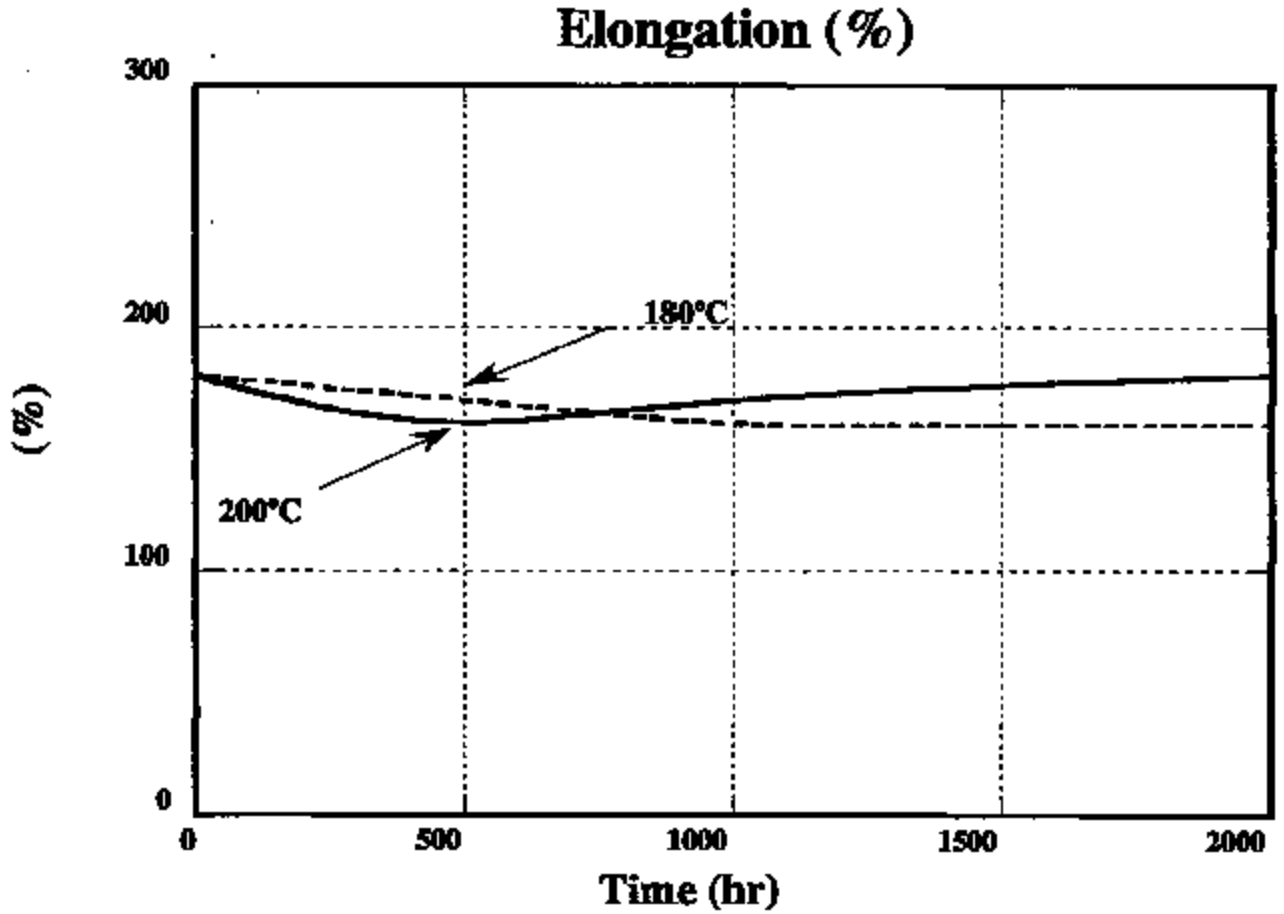


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Resistance to Heat (SIFEL3701)



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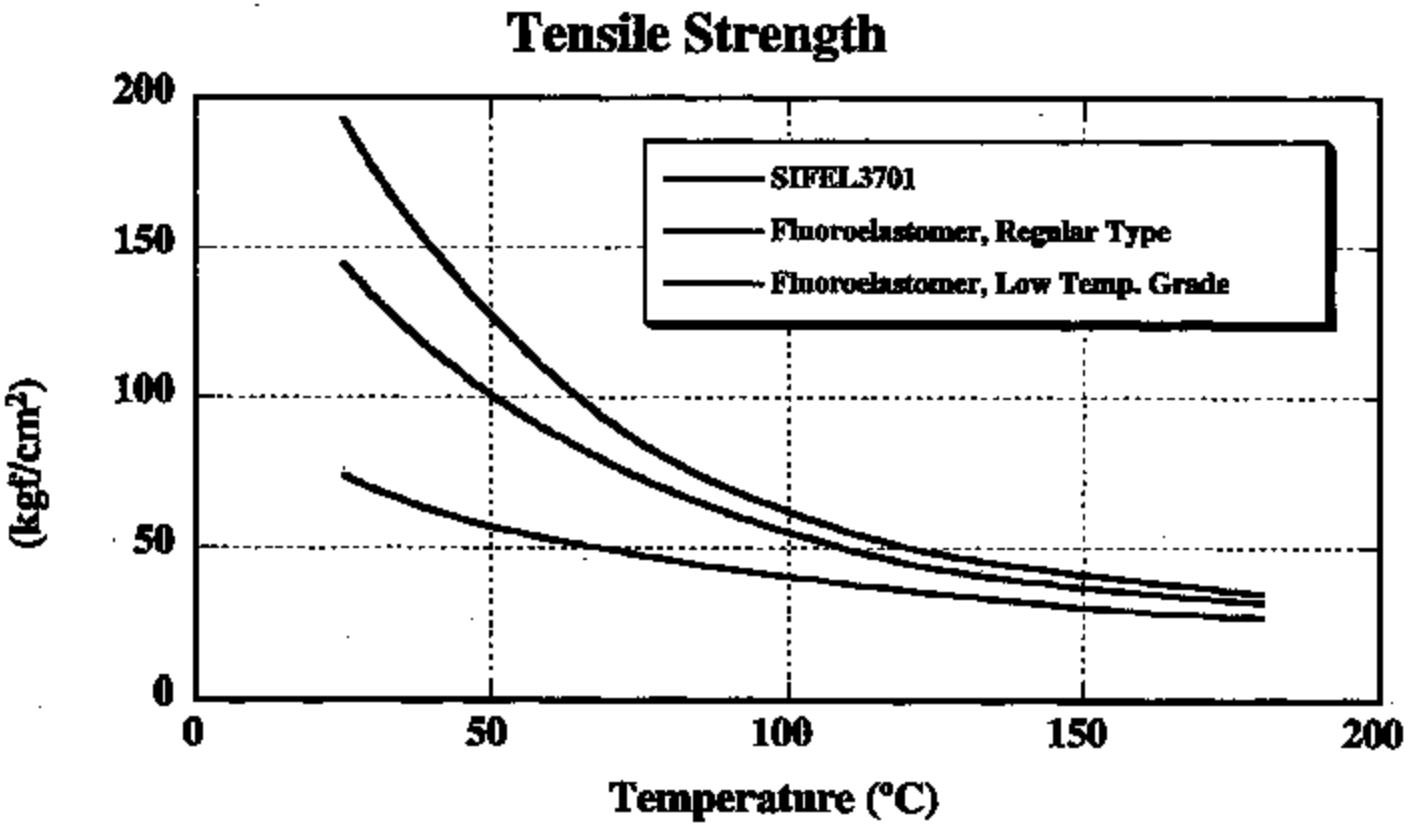
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Strength Retention at High Temperatures



E9902-027-A 15000

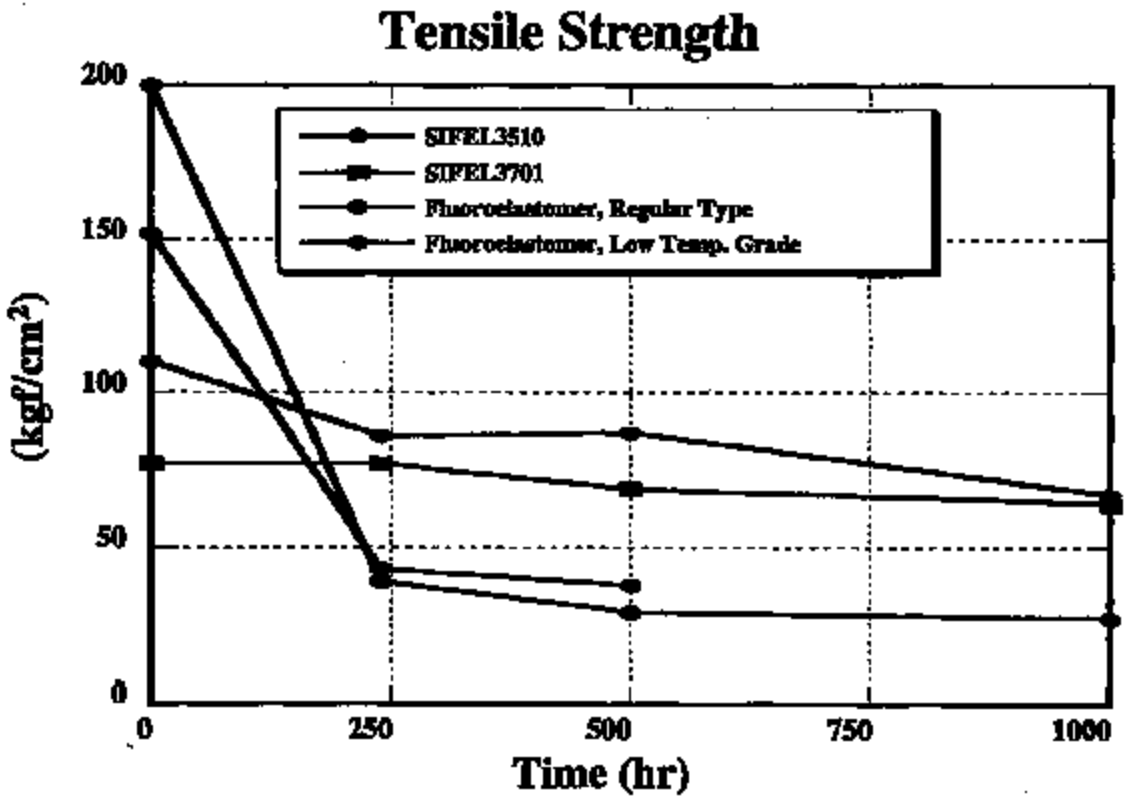
September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150ºC)

Nisseki –Caltex
SJ5W-20



EM02-027-B 15M1

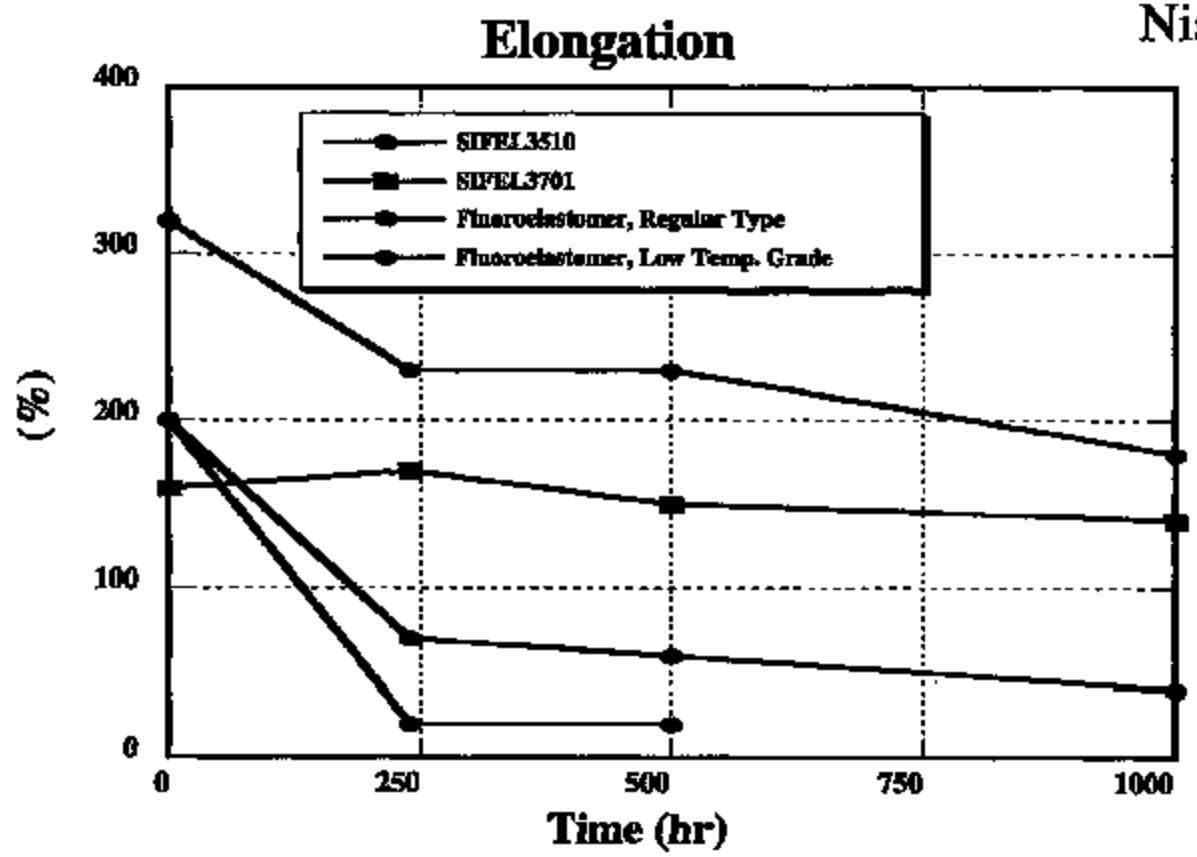
September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150ºC)

Nisseki –Caltex
SJ5W-20



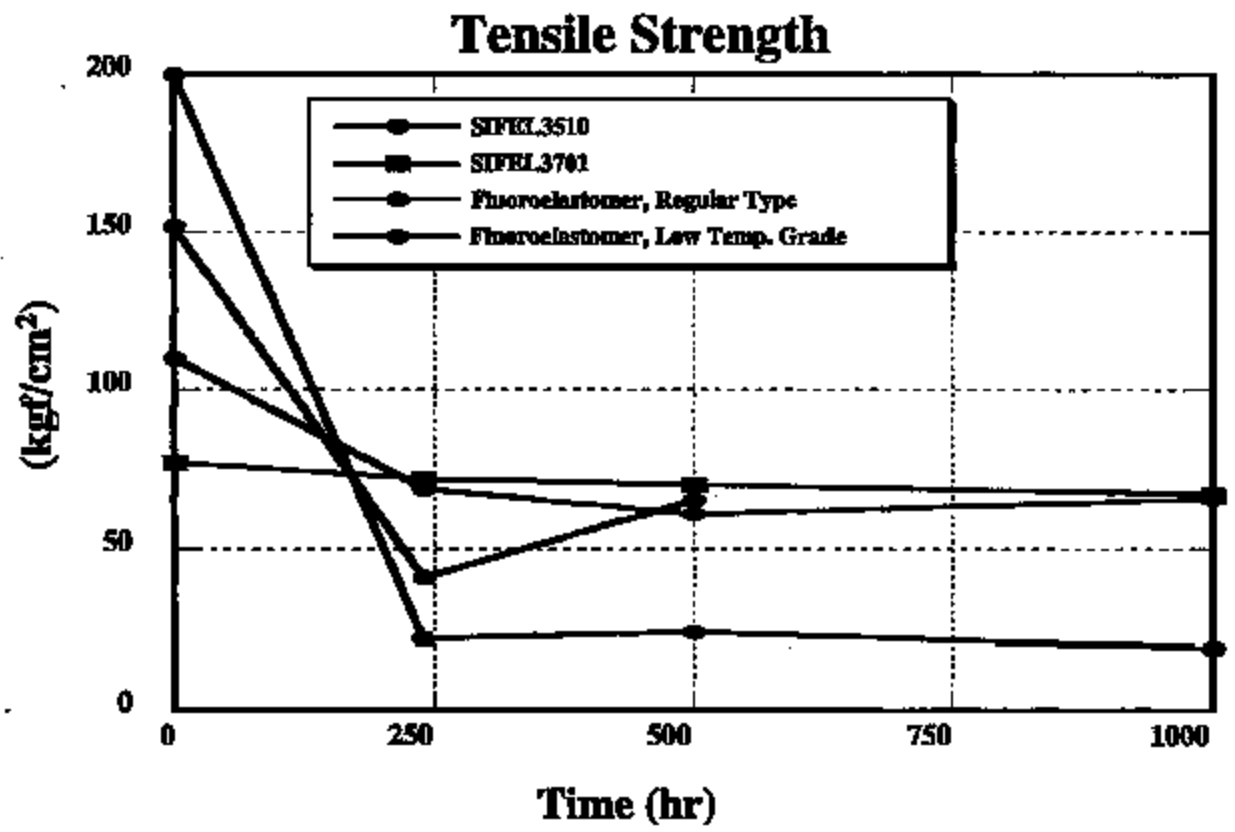
September 2000

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150ºC)

Showa-Shell
SJ5W-20

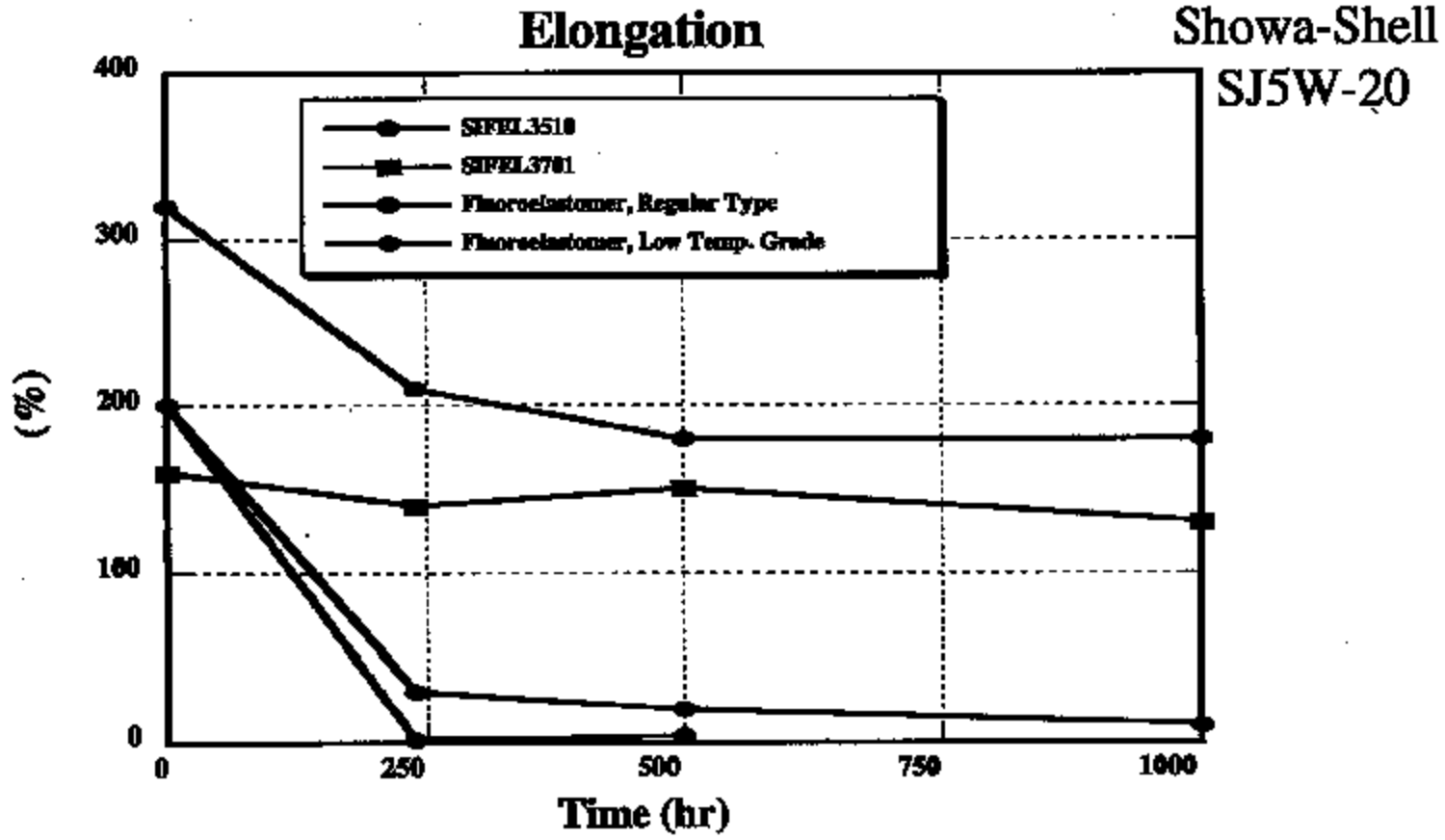


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150°C)



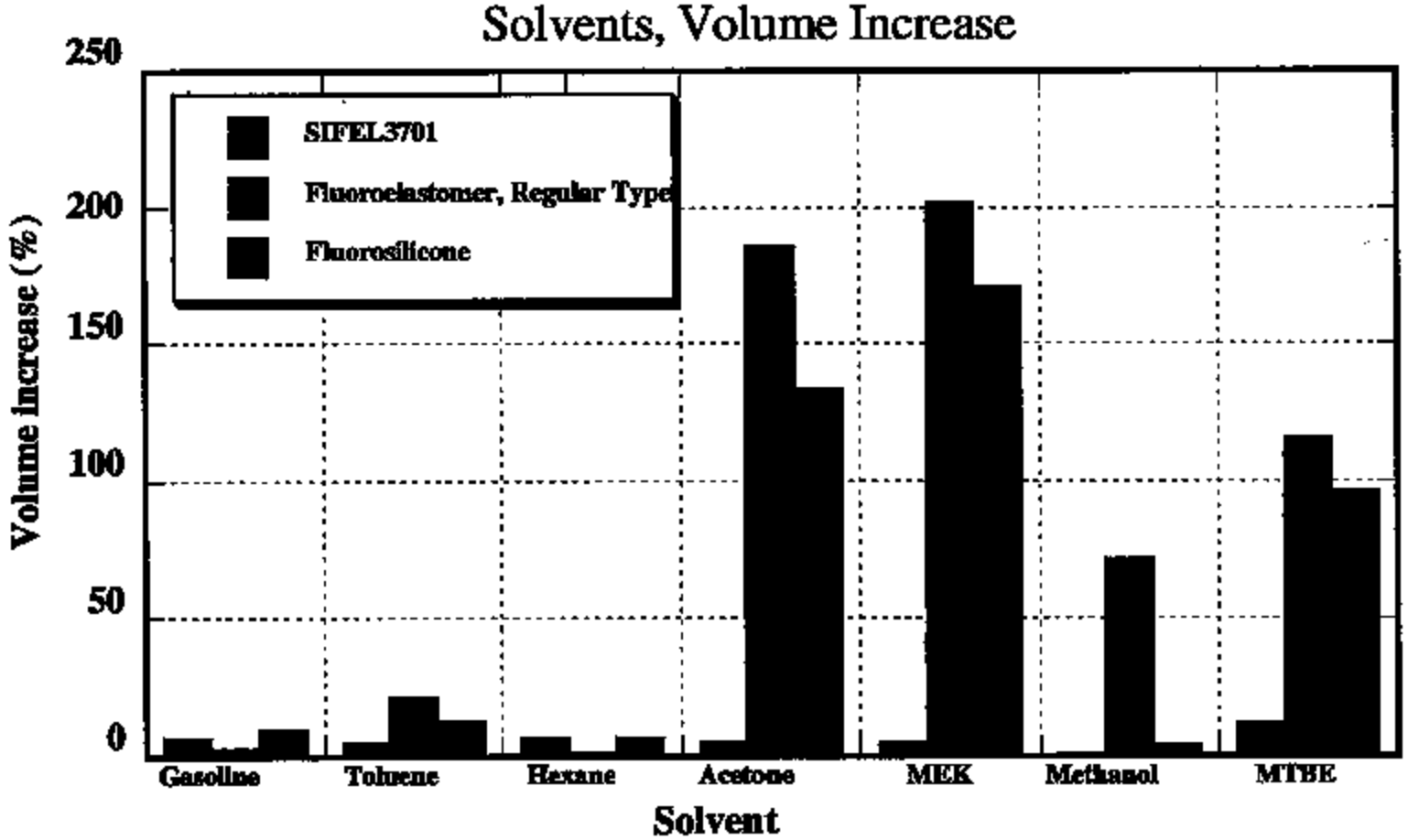
EM02-027-B 1000A

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi SHIN-ETSU SIFEL®

Solvent Resistance (7 days at room temperature)

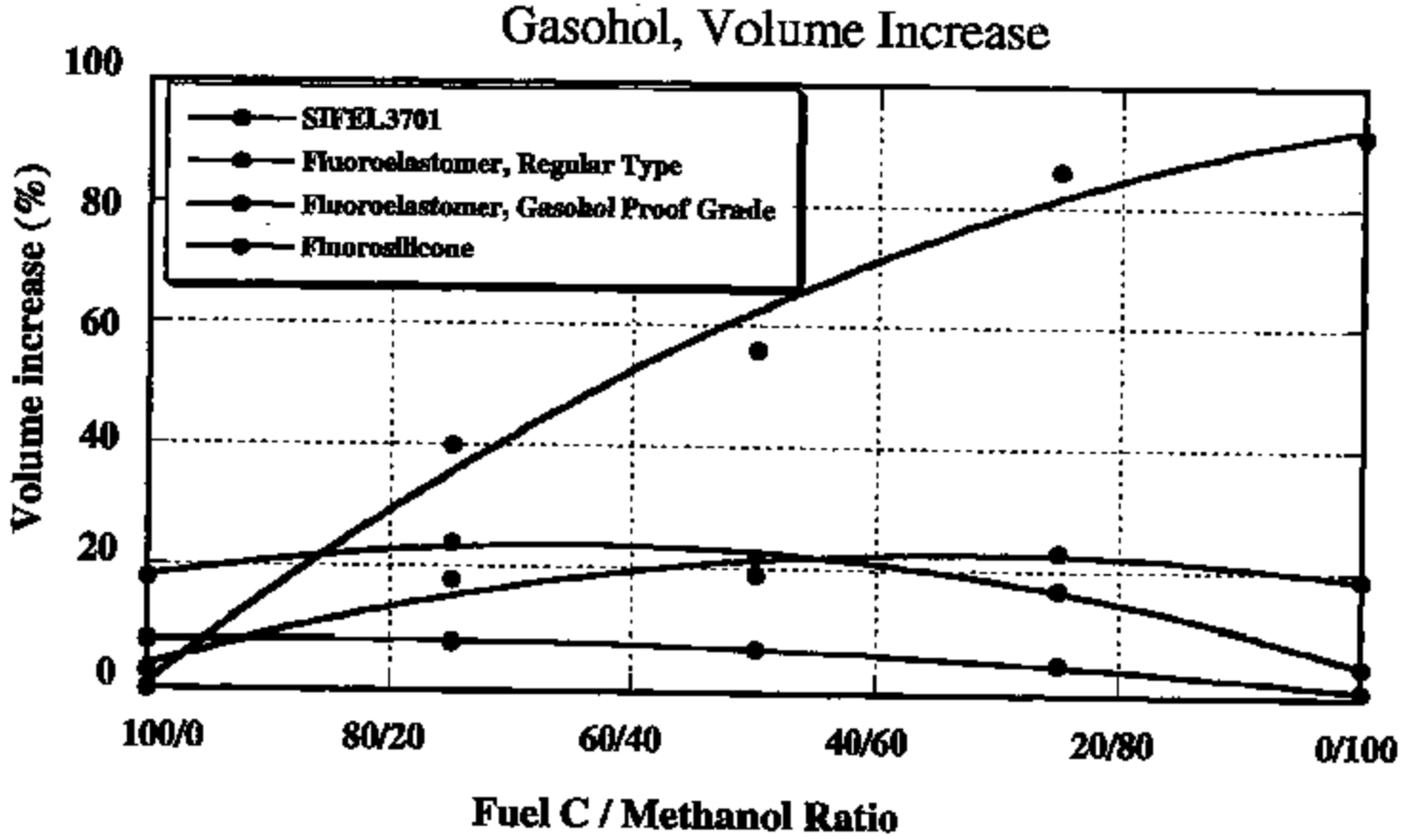


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Solvent Resistance (7 days at room temperature)



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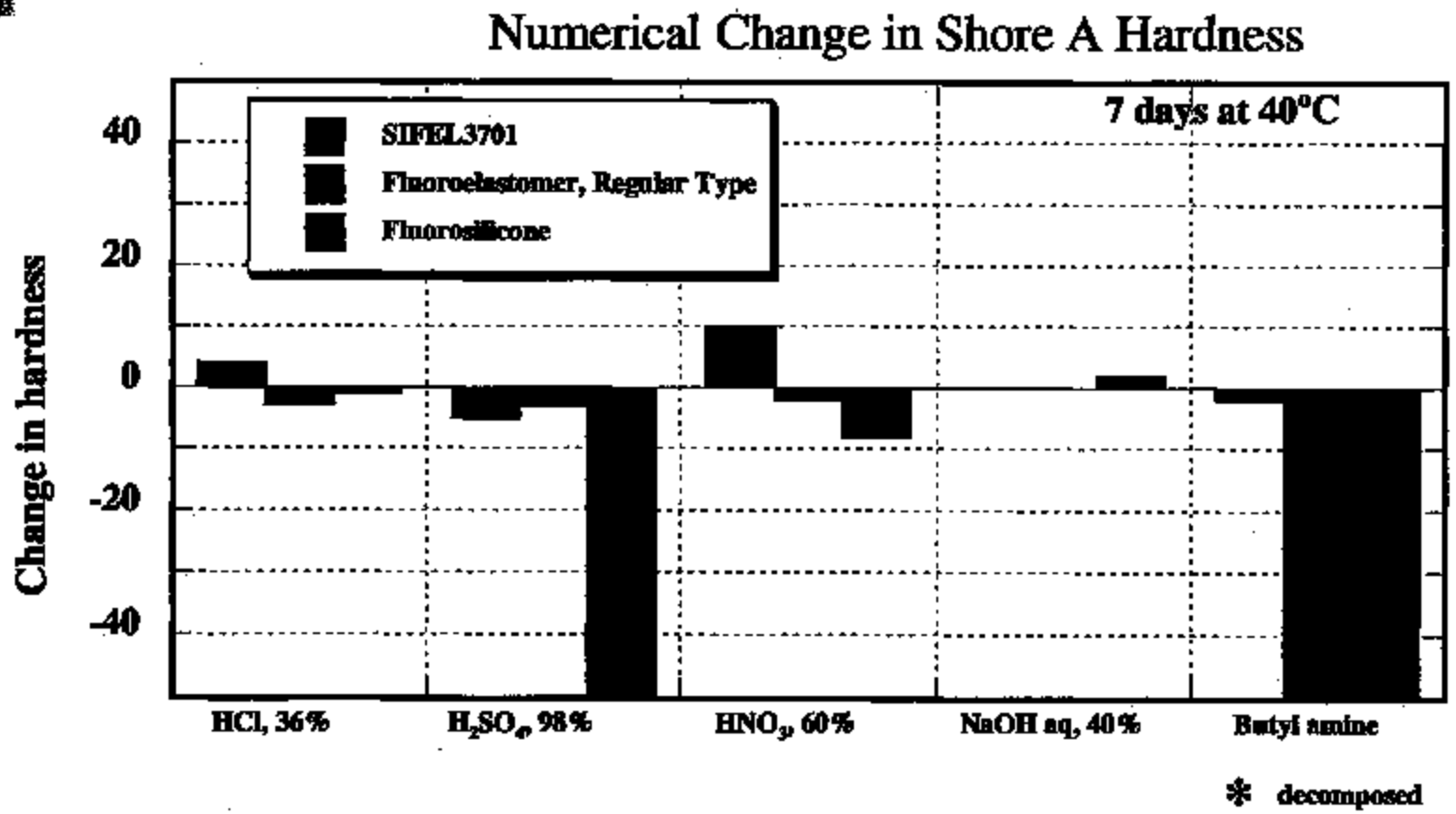
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Chemical Resistance (Numerical Change in Shore A Hardness)

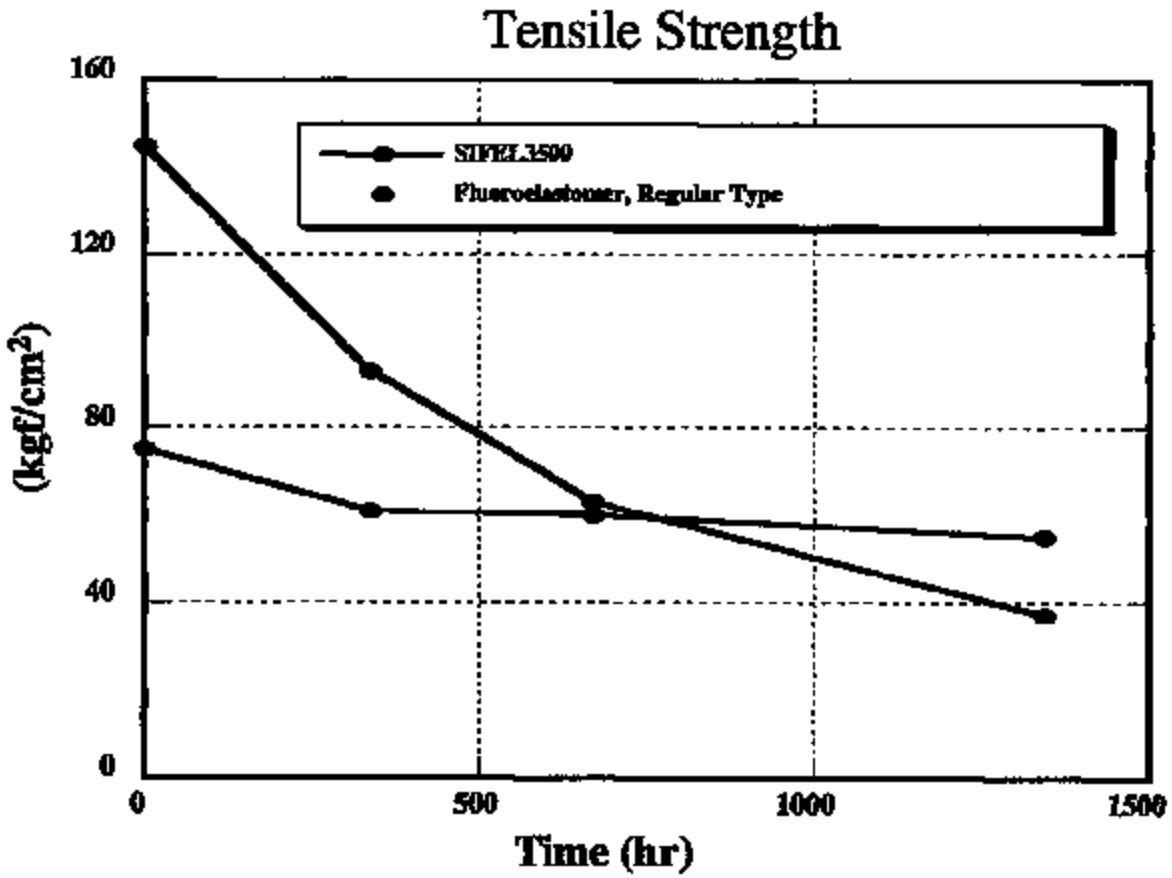


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Steam Resistance (Steam, 6.5 kgf/cm² @ 92psi)



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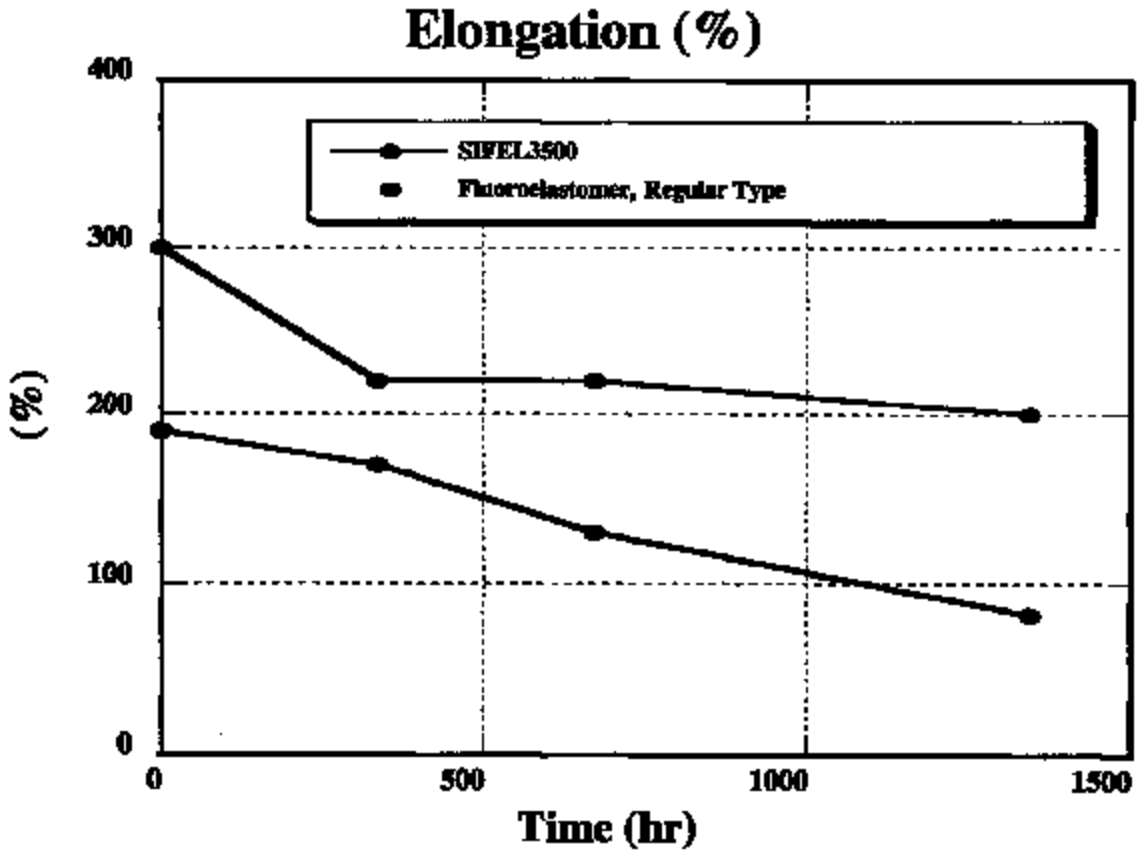
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Steam Resistance (Steam, 6.5 kgf/cm^2 @ 92psi)



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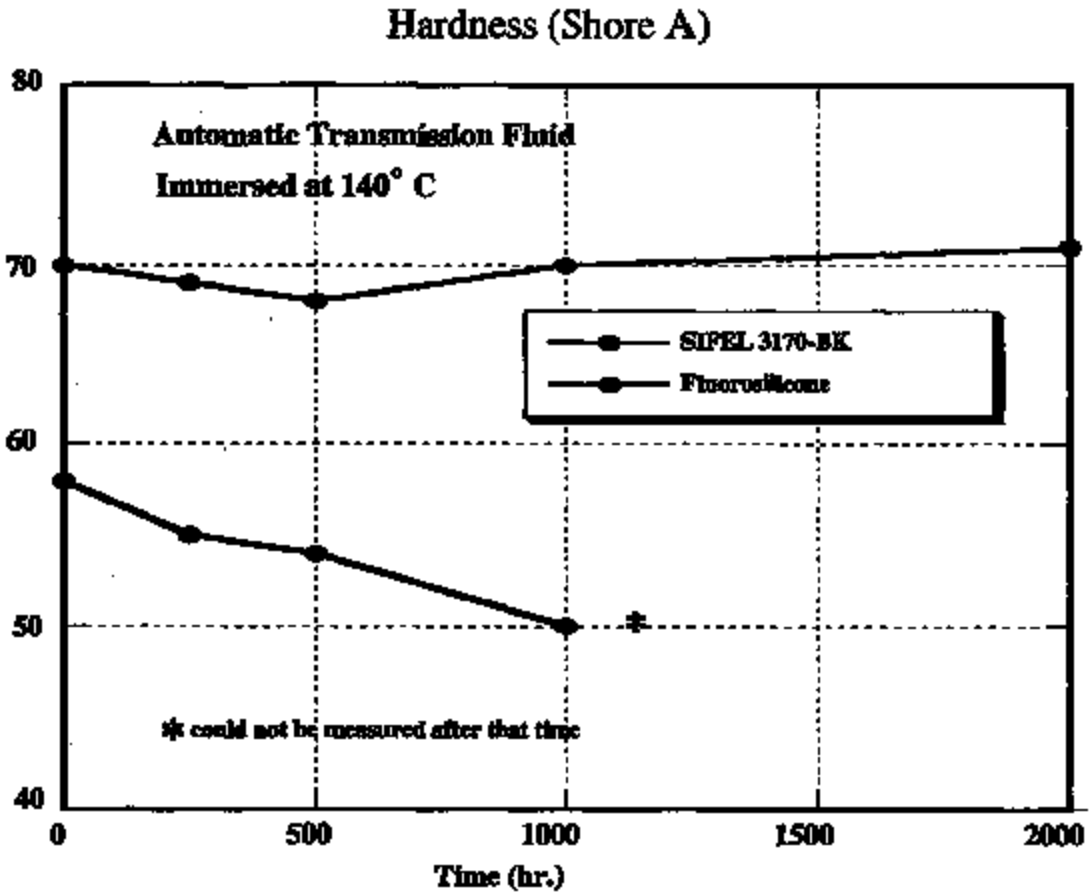
ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance



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September 2000

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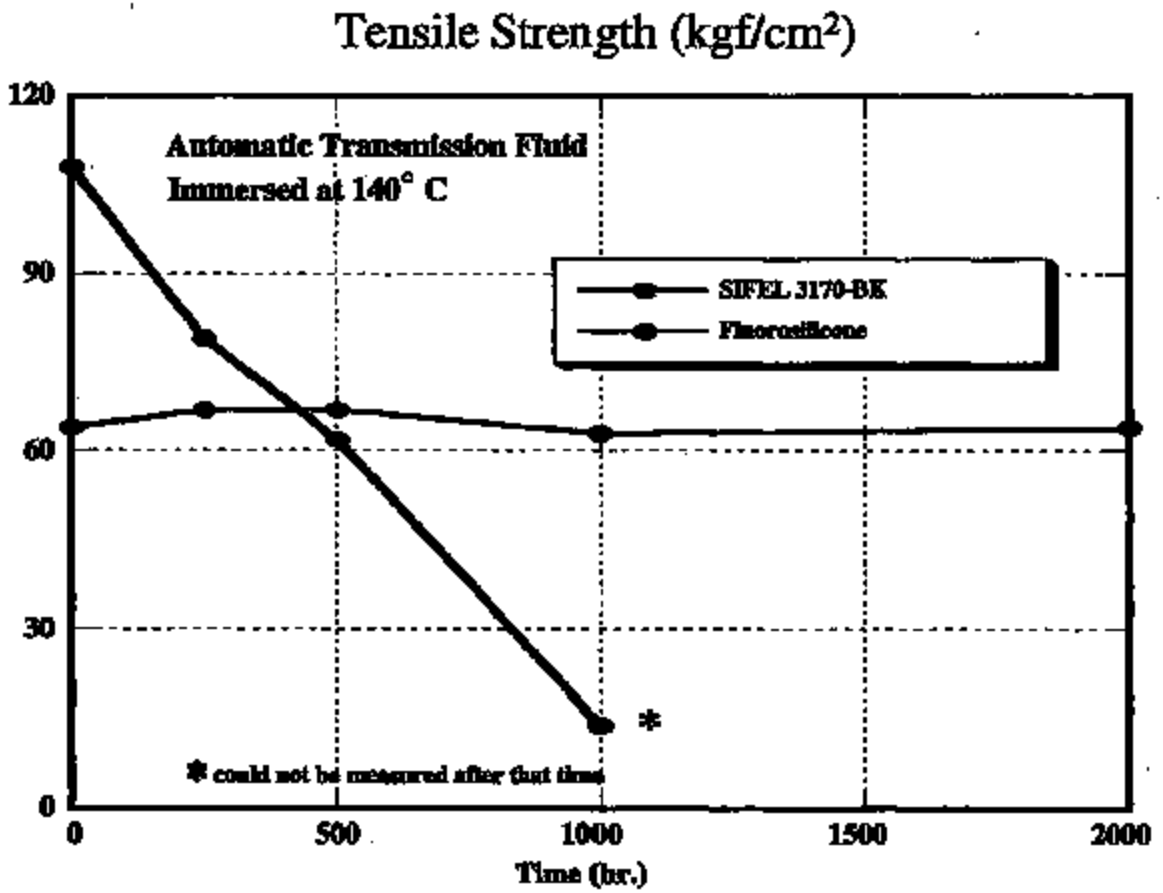
ShinEtsuMicroSi

SHIN-ETSU SIFEL®

Oil Resistance



11961 6-120-2000

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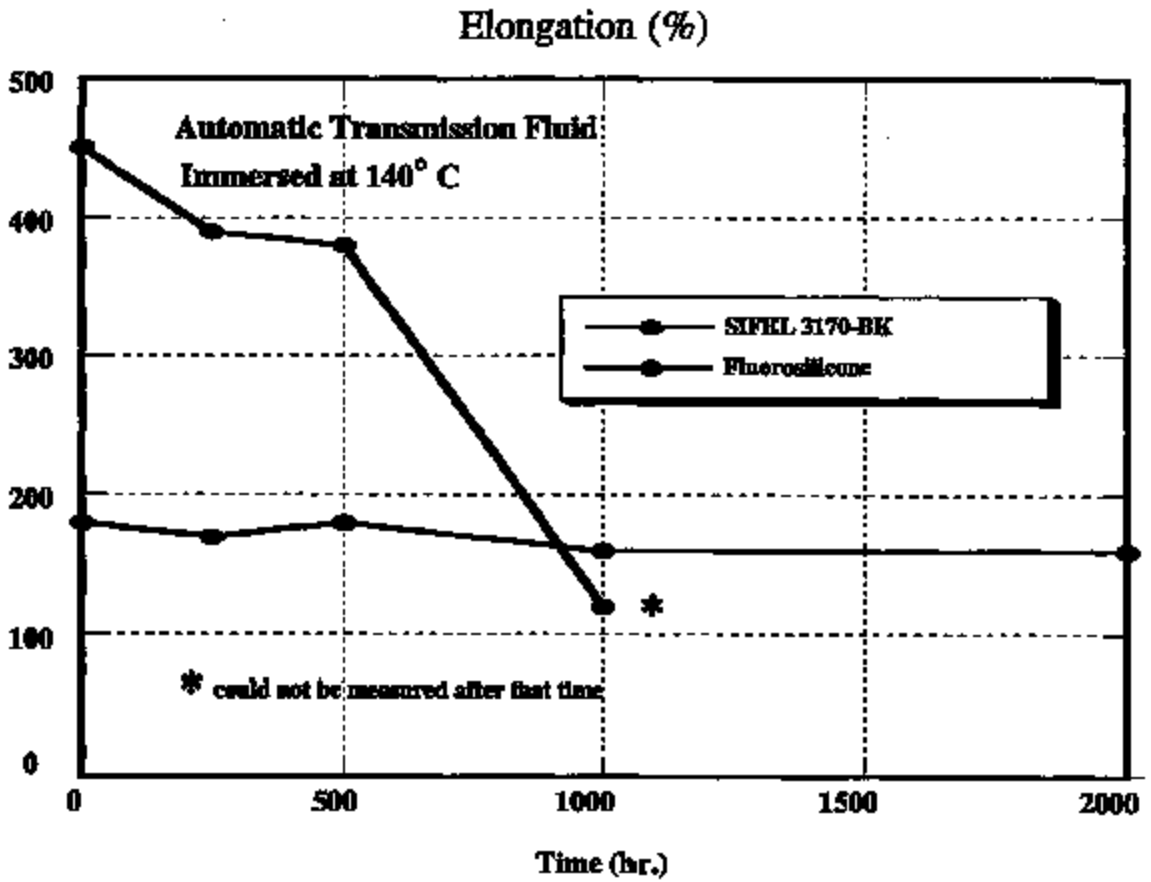
ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Oil Resistance



September 2000

Values listed are typical values and do not constitute a specification

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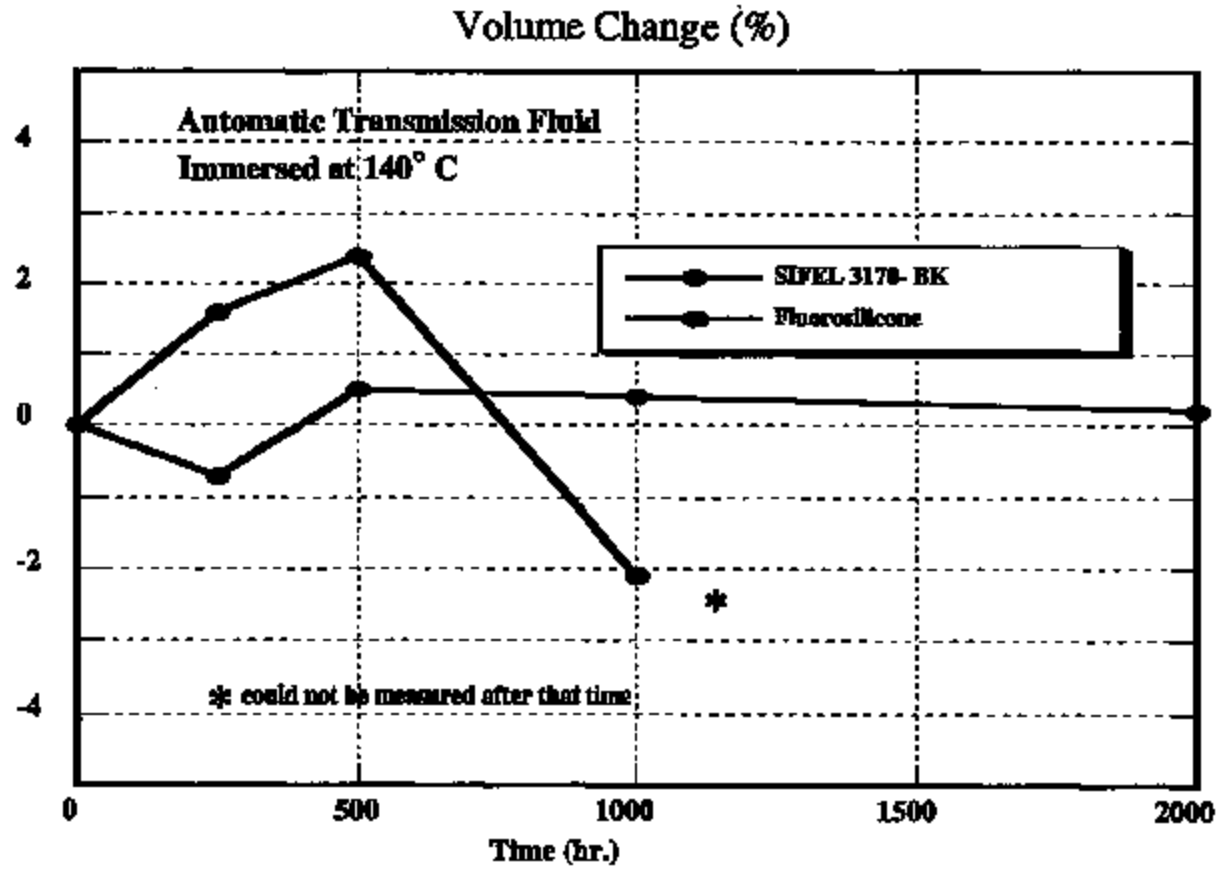
SHIN-ETSU SIFEL®

Oil Resistance



EM02-027-B 13813

September 2000

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi®

SHIN-ETSU SIFEL®

Product Listing

	SIFEL3510A/B	SIFEL3701A/B	SIFEL3140	SIFEL3155	SIFEL3170-BK
Features	2 components 50 Hardness High strength	2 components 70 Hardness	1 component 40 Hardness Liquid	1 component 55 Hardness Liquid	1 component 70 Hardness
	Before curing properties				
Appearance	A: Black paste B: White paste	A: Black paste B: White paste	Milky white liquid	Milky white liquid	Black paste
Viscosity 23°C	A: 3000 Poise (300 Pa·s) B: 4000 Poise (400 Pa·s)	A: 7000 Poise (700 Pa·s) B: 10000 Poise (1000 Pa·s)	300 Poise (30 Pa·s)	400 Poise (40 Pa·s)	5000 Poise (500 Pa·s)
	After curing properties (Press cure 150°C, 10min and post cure 200°C, 4hr)				
Specific gravity 23°C	1.83	1.94	1.88	1.87	1.94
Hardness (Shore A)	50	70	40	54	70
Tensile strength	120 kgf/cm^2 (12 MPa) (1710 psi)	65 kgf/cm^2 (6.4 MPa) (924 psi)	60 kgf/cm^2 (5.9 MPa) (853 psi)	80 kgf/cm^2 (7.8 MPa) (1140 psi)	70 kgf/cm^2 (6.9 MPa) (996 psi)
Elongation (%)	300	180	350	250	210
Tear strength	17 kgf/cm (17 kN/m) (95 ppi)	13 kgf/cm (13 kN/m) (73 ppi)	10 kgf/cm (9.8 kN/m) (56 ppi)	10 kgf/cm (9.8 kN/m) (56 ppi)	14 kgf/cm (14 kN/m) (78 ppi)
Compression set (%) 200°C, 24hr	10	11	-	-	-
	SIFEL 3510 and 3710 should be mixed 1:1 by volume, not weight				

91691 9-LZ9-X9B2

September 2000

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi®

SHIN-ETSU SIFEL®

Properties

Electrical Insulation Properties	SIFEL3701	Fluororubber	Fluorosilicone
Volume Resistivity (Ω-cm)	$2x10^{14}$	$3x10^{12}$	$4x10^{14}$
Dielectric Strength (kV/mm)	33	24	20
Dielectric Constant (50Hz)	3.1	11	6
Dielectric Dissipation Factor (50 Hz)	$2x10^{-2}$	$3x10^{-1}$	$2x10^{-3}$
Low Moisture Permeability			
Moisture Permeability ($g/m^2 \cdot 24$ hr)	5	4	50

ETMS1 9-0ZZ-BMS

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ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

SIFEL

Fluoroelastomer for Liquid Injection Molding (LIM)

E982-827-0 10/16

September 2000

[redacted]

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Features of Fluoroelastomer for LIM

- Has the same features and benefits of existing Fluoroelastomer compounds
  - Nonflammable
  - Chemical and oil resistance
  - Heat resistance
  - Low moisture permeability

EMC-677-9 19617

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Features of Fluoroelastomer for LIM

- Has additional features and benefits
  - Available in either liquid or paste
  - Shorter curing time and lower curing temperature provides improved productivity.
  - Improved low temperature flexibility
  - Resistance to solvents and amines
  - Resistance to steam
  - Excellent electrical properties

E0602-627-8 1/8/18

September 2000

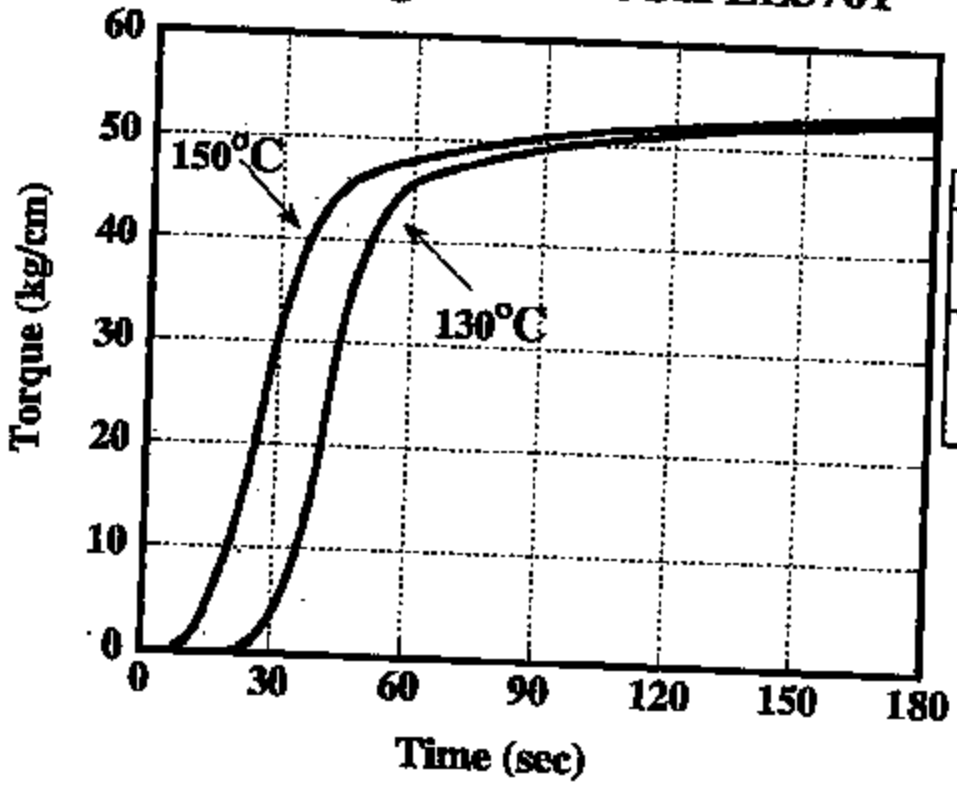
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Cure Speed

Curing Profile of SIFEL3701



Required Cure Conditions

	Press Cure	Post Cure
SIFEL (LIM)	150°C/ < 1 min.	200°C for 4 hr
Standard Fluoroelastomer (Comp. Molding)	170°C/15 min.	230°C for 24 hr

Shorter curing time and lower curing temperature means higher productivity

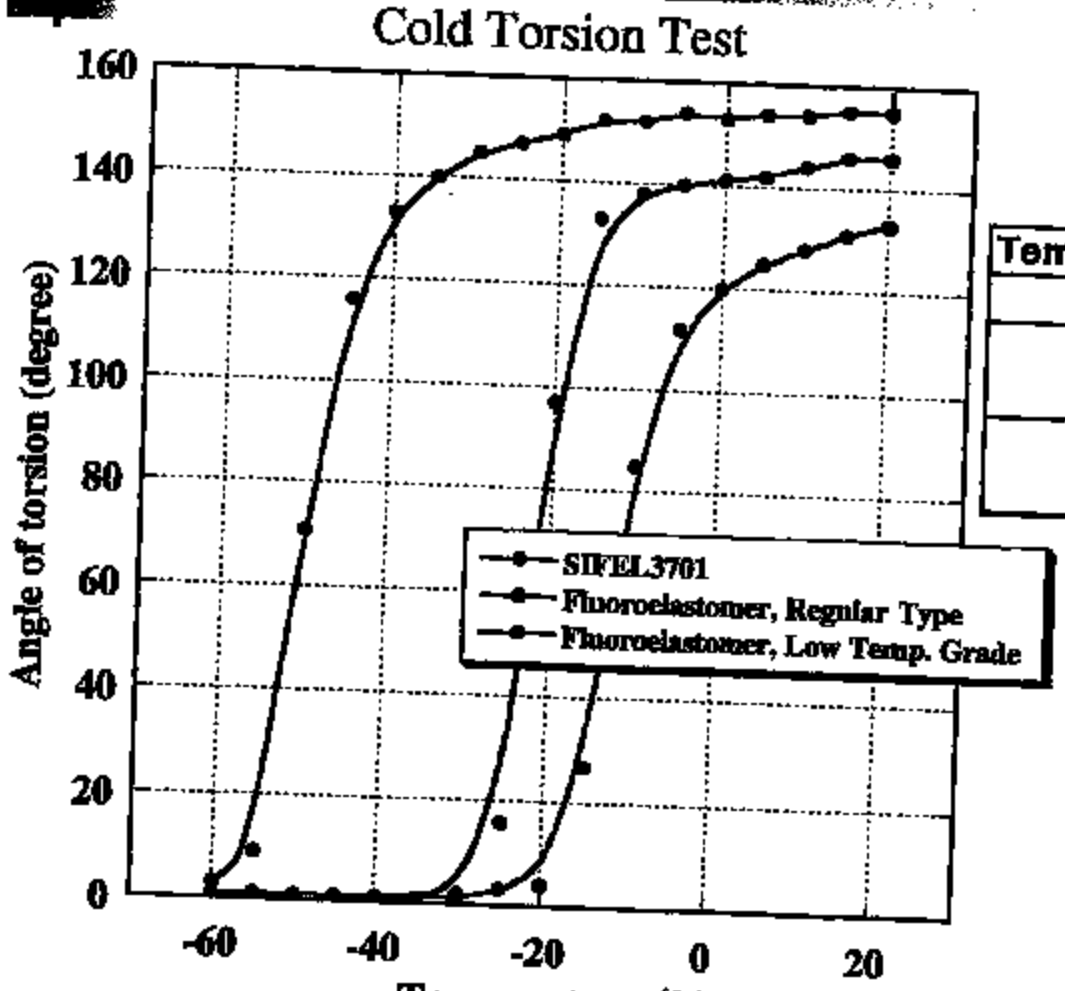
SHE-627-E 15610

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi®

SHIN-ETSU SIFEL®

Low Temperature Flexibility



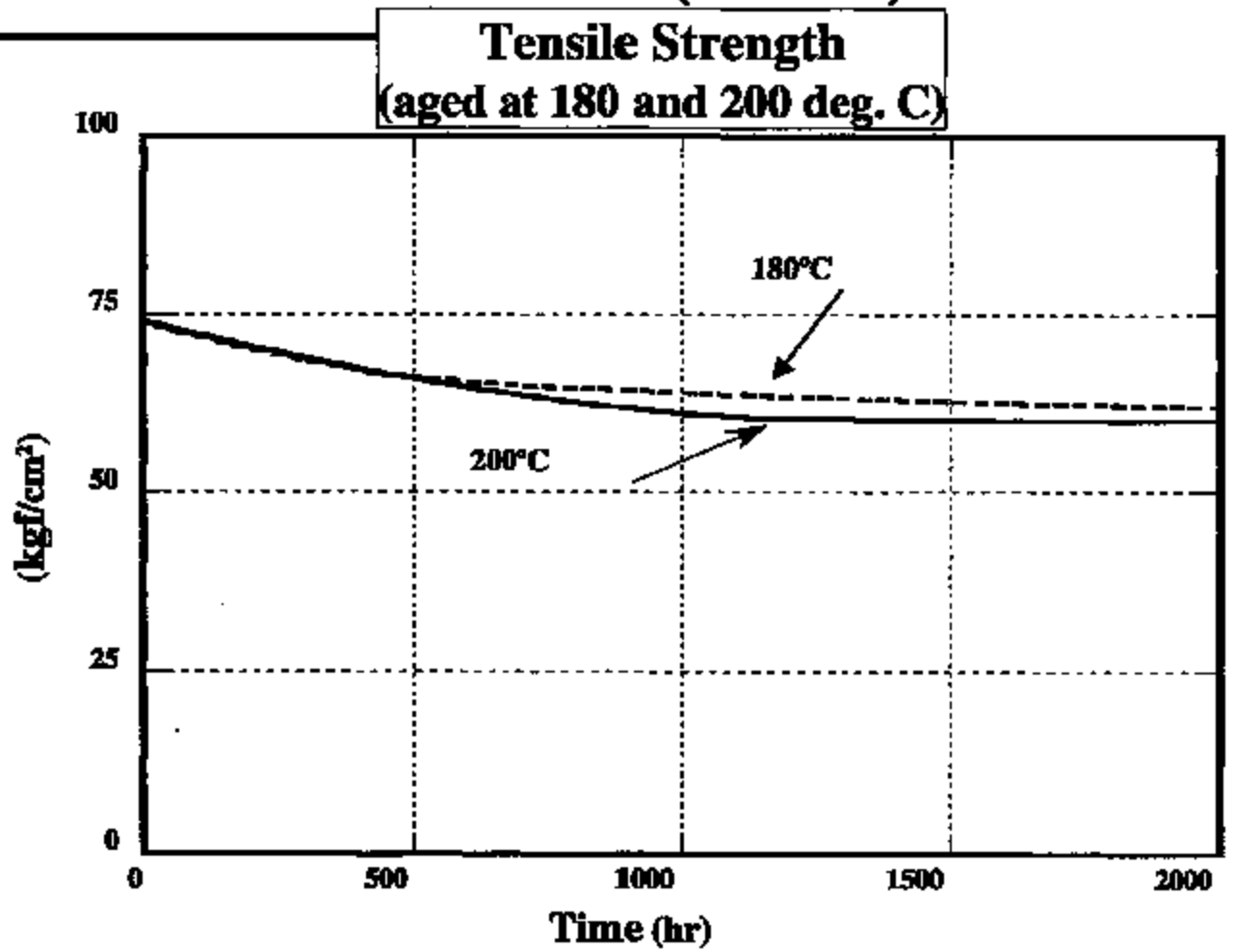
Temperature of Retraction	TR-10 (°C)
SIFEL3701	-50
Fluoroelastomer Regular Type	-17
Fluoroelastomer Low Temp. Grade	-30

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Resistance to Heat (SIFEL3701)



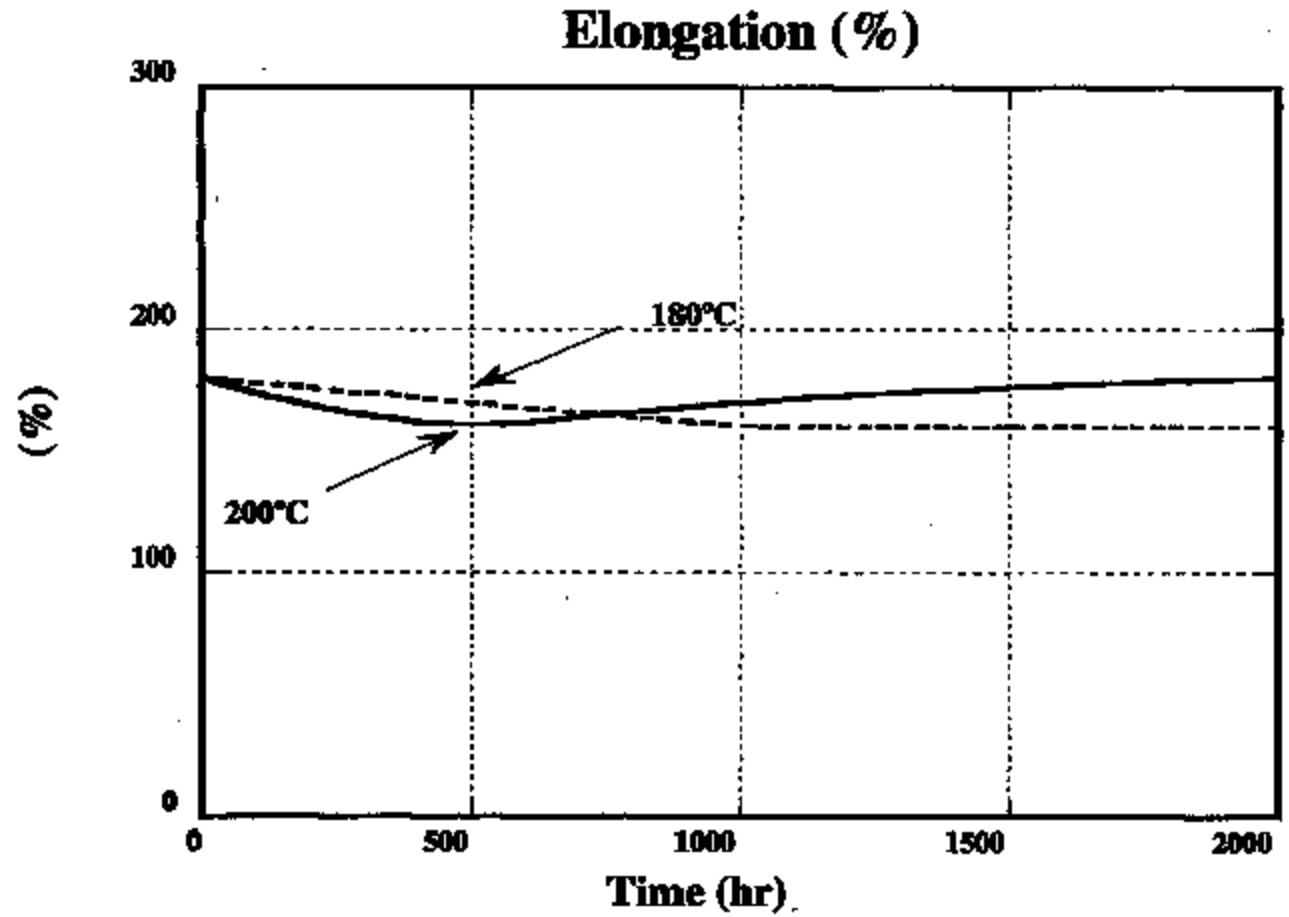
E002-827-B 15821

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Resistance to Heat (SIFEL3701)



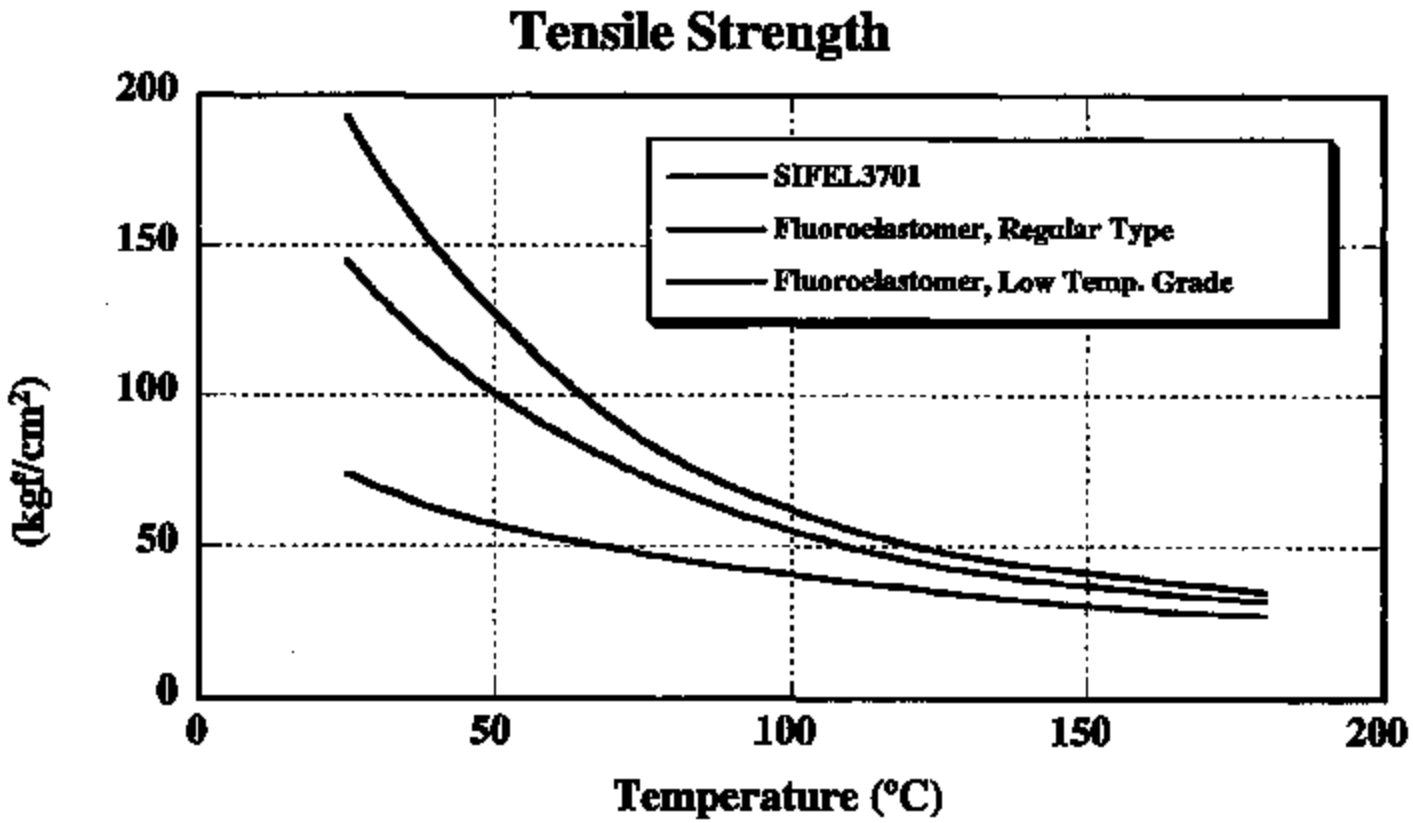
Values listed are typical values and do not constitute a specification

September 2000

ENG-027-0 1802

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Strength Retention at High Temperatures



E0202-427-0 10023

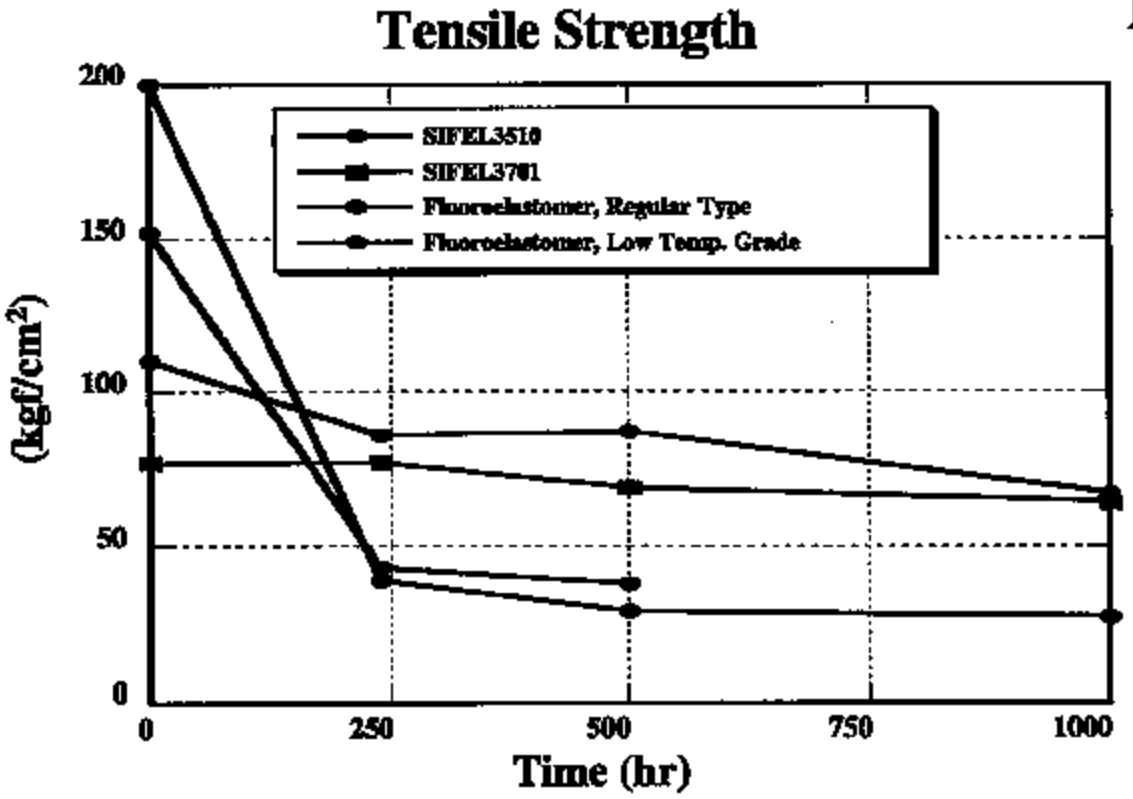
September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150ºC)

Nisseki –Caltex
SJ5W-20



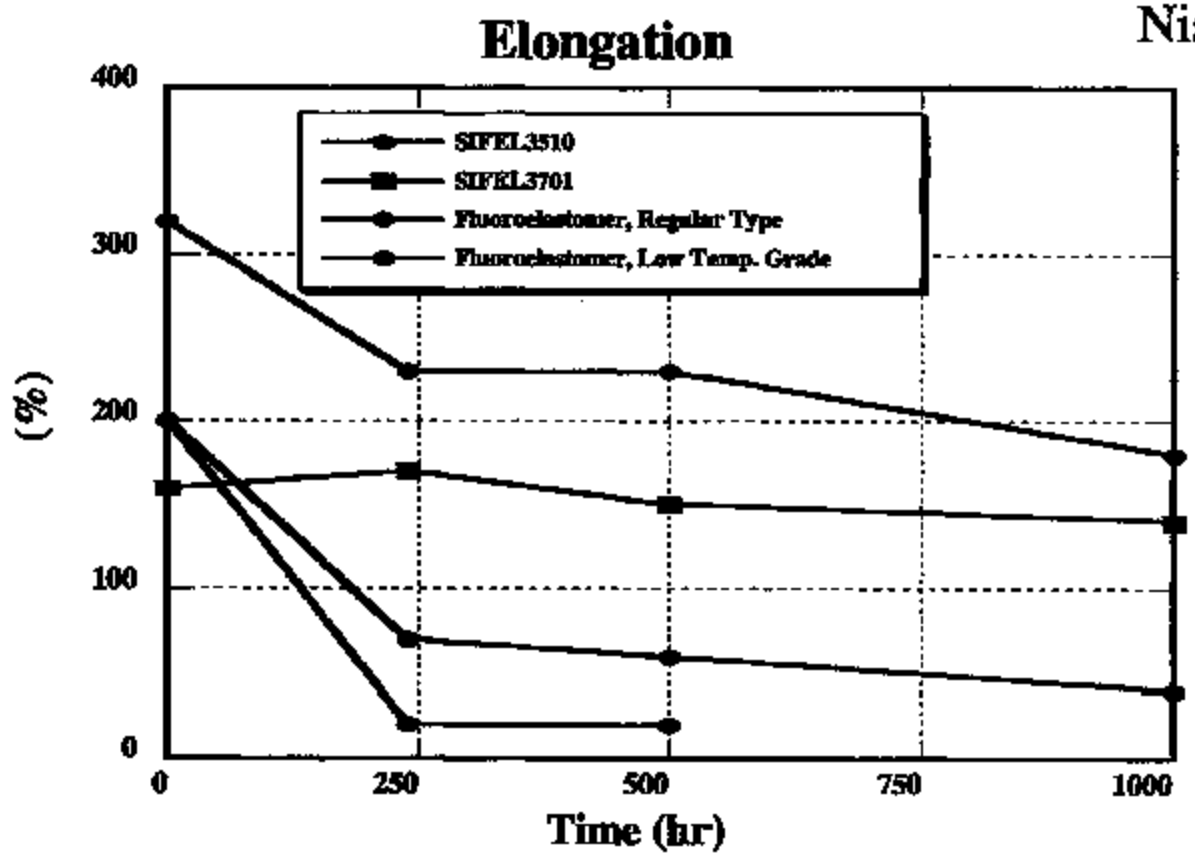
BM2-027-B 13824

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150ºC)

Nisseki –Caltex
SJ5W-20



SMS2-627-9 13823

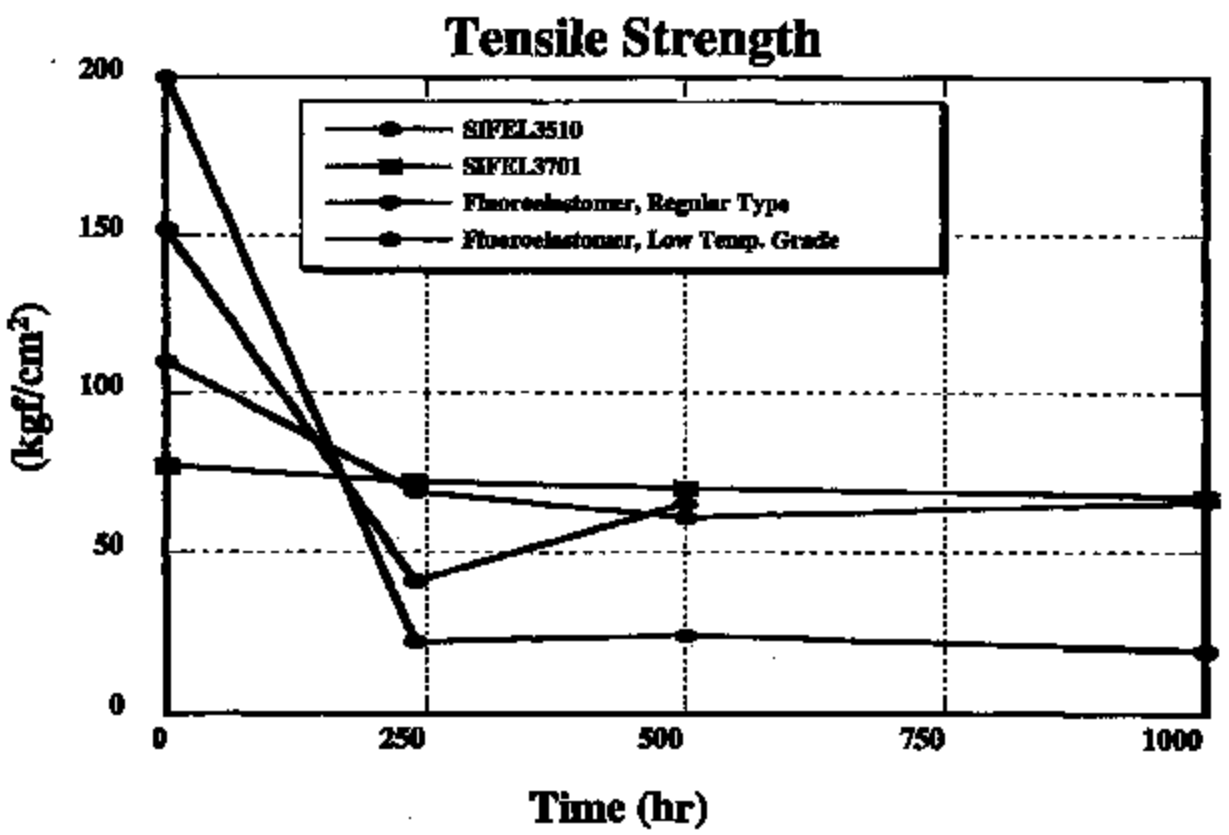
September 2000

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150°C)

Showa-Shell
SJ5W-20



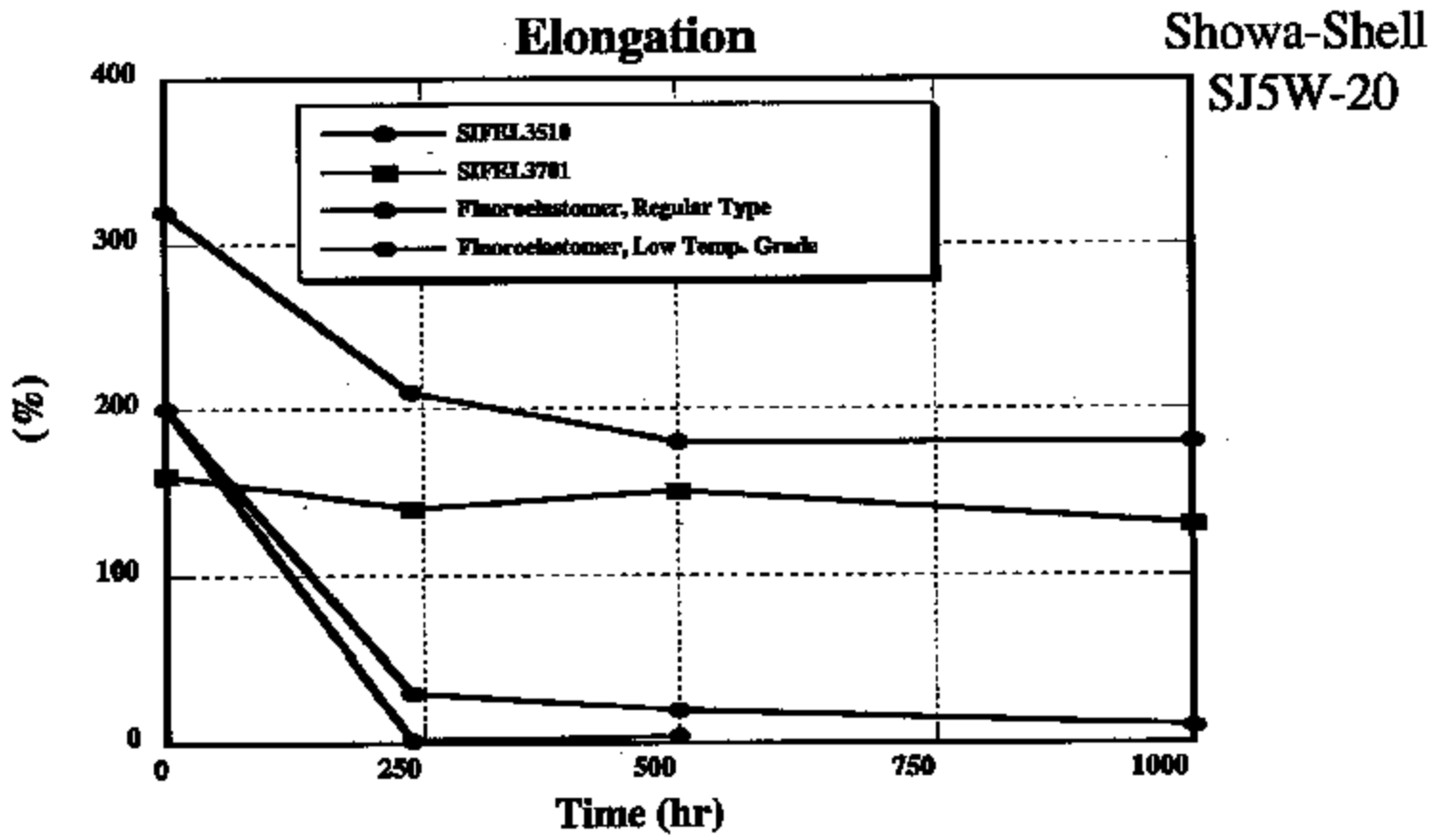
82961 0-127-2002

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance (Immersion test in engine oil at 150ºC)



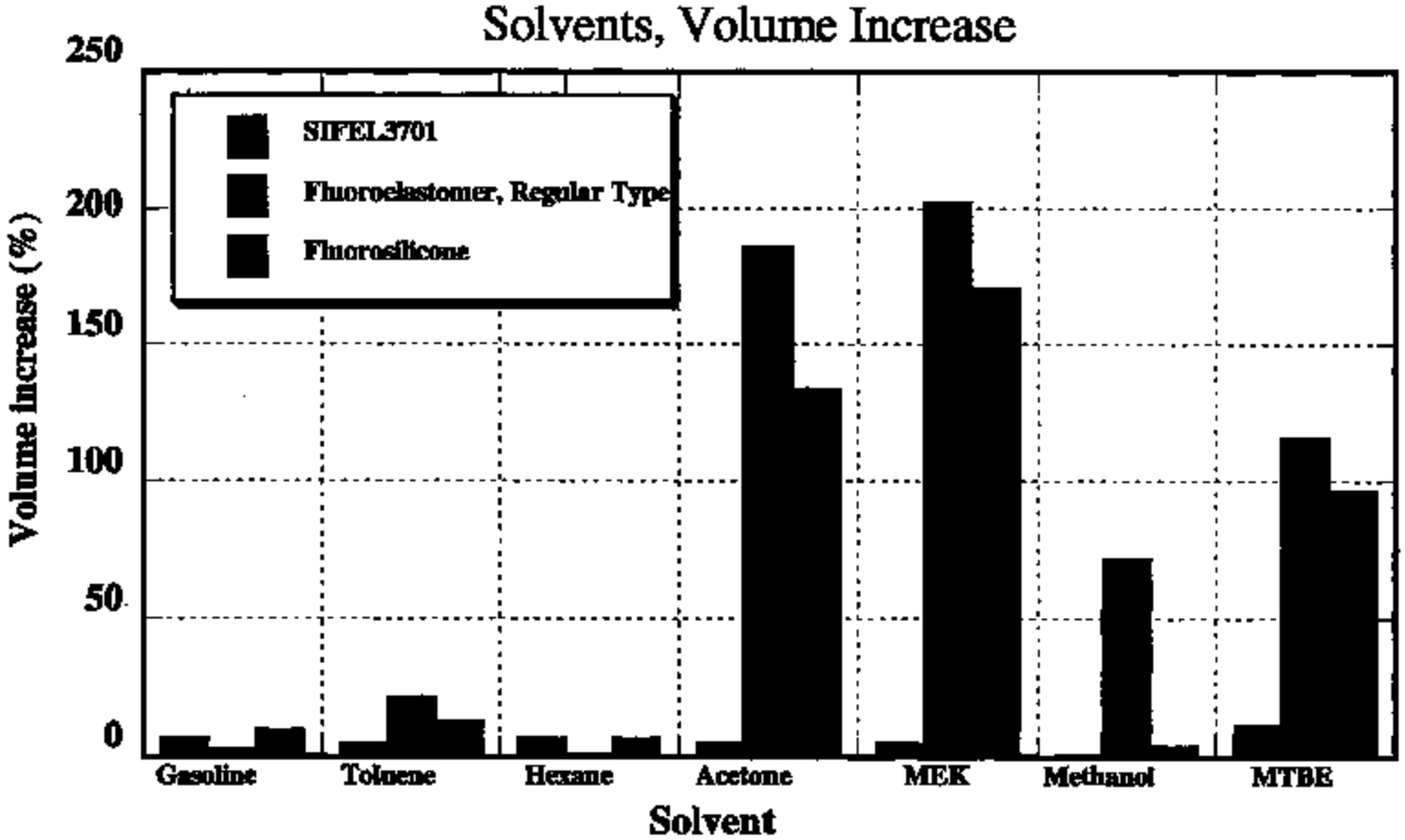
SMS-627-A 12827

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Solvent Resistance (7 days at room temperature)

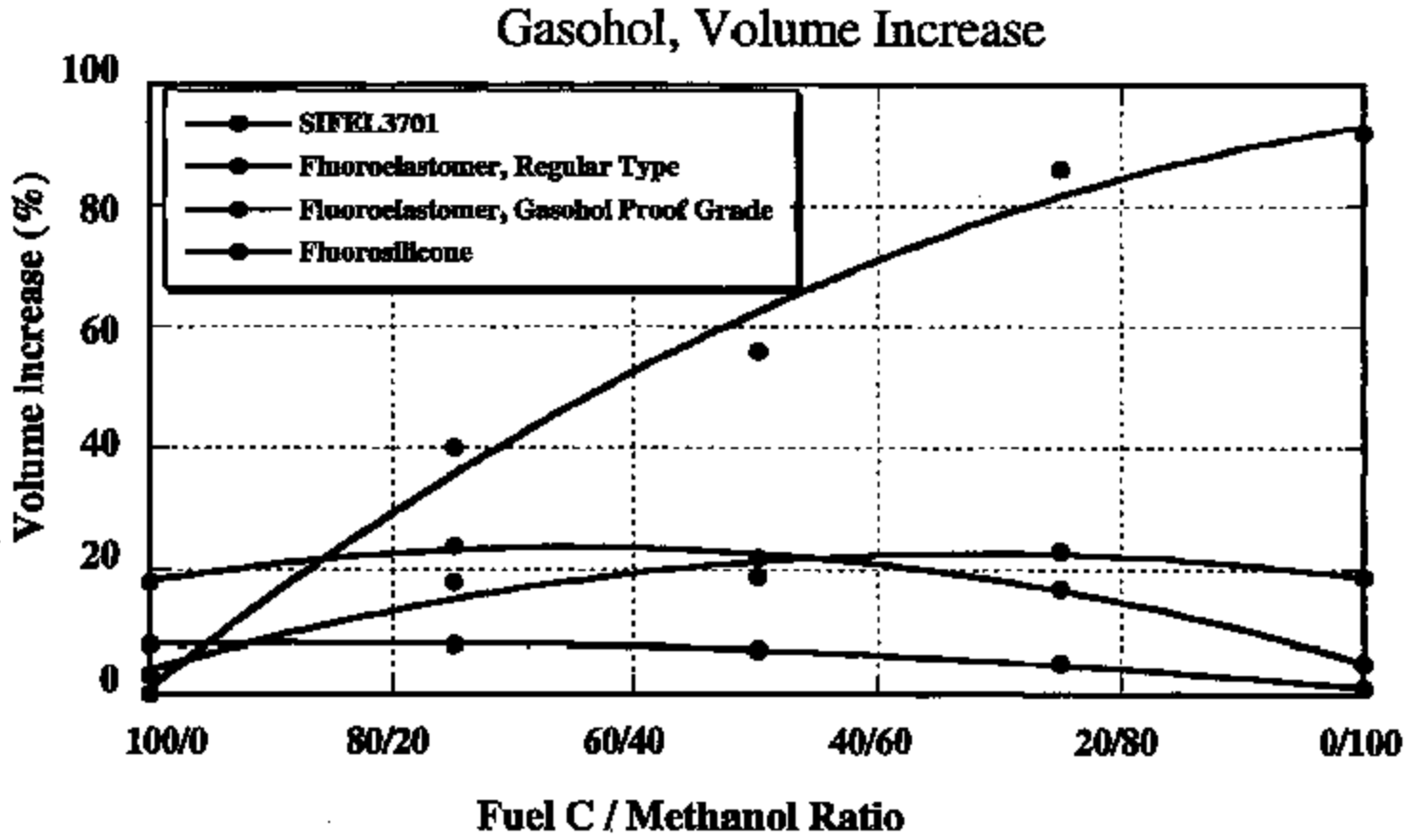


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Solvent Resistance (7 days at room temperature)

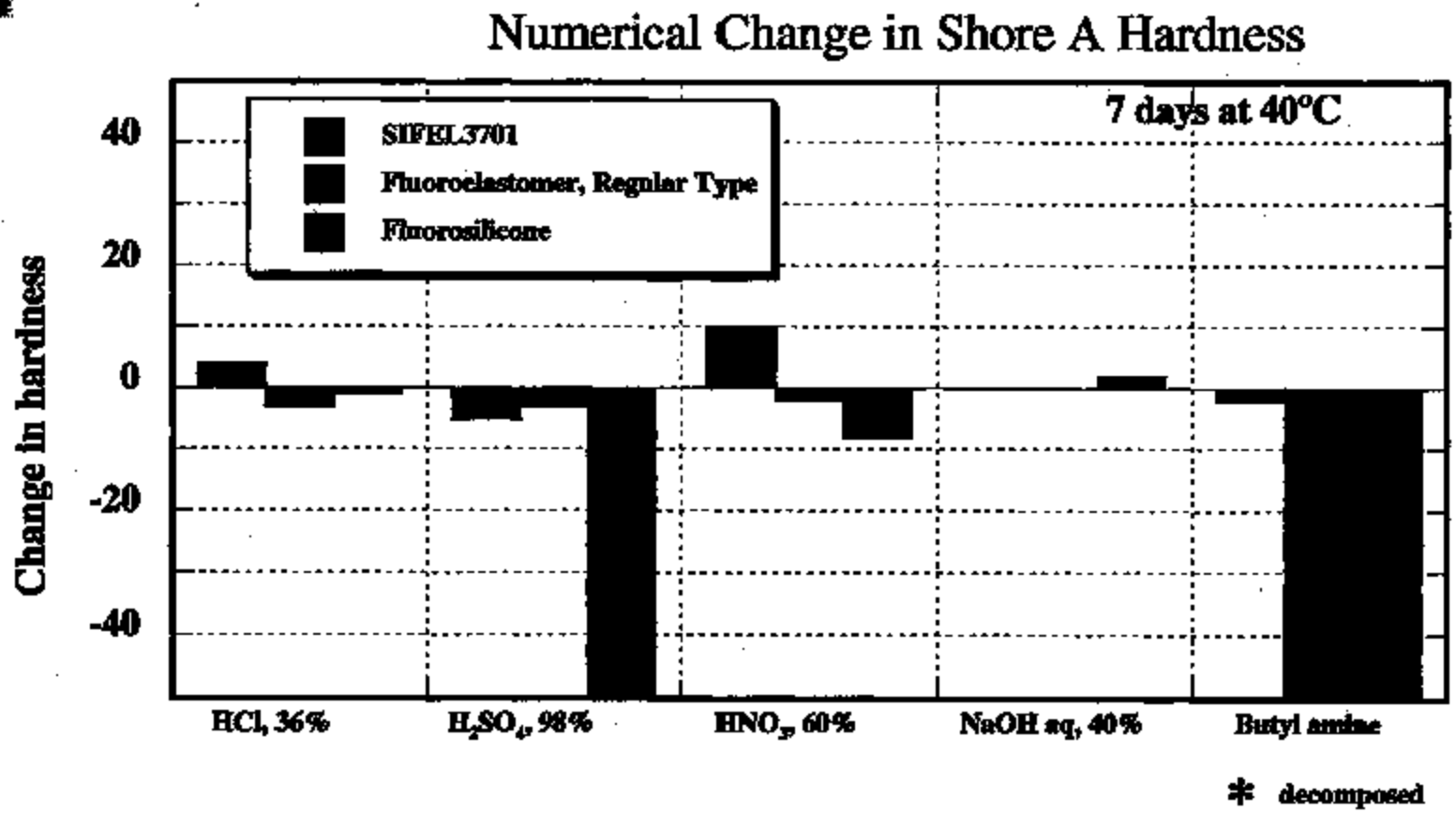


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Chemical Resistance (Numerical Change in Shore A Hardness)

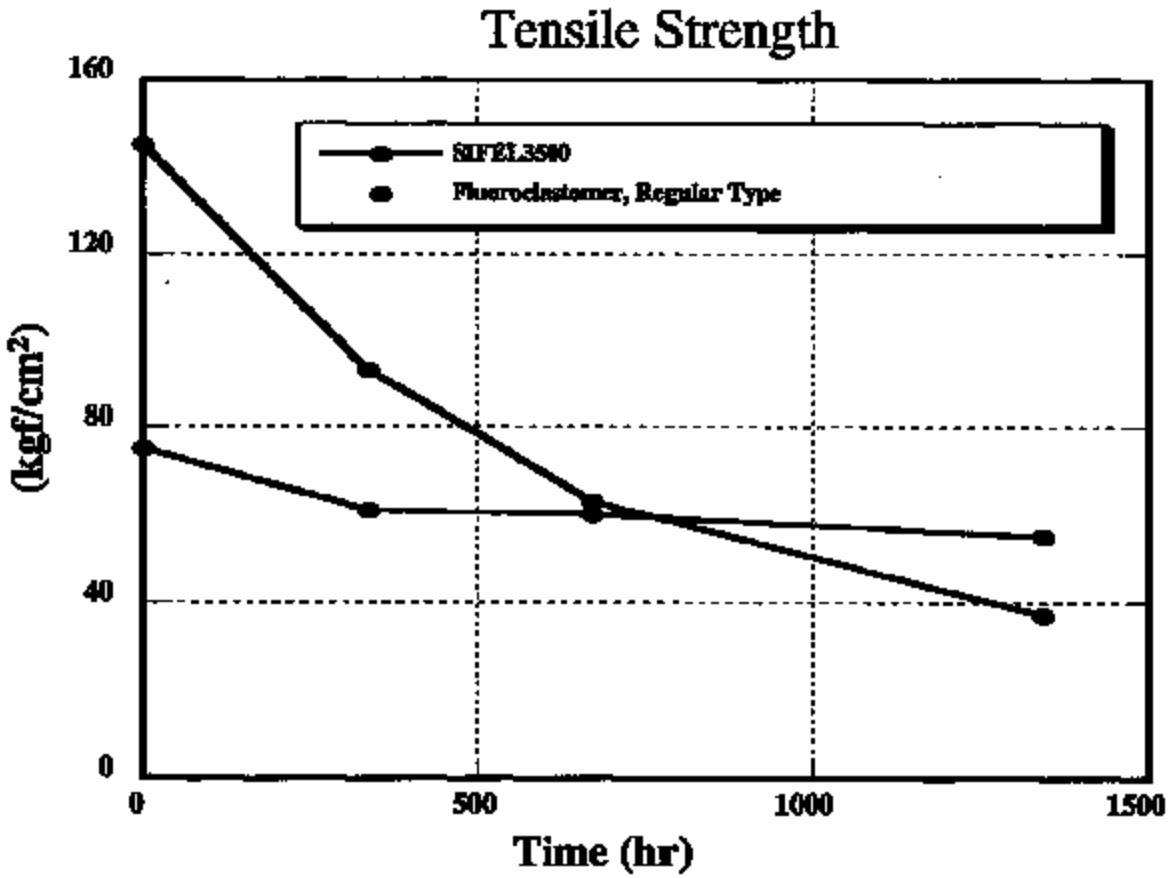


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Steam Resistance (Steam, 6.5 kgf/cm² @ 92psi)

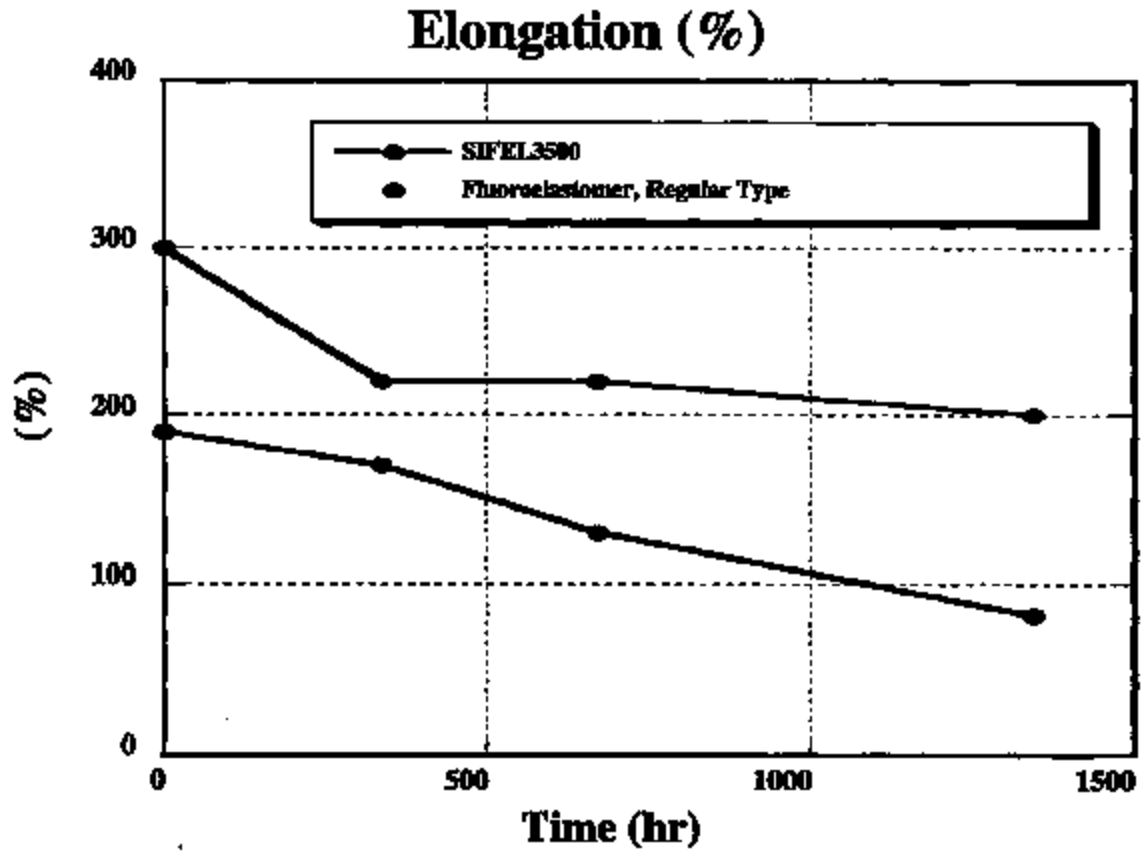


September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Steam Resistance (Steam, 6.5 kgf/cm² @ 92psi)



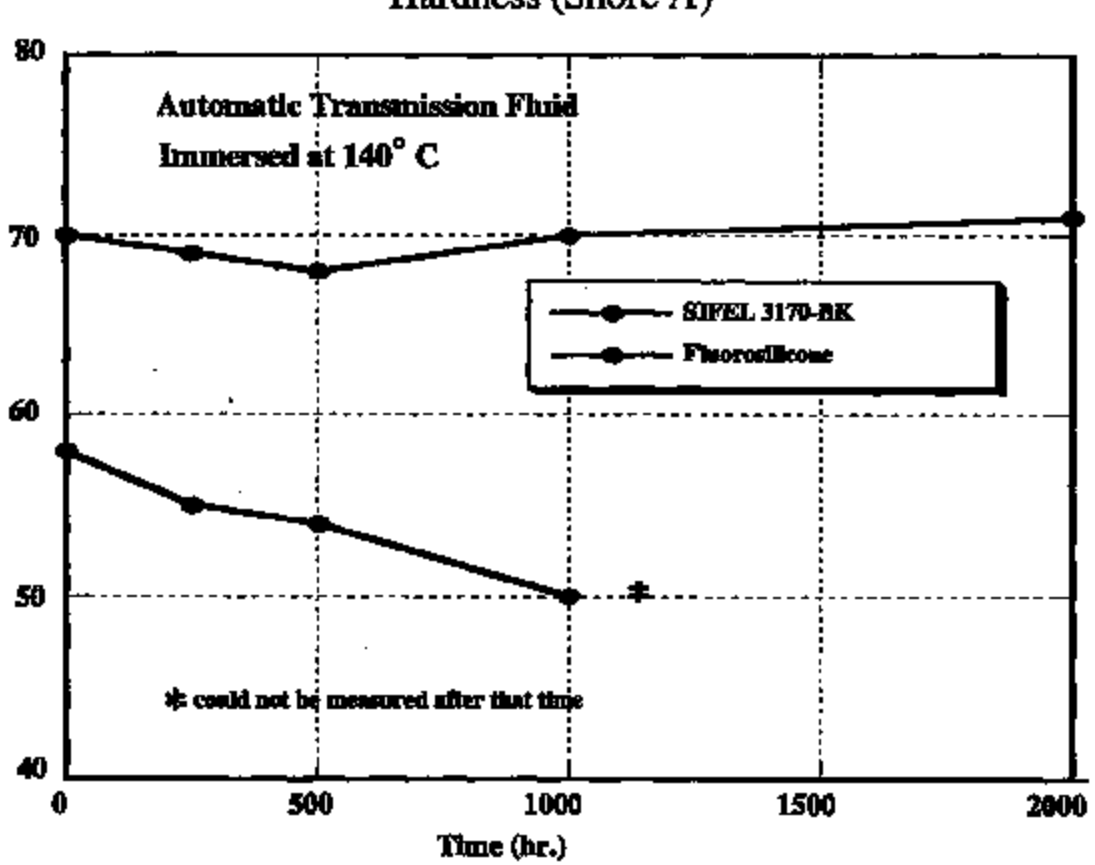
E962-427-6 19832

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance



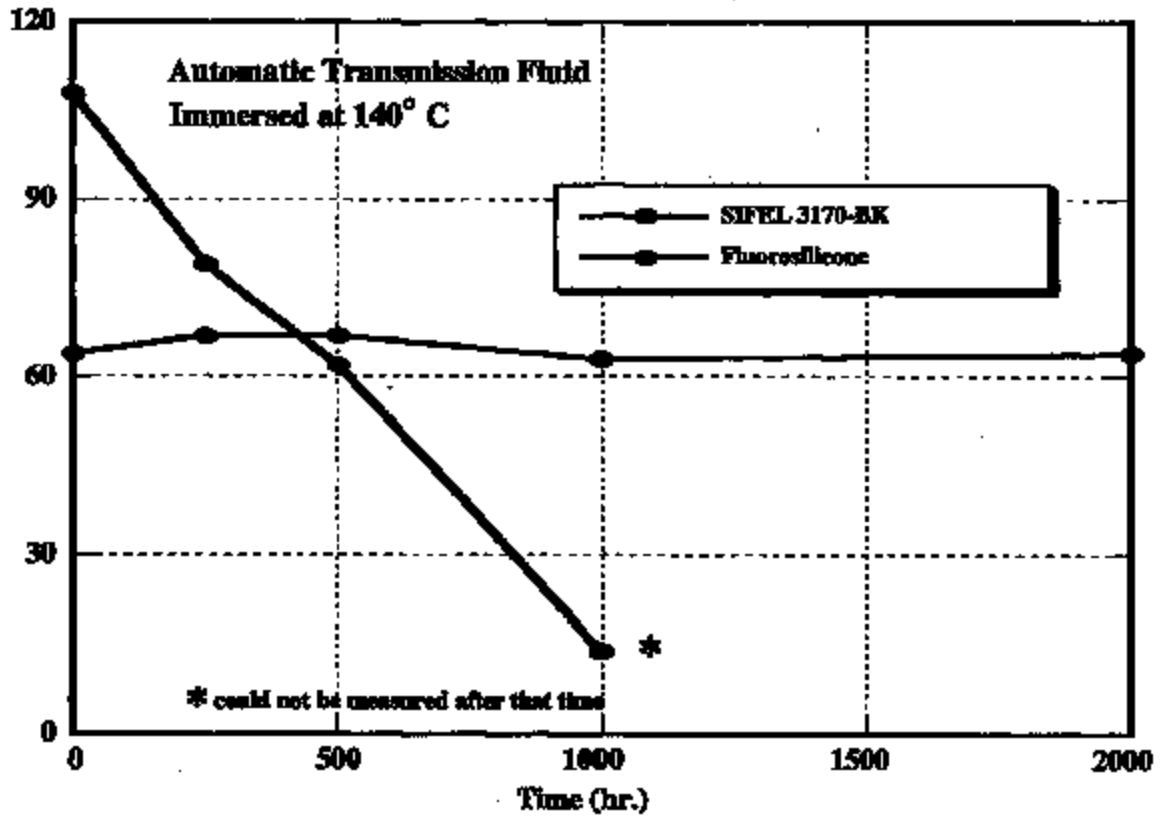
Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi®

SHIN-ETSU SIFEL®

Oil Resistance

Tensile Strength (kgf/cm^2)



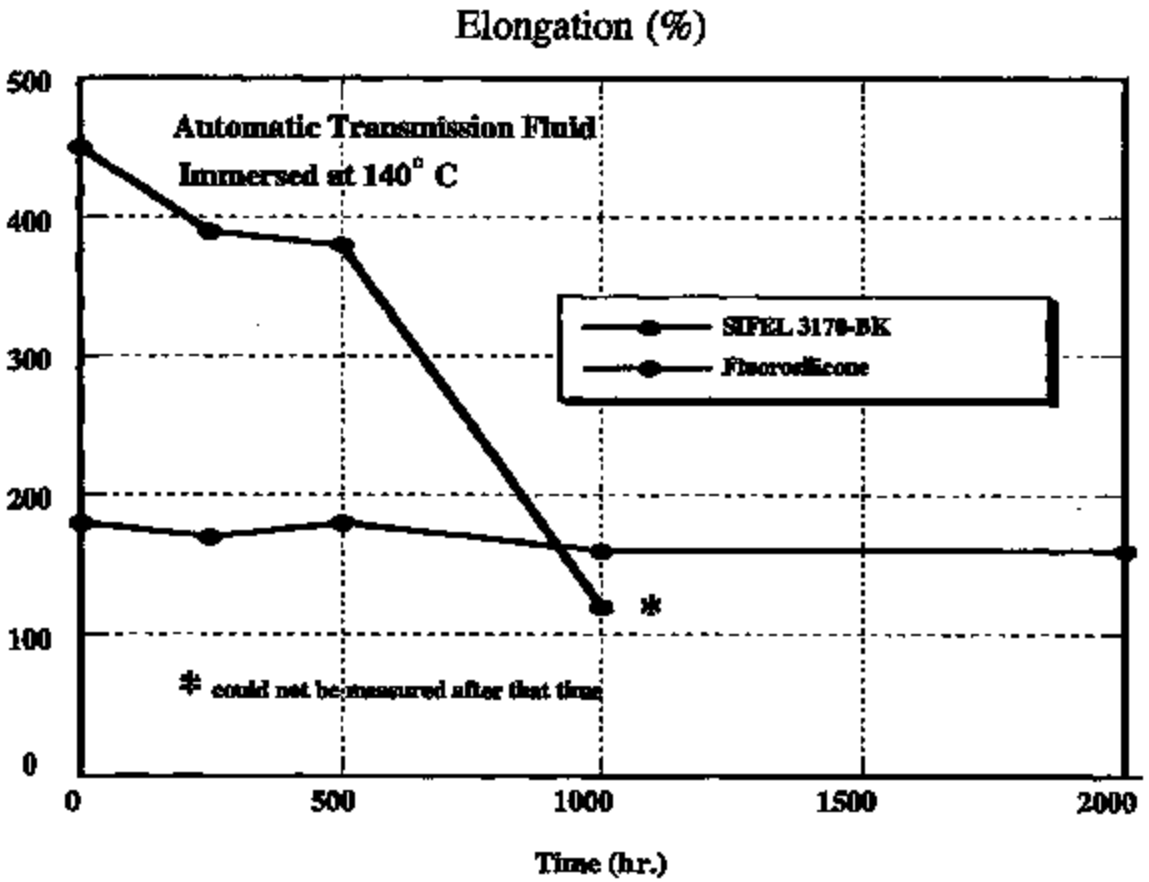
ECRM 6-127-9 1803A

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Oil Resistance



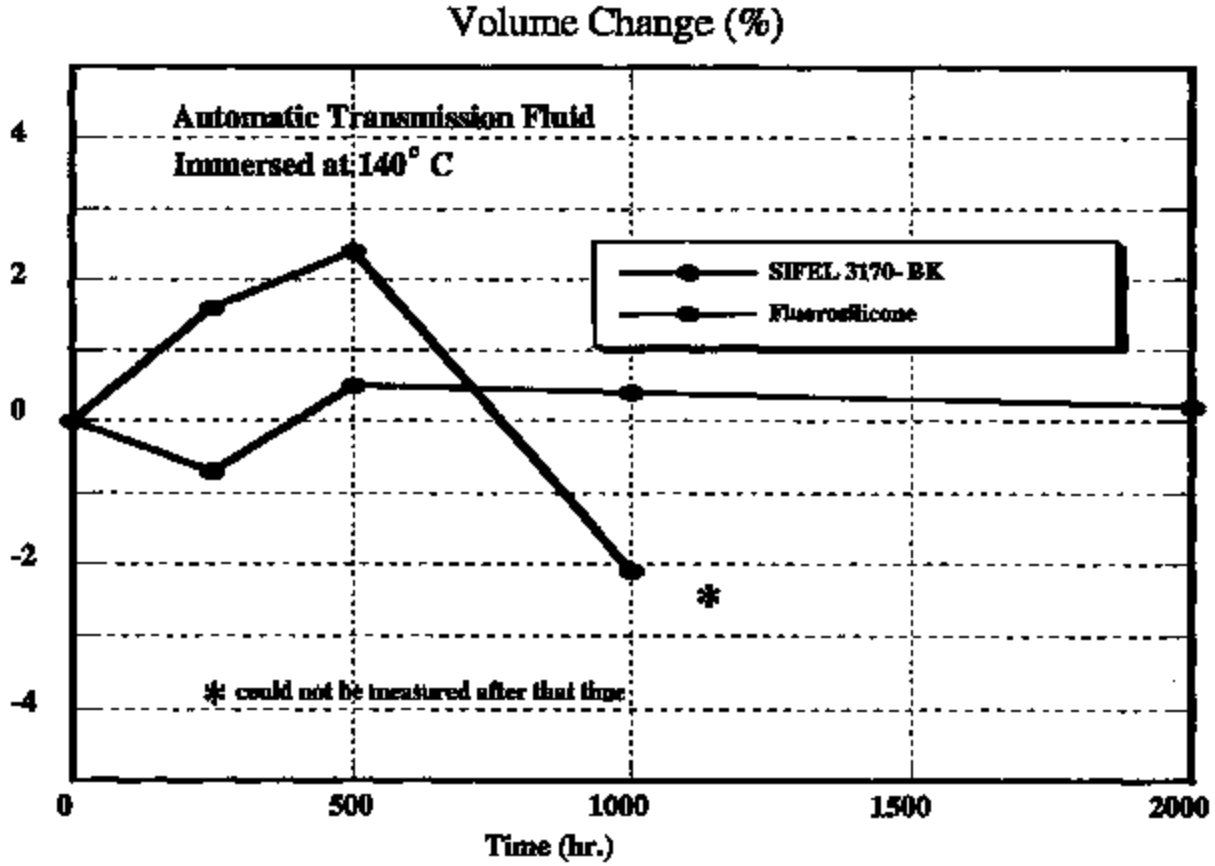
ESOZ-02T-0 1S905

Values listed are typical values and do not constitute a specification

Shin-Etsu MicroSi®

SHIN-ETSU SIFEL®

Oil Resistance



E002-027-B 15K06

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Product Listing

	SIFEL3510A/B	SIFEL3701A/B	SIFEL3140	SIFEL3155	SIFEL3170-BK
Features	2 components 50 Hardness High strength	2 components 70 Hardness	1 component 40 Hardness Liquid	1 component 55 Hardness Liquid	1 component 70 Hardness
	Before curing properties				
Appearance	A: Black paste B: White paste	A: Black paste B: White paste	Milky white liquid	Milky white liquid	Black paste
Viscosity 23°C	A: 3000 Poise (300 Pa·s) B: 4000 Poise (400 Pa·s)	A: 7000 Poise (700 Pa·s) B: 10000 Poise (1000 Pa·s)	300 Poise (30 Pa·s)	400 Poise (40 Pa·s)	5000 Poise (500 Pa·s)
	After curing properties (Press cure 150°C, 10min and post cure 200°C, 4hr)				
Specific gravity 23°C	1.83	1.94	1.88	1.87	1.94
Hardness (Shore A)	50	70	40	54	70
Tensile strength	120 kgf/cm^2 (12 MPa) (1710 psi)	65 kgf/cm^2 (6.4 MPa) (924 psi)	60 kgf/cm^2 (5.9 MPa) (853 psi)	80 kgf/cm^2 (7.8 MPa) (1140 psi)	70 kgf/cm^2 (6.9 MPa) (996 psi)
Elongation (%)	300	180	350	250	210
Tear strength	17 kgf/cm (17 kN/m) (95 ppi)	13 kgf/cm (13 kN/m) (73 ppi)	10 kgf/cm (9.8 kN/m) (56 ppi)	10 kgf/cm (9.8 kN/m) (56 ppi)	14 kgf/cm (14 kN/m) (78 ppi)
Compression set (%) 200°C, 24hr	10	11	-	-	-
	SIFEL 3510 and 3710 should be mixed 1:1 by volume, not weight				

EM02-0271-8 10/07

September 2000

Values listed are typical values and do not constitute a specification

ShinEtsuMicroSi® SHIN-ETSU SIFEL®

Properties

Electrical Insulation Properties	SIFEL3701	Fluororubber	Fluorosilicone
Volume Resistivity (Ω-cm)	$2x10^{14}$	$3x10^{12}$	$4x10^{14}$
Dielectric Strength (kV/mm)	33	24	20
Dielectric Constant (50Hz)	3.1	11	6
Dielectric Dissipation Factor (50 Hz)	$2x10^{-2}$	$3x10^{-1}$	$2x10^{-3}$
Low Moisture Permeability			
Moisture Permeability ($g/m^2 \cdot 24$ hr)	5	4	50

ENG4-027-e 1000

Values listed are typical values and do not constitute a specification

Thur. Jan. 30, 2003

Technical Data Sheet

URESOLVE PLUS SG

FOR DISSOLVING SILICONES, ANHYDRIDE EPOXIES, AND POSITIVE PHOTO RESIST FILMS

Uresolve Plus SG is a reactive solvent for dissolving cured silicone compounds and anhydride cured epoxy compounds from integrated circuits, power transistors, diodes, and hybrid circuits. It will not attack metals, including vacuum deposited aluminum. Dissolving action is gentle and will not break fragile interconnections, nor swell encapsulants prior to dissolving them. The use of Uresolve Plus SG will provide a clean surface that is free from all organics and is more wettable for any subsequent aqueous operation. It has been used worldwide for the past 30 years.

APPLICATIONS:

1. Uresolve Plus SG will dissolve the following materials:
   Silicones: Transfer molded Dow Corning 307, 306, 305, 304; silicone varnishes 643, 644, 646; RTV elastomers Dow Corning 3140, 3145, 3110, 3112, 3120, 599; Sylgard 184, 185; General Electric 600 series; SWS Silicone Dispersion T-49, Dielectric Gel V-104, For removal of silicone RTV's, we also recommend Dynasolve 210, 218, 220, 225, and 230.
   Epoxies: Anhydride type systems: Amicon Uniset E-205, E-106, E-217, E-207, E-117; 3M Scotchcast No. 281; Shell 828/methyl nadic; Hysol C-15-015; Ciba 6010/A906.
   Urethanes: PRC 1538, Coast Pro Seal 794; Conap 1500, 2025; DuPont Adiprene 315/Moca
2. This unique chemical system will not cause discoloration or chemical attack on the following materials:
   Plastics: Molding compounds such as certain phenolics, amine cured epoxy, vulcanized rubber, polyethylene, Teflon, Kel-F.
   Metals: Dry Uresolve Plus SG will not attack magnesium and magnesium alloys, aluminum or aluminum alloys, carbon steel, nickel, electroless nickel plate, silver, gold, beryllium and beryllium alloys, stainless steel or chromium, copper, brass, and bronze.
3. You can now do failure and reliability analysis on many plastic packaged semiconductors, where silicon compound or anhydride epoxies were used to package the device.
4. You can reclaim silicon chips coated with silicone varnishes.
5. Uresolve Plus SG will dissolve the following photo resist films: American Hoechst AZ 1370, DuPont Riston, Shipley 1350, Dynachem, and Hercules. It is an excellent solvent for the removal of positive photo resist in manufacturing applications. It removes the photo resist in flakes rather than dissolving it, thereby eliminating the redeposition of the photo resist.

Phone:
800.669.5709

Fax:
800.671.9583

EMC2-027-B 15838

Postal address:
P.O. Box 33609
1910 S. State Avenue
Indianapolis, IN 46203

6. Uresolve Plus SG can be used for deinking all types of components. Plastic molded devices cleaned with Uresolve Plus SG have shown consistent and improved printability.

SPECIFICATIONS:

Color	Blue-green to a brownish-yellow (color does not indicate change in purity or efficiency)
Specific Gravity	0.97
Boiling Point	256°F
Flash Point	105°F (CC)

DIRECTIONS FOR USE:

1. Pour Uresolve Plus SG into a glass or stainless steel container. Heat up the solution to 125oF. Keep covered to avoid excessive loss through evaporation.
2. Immerse plastic component into solution and observe carefully as removal time varies for different materials. It may be necessary to suspend the component in solution so that the material removed will settle to the bottom of the container and not redeposit onto the component.
3. To completely expose the chip of an in-line integrated circuit takes about 30 minutes. At 200oF it takes 10 minutes. Most anhydride epoxies require 30 minutes, or longer, at 250oF. At room temperature action is too slow to be effective.
4. After resin has been dissolved wash Uresolve Plus SG away with alcohol or water.
5. FOR SPOT REMOVAL: Saturate a cloth or Q-tip and apply to surface. Let stand for 30-45 minutes, reapply as necessary to keep surface wet. Rub with saturated cloth or Q-tip until resin is removed. Rinse surface with alcohol, then with water.
6. Uresolve Plus SG is hygroscopic and will absorb moisture when left open to the atmosphere. Keep containers tightly closed and use fresh solution.

CAUTION:

Uresolve Plus SG is a reactive solvent and proper precautions must be observed. Refer to MSDS before use or disposal.

AVAILABILITY AND TERMS:

Uresolve Plus SG is packaged in pints, quarts, 9-pint containers, 5-gallon pails, and 55-gallon drums. It is a stock item and can be shipped by UPS, truck or air freight. Terms are Net 30 days, FOB shipping point. Prices are subject to change without notice.

For additional information on our products and services, just click on any links or bottom categories, or call, fax or E-mail us. We look forward to working with you.

General Information: info@dynaloy.com Webmaster: webmaster@visionpublishing.com

Site last updated: February 7, 2000

created: 12/11/01
revised: 1/31/2003

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting

POEE - DI-196

Meeting Date: 2/12/02

Please:

- Initial or check the box to the left of your name to indicate your attendance.
- Make any corrections to the detail associated with your name.
- If you name is not on this list, please write it in at the bottom including the appropriate detail.

* Denotes Core Team Member

CORE TEAM	Initial	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL
*		[redacted]			On-Site Rep.	Kavlico	POEE	
					Service Engineer	Ford	POEE	
*					EESE - AVT Wiring Specialist	Ford	AVT5	
					PT Elec Appl - 4.6 F150 Supv./Leader	Ford	POEE	
					Chief Engineer	Ford	POEE	
*					Reliability Engineer/ Field Data Leader	Ford	POEE	
*					Program Manager/Technical Leader	Kavlico	CA	
					FMEI CPMT Eng./WERs concerns	Ford	POEE	
					FQE Supervisor	Ford	TWCTDR	
					ECI Supervisor	Ford	TWCTDR	
					On-Site Rep.	Motorola	POEE	
					Director MEMS Technology	Kavlico	CA	
					PT Elec Appl 3.0L 4V Esc/Taurus Supv.	Ford	POEE	
					Vehicle Environmental Engineering	Ford	FPB4	
*					6-Sigma Black Belt	Ford	FRL	
*					FMEI Tech Spec./Technical Lead	Ford	POEE	
					C&P Supervisor	Ford	VPC	
					FRL Scan Elec Microscope-Expert	Ford	FRL	
					PCSE Applications Engineer	Visteon	POEE	
					FMEI Section Supv.	Ford	POEE	
					AVT Chief Engineer	Ford	POEE	
					FMEI AWS Analyst	Ford	POEE	
					Chief Engineer	Ford	POEE	
					PT Focus Program Mgr.	Ford	VPC	
					Leader	Ford	FPB4	
*					Team Leader	Ford	POEE	

DI-02-07-13826

created: 12/11/01
revised: 1/31/2008

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting
POEE - DI-196

Meeting Date: 2/12/02

Please:								
- Initial or check the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If you name is not on this list, please write it in at the bottom including the appropriate detail.								
* Denotes Core Team Member								
CORE TEAM	Initial	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL
		[redacted]			Production Buyer	Ford	Purchasing	[redacted]
					Recall Analyst	Ford	FCSD	
*					Service Buyer	Ford	FCSD	
*					FMEI Dept. Mgr.	Ford	POEE	
					Critical Con. Mgr.	Ford	FCSD	
*					Proj. Mgt. Analyst	Project Solutions	POEE	
					VP Research and Dev't	Kavlico	CA	
					PT Electronics Engineer	Ford	POEE	
*					PT Elec Appl 2.0L Zetec Focus/Escape S	Ford	POEE	
*					Campaign Manager	Ford	POEE	
					C&P Quality Eng (Leader)	Ford	VPC	
					APTE PT CPS	Ford	APTE	
*					Wiring CPS - EESE Leader	Ford	Bldg. #1	
*					Reliability Supervisor	Ford	POEE	
					PT Electronics Engineer	Ford	POEE	
*					PS&L Recall Mgr.	Ford	FCSD	
*					STA Engineer (Leader)	Ford	PTE	
					Warranty Analysis	Kavlico	CA	
					OGC Lawyer	Ford	PDC	
*					FMEI Engineer	Ford	POEE	
					STA Site Manager	Ford	AVTS	
					ECI Prod.Con.Anal.	Ford	FCSD	
					Chief Engineer	Ford	AVTS	

EDS-027-0 15426

created: 12/11/01
revised: 1/31/2003

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting
POEE - DI-196

Meeting Date: 2/12/02

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- Make any corrections to the detail associated with your name.								
- If you name is not on this list, please write it in at the bottom including the appropriate detail.								
* Denotes Core Team Member								
CORE TEAM	Initial	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL

EXHIBIT 1527

created: 12/11/01
revised: 1/31/2003

2000-2002 Kavlico TM dPFE Sensor
Attendance List

Meeting Date: 1/31/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Akins	Mary	X		X	X	X	X	X				
	Albrecht	Gunther											
*	Alles	Sheran					X	X	X				
	Arnold	Ken					X	X					
	Auller	Jim											
*	Awad	Mahmoud		X	X	X	X	X	X				
*	Ayers	Don						X					
	Bansek	Catherine											
	Bansuder	Lee											
	Bissi	Gerry											
	Bronni	Mark											
	Davies	Brady											
	Deeb	Joe					X						
	Douglass	Jim						X	X				
*	Freeland	Mark		X	X	X	X	X	X				
*	Gates	Freeman	X	X	X	X	X	X	X				
	Giordano	Mike											
	Hangas	Jon											
	Jahshan	John					X	X	X				
	Johnson	Joe		X			X		X				
	Kapp	Dan											
	Kerezi	Karen											
	Kunde	Olaf											
	Masura	Gordon											
*	Maurer	Jim											
	McCarty	Bill							X				
	Muter	Doreen					X						

EM02-027-A 1SM26

created: 12/11/01
revised: 1/31/2003

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Meeting Date: 1/31/2003

Kavlico dPFE Sensor Team Roster													
* Denotes Core Team Member													
CORE TEAM	LAST NAME	FIRST NAME											
*	Nielsen	Chris						X					
*	O'Neall	Jim				X	X	X	X				
	Oswalt	Greg											
*	Owens	Karan	X	X		X	X	X	X				
*	Panaretos	Chris	X	X	X	X	X	X	X				
	Park	Kyong											
*	Perry	Brian					X	X	X				
*	Pierite	Paul	X	X	X	X	X	X	X				
	Popoff	Dan					X						
	Raquepau	Al											
*	Rossi	Robert				X	X		X				
*	Schieding	Kurt	X						X				
	Shore	John							X				
*	Smythe	Joe					X						
	Tameshiro	Terry						X	X				
	Trujillo	Tom											
*	Verner	Carol		X	X	X	X	X	X				
	White-Johnson	Patrice											
	Williamson	Rick											
	Wilson	Cary											
	others:												
	Bugaj	Barry					X	X	X				
	Williams	Les					X						
	Pascany	Ken					X	X					
	DiCicco	Tamara						X					
	Tyler	Dave						X					
	Sebold	Lynn						X					

BMS-627-9 1A28

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Org./Department

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
*	[redacted]			V-Engine	FMEI Tech Spec./Technical Lead	Ford	POEE	[redacted]	
*				V-Engine	Project Leader	Ford	POEE		
*				V-Engine	FMEI Dept. Mgr.	Ford	POEE		
*				V-Engine	Proj. Mgt. Analyst	Proj.Solution	POEE		
*				V-Engine	Campaign Manager	Ford	POEE		
*				V-Engine	FMEI Engineer	Ford	POEE		
				V-Engine	Service Engineer	Ford	POEE		
				V-Engine	FMEI CPMT Eng./WERs concerns	Ford	POEE		
				V-Engine	FMEI Section Supv.	Ford	POEE		
				V-Engine	FMEI AWS Analyst	Ford	POEE		
				V-Engine	Chief Engineer	Ford	POEE		
*				Quality Office	Reliability Engineer/ Field Data Leader	Ford	POEE		
*				Quality Office	Reliability Supervisor	Ford	POEE		
*				Purchasing	Service Buyer	Ford	FCSD		
*				Purchasing	STA Engineer (Leader)	Ford	PTE		
				Purchasing	Production Buyer	Ford	Purchasing		
				Purchasing	STA Site Manager	Ford	AVTS		
				PTSE	Chief Engineer	Ford	POEE		
				PT Elec Appl	4.6 F150 Supv./Leader	Ford	POEE		
*				PT Elec Appl	2.0L Zetec Focus/Escape Supv.	Ford	POEE		
				PT Elec Appl	3.0L 4V Esc/Taurus Supv.	Ford	POEE		
				PT Elec Appl	PT Electronics Engineer	Ford	POEE		
				PT Elec Appl	PT Electronics Engineer	Ford	POEE		
				PCSE	PCSE Applications Engineer	Visteon	POEE		
				OGC	Lawyer	Ford	PDC		
				Motorola	On-Site Rep.	Motorola	POEE		
*				Kavlico	On-Site Rep.	Kavlico	POEE		
*				Kavlico	Program Manager/Technical Leader	Kavlico	CA		
				Kavlico	Director MEMS Technology	Kavlico	CA		

2882-627-8 15436

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Org./Department

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	[redacted]			Kavlico	VP Research and Dev't	Kavlico	CA	[redacted]	
				Kavlico	Warranty Analysis	Kavlico	CA		
*				FRL	6-Sigma Black Belt	Ford	FRL		
				FRL	Scan Elec Microscope-Expert	Ford	FRL		
				Focus	C&P Supervisor	Ford	VPC		
				Focus	PT Focus Program Mgr.	Ford	VPC		
				Focus	C&P Quality Eng (Leader)	Ford	VPC		
				FCSD	FQE Supervisor	Ford	TWCTDR		
				FCSD	ECI Supervisor	Ford	TWCTDR		
				FCSD	Recall Analyst	Ford	FCSD		
*				FCSD	PS&L Recall Mgr./Parts costs & buy	Ford	FCSD		
				FCSD	ECI Prod.Con.Anal.	Ford	FCSD		
				EPRC	Leader	Ford	FPB4		
				EPRC	Critical Con. Mgr.	Ford	FCSD		
*				EESE	AVT Wiring Specialist	Ford	AVT5		
*				EESE	Wiring CPS - EESE Leader	Ford	Bldg. #1		
				EESE	Vehicle Environmental Engineering	Ford	FPB4		
				EESE	Chief Engineer	Ford	AVTS		
				CAPE	AVT Chief Engineer	Ford	POEE		
				APTE	PT CPS	Ford	APTE		

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Name

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
*	[redacted]			Kavlico	On-Site Rep.	Kavlico	POEE		
				V-Engine	Service Engineer	Ford	POEE		
*				EESE	AVT Wiring Specialist	Ford	AVT5		
				PT Elec Appl	4.6 F150 Supv./Leader	Ford	POEE		
				PTSE	Chief Engineer	Ford	POEE		
*				Quality Office	Reliability Engineer/ Field Data Leader	Ford	POEE		
*				Kavlico	Program Manager/Technical Leader	Kavlico	CA		
				V-Engine	FMEI CPMT Eng./WERs concerns	Ford	POEE		
				FCSD	FQE Supervisor	Ford	TWCTDR		
				FCSD	ECI Supervisor	Ford	TWCTDR		
				Motorola	On-Site Rep.	Motorola	POEE		
				Kavlico	Director MEMS Technology	Kavlico	CA		
				PT Elec Appl	3.0L 4V Esc/Taurus Supv.	Ford	POEE		
				EESE	Vehicle Environmental Engineering	Ford	FPB4		
*				FRL	6-Sigma Black Belt	Ford	FRL		
*				V-Engine	FMEI Tech Spec./Technical Lead	Ford	POEE		
				Focus	C&P Supervisor	Ford	VPC		
				FRL	Scan Elec Microscope-Expert	Ford	FRL		
				PCSE	PCSE Applications Engineer	Visteon	POEE		
				V-Engine	FMEI Section Supv.	Ford	POEE		
				CAPE	AVT Chief Engineer	Ford	POEE		
				V-Engine	FMEI AWS Analyst	Ford	POEE		
				V-Engine	Chief Engineer	Ford	POEE		
				Focus	PT Focus Program Mgr.	Ford	VPC		
				EPRC	Leader	Ford	FPB4		
*				V-Engine	Project Leader	Ford	POEE		
				Purchasing	Production Buyer	Ford	Purchasing		
				FCSD	Recall Analyst	Ford	FCSD		
*				Purchasing	Service Buyer	Ford	FCSD		

ER02-627-B 15432

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Name

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
*	[redacted]			V-Engine	FMEI Dept. Mgr.	Ford	POEE		
				EPRC	Critical Con. Mgr.	Ford	FCSD		
*				V-Engine	Proj. Mgt. Analyst	Proj.Solution	POEE		
				Kavlico	VP Research and Dev't	Kavlico	CA		
					PT Electronics Engineer	Ford	POEE		
*				PT Elec Appl	2.0L Zetec Focus/Escape Supv.	Ford	POEE		
*				V-Engine	Campaign Manager	Ford	POEE		
				Focus	C&P Quality Eng (Leader)	Ford	VPC		
				APTE	PT CPS	Ford	APTE		
*				EESE	Wiring CPS - EESE Leader	Ford	Bldg. #1		
*				Quality Office	Reliability Supervisor	Ford	POEE		
					PT Electronics Engineer	Ford	POEE		
*				FCSD	PS&L Recall Mgr./Parts costs & buy	Ford	FCSD		
*				Purchasing	STA Engineer (Leader)	Ford	PTE		
				Kavlico	Warranty Analysis	Kavlico	CA		
				OGC	Lawyer	Ford	PDC		
*				V-Engine	FMEI Engineer	Ford	POEE		
				Purchasing	STA Site Manager	Ford	AVTS		
				FCSD	ECI Prod.Con.Anal.	Ford	FCSD		
				EESE	Chief Engineer	Ford	AVTS		

From: Bachor, Ruth (R.A.)
Sent: Wednesday, September 18, 2002 11:32 AM
To: Poma, Amy (A.)
Subject: RE: cost info tracking for throttle bodies

Are you set on this?

Ruth A. Bachor
Program Management
POEE, cube CG070
e-mail: rbachor@ford.com
phone: 313-390-3703 fax: 313-322-9265

-----Original Message-----
From: Poma, Amy (A.)
Sent: Wednesday, September 18, 2002 9:02 AM
To: Bachor, Ruth (R.A.)
Subject: cost info tracking for throttle bodies

Ruth,

Gary sent a supervisor by the name of Pam Lee to me to provide her with cost tracking info for throttle bodies. Can you please advise where I could find this info. I didn't see any "cost tracking" documents. Perhaps you were calling it something else? Please advise. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Jones, Shiela (S.M.)
Sent: Thursday, August 15, 2002 11:03 AM
To: Poma, Amy (A.)
Subject: eRoom - Where the best minds get to work

eRoom - Where the best minds g...

https://www.eroom.ford.com/

DPFE Sensor Vehicle Issues Meeting, Monday 5/20/02, 1:00-3:00 p.m., POEE, E103A (pillar L10)

Attendees:	Paul Plante	Mahmoud Awad	Mary Akins
	Amy Poma	Freeman Gates	John Jahshan
	Jim Maurer	Jon Janda	Mark Freeland
	Jim McCoy	Sheran Alles-no	Carol Vernor-no
	Robert Roesi-no		

Meeting Objective: This is an issues resolution meeting. The objective being to address vehicle issues, decide if it is an IS/IS NOT Root Cause, with a delegation of assignments/collection of data to further discuss and bring to conclusion.

Assignments:

- **Paul Plante** – contact EESE chief engineering and establish the support required from that office for this team.
- **John Jahashan/Freeman Gates** – Powertrain applications – get pressure, pulsation and temperature information. John to get with Freeman to define what requirements are necessary for the test and to make sure the vehicles being used are the same. Proposed vehicles are:
    - 4.6L SOHC F-Series
    - 4.6L SOHC Econoline
    - 4.2L OHV F-Series
    - 4.2L OHV Econoline
- **Jim McCoy-leader**–Study non-standard sensor current and voltage for the "best of the best" and the "worst of the worst" vehicles.
    - 4.0L 2002 Explorer-need to establish month of production for low warranty condition. (best)
    - 2.0L Alan Ford Zetec Focus (worst) with original PCM. **Paul** will check with Marty on car status.

  Need to collectively test a variety of different concepts that cause transient noise:
  Transient noise coming out of V-ref to be checked (C=connections, G=grounds.)
  C270B,C270C,C270D,C110,C133,G300,G100,G104,G105, and G101

  Concepts decided for discussion of 20 minutes each at **next week's May 20th meeting**:
  1. J1-PCM solder
  2. C-90 connector intermittent
  3. Cigarette lighter does not work or fuse blows indicating electrical short in harness
  4. Alternator
  5. Escape-brake pedal switch connector.

The next meeting is scheduled for Monday, May 20, 2002 in conference room B103A. Please bring 13 copies of your issues to present and discuss. If you are unable to attend but would like to call in, please contact me in advance and I will obtain a conference call phone for the room. An Agenda for the May 20th meeting will be out later this week.
Aposna2@ford.com.

From: Maurer, James (J.B.)
Sent: Tuesday, April 16, 2002 8:47 AM
To: Panaretos, Christine (C.M.)
Subject: RE: Focus Zetec DPFE and PCM replacements

This is good information from Brian. We would still like to know how much current the PCM can supply before the vehicle stalls on the various vehicle applications that use the DPFE

Regards,

Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

—Original Message—
From: Panaretos, Christine (C.M.)
Sent: Monday, April 15, 2002 3:02 PM
To: Maurer, James (J.B.)
Subject: FW: Focus Zetec DPFE and PCM replacements

Jim,
Should I add this comment to the open issues? Should it be closed out, or is this just the opinion of Brian?

Please let me know if we are having a meeting tomorrow.

Chris Panaretos
Account Manager, **Project Solutions at Ford Powertrain**
POEE Building, Cube CG-071
(313) 24-69337; Fax: (313) 32-29265
cpanaret@ford.com

—Original Message—
From: Perry, Brian (B.J.)
Sent: Monday, April 15, 2002 2:09 PM
To: John Jahehan (E-mail); Planta, Paul (P.G.); Freeland, Mark (M.); Gates, Freeman (F.C.)
Cc: Panaretos, Christine (C.M.); Awad, Mahmoud (M.I.)
Subject: FW: Focus Zetec DPFE and PCM replacements

The PCM was not the last part repaired in the vast majority of cases when both DPFE and PCM was failed on a Focus built in 8/00 thru 10/00. I therefore believe this indicates that the PCM was not the cause of the original DPFE failure.

Brian J. Perry
Supervisor - C170, U231 & Outsourced Control Systems
GCS-PCSE-Powertrain Electronic Applications
Phone/Fax: (313) 39-04170
Cube AP-062 POEE MailDrop 75

—Original Message—
From: Kalinowski, Teresa (T.A.)
Sent: Friday, April 12, 2002 10:52 AM
To: Perry, Brian (B.J.)
Subject: Focus Zetec DPFE and PCM replacements

Brian, here's a file with info on the 2001MY 2.0L Zetec Focus built from August thru October 2000 with both DPFE and PCM claims. For vehicles with more than one DPFE claim and at least one PCM claim, the DPFE claim was last on 90% of the vehicles. I also added a little more info on vehicles with just one DPFE and one PCM claim and stack charts for both those parts. Most of the DPFE claims are coming at higher TIS, the majority of PCM claims are at lower TIS. Note that the stack charts do NOT have the same scale, there are many more DPFE claims than PCM claims.

I couldn't find John Jahshan's email address so could you please forward to him. Also the PCM claim list - there are 1128 PCM claims, I can send them in a csv file or I can print them all out (that would be a lot of paper). Is the csv format OK, it is about a 600Kb file, do you want it or should I only send it to John? THANKS.

<< File: FOCUS_CORRDPFEPCM.XLS >>

Teresa Kalinowski
Phone 313-594-2432, Fax 313-248-1906
POEE, MD #75, Cube BS199
(Email) tkalinow@ford.com
Powertrain Control Systems Quality, Reliability, and Customer Satisfaction
Ford Motor Company

From: Kazmer, Jerry (J.)
Sent: Thursday, October 03, 2002 10:38 AM
To: McCoy, James (J.D.); Porna, Amy (A.)
Subject: MAZDA TRIBUTE

Vehicle mileage is 24,730 with no drivability issues or concerns. No DTC's.

Regards

Jerry Kazmer
RV&T Pwrtrain Elec. Appl. Dept.
Ford Motor Company
e-mail: jkazmer@ford.com
Phone/Fax: 313 84-59134
Pager: 800-582-2675
Text Page Web:
http://www.poes.poes.ford.com/pager/others.htm

From: Panaretos, Christine (C.M.)
Sent: Wednesday, January 15, 2003 12:53 PM
To: Bachor, Ruth (R.A.); Bond, Natalie (N.M.); Jones, Shiela (S.M.); Panaretos, Christine (C.M.); Pegg, Clare (C.A.); Poma, Amy (A.); Prusaitis, Randy (R.W.); Smith, Ted (T.A.)
Subject: Mandatory PSC Meeting

Importance: High

Please come to the PSC office at 4:00 for a mandatory meeting today. Cancel all customer meetings you may have, as this is extremely important.

Chris Panaretos
Account Manager, **Project Solutions at Ford Powertrain**
POEE Building, Cube CG-071
(313) 24-89337; Fax: (313) 32-29265
cpanaret@ford.com

From: Poma, Amy (A.)
Sent: Monday, September 16, 2002 10:01 AM
To: Gundry, Rob (R.C.)
Subject: RE: Pending Moves / New Employees to be discussed at FMEI Staff Meetings

Frank is here and all set up.

Larry told me today for future requests for me not to do a move request for computers. Just to call him and he'll take care of it. Is that the case? On the request form, should I just leave the desktop PC check of spot blank? Please advise. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Gundry, Rob (R.C.)
Sent: Wednesday, September 11, 2002 1:16 PM
To: Poma, Amy (A.)
Subject: RE: Pending Moves / New Employees to be discussed at FMEI Staff Meetings

yes it has, if you look below it says scheduled for Mon. Sept. 16. That means that his phone will be transfer on this date. I must of forgot to put his confirmation number on this sheet. You may want to get a hold of Larry Harris and let him know about this so that he can set up Franks computer this day also, or do whatever needs to be done to his computer.

Rob Gundry
Lead PMA Mercury Escape
Phone: 313-84-56066
CDSId: rgundry
rgundry@ford.com

—Original Message—
From: Poma, Amy (A.)
Sent: Wednesday, September 11, 2002 12:38 PM
To: Gundry, Rob (R.C.)
Subject: RE: Pending Moves / New Employees to be discussed at FMEI Staff Meetings

Rob has Frank Angelo's move been initiated, if so I don't see a tracking number for him. Please advise. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Gundry, Rob (R.C.)
Sent: Wednesday, August 28, 2002 11:04 AM
To: Poma, Amy (A.)

Subject: Pending Moves / New Employees to be discussed at FMEI Staff Meetings

Pending Moves / New Employees

New ETB Section	Reports to:	Location	Timing
Gary Limatta	Jim O'Neall	Relocate to CQ156 / CO156	Completed
Sue Libertiny	Gary Limatta	Relocate to CK152	Submitted
8/7/02. #42257 PC/Phone sch. for Aug. 30.			
Bill Wettach	Gary Limatta	Relocate to CI156	Submitted on
8/15/02 #43467 Cancelled			
Swami Subramanian	Gary Limatta	Relocate to CM152	Submitted on
8/15/02 #43469			
Bryce Scwager	Gary Limatta	Relocate to CK156	Submitted on
8/21/02 #44229			
Chuck Pettit	Gary Limatta	Relocate to CO152	Submitted 8/7.
Scheduled 8/26 #42192			
New employee	Gary Limatta	Cube CM156	August
New employee	Gary Limatta	Cube CQ152	August
New employee	Gary Limatta	Cube CI152	August
Shari Pietta (Finn)	Jim O'Neall	Relocate to DJ139	Submitted on
9/4 #45923			

Supplier	Reports to:	Location	Timing
Dale Viers (Millennium)	Elmer Foster	Relocate to DB159	Completed
Josh McKay (Siemens)	Elmer Foster	Relocate to DJ162	Completed
Ray Hill (Siemens)	Troy Fisher	Relocate to DJ162 / DH162	Completed
Sly Galczyk (Siemens)	Shari Finn	Relocate to DH162	Completed
Eric Hahne (Siemens)	Victor Dobrin	*Relocate OUT of department*	Submitted on
8/15/02 #43381 Cancelled-On again			
Eszter Patantyus (Visteon)	Elmer Foster	Relocate to DF162	Completed
Scott Nelson (Motorola)	Walt Jasiolek	Relocate to DH160	Completed
Neko Tgakayenagi / Rebecca Spence (Denso)		Elmer Foster	Waiting for
availability. All reside in same cube.			
Jason Hutchinson	Shari Finn		Waiting for
availability. All reside in same cube.			
Tom Steele (Bosch)	Victor Dobrin	*Relocate OUT of department*	Submitted on
8/15/02 #43380 **Cancelled-On again**			

Frank Angelo Melissa Zamora CS191 **Arriving Sept. 16. Scheduled for Mon. Sept. 16**

Current Available Cubes

CQ152 Hold for Gary Limatta
CK152 Hold for Gary Limatta
CM156 Hold for Gary Limatta

CO158 Hold for J.Johnson

CU191 Unoccupied
DF191 Hold for M.Zamora
CS191 Hold for M.Zamora

CS160 Walk up station

Pager / waiting list

None available

5982-827-8 15783

Chuck Pettit

Rob Gundry
Project Management PMA
5.4L 3V VCT
Phone: 313-84-58066
Fax: 313-845-6080
CDS ID: rgundry
rgundry@ford.com

From: Jones, Shiela (S.M.)
Sent: Thursday, August 29, 2002 2:25 PM
To: Poma, Amy (A.)
Subject: Ford Audio Conferencing Services Tips on Audio Conference Calling

Ford Audio
Conferencing Servic..

http://www.itp.ford.com/conf/tips.html

From: Poma, Amy (A.)
Sent: Wednesday, September 11, 2002 2:09 PM
To: Pettit, Chuck (C.W.)
Subject: RE: My Responsibilities

Thanks for your quick response.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

-----Original Message-----
From: Pettit, Chuck (C.W.)
Sent: Wednesday, September 11, 2002 2:08 PM
To: Poma, Amy (A.)
Subject: My Responsibilities

Amy,
Here are my responsibilities:
- CPMT leader for V6 throttle body programs
- Assume all applicable responsibilities as outlined in generic CPMT leader roles and responsibilities for specific throttle body program
- Oversee water heated throttle body implementation
- Oversee TRC screw concern
- Support ETB launch concerns

Chuck Pettit
cpettit@ford.com
FAX (313) 390-4084
Phone (313) 248-9094
V-Engine Engineering - Ford Motor Co.

From: Poma, Amy (A.)
Sent: Thursday, August 29, 2002 10:20 AM
To: Weber, Michael (M.J.); Newman, Chris (C.W.); 'tparkin1@visteon.com'
Subject: Follow Up on 4.0L Cable Failures August 8th meeting assignments

Please see attached previously sent email and please advise me of the status of your issue/assignment. Thanks.

-----Original Message-----
From: Poma, Amy (A.)
Sent: Friday, August 09, 2002 11:13 AM
To: Limatta, Gary (G.D.); Weber, Mike (M.); Newman, Chris (C.W.); Kusko, Jeff (J.R.); Traczynski, Albert (A.J.); Florini, John (J.J.); 'tparkin1@visteon.com'
Cc: Bachor, Ruth (R.A.)
Subject: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Hi,

My name is Amy Poma and I am a PMA for the FMEI department. I will be working with Gary on tracking issues and assignments regarding the 4.0L cable failures. Discussion of potential design changes to the cam and cable have required the following tasks as listed below. Please review the assigned tasks that were generated from Thursday's meeting:

Mike Weber- Go to supplier and verify that accelerated cable is to print.

Tim Parkinson- Go to supplier Key Plastics and verify if cam is to print and if production cams are to spec.

Review nominal stack up of current cams and accelerated cables verifying if they are actually making parts to print.

Complete throttle body CAD data.

Chris Newman- Pull part numbers to update intake assembly prints.

A follow up meeting needs to be scheduled as soon as the above tasks are completed. I will check back with you next week to check status and confirm when the meeting can be scheduled.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-6849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Monday, August 26, 2002 1:34 PM
To: Panaretos, Christine (C.M.)
Subject: September 1, 2002 PSC Monthly Report

HI Chris,

Attached is my monthly report for August.

pscmonthlyrpt090102.doc

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FME! Cube CO162
phone-313-390-8849, fax: 313-390-4064
apoma2@ford.com

Name: **Amy Poma**
Program: **FMEI-dPFE sensor potential recall issue**
Date: **September 1, 2002**

Summary

Support the FMEI Teams in project management in developing project plans, organizing and facilitating meetings, managing special projects and assist in creating systems and processes to better support the teams in tracking ongoing developments and issues. Coordinate efforts for continued services to the Ford customer.

August Accomplishments

- Continue twice weekly meetings with Jim Maurer and the team to review issues to manage the Kavlico dPFE Sensor recall campaign.
- Meet weekly with Bill McCarty, Joe Johnson, Jim Maurer, Freeman Gates and Kavlico to review and track Action Items for the Sensor campaign.
- Tracking all issues for the above weekly meetings via PSC issues database, incorporating all assignments and tracking assignments to completion.
- Central point of contact for all documents related to the Sensor campaign.
- Maintain Supporting Documents/Evidence Book for the Sensor recall campaign.
- Initiate and control Vehicle Testing Project for seven (7) test vehicles.
- PMP certification preparation.
- Completing transition of the addition of Gary Liimatta's Intake Trottle Body team to the FMEI department and its support from Ruth Bachor to myself.

August Goals

- Provide exceptional project management support to Jim O'Neall's FMEI department with the addition of Gary Liimatta's Intake-Throttle Body team.
- Pass the PMP exam 2- scheduled for September 16, 2002.

From: Poma, Amy (A.)
Sent: Thursday, August 15, 2002 11:10 AM
To: Shah, Jay (J.M.)
Subject: timing plans on web

Jay,

Below is the website to look up timing plans on the web. (By North America then then by program) You have to obtain an ID through PPM before you can look into the plans. When you click on the website below, you'll see on the webpage an area for first time users, there you should see a contact name to get the id, etc. or contact you systems eng. if you are having trouble.

https://www.eroom.ford.com/

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Tuesday, August 13, 2002 11:49 AM
To: Freeland, Mark (M.)
Subject: RE: Ongoing Vehicle Testing Spreadsheet

I was advised that the vehicle testing has been discontinued. You might want to check with Jim Maurer if info needs to still be tracked on your Mountaineer.
Let me know if you still need it.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Freeland, Mark (M.)
Sent: Tuesday, August 13, 2002 11:25 AM
To: Poma, Amy (A.)
Subject: Ongoing Vehicle Testing Spreadsheet

Amy,

Could you please send me the latest copy of the vehicle test workbook, so that I may update it and send you my new information on the Mountaineer.

Thank you

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Poma, Amy (A.)
Sent: Monday, August 12, 2002 9:15 AM
To: Bachor, Ruth (R.A.)
Subject: RE: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Morning Ruth,

Thanks very much for the email address.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Bachor, Ruth (R.A.)
Sent: Monday, August 12, 2002 9:00 AM
To: Poma, Amy (A.)
Subject: RE: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Have not recently worked with a Mike Weber...
My gut reaction was to check with Chris Newman who is on vacation (you may have known that). So I checked with Mary Davis who knows another person in cables and controls and we looked at Super Duper CDS under that person's name and looked at the org chart and came up with:

Michael Weber (mweber3@ford.com) who is a Product Engineer, Supervisor Accel. Control over at PDC (Product Development Center - across the street).

I would give this guy a try.

Ruth A. Bachor
Program Management
POEE, cube CG070
e-mail: rbachor@ford.com
phone: 313-390-3703 fax: 313-322-9265

—Original Message—
From: Poma, Amy (A.)
Sent: Monday, August 12, 2002 8:33 AM
To: Bachor, Ruth (R.A.)
Subject: FW: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Ruth,

Can you please see note below and advise me of Mike Weber's email. There are several Mike Weber's in email, but none that I saw with the POEE address. Need to forward follow up note from Friday to him this morning. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Weber, Mike (M.)
Sent: Sunday, August 11, 2002 7:28 AM
To: Poma, Amy (A.)

Subject: RE: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Amy,
I believe you forwarded this to the wrong Mike Weber.

Mike Weber
CIWG Coordinator
Kentucky Truck Plant

-----Original Message-----
From: Poma, Amy (A.)
Sent: Friday, August 09, 2002 11:13 AM
To: Limatta, Gary (G.D.); Weber, Mike (M.); Newman, Chris (C.W.); Kosko, Jeff (J.R.); Traczynski, Albert (A.J.); Fiorini, John (J.J.); 'tparkin1@nisbcon.com'
Cc: Bachor, Ruth (R.A.)
Subject: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

HI,

My name is Amy Poma and I am a PMA for the FMEI department. I will be working with Gary on tracking issues and assignments regarding the 4.0L cable failures. Discussion of potential design changes to the cam and cable have required the following tasks as listed below. Please review the assigned tasks that were generated from Thursday's meeting:

Mike Weber- Go to supplier and verify that accelerated cable is to print.

Tim Parkinson- Go to supplier Key Plastics and verify if cam is to print and if production cams are to spec.

Review nominal stack up of current cams and accelerated cables verifying if they are actually making parts to print.

Complete throttle body CAD data.

Chris Newman- Pull part numbers to update intake assembly prints.

A follow up meeting needs to be scheduled as soon as the above tasks are completed. I will check back with you next week to check status and confirm when the meeting can be scheduled.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Monday, August 12, 2002 9:15 AM
To: Weber, Michael (M.J.)
Subject: FW: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Mike,

Please see note below. I had a bit of trouble figuring out who the correct Mike Weber was so please advise if I am incorrect. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Poma, Amy (A.)
Sent: Friday, August 09, 2002 11:13 AM
To: Limatta, Gary (G.D.); Weber, Mike (M.); Newman, Chris (C.W.); Kosto, Jeff (J.R.); Traczynski, Albert (A.J.); Florki, John (J.J.); 'tparkin1@visteon.com'
Cc: Bachar, Ruth (R.A.)
Subject: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Hi,

My name is Amy Poma and I am a PMA for the FMEI department. I will be working with Gary on tracking issues and assignments regarding the 4.0L cable failures. Discussion of potential design changes to the cam and cable have required the following tasks as listed below. Please review the assigned tasks that were generated from Thursday's meeting:

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Amy Poma
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POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Monday, August 12, 2002 8:33 AM
To: Bachor, Ruth (R.A.)
Subject: FW: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Ruth,

Can you please see note below and advise me of Mike Weber's email. There are several Mike Weber's in email, but none that I saw with the POEE address. Need to forward follow up note from Friday to him this morning. Thanks.

Amy Poma
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phone-313-390-8649, fax: 313-390-4084
apoma2@ford.com

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From: Weber, Mike (M.)
Sent: Sunday, August 11, 2002 7:28 AM
To: Poma, Amy (A.)
Subject: RE: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Amy,
I believe you forwarded this to the wrong Mike Weber.

Mike Weber
CIWG Coordinator
Kentucky Truck Plant

----Original Message----
From: Poma, Amy (A.)
Sent: Friday, August 09, 2002 11:13 AM
To: Lilmelda, Gary (G.D.); Weber, Mike (M.); Newman, Chris (C.W.); Kosko, Jeff (J.R.); Traczynski, Albert (A.J.); Florini, John (J.J.); 'tparkin1@visteon.com'
Cc: Bachor, Ruth (R.A.)
Subject: 4.0L Cable Failures August 8, 2002 meeting issues/tasks

Hi,

My name is Amy Poma and I am a PMA for the FMEI department. I will be working with Gary on tracking issues and assignments regarding the 4.0L cable failures. Discussion of potential design changes to the cam and cable have required the following tasks as listed below. Please review the assigned tasks that were generated from Thursday's meeting:

Mike Weber-	Go to supplier and verify that accelerated cable is to print.
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	Review nominal stack up of current cams and accelerated cables verifying if they are actually making parts to print.
	Complete throttle body CAD data.
Chris Newman-	Pull part numbers to update intake assembly prints.

A follow up meeting needs to be scheduled as soon as the above tasks are completed. I will check back with you next week to check status and confirm when the meeting can be scheduled.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8649, fax: 313-390-4084
apoma2@ford.com

From:	Poma, Amy (A.)
Sent:	Friday, August 09, 2002 11:13 AM
To:	Limatta, Gary (G.D.); Weber, Mike (M.); Newman, Chris (C.W.); Kosko, Jeff (J.R.); Traczynski, Albert (A.J.); Florini, John (J.J.); 'tparkin1@visteon.com'
Cc:	Bachor, Ruth (R.A.)
Subject:	4.0L Cable Failures August 8, 2002 meeting issues/tasks

Hi,

My name is Amy Poma and I am a PMA for the FMEI department. I will be working with Gary on tracking issues and assignments regarding the 4.0L cable failures. Discussion of potential design changes to the cam and cable have required the following tasks as listed below. Please review the assigned tasks that were generated from Thursday's meeting:

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Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Friday, August 09, 2002 11:01 AM
To: Limatta, Gary (G.D.); Newman, Chris (C.W.); Koeko, Jeff (J.R.); Traczynski, Albert (A.J.); Florini, John (J.J.)
Cc: Bachor, Ruth (R.A.)
Subject: 4.0L Cable failures August 8, 2002 mtg. Issues/Assignments

My name is Amy Poma and I am a PMA for the FMEI department. I will be working with Gary on tracking issues and assignments regarding the 4.0L cable failures. Discussion of potential design changes to the cam and cable have required the following tasks as listed below. Please review the assigned tasks that were generated from Thursday's meeting:

Mike Weber- Go to supplier and verify that accelerated cable is to print.

Tim Parkinson- Go to supplier Key Plastics and verify if cam is to print and if production cams are to spec.

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Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8649, fax: 313-390-4084
apoma2@ford.com

Tracking:	Recipient	Recall
	Limatta, Gary (G.D.)	
	Newman, Chris (C.W.)	
	Koeko, Jeff (J.R.)	
	Traczynski, Albert (A.J.)	Succeeded: 8/9/2002 10:58 AM
	Florini, John (J.J.)	Succeeded: 8/9/2002 11:06 AM
	Bachor, Ruth (R.A.)	
	Panaretos, Christine (C.M.)	Succeeded: 8/9/2002 11:02 AM

From: Poma, Amy (A.)
Sent: Wednesday, August 07, 2002 1:55 PM
To: Maurer, James (J.B.)
Subject: RE: Thursday 1:00-3:00 call in meeting

I sent Shri a note today for him to confirm if Tuesday is good and confirm who he wants to attend. I'm waiting to hear back from him, then I will set up mtg.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Wednesday, August 07, 2002 11:25 AM
To: Poma, Amy (A.)
Subject: RE: Thursday 1:00-3:00 call in meeting

Amy,
The last proposal from John Koszewnik to Kavlico contained the Tuesday and Thursday meetings and indicated they would start next week. Just keep these times open for now because the meetings are not finalized yet. The meeting with Freeman and Shri needs to be set up, and I don't know if Tuesday is good anymore.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

-----Original Message-----
From: Poma, Amy (A.)
Sent: Wednesday, August 07, 2002 10:57 AM
To: Maurer, James (J.B.)
Subject: RE: Thursday 1:00-3:00 call in meeting

Jim,

I thought so, just wanted to check with you to make sure. Also, it has been confirmed that I will be supporting Gary Lilmatta for Electronic Throttle body too so I just want to make sure I keep all these meetings straight. Do you want to have a 1:00 Monday meeting or wait until things are decided?

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Wednesday, August 07, 2002 9:17 AM
To: Poma, Amy (A.)
Subject: RE: Thursday 1:00-3:00 call in meeting

Amy,
From everything I can tell, there is no agreement yet between Ford and Kavlico as to how to proceed. There is no reason to have a call in.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

—Original Message—
From: Poma, Amy (A.)
Sent: Wednesday, August 07, 2002 9:14 AM
To: Maurer, James (J.B.)
Subject: Thursday 1:00-3:00 call in meeting

Jim,

Please advise if we will be having a call in meeting tomorrow and if so, is it with the old team or the new, smaller team? I need to get with you to put an Agenda together.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-6849, fax 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Wednesday, August 07, 2002 12:42 PM
To: Bachor, Ruth (R.A.)
Subject: RE: Tamper Resistant Screw and Throttle Body

Thanks for forwarding. I'll carefully review all of your notes.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Bachor, Ruth (R.A.)
Sent: Wednesday, August 07, 2002 12:41 PM
To: Poma, Amy (A.)
Subject: FW: Tamper Resistant Screw and Throttle Body

Amy,

See notes below for intro to this topic, as you and I have not discussed this yet.

Current status: Gary is responsible to address this related to the TRC screw, but he has never written an EPRC paper nor has a proforma or tool nor does Gary have a due date for this (and left Whitbeck a voicemail stating as much). I don't expect any assignment to come out of this, but you never know, and I just wanted you to be aware of it.

Ruth A. Bachor
Program Management
POEE, cube CG070
e-mail: rbachor@ford.com
phone: 313-390-3703 fax: 313-322-9265

—Original Message—
From: Whitbeck, Neil (N.G.)
Sent: Wednesday, August 07, 2002 11:19 AM
To: Bachor, Ruth (R.A.)
Subject: RE: Tamper Resistant Screw and Throttle Body

Paul has not contacted me. He is on the hook to write the EPRC paper and conduct testing to support that paper. I do not know status, at present.

Regards,

Neil Whitbeck
Supervisor, Adv. & Special Programs
VEE-Certification Engineering

Tel. (313) 84-56120
FAX (313) 99-04991
e-mail: nwhitbec@ford.com

—Original Message—
From: Bachor, Ruth (R.A.)
Sent: Tuesday, August 06, 2002 12:16 PM
To: Whitbeck, Neil (N.G.)
Subject: Tamper Resistant Screw and Throttle Body

Neil,

Gary Liimatta asked me to contact you regarding the status of the safety issue with the tamper resistant screw on the throttle body.

Is was Gary understanding that Paul Plante was to be writing a "paper" on this with support from Ram Sriramam last week as Gary was on vacation. Paul is on vacation this week and Ram tells me that Paul did not contact him last week. Gary did not receive anything from Paul with a status.

Did Paul contact you last week?

Ruth A. Bachor
Program Management
POEE, cube CG070
e-mail: rbachor@ford.com
phone: 313-390-3703 fax: 313-322-9265

From: Poma, Amy (A.)
Sent: Wednesday, August 07, 2002 11:00 AM
To: Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guanter (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auller, Jim (J.E.); Awad, Mahmoud (M.I.); Ayers, Don; Bandoske, Pete (P.F.); Banaek, Catherine (C.K.); Berauder, Lee (L.C.); Bissl, Gerry (G.); Bronni, Mark (M.J.); Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.); Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates, Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hangas, Jon (.); Jahshan, John; Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerezi, Karen (K.J.); Koazewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.); Nielsen, Christian (C.A.); O'Neall, Jim (J.D.); Oswalt, Greg (G.G.); Park, Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Pianta, Paul (P.G.); Poma, Amy; Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Reddy, Srikanth; Rossi, Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro, Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); Williamson, Richard (E.)
Subject: Status of call in meetings

Team-

I have been advised that still no decision has been reached between Ford and Kavlico on how we are going to proceed so the Thursday 1:00-3:00 call in meetings are cancelled until further notice.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Wednesday, August 07, 2002 10:57 AM
To: Maurer, James (J.B.)
Subject: RE: Thursday 1:00-3:00 call in meeting

Jim,

I thought so, just wanted to check with you to make sure. Also, it has been confirmed that I will be supporting Gary Limatta for Electronic Throttle body too so I just want to make sure I keep all these meetings straight. Do you want to have a 1:00 Monday meeting or wait until things are decided?

Amy Poma
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From: Maurer, James (J.B.)
Sent: Wednesday, August 07, 2002 9:17 AM
To: Poma, Amy (A.)
Subject: RE: Thursday 1:00-3:00 call in meeting

Amy,
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Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

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Sent: Wednesday, August 07, 2002 9:14 AM
To: Maurer, James (J.B.)
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Jim,

Please advise if we will be having a call in meeting tomorrow and if so, is it with the old team or the new, smaller team? I need to get with you to put an Agenda together.

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phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Tuesday, August 06, 2002 2:18 PM
To: Reddy, Srikanth (S.C.)
Subject: RE: Updated: Cpk's and process changes review

Since you will be returning on the next Tuesday, I will confirm you will be calling in at 3:00 correct?

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Reddy, Srikanth (S.C.)
Sent: Tuesday, August 06, 2002 2:01 PM
To: Poma, Amy (A.)
Subject: RE: Updated: Cpk's and process changes review

Amy,

My request for time off was rejected. Mainly because of Kavlico. Anyhow, I will be taking some vacation. I'll be off tommorrow and return next Tuesday.

I'll be taking some more vacation as well.

Sri

—Original Message—
From: Poma, Amy (A.)
Sent: Tuesday, August 06, 2002 1:56 PM
To: Reddy, Srikanth (S.C.)
Subject: RE: Updated: Cpk's and process changes review

Thanks for your response. I will foward the info that you will call in. Thanks. (p.s. you aren't going back to school this month? please advise.).

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Appointment—
From: Reddy, Srikanth (S.C.)
Sent: Tuesday, August 06, 2002 1:55 PM
To: Poma, Amy (A.); Johnson, Joe (J.H.)
Subject: Tentative: Updated: Cpk's and process changes review
When: Tuesday, August 13, 2002 3:00 PM-4:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Call in Joe Johnson's office (same call in numbers for the Monday 4:00 mtgs.)

Hi Amy and Joe,

I will be at Kavlico during the time of the meeting. I will call in. Joe while, I'm there, I will try to find out as much info. as possible regarding Capability of their process.

Sri

From: Poma, Amy (A.)
Sent: Tuesday, August 06, 2002 1:56 PM
To: Reddy, Srikanth (S.C.)
Subject: RE: Updated: Cpk's and process changes review

Thanks for your response. I will foward the info that you will call in. Thanks. (p.s. you aren't going back to school this month? please advise.).

Amy Poma
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phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

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Sent: Tuesday, August 06, 2002 1:55 PM
To: Poma, Amy (A.); Johnson, Joe (J.H.)
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Sri

Subject:	Canceled: Cpk's and process changes review
Location:	Call in Joe Johnson's office (same call in numbers for the Monday 4:00 mtgs.)
Start:	Tue 8/13/2002 3:00 PM
End:	Tue 8/13/2002 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Reddy, Shridevi (S.)
Importance:	High

This meeting is based on yesterday's discussion of item #9 of the Monday 4:00 call in mtg. issues deck.

#9. Verify Cpk's and any process changes related to the sil-gel operation to address variation concerns on obth the "chimney" and the hybrid circuit.

Ford schedules look clear for this date and time, Stu, please advise if you have a conflict at this time. Thanks.

Subject:	Canceled: Cpk's and process changes review
Location:	Call in Joe Johnson's office (same call in numbers for the Monday 4:00 mtgs.)
Start:	Tue 8/13/2002 3:00 PM
End:	Tue 8/13/2002 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Reddy, Shridevi (S.)
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Subject:	Canceled: Cpk's and process changes review
Location:	Call in Joe Johnson's office (same call in numbers for the Monday 4:00 mtgs.)
Start:	Tue 6/13/2002 3:00 PM
End:	Tue 6/13/2002 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Reddy, Shridevi (S.)
Importance:	High

This meeting is based on yesterday's discussion of item #9 of the Monday 4:00 call in mtg. issues deck.

#9. Verify Cpk's and any process changes related to the sil-gel operation to address variation concerns on obth the "chimney" and the hybrid circuit.

Ford schedules look clear for this date and time, Stu, please advise if you have a conflict at this time. Thanks.

From: Poma, Amy (A.)
Sent: Tuesday, August 06, 2002 9:05 AM
To: Tyler Jr., Dave (D.)
Cc: Shopp, James (J.J.)
Subject: FW: DPFE WEB Site Access

Dave,

Can you please grant James Shopp Ford/Kavlico web access? He is following some issues on the DPFE sensor. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

----Original Message----
From: Shopp, James (J.J.)
Sent: Thursday, August 01, 2002 4:25 PM
To: Maurer, James (J.B.); Poma, Amy (A.)
Subject: FW: DPFE WEB Site Access

Pls add my name.
Thanks,

Jim Shopp
jshopp@ford.com
Focus Engines
x37650

----Original Message----
From: Panaretos, Christine (C.M.)
Sent: Thursday, August 01, 2002 4:11 PM
To: Shopp, James (J.J.)
Subject: RE: DPFE WEB Site Access

Please send your request to Jim Maurer and Amy Poma. I am no longer involved in this project.

Thanks.

Chris Panaretos
Account Manager, **Project Solutions at Ford Powertrain**
POEE Building, Cube CG-071
(313) 24-89337; Fax: (313) 32-29265
cpanaret@ford.com <mailto:cpanaret@ford.com>

----Original Message----
From: Shopp, James (J.J.)
Sent: Thursday, August 01, 2002 4:11 PM
To: Panaretos, Christine (C.M.)
Cc: King II, Lamar (L.L.); Johnson, Joe (J.H.)
Subject: DPFE WEB Site Access

I am currently following some warranty issues involving the DPFE sensors. Pls add my name for access to your WEB site.
Thanks

Jim Shopp
jshopp@ford.com <mailto:jshopp@ford.com>

Focus Engines
x37550

Subject: FW: Dyno test and evaluation/diagnosis of recent failures-CANCELLED
Location: POEE CR E103A by pillar L10

Start: Mon 8/5/2002 1:00 PM
End: Mon 8/5/2002 3:00 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Required Attendees: Poma, Amy (A.); Fablen, Phil (P.A.); Petty, Neal (N.E.); Verner, Carol (C.J.); Maurer, James (J.B.)

-----Original Appointment-----
From: Poma, Amy (A.)
Sent: Monday, August 05, 2002 9:52 AM
To: Poma, Amy (A.); Fablen, Phil (P.A.); Petty, Neal (N.E.); Verner, Carol (C.J.); Maurer, James (J.B.); Akolkar, Shrikant (S.V.)
Subject: Dyno test and evaluation/diagnosis of recent failures-CANCELLED
When: Monday, August 05, 2002 1:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: POEE CR E103A by pillar L10

MEETING CANCELLED. Phil Fablen is out today, so this meeting will have to be rescheduled.

Subject:	FW: Dyno test and evaluation/diagnosis of recent failures-CANCELLED
Location:	POEE CR E103A by pillar L10
Start:	Mon 8/5/2002 1:00 PM
End:	Mon 8/5/2002 3:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Fablen, Phil (P.A.); Petty, Neal (N.E.); Verner, Carol (C.J.); Maurer, James (J.B.)

-----Original Appointment-----

From:	Poma, Amy (A.)
Sent:	Monday, August 05, 2002 9:52 AM
To:	Poma, Amy (A.); Fablen, Phil (P.A.); Petty, Neal (N.E.); Verner, Carol (C.J.); Maurer, James (J.B.); Akolkar, Shrikant (S.V.)
Subject:	Dyno test and evaluation/diagnosis of recent failures-CANCELLED
When:	Monday, August 05, 2002 1:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where:	POEE CR E103A by pillar L10

MEETING CANCELLED. Phil Fablen is out today, so this meeting will have to be rescheduled.

Subject:	FW: Dyno test and evaluation/diagnosis of recent failures-CANCELLED
Location:	POEE CR E103A by pillar L10
Start:	Mon 8/5/2002 1:00 PM
End:	Mon 8/5/2002 3:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Fabien, Phil (P.A.); Petty, Neal (N.E.); Verner, Carol (C.J.); Maurer, James (J.B.)

—Original Appointment—

From:	Poma, Amy (A.)
Sent:	Monday, August 05, 2002 9:52 AM
To:	Poma, Amy (A.); Fabien, Phil (P.A.); Petty, Neal (N.E.); Verner, Carol (C.J.); Maurer, James (J.B.); Akolkar, Shrikant (S.V.)
Subject:	Dyno test and evaluation/diagnosis of recent failures-CANCELLED
When:	Monday, August 05, 2002 1:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where:	POEE CR E103A by pillar L10

MEETING CANCELLED. Phil Fabien is out today, so this meeting will have to be rescheduled.

From: Poma, Amy (A.)
Sent: Friday, August 02, 2002 2:39 PM
To: Freeland, Mark (M.)
Subject: FW: Uninterruptable power supply

Mark,

Please see Jim's note below.
—

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Maurer, James (J.B.)
Sent: Friday, August 02, 2002 1:07 PM
To: Poma, Amy (A.)
Subject: RE: Uninterruptable power supply

Amy,
I left one on Mary Akins desk and asked her to take it to Mark.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

—Original Message—
From: Poma, Amy (A.)
Sent: Friday, August 02, 2002 9:03 AM
To: Maurer, James (J.B.)
Cc: Freeland, Mark (M.)
Subject: Uninterruptable power supply

Jim,

Mark Freeland is asking me to see if I can help locate these units that Tim Potter ordered and had sent to Jim McCoy. Jim M. is on vacation until next week and Mark wanted to try to get one of the six of these if I could locate. The others in Jim M.'s area are also out, so I can't ask any questions. If you know anything, please let myself or Mark know. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Friday, August 02, 2002 9:03 AM
To: Maurer, James (J.B.)
Cc: Freeland, Mark (M.)
Subject: Uninterruptable power supply

Jim,

Mark Freeland is asking me to see if I can help locate these units that Tim Potter ordered and had sent to Jim McCoy. Jim M. is on vacation until next week and Mark wanted to try to get one of the six of these if I could locate. The others in Jim M.'s area are also out, so I can't ask any questions. If you know anything, please let myself or Mark know. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4064
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Thursday, August 01, 2002 2:43 PM
To: Panaretos, Christine (C.M.)
Subject: RE: Status Report for July

Here is my report.

psmonthlyrpt0801 02.doc

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

-----Original Message-----
From: Panaretos, Christine (C.M.)
Sent: Wednesday, July 31, 2002 2:26 PM
To: Bachor, Ruth (R.A.); Poma, Amy (A.); Prussitis, Randy (R.W.)
Subject: Status Report for July

When you get a chance, please send me your status report for July. Thanks.

Chris Panaretos
Account Manager, **Project Solutions at Ford Powertrain**
POEE Building, Cube CG-071
(313) 24-89337; Fax: (313) 32-20265
cpanaret@ford.com

Name: **Amy Poma**
Program: **FMEI-dPFE sensor potential recall issue**
Date: **August 1, 2002**

Summary

Support the FMEI Team as a project manager in developing project plans, organizing meetings, managing special projects and assist in creating systems and processes to better support the team in tracking ongoing developments in the potential recall issues. Coordinate efforts for continued services to the Ford customer.

July Accomplishments

- Continue twice weekly meetings with Jim Maurer and the team to review issues to manage the Kavlico dPFE Sensor recall campaign.
- Meet weekly with Jon Janda and Paul Plante and Issues Resolution team to review, track and assign vehicle IS/IS NOT issues.
- Meet weekly with Bill McCarty, Joe Johnson, Jim Maurer, Freeman Gates and Kavlico to review and track Action Items for the Sensor campaign.
- Tracking all issues for the above weekly meetings via PSC issues database, incorporating all assignments and tracking assignments to completion.
- Central point of contact for all documents related to the Sensor campaign.
- Maintain Supporting Documents/Evidence Book for the Sensor recall campaign.
- Initiate and control Vehicle Testing Project for seven (7) test vehicles.
- Preparation for PMP Exam-Sunday, July 28, 2002 9:00 a.m.

August Goals

- Provide exceptional project management support to the customer and department and continuously strive to gain additional responsibilities advancing my career.
- Pass the PMP exam 2- scheduled for September 4, 2002, did not pass first attempt.

From: Poma, Amy (A.)
Sent: Thursday, August 01, 2002 10:33 AM
To: Maurer, James (J.B.)
Subject: RE: Available for additional support

See you at 2:00 today. Just let me know what you need for anything else. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

----Original Message----
From: Maurer, James (J.B.)
Sent: Thursday, August 01, 2002 10:30 AM
To: Poma, Amy (A.)
Subject: RE: Available for additional support

Amy,
Please attend. The info. presented will be still needed for the 14D. The 14D will still need to be updated and information added. Paul and I will be updating the 14D without the team and we will still be having reviews of it with the CCRG.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

----Original Message----
From: Poma, Amy (A.)
Sent: Thursday, August 01, 2002 10:06 AM
To: Maurer, James (J.B.); O'Neal, Jim (J.D.); Plante, Paul (P.G.)
Subject: Available for additional support

Gentlemen:

With the recent changes taking place within the Ford/Kavlico team, meetings, direction, etc., I wanted to advise you that I have additional time available to provide project management support and/or other support as required for other additional projects and teams that are in need of assistance.

Paul, I know you work with several other project teams in an issues resolution arena so please let me know if I can be of assistance to any of these issues.

Jim M. would you like me to attend the 2:00 meeting today regarding Usefule Life Data? Please advise. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Thursday, August 01, 2002 9:45 AM
To: Freeland, Mark (M.)
Subject: RE:

Mark,

Talk to Jim Maurer regarding the status of the Ford/Kavlico Team, scheduled meetings and how we are going to proceed. A lot happend while you were on vacation.

I will send you the mileages.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

---Original Message---
From: Freeland, Mark (M.)
Sent: Tuesday, July 30, 2002 5:08 PM
To: Poma, Amy (A.)
Subject: RE:

Amy,

Could you forward me a copy of the status of accumulated miles on each test vehicle along with any reports of unusual events.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

---Original Message---
From: Poma, Amy (A.)
Sent: Monday, July 15, 2002 8:35 AM
To: Akins, Mary (M.); Allen, Sheran (S.A.); Awad, Mahmoud (M.I.); Freeland, Mark (M.); Gates, Freeman (F.C.); Janda, Jon (J.M.); John Jahshan (E-mail); Maurer, James (J.B.); McCoy, James (J.D.); Plante, Paul (P.G.); Poma, Amy (A.); Reddy, Srikanth; Rossi, Roberto (R.A.); Verner, Carol (C.J.)
Subject:

Team below please see note Jon asked me to forward regarding week end drives. If you have any questions, please contact him directly. Thanks.

The following people are the ***ONLY*** ones approved for week end drives:

Jim McCoy
Dennis Kryzske
Jim Maurer
Jerry Kazmer
Freeman Gates
Gary Elliot

It's expected that those on the list accumulate notable mileage.

Thank You,
Jon Janda

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-6849, fax: 313-390-4084
apoma2@ford.com

Subject:	Useful Life Data
Location:	POEE DI-196 FMEI dept. pillar 17G
Start:	Thu 8/1/2002 2:00 PM
End:	Thu 8/1/2002 2:30 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Sun, Baocheng (B.); O'Neall, Jim (J.D.); Awad, Mahmoud (M.I.); Maurer, James (J.B.); Hallauer, Julie (J.A.)

The meeting time has changed to begin at 2:00 on Thursday August 1.

From: Poma, Amy (A.)
Sent: Tuesday, July 30, 2002 10:27 AM
To: Sun, Beocheng (B.); Awad, Mahmoud (M.I.); O'Neall, Jim (J.D.); Hallauer, Julie (J.A.); Maurer, James (J.B.)
Subject: Kavlico dPFE Sensor Useful Life Data-HIGH PRIORITY

TIME CHANGE FOR August 1st meeting. J. O'Neall has important meeting conflict requiring a time change from beginning at 1:00 to a 2:00 start time on August 1st. I will send out a new meeting notice.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

Subject:	Kavlico dPFE Sensor Useful Life Data-HIGH PRIORITY
Location:	POEE FMEI dept. CR DI-196 by pillar G-17
Start:	Thu 8/1/2002 1:00 PM
End:	Thu 8/1/2002 1:30 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Required Attendees:	Poma, Amy (A.); Sun, Baocheng (B.); Awad, Mahmoud (M.I.); O'Neall, Jim (J.D.); Hallauer, Julie (J.A.); Maurer, James (J.B.)

It has been requested that you please plan on attending the above 30 minute meeting to discuss dPFE sensor Useful Life Data.

From: Poma, Amy (A.)
Sent: Tuesday, July 30, 2002 8:17 AM
To: Blair, Mark (M.A.)
Subject: RE: FW: Kavlico dPFE Sensor Core Team Meeting (MUST ATTEND)

This timeslot use to be used for a 1-2:30 Kavlico/Ford 14D call in meeting, but is no longer taking place. We still have this timeslot reserved in case we have carryover issues from other meetings, etc. I am not familiar with who Julie Hallauer is either. My group is not having a meeting in this timeslot today. Perhaps you should check with Jim O'Neall's office in case he is using the timeslot for something specific and Mark needs to attend.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Lovasz, Dorothy (D.A.) On Behalf Of Blair, Mark (M.A.)
Sent: Monday, July 29, 2002 3:17 PM
To: Poma, Amy (A.)
Subject: RE: FW: Kavlico dPFE Sensor Core Team Meeting (MUST ATTEND)

This meeting is called by you. Julie Hallauer requested Mark to attend. From what I understand, Jim O'Neal will be attending the same one. Mark is the Director of Powertrain Quality.

—Original Message—
From: Poma, Amy (A.)
Sent: Monday, July 29, 2002 2:30 PM
To: Blair, Mark (M.A.)
Subject: RE: FW: Kavlico dPFE Sensor Core Team Meeting (MUST ATTEND)

Can you please advise who you are, where you are from and the purpose of the meeting. I check with a few of the supervisors on the Ford/Kavlico team and we are unable to identify you.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Appointment—
From: Lovasz, Dorothy (D.A.) On Behalf Of Blair, Mark (M.A.)
Sent: Friday, July 26, 2002 12:45 PM
To: Poma, Amy (A.)
Subject: Accepted: FW: Kavlico dPFE Sensor Core Team Meeting (MUST ATTEND)
When: Tuesday, August 20, 2002 1:00 PM-2:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: POEE DI-196 (War Room in FMEI Dept.)

From: Poma, Amy (A.)
Sent: Monday, July 29, 2002 2:30 PM
To: Blair, Mark (M.A.)
Subject: RE: FW: Kavlico dPFE Sensor Core Team Meeting (MUST ATTEND)

Can you please advise who you are, where you are from and the purpose of the meeting. I check with a few of the supervisors on the Ford/Kavlico team and we are unable to identify you.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Appointment—
From: Lovasz, Dorothy (D.A.) **On Behalf Of** Blair, Mark (M.A.)
Sent: Friday, July 26, 2002 12:45 PM
To: Poma, Amy (A.)
Subject: Accepted: FW: Kavlico dPFE Sensor Core Team Meeting (MUST ATTEND)
When: Tuesday, August 20, 2002 1:00 PM-2:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: POEE DI-196 (War Room in FMEI Dept.)

From: Poma, Amy (A.)
Sent: Friday, July 26, 2002 10:59 AM
To: Akins, Mary (M.); Alles, Sheran (S.A.); Awad, Mahmoud (M.I.); Freeland, Mark (M.); Gates, Freeman (F.C.); Janda, Jon (J.M.); John Jahshan (E-mail); Maurer, James (J.B.); McCoy, James (J.D.); Plante, Paul (P.G.); Poma, Amy (A.); Reddy, Srikanth; Rossi, Roberto (R.A.); Verner, Carol (C.J.)
Subject: July 29, 2002 Issues Resolution mtg. Agenda

Team-

Attached is the Agenda for Monday, July 29, 2002 1:00-3:00 meeting.

Kavlico Meeting Agenda_072902...

Have a nice weekend everyone.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

Ford

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**To Achieve Vehicle Issues Resolution by addressing vehicle issues leading to decision if IS/IS NOT Root Cause with delegation of assignments and collection of data to bring to conclusion**

Meeting Logistics		
Subject:	Kavlico TM dPFE Sensor Vehicle Issues Resolution.	
Dates:	July 29, 2002	
Time:	1-3:00 p.m.	
Location:	POHE, conference rm.E103A, (pillar L10)	
Called By:	Jon Janda, Team Leader 24(8-2589)	
Next Meeting (s):	August 5, 2002, Core Team Meeting	
Conference Call-in Number(s):		

Core Team Participants					
Black Belts	Kavlico	V-Engine	Quality Office	EESE	
Mark Freeland	Mary Akins	Jim Maurer	Mahmoud Awad	Sherim Alles	
Shri Akolkar		Freeman Gates		Robert Rossi	
Jim McCoy		Amy Poma			
		Paul Plante			
Team Leader	Vistecm	Carol Verner			
Jon Janda	John Jabshua				

Meeting Agenda –7/29/02			
Order of Agenda Items		Person(s) Responsible	Time Allocated
1. EGR pressure and temperature@ zero flow.		Shri Akolkar	15 minutes
2. Definition of latch.		All	20 minutes
3. Quantifying a latch condition.		All	20 minutes
4. Escape brake light switch & cigarette lighter wirking harness 1 pg. Document.		Robert Rossi	10 minutes
5. 14D Team meetings-structure/status - follow up from Koszewnik mtg.		Jim Maurer	15 minutes
6. Walk Ins.		All	

Other Open Issues for Discussion	Person(s) Responsible	Time Estimated

Jim Maurer/cp: 7/26/02
Kavlico dPFE Sensor Core Team

From: Poma, Amy (A.)
Sent: Friday, July 26, 2002 10:58 AM
To: Janda, Jon (J.M.)
Subject: RE: Monday July 29 Issues Resolution mtg.

As a matter of fact I've gotten two calls from girlfriends asking me to lunch suggesting the same thing. Sounds like great minds think alike! We'll say how long I can hold out. See ya!

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Janda, Jon (J.M.)
Sent: Friday, July 26, 2002 10:50 AM
To: Poma, Amy (A.)
Subject: RE: Monday July 29 Issues Resolution mtg.

Relax you'll do fine! Sounds like you need a margarita for lunch.

Thanks for keeping on top of things.

Thank You,
Jon Janda
V-Engine Engineering - Ford
2V - V6 Certified Black Belt
Ph: 313-24-62589 Pgr: 313-795-5869
E-mail: JJANDA@ford.com
Fax: 313-84-50613

—Original Message—
From: Poma, Amy (A.)
Sent: Friday, July 26, 2002 10:47 AM
To: Janda, Jon (J.M.)
Subject: RE: Monday July 29 Issues Resolution mtg.

Yes, I have studying to do so I want to get this done so I can get it together and out so I can get back to studying. I can't wait until this is over. We've been told there is only a 60% pass rate nationwide on this certification test and it takes the whole 4 hrs. to complete, so I have my work cut out for me.

I'll have this stuff ready for Monday. Have a nice weekend.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Janda, Jon (J.M.)
Sent: Friday, July 26, 2002 10:43 AM
To: Poma, Amy (A.)
Subject: RE: Monday July 29 Issues Resolution mtg.

AMY,

There you go pestering me again....don't you have studying to do??????????????????????????
Agenda Items:

EGR pres. & temp @ zero flow - Shri Akolkar
Definition of a latch - All
Quantifying a latch condition - all
Escape brake light switch & cigarette lighter wiring harness 1 pager - R. Rossi

Thank You,
Jon Janda

V-Engine Engineering - Ford
2V - V6 Certified Black Belt
Ph: 313-24-82589 Pgr: 313-795-5869
E-mail: JJANDA@ford.com
Fax: 313-84-50613

----Original Message----

From: Poma, Amy (A.)
Sent: Friday, July 26, 2002 10:35 AM
To: Janda, Jon (J.M.)
Subject: Monday July 29 Issues Resolution mtg.

Jon,

Please forward anything you want on Monday's agenda. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Friday, July 26, 2002 10:47 AM
To: Janda, Jon (J.M.)
Subject: RE: Monday July 29 Issues Resolution mtg.

Yes, I have studying to do so I want to get this done so I can get it together and out so I can get back to studying. I can't wait until this is over. We've been told there is only a 60% pass rate nationwide on this certification test and it takes the whole 4 hrs. to complete, so I have my work cut out for me.

I'll have this stuff ready for Monday. Have a nice weekend.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-6849, fax: 313-390-4084
apoma2@ford.com

-----Original Message-----
From: Janda, Jon (J.M.)
Sent: Friday, July 26, 2002 10:43 AM
To: Poma, Amy (A.)
Subject: RE: Monday July 29 Issues Resolution mtg.

AMY,
There you go pestering me again....don't you have studying to do??????????????????????????????
Agenda items:

- EGR pres. & temp @ zero flow - Shri Akolkar
- Definition of a latch - All
- Quantifying a latch condition - all
- Escape brake light switch & cigarette lighter wiring harness 1 pager - R. Rossi

Thank You,
Jon Janda
V-Engine Engineering - Ford
2V - V6 Certified Black Belt
Ph: 313-24-82589 Pgr: 313-795-5869
E-mail: JJANDA@ford.com
Fax: 313-84-50613

-----Original Message-----
From: Poma, Amy (A.)
Sent: Friday, July 26, 2002 10:35 AM
To: Janda, Jon (J.M.)
Subject: Monday July 29 Issues Resolution mtg.

Jon,

Please forward anything you want on Monday's agenda. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-6849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Thursday, July 25, 2002 8:38 AM
To: Tyler Jr., Dave (D.)
Subject: RE: Kavlico dPFE sensor documents to go on the website

Still plan on doing this, but I've been swamped. I'll get back in touch with you when I've scanned the documents and are going to send. Thanks for your help.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Tyler Jr., Dave (D.)
Sent: Wednesday, July 03, 2002 11:43 AM
To: Poma, Amy (A.)
Subject: RE: Kavlico dPFE sensor documents to go on the website

Yes, that'll be the best method.

(BTW...I will be on vacation until July 19th,...I'll be back July 22...pls see B. Moni (bmoni@ford.com) for assistance or questions:)

Thanks:)
-Dave

—Original Message—
From: Poma, Amy (A.)
Sent: Wednesday, July 03, 2002 11:39 AM
To: Tyler Jr., Dave (D.)
Subject: RE: Kavlico dPFE sensor documents to go on the website

I found a scanner in our department. Should I scan the documents and send you an email with the attachment?

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

—Original Message—
From: Tyler Jr., Dave (D.)
Sent: Thursday, June 27, 2002 3:44 PM
To: Poma, Amy (A.)
Subject: RE: Kavlico dPFE sensor documents to go on the website

Are you near a scanner?? If not, I believe there's one in MSX files.

Thanks:)
-Dave

—Original Message—
From: Poma, Amy (A.)

Sent: Thursday, June 27, 2002 3:33 PM
To: Tyler Jr., Dave (D.)
Subject: RE: Kavlico dPFE sensor documents to go on the website

These documents are of a wide variety from different people collecting data. These are all hard paper copies with text, graphs, spreadsheets, etc.. I believe I have to scan them and if we have to update they'll have to be rescanned.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

----Original Message----
From: Tyler Jr., Dave (D.)
Sent: Thursday, June 27, 2002 3:27 PM
To: Poma, Amy (A.)
Subject: RE: Kavlico dPFE sensor documents to go on the website

Amy,

Are these hard (paper) copies?? If so, you can scan them, but that may create a problem. If you want to update those documents, you would have to somehow change the hard copy and re-scan.

Is there some way to type these documents into a MicroSoft Application (I.e. Word, XL...) ??

What is the format of your documents...(...all text?, data in rows/columns?, images?...).

Please advise.

-Dave

----Original Message----
From: Poma, Amy (A.)
Sent: Thursday, June 27, 2002 3:11 PM
To: Tyler Jr., Dave (D.)
Subject: FW: Kavlico dPFE sensor documents to go on the website

Sent incorrectly initially. Please see note below.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

----Original Message----
From: Poma, Amy (A.)
Sent: Thursday, June 27, 2002 10:26 AM
To: Tyler, Dave (D.)
Subject: Kavlico dPFE sensor documents to go on the website

Dave,

I've recently taken over the Kavlico sensor issue from Chris Panaretos and I understand I need to work with you to update and add documents to the website.

I've gone over what is currently there and I have one update and 6 new documents to be added. I do not have electronic copies of these documents. Can they be scanned and added? I have a list, description etc. for the

new documents. How do I need to proceed with you to update the website? Please advise. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Poma, Amy (A.)
Sent: Wednesday, July 24, 2002 9:04 AM
To: Maurer, James (J.B.)
Subject: July 25 Agenda and Issues Deck

Jim,

Attached is the Agenda and deck for Thursday, July 25th meeting. The deck has not had many updates in the last few meetings, because, well you've know/heard how the last few meetings have gone. Please review and advise of any additions/changes. Thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

Tracking:	Recipient	Recall
	Maurer, James (J.B.)	Succeeded: 7/24/2002 9:22 AM

Name: **Amy Poma**
Program: **FMEI-dPFE sensor potential recall issue**
Date: **October 1, 2002**

Summary

Support the FMEI Teams in project management in developing project plans, organizing and facilitating meetings, tracking recall issues, managing special projects and assist in creating systems and processes to better support the teams in tracking ongoing developments and issues. Coordinate efforts for continued services to the Ford customer.

September Accomplishments

- Project tracking for the DPFE sensor – potential recall campaign, issues resolution, database and website management, vehicle test tracking and document control.
- Develop and manage timing plans for the Fuel Metering Emissions Ignition (FMEI) and Air Metering groups.
- Develop and manage integration work plans for the FMEI department.
- Effective communication between multiple teams and suppliers for ongoing automotive and move coordinating issues.
- Create and manage ISO requirements on department website for Air Metering group.
- Facilitities coordinator for the FMEI department.

October Goals

- Effectively balance the combination of my new workload in both V-Engine project management, facilities coordination and ISO responsibilities.
- Provide exceptional support to the customer and continuously strive to gain additional responsibilities to advance my career.
- Pass the PMP Exam scheduled for October 15, 2002.

5982-027-B 15945

Name: **Amy Poma**
Program: **FMEI-dPFE sensor potential recall issue**
Date: **November 1, 2002**

Summary

Support the FMEI Teams in project management in developing project plans, organizing and facilitating meetings, tracking recall issues, managing special projects and assist in creating systems and processes to better support the teams in tracking ongoing developments and issues. Coordinate efforts for continued services to the Ford customer.

October Accomplishments

- Project tracking for the DPFE sensor – potential recall campaign, issues resolution, database and website management, vehicle test tracking and document control.
- Develop and manage timing plans for the Fuel Metering Emissions Ignition (FMEI) and Air Metering groups.
- Develop and manage integration work plans for the FMEI department.
- Effective communication between multiple teams and suppliers for ongoing automotive and move coordinating issues.
- Working continuously with Delphi in New York to procure high mileage GM TPS sensor parts for study.
- Coordinated Market Test Evaluation presentations with Delphi, Hitachi, Denso, Bosch and Siemens for Ford's selection of top supplier for ETB.
- Create and manage ISO requirements on department website for Air Metering group.
- Facilitities coordinator for the FMEI department: Coordinated moves for 4 suppliers, 1 new hire and 2 current employees this month.
- Created up to date matrix per J.O'Neall's request of all current Full Service Suppliers in department and did badge renewal/non renewal assessment for department.
- Attend J. O'Neall's weekly staff mtg. To provide facilities coordinating updates for department, assessment of pager use and reassignment of same.
- Coordinate pictel conferences with Mazda Japan and Ford for ETB. Translator and data transferences arranged.

- Review weekly AWS (warranty claims) for throttle body for report out in weekly Reliability Council meeting looking at warranty trends.
- Provide department with status of department issues in weekly Throttle Body Section meeting.
- Volunteered as Throttle Body representative for the Activities Committee and planned and executed Halloween costume/pot luck luncheon for FMEI department with 2 other volunteers.

November Goals

- Effectively balance the combination of my workload in both V-Engine project management, facilities coordination and ISO responsibilities. Continuously working with the new teams in FMEI offering the many types of support I can provide.
- Continuously strive to gain additional responsibilities to advance my career.
- Continuously improve skills matrix to remain a valuable member of the department.

Name: **Amy Poma**
Program: **FMEI-dPFE sensor potential recall issue**
Date: **December 20, 2002**

Summary

Support the FMEI Teams in project management in developing project plans, organizing and facilitating meetings, tracking recall issues, managing special projects and assist in creating systems and processes to better support the teams in tracking ongoing developments and issues. Coordinate efforts for continued services to the Ford customer.

December Accomplishments

- Continued PMA support for the 4.6L PN96/U222 IAC (Idle Air Control) valve newly formed S.W.A.T. Team which is a highly visible six sigma project requiring 24hr. turnaround for the responsibilities and assignments as the team works to identify root cause for the sticking of the IAC valve.
    - Support in twice daily meetings in determining and tracking work streams to identify root cause for the IAC sticking.
    - Identify new work streams for the day and continue to track these in parallel to those previously identified.
    - Provide countermeasures and samples for test and work with Hitachi Japan and Hitachi Kentucky who are developing the countermeasures.
    - Analysis of Critical sources of variation – work with the team to compare production capability to the measurements from field return valves.
    - Create and maintain evidence book, chemical and vehicle testing analysis.
- Effective communication between multiple teams and suppliers for ongoing automotive and move coordinating issues.
- Facilitities coordinator for the FMEI department including MAC updates, IT billing, pager assessment, telecommunications equipment, floor plan and seating matrix updates.
- Attend J. O'Neall's weekly staff meeting to provide facilities coordinating updates for department, assessment of pager use and reassignment of same.
- Review weekly AWS (warranty claims) for throttle body for report out in weekly Reliability Council meeting looking at warranty trends.
-

January Goals

- Effectively support the S.W.A.T. team with an interim containment action plan, continue V-Engine PMA responsibilities, facilities coordination and ISO responsibilities to the department. Continuously strive to gain additional responsibilities to advance my career and improve skills matrix to remain a valuable member of the department.

Name: **Amy Poma**
Program: **FMEI-dPFE sensor potential recall issue**
Date: **December 20, 2002**

Summary

Support the FMEI Teams in project management in developing project plans, organizing and facilitating meetings, tracking recall issues, managing special projects and assist in creating systems and processes to better support the teams in tracking ongoing developments and issues. Coordinate efforts for continued services to the Ford customer.

December Accomplishments

- Continued PMA support for the 4.6L PN96/U222 IAC (Idle Air Control) valve newly formed S.W.A.T. Team which is a highly visible six sigma project requiring 24hr. turnaround for the responsibilities and assignments as the team works to identify root cause for the sticking of the IAC valve.
    - Support in twice daily meetings in determining and tracking work streams to identify root cause for the IAC sticking.
    - Identify new work streams for the day and continue to track these in parallel to those previously identified.
    - Provide countermeasures and samples for test and work with Hitachi Japan and Hitachi Kentucky who are developing the countermeasures.
    - Analysis of Critical sources of variation – work with the team to compare production capability to the measurements from field return valves.
    - Create and maintain evidence book, chemical and vehicle testing analysis.
- Effective communication between multiple teams and suppliers for ongoing automotive and move coordinating issues.
- Facilitities coordinator for the FMEI department including MAC updates, IT billing, pager assessment, telecommunications equipment, floor plan and seating matrix updates.
- Attend J. O'Neall's weekly staff meeting to provide facilities coordinating updates for department, assessment of pager use and reassignment of same.
- Review weekly AWS (warranty claims) for throttle body for report out in weekly Reliability Council meeting looking at warranty trends.
-

January Goals

- Effectively support the S.W.A.T. team with an interim containment action plan, continue V-Engine PMA responsibilities, facilities coordination and ISO responsibilities to the department. Continuously strive to gain additional responsibilities to advance my career and improve skills matrix to remain a valuable member of the department.

14D: Kavlico TM-dPFE (9J460) Sensor Roster

Name:	CDSID @ford.com	Role	Phone (313)	Fax (313)	Department	Time Allotted
Ken Klostermeyer	kklooster	FMEI Department Manager	[redacted]		FMEI	
Karen Owens	kowens	Supervisor			FMEI	100%
Mark Freeland	mfreela1	Six Sigma Black Belt (FRL)			FRL	100%
Carol Verner	cverner	FMEI Engineer			FMEI	100%
Kurt Schleding	kschledt	Reliability Integration Group-Supervisor			RIE	
Mahmoud Awad	mawad	Reliability Integration Engineer			RIE	
Cathy Bansek	cbansek2	CMPT Engineer			FMEI	10-15%
Freeman Gatee	fgatee	Technical Specialist (FMEI)			FMEI	As Needed
Karen Kerezi	kkerezi	AWS Analyst (FMEI)			FMEI	As Needed
Mary Akins	makins	Kavlico Representative				100%
					FMEI	
Joe Johnson	jjohnson	Section Supervisor			FMEI	
Mark Bronni	mbronnf	Motorola Representative			FMEI	
					V-Engine:	
Lawdan Ehsani	lehsani	Six Sigma Black Belt (4.0L)			4.0L	
Joe Smythe	jsmythe	STA Engineer			STA	75%
Patrice White-Johnson	pwhitejo	STA Site Manager			STA	
Marci Kaminski	mkaminsk	Consumer Driven Six Sigma Blackbelt			FMEI	
Bill McCarty	wmccart1	Production Buyer			Purchasing Service	
Gunther Albrecht	galbrech	V-Engine Service Engineer			V-Engine	
Chris Nielsen	cnielse4	Service Buyer			FCSD	
Mitch Mardell	mmardell	CCRG Manager (I-4 Engine)			FCSD	
Olaf Kunde	okunde1	Program Manager: Focus			Focus Team	
Rick Williamson	rwill110	ECI Product Concern Analyst			FCSD	
John Shore	jshore	PS&L Recall Manager			FCSD	
Greg Oswalt	goswalt	Critical Concerns Manager (Truck)			FCSD	
Chris Panaretos	cpanaret	Team PMA			VEE	

EXHIBIT 6-127-8 19606

created: 6/04/02
revised:

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting
FMEI - DI196

Meeting Date: _____

Please:								
- Initial or check the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If you name is not on this list, please write it in at the bottom including the appropriate detail.								
*** Denotes Core Team Member**								
CORE TEAM	Initial	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL
*		[redacted]			On-Site Rep.	Kavlico	POEE	[redacted]
					Six Sigma Black Belt	Ford	POEE	
					Service Engineer	Ford	POEE	
*					EESE - AVT Wiring Specialist	Ford	AVT5	
					PT Elec Appl - 4.6 F150 Supv./Leader	Ford	POEE	
					Chief Engineer	Ford	POEE	
*					Reliability Engineer/ Field Data Leader	Ford	POEE	
*					Program Manager/Technical Leader	Kavlico	CA	
					FMEI CPMT Eng./WERs concerns	Ford	POEE	
					FQE Supervisor	Ford	TWCTDR	
					ECI Supervisor	Ford	TWCTDR	
					On-Site Rep.	Motorola	POEE	
					Master Black Belt	Ford	POEE	
					Director MEMS Technology	Kavlico	CA	
					PT Elec Appl 3.0L 4V Esc/Taurus Supv.	Ford	POEE	
					Vehicle Environmental Engineering	Ford	FPB4	
*					6-Sigma Black Belt	Ford	FRL	
					4.6L OPD	Ford	POEE	
*					FMEI Tech Spec./Technical Lead	Ford	POEE	
					C&P Supervisor	Ford	VPC	
					FRL Scan Elec Microscope-Expert	Ford	FRL	
					PCSE Applications Engineer	Visteon	POEE	
					Six Sigma Black Belt	Ford	POEE	
					FMEI Section Supv.	Ford	POEE	
					FMEI AWS Analyst	Ford	POEE	
					FMEI EGR Supervisor	Ford	POEE	
					Chief Engineer	Ford	POEE	

EM02-027-8 10807

created: 01/04/02
revised:

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting

FMEI - DI196

Meeting Date: _____

Please:
- Initial or check the box to the left of your name to indicate your attendance.
- Make any corrections to the detail associated with your name.
- If you name is not on this list, please write it in at the bottom including the appropriate detail.

* Denotes Core Team Member

CORE TEAM	Initial	LAST NAME	FIRST NAME	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL
		[redacted]		PT Focus Program Mgr.	Ford	VPC	
*				Leader	Ford	PPB4	
				Team Leader	Ford	POEE	
*				Production Buyer	Ford	Purchasing	
				Recall Analyst	Ford	FCSD	
*				Service Buyer	Ford	FCSD	
				FMEI Dept. Mgr.	Ford	POEE	
				Critical Con. Mgr.	Ford	FCSD	
*				Proj. Mgt. Analyst	Project Solutions	POEE	
*				VP Research and Dev't	Kavlico	CA	
				PT Electronics Engineer	Ford	POEE	
				PT Elec Appl 2.0L Zetec Focus/Escape S	Ford	POEE	
*				Campaign Manager	Ford	POEE	
				C&P Quality Eng (Leader)	Ford	VPC	
*				APTE PT CPS	Ford	APTE	
				STA Site Engineer	Ford	PTE	
				Wiring CPS - EESE Leader	Ford	Bldg. #1	
				Reliability Supervisor	Ford	POEE	
				PS&L Recall Mgr.	Ford	FCSD	
				Warranty Anelysis	Kavlico	CA	
				OGC Lawyer	Ford	PDC	
				FMEI Engineer	Ford	POEE	
				SCI Prod.Con.Anal.	Ford	FCSD	

created: 12/11/01
revised: 2/4/2003

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Meeting Date: 2/4/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Akins	Mary	X		X	X	X	X	X	X	X	X	X
	Albrecht	Gunther											
	Akolkar	Shri											
*	Alles	Sheran					X	X	X		X		X
	Arnold	Ken					X	X					
	Auller	Jim											
*	Awad	Mahmoud		X	X	X	X	X	X	X	X	X	X
*	Ayers	Don						X					
	Bansek	Catherine											
	Barauder	Lee											
	Bissi	Gerry											
	Bronni	Mark											
	Danes	Adam											
	Davies	Brady									X	X	X
	Deeb	Joe					X						
	Douglass	Jim						X	X				
*	Freeland	Mark		X	X	X	X	X	X	X	X	X	X
	Galante	Chris											
*	Gates	Freeman	X	X	X	X	X	X	X	X	X	X	X
	Giordano	Mike											
	Hangas	Jon											
	Jahshan	John					X	X	X		X	X	
	Janda	Jon											
	Johnson	Joe		X			X		X			X	
	Karezi	Karen											
	Kunde	Olef											
	Masura	Gordon											

created: 12/11/01
revised: 2/4/2003

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Meeting Date: 2/4/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Maurer	Jim										
	McCarty	Bill							X			
	Muter	Doreen					X				X	
*	Nielsen	Chris						X				X
*	O'Neall	Jim				X	X	X	X	X		X	X
	Oswalt	Greg										
	Owens	Karen	X	X		X	X	X	X				X
*	Panaretos	Chris	X	X	X	X	X	X	X	X	X	X	X
	Park	Kyong									X	X	X
	Pascany	Ken					X	X		X			
*	Perry	Brian					X	X	X	X	X		X
*	Planta	Paul	X	X	X	X	X	X	X	X	X	X	X
	Popoff	Dan					X						
	Raquepau	Al											
*	Rossi	Robert				X	X		X		X		
	Schleding	Kurt	X						X		X	X	X
	Shore	John							X			X	X
*	Smythe	Joe					X			X			
	Tamashiro	Terry						X	X		X		X
	Trujillo	Tom											
	Verner	Carol		X	X	X	X	X	X	X			X
	White-Johnson	Patrice											
	Williamson	Rick											
	Wilson	Cary											
	others:												
	Bugsl	Barry					X	X	X	X		X	

EMO-427-A 1/1999

created: 12/11/01
revised: 2/4/2003

2000-2002 Kavlico TM dPFE Sensor
Attendance List

Meeting Date: 2/4/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
	Williams	Les					X					
	DiCicco	Tamara						X				
	Tyler	Dave						X				
	Sebold	Lynn						X				

EMC2-627-8 10681

created: 12/11/01

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Core Team, Department

Revision Date: 2/4/2003

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
*	[redacted]			EESE	AVT Wiring Specialist	Ford	AVT5		
*				EESE	Wiring CPS - EESE Leader	Ford	Bldg. #1		
*				FCSD	PS&L Recall Mgr./Parts costs & buy	Ford	FCSD		
*				FRL	6-Sigma Black Belt	Ford	FRL		
*				Kavlico	On-Site Rep.	Kavlico	POEE		
*				Kavlico	Program Manager/Technical Leader	Kavlico	CA		
*				PT Elec Appl	2.0L Zetec Focus/Escape Supv.	Ford	POEE		
*				Purchasing	Service Buyer	Ford	FCSD		
*				Purchasing	STA Site Manager	Ford	AVT5		
*				Quality Office	Reliability Engineer/ Field Data Leader	Ford	POEE		
*				V-Engine	FMEI Tech Spec./Technical Lead	Ford	POEE		
*				V-Engine	Project Leader	Ford	POEE		
*				V-Engine	FMEI Dept. Mgr.	Ford	POEE		
*				V-Engine	Proj. Mgt. Analyst	Proj.Solution	POEE		
*				V-Engine	Campaign Manager	Ford	POEE		
				APTE	PT CPS	Ford	APTE		
				EESE	Vehicle Environmental Engineering	Ford	FPB4		
				EESE	PT Electronics Engineer	Ford	POEE		
				EPRC	Leader	Ford	FPB4		
				EPRC	Critical Con. Mgr.	Ford	FCSD		
				FCSD	FQE Supervisor	Ford	TWCTDR		
				FCSD	ECI Supervisor	Ford	TWCTDR		
				FCSD	Recall Analyst	Ford	FCSD		
				FCSD	ECI Prod.Con.Anal.	Ford	FCSD		
				Focus	C&P Supervisor	Ford	VPC		
				Focus	PT Focus Program Mgr.	Ford	VPC		
				Focus	C&P Quality Eng (Leader)	Ford	VPC		
				FRL	Scan Elec Microscope-Expert	Ford	FRL		
				Kavlico	Director MEMS Technology	Kavlico	CA		

EP02-027-B 18982

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Core Team, Department

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	[redacted]			Kavlico	VP Research and Dev't	Kavlico	CA	[redacted]	
				Kavlico	Warranty Analysis	Kavlico	CA		
				Motorola	On-Site Rep.	Motorola	POEE		
				OGC	Lawyer	Ford	PDC		
				PCSE	PCSE Applications Engineer	Visteon	POEE		
				PT Elec Appl	4.6 F150 Supv./Leader	Ford	POEE		
				PT Elec Appl	3.0L 4V Esc/Taurus Supv.	Ford	POEE		
				PTSE	Chief Engineer	Ford	POEE		
				Purchasing	Production Buyer	Ford	Purchasing		
				Quality Office	Reliability Supervisor	Ford	POEE		
				V-Engine	Six Sigma Black Belt	Ford	POEE		
				V-Engine	Service Engineer	Ford	POEE		
				V-Engine	FMEI CPMT Eng./WERs concerns	Ford	POEE		
				V-Engine	Master Black Belt	Ford	POEE		
				V-Engine	Six Sigma Black Belt	Ford	POEE		
				V-Engine	FMEI Section Supv.	Ford	POEE		
				V-Engine	FMEI AWS Analyst	Ford	POEE		
				V-Engine	FMEI EGR Supervisor	Ford	POEE		
				V-Engine	Chief Engineer	Ford	POEE		
				V-Engine	FMEI Engineer	Ford	POEE		

created: 12/11/01

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Name

Revision Date: 2/4/2003

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
*	[redacted]			Kavlico	On-Site Rep.	Kavlico	POEE		
				V-Engine	Six Sigma Black Belt	Ford	POEE		
				V-Engine	Service Engineer	Ford	POEE		
*				EESE	AVT Wiring Specialist	Ford	AVT5		
				PT Elec Appl	4.6 F150 Supv./Leader	Ford	POEE		
				PTSE	Chief Engineer	Ford	POEE		
*				Quality Office	Reliability Engineer/ Field Data Leader	Ford	POEE		
*				Kavlico	Program Manager/Technical Leader	Kavlico	CA		
				V-Engine	FMEI CPMT Eng./WERs concerns	Ford	POEE		
				FCSD	FQE Supervisor	Ford	TWCTDR		
				FCSD	ECI Supervisor	Ford	TWCTDR		
				Motorola	On-Site Rep.	Motorola	POEE		
				V-Engine	Master Black Belt	Ford	POEE		
				Kavlico	Director MEMS Technology	Kavlico	CA		
				PT Elec Appl	3.0L 4V Esc/Taurus Supv.	Ford	POEE		
				EESE	Vehicle Environmental Engineering	Ford	FPB4		
*				FRL	6-Sigma Black Belt	Ford	FRL		
*				V-Engine	FMEI Tech Spec./Technical Lead	Ford	POEE		
				Focus	C&P Supervisor	Ford	VPC		
				FRL	Scan Elec Microscope-Expert	Ford	FRL		
				PCSE	PCSE Applications Engineer	Visteon	POEE		
				V-Engine	Six Sigma Black Belt	Ford	POEE		
				V-Engine	FMEI Section Supv.	Ford	POEE		
				V-Engine	FMEI AWS Analyst	Ford	POEE		
				V-Engine	FMEI EGR Supervisor	Ford	POEE		
				V-Engine	Chief Engineer	Ford	POEE		
				Focus	PT Focus Program Mgr.	Ford	VPC		
				EPRC	Leader	Ford	FPB4		
*				V-Engine	Project Leader	Ford	POEE		

ESEZ-827-B 16894

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Name

Kavlico TM dPFE Sensor									
Team Roster									
* Denotes Core Team Member									
CORE TEAM	LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	[redacted]			Purchasing	Production Buyer	Ford	Purchasing	[redacted]	
				FCSD	Recall Analyst	Ford	FCSD		
*				Purchasing	Service Buyer	Ford	FCSD		
*				V-Engine	FMEI Dept. Mgr.	Ford	POEE		
				EPRC	Critical Con. Mgr.	Ford	FCSD		
*				V-Engine	Proj. Mgt. Analyst	Proj.Solution	POEE		
				Kavlico	VP Research and Dev't	Kavlico	CA		
				EESE	PT Electronics Engineer	Ford	POEE		
*				PT Elec Appl	2.0L Zetec Focus/Escape Supv.	Ford	POEE		
*				V-Engine	Campaign Manager	Ford	POEE		
				Focus	C&P Quality Eng (Leader)	Ford	VPC		
				APTE	PT CPS	Ford	APTE		
*				EESE	Wiring CPS - EESE Leader	Ford	Bldg. #1		
				Quality Office	Reliability Supervisor	Ford	POEE		
*				FCSD	PS&L Recall Mgr./Parts costs & buy	Ford	FCSD		
				Kavlico	Warranty Analysis	Kavlico	CA		
				OGC	Lawyer	Ford	PDC		
				V-Engine	FMEI Engineer	Ford	POEE		
*				Purchasing	STA Site Manager	Ford	AVTS		
				FCSD	ECI Prod.Con.Anal.	Ford	FCSD		

EXHIBIT 1006
IPR2015-00627

Kavlico TM dPFE Sensor

Issues Tracking Documents, Correspondence

Kavlico TM dPFE Sensor

Supporting Documents

ER82-827-B 18697

Kavlico TM dPFE Sensor

Meeting Minutes, Attemdance Sheets

Book 2

Internal Ford Kavlico Meeting

Where: POEE FMEI conf. Rm. DI-196

Time: 1:00-2:30 p.m.

Attendees:
Jim O'Neall
Jim Maurer
Paul Plante
Bill McCarty
Roberto Rossi
John Jahshan

Agenda:
-Pareto of warranty from 21 vehicle lines
-Repeat Repair Study
-Correlation of PCM warranty and dPFE warranty
-Warranty of other sensors that use CMOS technology and correlation to dPFE.
-Electrical testing to date
-PV failures
-Soft failures
-Control Charts out of control
-Other Issues

created: 6/10/10
revised:

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting
POEE E103A (Pillar L10)

Meeting Date: _____

Please:								
- Initial or check the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If you name is not on this list, please write it in at the bottom including the appropriate detail.								
Initial		LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL
		[redacted]			Quality Manager	Ford	to POEE	[redacted]
					Engineering Supervisor	Ford	POEE	
					Component Engineer	Ford	POEE	
					Project Management	Project Solutions	POEE	
					6-Sigma Black Belt	Ford	POEE	
					Section Supervisor	Ford	POEE	
					6-Sigma Black Belt	Ford	POEE	

6902-627-9 10946

created: 12/11/01
revised: 2/4/2003

2000-2002 Kavlico TM dPFE Sensor
Attendance List

Meeting Date: 2/4/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Akins	Mary	X		X	X	X	X	X	X	X	X	X
	Albrecht	Gunther											
	Akolkar	Shri											
*	Alles	Sheran					X	X	X		X		X
	Arnold	Ken					X	X					
	Auller	Jim											
*	Awad	Mahmoud		X	X	X	X	X	X	X	X	X	X
*	Ayers	Don						X					
	Banaek	Catherine											
	Benauder	Lee											
	Blasl	Gerry											
	Bronni	Mark											
	Danes	Adam											
	Davies	Brady									X	X	X
	Deeb	Joe					X						
	Douglass	Jim						X	X				
*	Freeland	Mark		X	X	X	X	X	X	X	X	X	X
	Galante	Chris											
*	Gates	Freeman	X	X	X	X	X	X	X	X	X	X	X
	Giordano	Mike											
	Hangas	Jon											
	Jahshan	John					X	X	X		X	X	
	Janda	Jon											
	Johnson	Joe		X			X		X			X	
	Kerazi	Karen											
	Kunde	Olaf											
	Masura	Gordon											

created: 12/11/01
revised: 2/4/2003

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Meeting Date: 2/4/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Maurer	Jim										
	McCarty	Bill							X				
	Muter	Dorsen					X				X		
*	Nielsen	Chris						X					X
*	O'Neall	Jim				X	X	X	X	X		X	X
	Oswalt	Greg											
	Owens	Karen	X	X		X	X	X	X				X
*	Panaretos	Chris	X	X	X	X	X	X	X	X	X	X	X
	Park	Kyong									X	X	X
	Pascany	Ken					X	X		X			
*	Perry	Brian					X	X	X	X	X		X
*	Plante	Paul	X	X	X	X	X	X	X	X	X	X	X
	Popoff	Dan					X						
	Raquepau	Al											
*	Rossi	Robert				X	X		X		X		
	Schleding	Kurt	X						X		X	X	X
	Shore	John							X			X	X
*	Smythe	Joe					X			X			
	Tamashiro	Terry						X	X		X		X
	Trujillo	Tom											
	Verner	Carol		X	X	X	X	X	X	X			X
	White-Johnson	Patrice											
	Williamson	Rick											
	Wilson	Cary											
	others:												
	Bugaj	Berry					X	X	X	X		X	

EXHIBIT 1004 - 027 - 6

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
	Williams	Les					X					
	DiCicco	Tamara						X				
	Tyler	Dave						X				
	Sebold	Lynn						X				

EXHIBIT 1004
8-27-2003

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**To Achieve Vehicle Issues Resolution by addressing vehicle issues leading to decision if IS/IS NOT Root Cause with delegation of assignments and collection of data to bring to conclusion**

Meeting Logistics		
Subject:	Kavlico TM dPFE Sensor Vehicle Issues Resolution.	
Dates:	July 8, 2002	
Time:	1-3:00 p.m.	
Location:	POHR, conference rm.B103A, (pillar L10)	
Called By:	Jon Janda, Team Leader 24(8-2589)	
Next Meeting (s):	July 15, 2002, Core Team Meeting	
	July 22, 2002, Core Team Meeting	
	NOTE NO MEETING JULY 1, 2002	
Conference Call-in Number(s):		

Core Team Participants					
Black Belts	Kavlico	V-Engine	Quality Office	BESE	
Mark Freeland	Mary Akins	Jim Maurer	Mahmoud Awad	Sheran Allen	
Shri Akolkar		Freeman Gates		Robert Rossi	
Jim McCoy		Amy Poma			
		Paul Plante			
Team Leader	Visteon	Carol Verner			
Jon Janda	John Jahahan				

Meeting Agenda –6/24/02			
Order of Agenda Items		Person(s) Responsible	Time Allocated
1. Review IS/IS NOT document and update.		Jon Janda	20 minutes
2. Keith Frazier conclusions		Keith Frazier	20 minutes
3. Test status		Mark Freeland	20 minutes

Other Open Issues for Discussion	Person(s) Responsible	Time Estimated

Jim Maurer/cp: 2/4/2003
Kavlico dPFE Sensor Core Team

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**To Achieve Vehicle Issues Resolution by addressing vehicle issues leading to decision if IS/IS NOT Root Cause with delegation of assignments and collection of data to bring to conclusion**

Meeting Logistics		
Subject:	Kavlico TM dPFE Sensor Vehicle Issues Resolution.	
Dates:	July 29, 2002	
Time:	1-3:00 p.m.	
Location:	POEE, conference rm.E103A, (pillar L10)	
Called By:	Jon Janda, Team Leader 24(8-2589)	
Next Meeting (s):	August 5, 2002, Core Team Meeting	
Conference Call-in Number(s):		

Core Team Participants					
Black Belts	Kavlico	V-Engine	Quality Office	EESE	
Mark Freeland	Mary Akins	Jim Maurer	Mahmoud Awad	Sheran Allen	
Shri Akolkar		Freeman Gates		Robert Rossi	
Jim McCoy		Amy Poma			
		Paul Plante			
Team Leader	Visteon	Carol Verner			
Jon Janda	John Jahshan				

Meeting Agenda –7/29/02			
Order of Agenda Items		Person(s) Responsible	Time Allocated
1. EGR pressure and temperature@ zero flow.		Shri Akolkar	15 minutes
2. Definition of latch.		All	20 minutes
3. Quantifying a latch condition.		All	20 minutes
4. Escape brake light switch & cigarette lighter wirking harness 1 pg. Document.		Robert Rossi	10 minutes
5. 14D Team meetings-structure/status - follow up from Koszewnik mtg.		Jim Maurer	15 minutes
6. Walk Ins.		All	

Other Open Issues for Discussion	Person(s) Responsible	Time Estimated

Jim Maurer/cp: 2/4/2003
Kavlico dPFE Sensor Core Team

AIR METERING SYSTEMS SECTION RESPONSIBILITIES
SUPERVISOR – Gary Liimatta
(32-27714 - GLIIMAT)

G. Liimatta – Responsibilities

- Mentor and develop subordinates, including career counseling and encouraging growth through the Skills Management Process.
- Assist Purchasing and STA (Supplier Technical Assistance) in the development and selection of sub-system suppliers.
- Oversee the development of, and manage Subsystem Design Specifications where applicable.
- Support Corporate Human Resource directives.
- Accountable to support >> PTPRP.
- Responsible for managing the design activity for sub-systems are met, as defined by Environmental and Safety Engineering Staff and Car Product Development.
- Ensure that the investigation and solution of product concerns are carried out, that may be related directly or indirectly to sub-systems.
- Assume all responsibilities as outlined in generic Manager/Supervisor Roles and Responsibilities.

C. Pettit (Chuck) 24-89094 (cpettit)	▪ CPMT leader for V6 throttle body programs. ▪ Assume all applicable responsibilities as outlined in generic CPMT leader roles and responsibilities for specific throttle body program. ▪ Oversee water headed throttle body implementation. ▪ Oversee TRC screw concern. ▪ Support ETB launch concerns.
S. Subramanian (Swami) 32-29265 (ssubram2)	▪ Certified Blackbelt ▪ Working on Blackbelt projects: Electronic Throttle Body, Idle Air Control Valve to reduce warranty cost and improve customer satisfaction. ▪ Mentor and coach to Blackbelt candidates.
B. Schwager (Bryce) 33-79554 (bschwage)	▪ Six Sigma Blackbelt candidate. ▪ Working on Electric Throttle Body Blackbelt projects to reduce warranty cost and improve customer satisfaction.
S. Liberatiny (Sue) 31-79085 (sliberti)	
W. Wettach (Bill) 32-21695 (wwettach)	▪ Component Champion for the IACV (Idle Air Control Valve) Hitachi/Denso ▪ Component Champion for the IMTV (Intake Manifold Tuning Valve) Eaton ▪ Component Champion for the IMRC (Intake Manifold Runner Control) SVDO ▪ Component Champion for the LSRC (Long Short Runner Control) Eaton ▪ Component Champion for the CMCV (Charge Motion Control Valve) SVDO/Sturdy

created: 6/10/10
revised:

2000-2002 Kavlico TM dPFE Sensor

Core Team Meeting
POEE E103A (Pillar L10)

Meeting Date: _____

Please:
- **Initial or check the box to the left of your name to indicate your attendance.**
- **Make any corrections to the detail associated with your name.**
- **If you name is not on this list, please write it in at the bottom including the appropriate detail.**

Initial		LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL
		Libertiny	Susan	789-2050	Quality Manager	Ford	to POEE	[redacted]
		Limatta	Gary	322-7714	Engineering Supervisor	Ford	POEE	
		Petitt	Chuck	248-6094	Component Engineer	Ford	POEE	
		Poma	Amy	390-6849	Project Management	Project Solutions	POEE	
		Schwager	Bryce	337-9554	6-Sigma Black Belt	Ford	POEE	
		Sriraman	Ram	594-9823	Section Supervisor	Ford	POEE	
		Subramanian	Swami	594-3328	6-Sigma Black Belt	Ford	POEE	
		Wetzel	Bill	322-1695	Design Engineer	Ford	POEE	

Issue 6-29-2010

Amy Poma, Project Solutions, LLC.

created: 12/11/01
revised: 2/5/2003

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Meeting Date: 2/5/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Akins	Mary	X		X	X	X	X	X	X	X	X	X
	Albrecht	Gunther											
	Akolkar	Shri											
*	Allee	Sheran					X	X	X		X		X
	Arnold	Ken					X	X					
	Auller	Jim											
*	Awad	Mahmoud		X	X	X	X	X	X	X	X	X	X
*	Ayers	Don						X					
	Bansek	Catherine											
	Bersuder	Lee											
	Bisel	Gerry											
	Bronni	Mark											
	Danee	Adam											
	Davies	Brady									X	X	X
	Deeb	Joe					X						
	Douglass	Jim						X	X				
*	Freeland	Mark		X	X	X	X	X	X	X	X	X	X
	Galante	Chris											
*	Gates	Freeman	X	X	X	X	X	X	X	X	X	X	X
	Giordano	Mike											
	Hangas	Jon											
	Johshon	John					X	X	X		X	X	
	Janda	Jon											
	Johnson	Joe		X			X		X			X	
	Kerezi	Karen											
	Kunde	Olaf											
	Masura	Gordon											

ER02-427-0 18992

created: 12/11/01
revised: 2/5/2003

2000-2002 Kavlico TM dPFE Sensor

Attendance List

Meeting Date: 2/5/2003

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
*	Maurer	Jim										
	McCarty	Bill							X			
	Muter	Doreen					X				X	
*	Nielsen	Chris						X				X
*	O'Neall	Jim				X	X	X	X	X		X	X
	Oswalt	Greg										
	Owens	Karen	X	X		X	X	X	X				X
*	Panarelos	Chris	X	X	X	X	X	X	X	X	X	X	X
	Park	Kyong									X	X	X
	Pascany	Ken					X	X		X			
*	Perry	Brian					X	X	X	X	X		X
*	Plante	Paul	X	X	X	X	X	X	X	X	X	X	X
	Popoff	Dan					X						
	Raquepeu	Al											
*	Rossi	Robert				X	X		X		X		
	Schiedling	Kurt	X						X		X	X	X
	Shore	John							X			X	X
*	Smythe	Joe					X			X			
	Tamashiro	Terry						X	X		X		X
	Trujillo	Tom											
	Verner	Carol		X	X	X	X	X	X	X			X
	White-Johnson	Patrice											
	Williamson	Rick											
	Wilson	Cary											
	others:												
	Bugaj	Barry					X	X	X	X		X	

E982-627-8 19983

2000-2002 Kavlico TM dPFE Sensor
Attendance List

Kavlico dPFE Sensor Team Roster												
* Denotes Core Team Member												
CORE TEAM	LAST NAME	FIRST NAME										
	Williams	Lee					X					
	DiCicco	Tamara						X				
	Tyler	Dave						X				
	Sebold	Lynn						X				

EXHIBIT 1
02-027-P

created: 12/11/01

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Organization/Department

Revision Date: 3/3/2003

Kavlico TM dPFE Sensor								
Team Roster								
* Denotes Core Team Member								
LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
[redacted]			V-Engine	FMEI Tech Spec./Technical Lead	Ford	POEE	[redacted]	
			V-Engine	FMEI Supervisor	Ford	POEE		
			V-Engine	Proj. Mgt. Analyst	Proj.Solution	POEE		
			V-Engine	Campaign Manager	Ford	POEE		
			V-Engine	FMEI Engineer	Ford	POEE		
			V-Engine	Service Engineer	Ford	POEE		
			V-Engine	FMEI CPMT Eng./WERs concerns	Ford	POEE		
			V-Engine	FMEI Section Supv.	Ford	POEE		
			V-Engine	FMEI AWS Analyst	Ford	POEE		
			V-Engine	FMEI Dept. Mgr.	Ford	POEE		
			Quality Office	Reliability Engineer/ Field Data Leader	Ford	ATNPC		
			Quality Office	Reliability Supervisor	Ford	POEE		
			Purchasing	STA Engineer (Leader)	Ford	PTE		
			Purchasing	Production Buyer	Ford	Purchasing		
			Purchasing	Service Buyer	Ford	FCSD		
			Purchasing	STA Site Manager	Ford	AVTS		
			PTSE	Chief Engineer	Ford	POEE		
			PTSE	AVT Chief Engineer	Ford	POEE		
			Motorola	On-Site Rep.	Motorola	POEE		
			Kavlico	On-Site Rep.	Kavlico	POEE		
			Kavlico	Program Manager/Technical Leader	Kavlico	CA		
			Kavlico	Director MEMS Technology	Kavlico	CA		
			Kavlico	VP Research and Dev't	Kavlico	CA		
			Kavlico	Warranty Analysis	Kavlico	CA		
			FRL	6-Sigma Black Belt	Ford	FRL		
			Focus	C&P Supervisor	Ford	VPC		
			Focus	PT Focus Program Mgr.	Ford	VPC		
			Focus	C&P Quality Eng (Leader)	Ford	VPC		

created: 12/11/01

2000-2002 Kavlico TM dPFE Sensor

Team Roster by Organization/Department

Revision Date: 3/3/2003

Kavlico TM dPFE Sensor								
Team Roster								
* Denotes Core Team Member								
LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
[redacted]			FCSD	Recall Program Manager	Ford	DSCII	[redacted]	[redacted]
			FCSD	FQE Supervisor	Ford	TWCTDR		
			FCSD	ECI Supervisor	Ford	TWCTDR		
			FCSD	PS&L Recall Mgr.	Ford	FCSD		
			FCSD	ECI Prod.Con.Anal.	Ford	FCSD		
			EPRC	Leader	Ford	FPB4		
			EPRC	Critical Con. Mgr.	Ford	FCSD		
			EESE	Wiring CPS	Ford	Bldg. #1		
			EESE	Chief Engineer	Ford	AVTS		
pgp/dpfeteam.xls; 12/17/01								

EXHIBIT 17038

From: Fournelle, Gilbert (G.)
Sent: Friday, January 24, 2003 9:03 AM
To: Fascetti, Bob (R.J.); Altoonian, Don (D.J.); Andy Jones (E-mail); Bauer, Scott (S.C.); Bernie Nikolai (E-mail); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell (E-mail); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diaz, Timothy (T.P.); Duvall, Allen (A.W.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Goodwin, William (W.R.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hoshino, Jun (J.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald (E-mail); Jordan, Donald (D.E.); Kanai, Shinji (S.); Kosko, Jeff (J.R.); Lawler, Dave (D.A.); Le, Dzung (D.H.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Marck, Edmond (E.C.); Marianos, Tom (T.E.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); McGee, Brett (B.L.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morishima, Shigeki (S.); Nakano, Hideki (H.); Naveed Khan (E-mail); Namatollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Ott, David (D.J.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Rothweiler, Daniel (D.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hirokhi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.); Yeung, Lam (.)
Subject: 3.0L U204 Phantom stall meeting minutes

1/23/02 2:00pm MEETING AGENDA

Attendees:

Don Altoonian
Marti Price
Rhae Suarez
Steve Limtiaco
John McDonald
Bob Dalbo

- **Reports from Field**

Don Altoonian:

- o Phantom stall reported on 2003 MY vehicle built in December 02. Don Altoonian will check with dealership
- o 2002 MY buy back vehicle with 9600 mi from Gainesville FL has stalls on engagement from Drive to Reverse. Don Altoonian will pick up the vehicle in FL and bring it back to Dearborn to be checked out.

Dan Rothweiler:

- o Early built 01 vehicle had phantom stall after TSB was performed. Problem was diagnosed to be missing MAF sensor gasket which caused erroneous drift in fuel trims.
- o Buy back vehicle which had been driven by Dan for 2500 miles without stall had 3 stalls within 100 mi after resale. No faults were found, no problems for last two weeks. Dan is staying in contact with customer for follow up.

Steve Limtiaco:

- o Vehicle built on November 8 2002 had stall problem is Connecticut. Dealership called hotline. Hotline suggested to check electrical connections and is currently waiting for feedback from dealer. Dan Rothweiler is also following up with dealer.

EP02-827-C 2383

- **Issue of reprogramming a new (MPC-161) PCM with the old (MPC-160) calibration**

  o WDS Releases (B22NM.9 and B22N.5) released on 1/20/03 fixed concern. Rhae Suarez will issue an SSM to notify dealerships.

KCAP Implementation Timing

KCAP Actions	Concern #	Revised Part #	Implementation Timing	
1. Omron to Hella Relays	C11293441	No Change	07/27/01	
2. Updated production calibration	C11299149	See concern	1/16/02 (3 out of 7)	
3. Inverted delta status- G101 ground		N/A	01/15/02	
4. Inverted delta status- G100 ground	C11294758	N/A		
5. Inverted delta status- G104/G105	C11294758	N/A		
6. Implementation of robust MAF	C11299286	1L2F-12B579-BA	05/30/02	
7. IAC change from Guide A to Finned Pintle (CEP2 action)	C11252737	1L8E-9F715-AA	8/30/02 Cleveland	
			9/16/02 KCAP	
8. 3.0L dPFE change from Kavlico to Motorola	C11262413	2F1Z-9J460-AA	07/22/02	
9. 2.0L dPFE change from Kavlico to Motorola	C11274132	2F1Z-9J460-AA	07/22/02	
10. Revised vent line location	C11326381		09/09/02	
11. Technical Service Bulletin (TSB 02-08-06)	N/A	N/A	4/24/02	
12. Special Service Message (SSM 15589)	N/A	N/A	1/29/02	
13. Internal Service Message (ISM 02-01-070) - pre-TSB	N/A	N/A	2/5/02	
14. ISM 02-05-017 - post-TSB	N/A	N/A	5/6/02	
15. ISM 02-05-043 - Add MAF Gskt to ISM 02-05-017	N/A	N/A	5/20/02	
16. TSB 02-11-06 - Modify Calibration Wording	N/A	N/A	6/5/02	
17. ISM 02-06-025 - Update TSB Reference	N/A	N/A	6/14/02	
18. TSB 02-23-1 - Incorporate some of ISM & improve wording		N/A	N/A	11/14/02
19. IAC changed to Finned Pintle for service (released)	C11390555	1L8Z-9F715-AA	9/13/02	
Estimated availability is 11/08/02				
20. Calibration Enhancements	C11390580	See concern	9/11/02 for N.A.	
21. EEC w/modified capacitor - production	C11371349	See concern	8/12/02 Est.	
22. EEC w/modified capacitor - service	C11350478	See concern	8/12/02 Est.	
23. Inverted delta status - G102/103	C11394835	N/A	TBD	

Regards,

Gilbert Fournelle
V6 U204 Calibration Engineering
1AE27 Truck Engine Engineering (TEE)
Phone:(313)3904968 Fax:(313)3231786

E982-627-C 2384

From: Peplone, Gil (J.)
Sent: Monday, July 15, 2002 6:10 PM
To: Hansen, George (G.C.); Bak, Paul (P.E.); Alasha, Wahsed (W.D.); Altoonian, Don (D.J.); Anyanwu-Ebo, Ike (I.C.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Dubovec, Jan (J.D.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hale, Tony (A.S.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hoshino, Jun (J.); 'Inoue, Takashi (T.)'; Katinas, Dana (D.J.); Kemerly-Finke, Nikki (K.); King, Robert (R.F.); Klarr, Jerry (G.T.); Kresovsky, Lee (L.P.); Metesa, John (J.); McGee, Brett (B.L.); Miller, Brian (B.J.); Moorhouse, Scott (S.R.); Offer, John (J.D.); Ondrejko, Rick (R.T.); Pheriss, Richard (R.L.); Ronoler, Philippe (P.); Shiraishi, Masaru (M.); Smith, Tony (T.R.); Suarez, Rhae (R.); Vecchio, Anne Marie (A.); Yeung, Lem (.); Johnson, Jim (J.S.); Whitworth, Rudy (A.R.); Bilicki, John (J.R.); Aynessazian, Kam (K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald III, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Koska, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Merck, Edmond (E.C.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Stilgenbauer, Jeffrey (J.R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Les (LHW.); Yeung, Lem (.); Benintende, Robert (R.F.); Terzes, Laura (L.D.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Amely, Felix (F.A.); Bradley, Joe (J.C.); Linde, Peter (P.A.); Goering, Kimberly (K.L.); Benintende, Robert (R.F.); Amely, Felix (F.A.); Lee, Pamela (P.F.); 'mmikee@visteon.com'; Hollister, Dave (D.); Zigler, Brad (B.T.); Stump, Steven (S.M.); Giordano, Mike (M.A.); Zaghati, Z. (.); Samardzich, Raul (R.J.)
Cc: Noteboom, Jim (J.E.); Peplone, Gil (J.); DiAngelo, Renaldo (R.); Surti, P. J. (P.J.)
Subject: Collapsing PCV Hose on 2.0L Zetec for Focus and Escape causing Idle Concerns and/or MIL

Executive Summary

2.0l Zetec Applications can have Rolling Idle/Idle Stalls and "Check Engine" event due to the collapse of the YS4Z-6758-EA PCV hose. This same hose PN is used on both the Focus and Escape.

This Concern is difficult to diagnosis due to the intermittent nature of the failed state. High idle vacuum causes the softened hose elbow rubber to collapse, which partially blocks airflow to the PCV value. This restriction alters the calibration of the PCV value, which allows crankcase airflow at idle.

The two results are:
a. Increased throttle body sludge due to increase oil presence within the zip tube. The resulting TB sludge decreases base idle air flow beyond IAC duty cycle compensation with a resulting Rolling/Hunting Idle.
b. PCV airflow at idle bias the HEGO sensor lean, which the MIL sets a Lean System DTC P0171.

The long term durability of the 2.0L Zetec intake sealing system may also be affected.

TSB/Oasis Communications is recommended.

Pls note that this failure mode affects the 2.0L Zetec engine only. Also, this is not involve the "splitting" rubber elbow/vacuum leak issue reported recently.

Background

PCV hose/elbow material issues involving multiple engine applications is currently in investigation. An Oasis Message describing vacuum leaks which set lean DTCs P0171/P0174 and at the PCV elbow is currently being drafted.

F002-027-C 2581

However, there is new failure mode with involves the 2.0L Zetec only, which causes a Drive Concern of Rolling/Hunting Idle and/or MIL on with DTC P0171.

US Virgin Island 2.0L Zetec Escape

One of 23 Escape Units inspected recently was a 2.0L Zetec Escape exhibiting rolling idle. High IAC DC of 46% were observed.
Root cause was a sludge throttle body.
Further inspection revealed that the YS4Z-6758-EA PCV hose was deformed and collapsed at it's elbow area at Idle.

Local South Florida 2.0L Zetec Focus'

Recently, local Technicians have alerted PFQS to a growing Concern Trend. The 2000/01 2.0L Zetec Focus have been generating a MIL/DTC of P0171. However, instead of root cause of the above "split rubber elbow" concern as described above (this vacuum leak also affects the 2.0L SPI), the hose would be found collapsed at it's elbow.


Overview of subject PCV hose.j...


PCV soft elbow. Note the sligh...


Hose is easily pushed in. It i...

The Techs state that the setting of this lean DTC was common on the 2.0L Zetec Focus and replacement of this PCV hose resolved the Concern. They learned to inspect this hose due to the other failure scenario cited of rubber failure/splitting, which causes engine vacuum leak.

Investigation

PFQS (Powertrain Field Quality Specialist) pondered how a collapsed PCV hose could set a lean DTC. He then realized a system relationship.
Challenges to this theory are welcome, as are alternate suggestions as to the relationship of the subject collapsed PCV hose and the setting of the MIL with lean DTC P0171.

The PCV valve is normally closed at Idle, due to the high idle engine vacuum.

However, if the subject hose is restricted, this changes the ability of the engine's vacuum to fully close the PCV valve at Idle. The PCV valve's spring is calibrated to be overcome the application of the high engine idle vacuum.
With diminished idle vacuum volume, the PCV valve remains partially open.

This results in unmetered airflow at idle, as supplied by the crankcase. The HEGO signal is now biased lean. Short Term Fuel Trims are now affected, which in turn sets the Check Engine Light, with the Lean System DTC of P0171 in Memory.

Also, not all of this additional crankcase Idle is ingested back into the intake manifold . Some will migrate toward the throttle body and solidify in the form of sludge between the TB plate and bore.
This sludge will reduce the base airflow, increasing the IAC duty cycle. Over time, the IAC is not able to compensate.
The result is low idle airflow, which results in Rolling/Hunting Idle.

The affect of Idle Ingestion of crankcase airflow can adversely affect the intake manifold sealing system. A current example is 1999-2000 3.8L Windstar, in which PCV system improvements are part of the exhibiting TSB Service actions to resolve intake system leakage.

While not experienced on the above Concern Units, a low base airflows can result in Decell Engine Stalls.

Recommendation

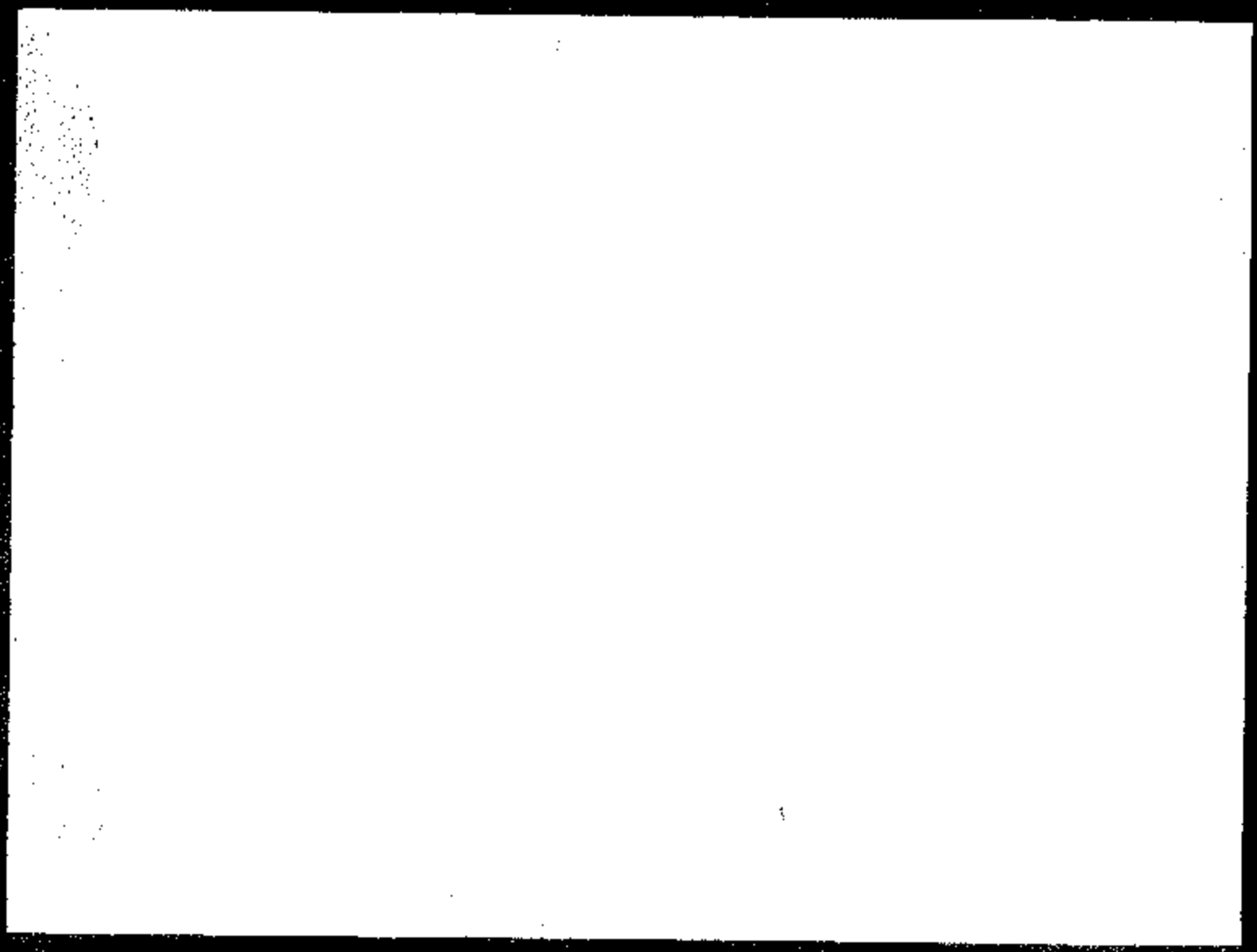
An Oasis Message, both Broadcast and Symptom Code driven, should be generated. A TSB should also be generated, complete with an illustration.

Sample Oasis Message XXXX: 2000-2002 2.0L Zetec Focus, 2001/2002 Escape. Rolling/Hunting Idle and/or Check Engine Light with DTC P0171 may be caused by a soft/collapsed PCV hose, PN YS4Z-6758-EA, located at the intake manifold/bulkhead side of the engine. Inspect the elbow area for deformities. Note if the hose can easily be squeezed shut and remains in that state. If found, replace and check engine oil condition/change interval. Advise Owner that proper oil change intervals need to be maintained to ensure that oil degradation does not deteriorate rubber components.

PFQS volunteers to assist Engineering in creation of any resulting communications.

Feedback is requested.

Thank you,
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" In
South Florida
Office/Answering Machine: 954-753-9989
Cell Phone 954-242-2068
"With Warranty you are Paying for the Sins of the Past"



B982-827-C 2586

From: Hermann, Thomas (T.J.)
Sent: Wednesday, February 20, 2002 1:03 PM
To: Williams, Lee (LHW.); Altoonian, Don (D.J.); Amanda, Harry (H.F.); Badgley, Joel (J.K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); 'Cary Powell'; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hurley, Robert (R.E.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald (E-mail); 'Jones, Andy'; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Luehrsen, Eric (E.A.); Marck, Edmond (E.C.); Matese, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); 'Morgan, Tom'; Morishima, Shigeki (S.); 'Naveed Khan'; Nematollahi, Sonya (S.); 'Nikolai, Bernie'; Noteboom, Jim (J.E.); Ortman, James (J.W.); 'Powell, Cary'; Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aldan (A.P.); Rothweiler, Daniel (D.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Vecchio, Anne Marie (A.); Wakenell, Ray (R.A.); Williamson, David (D.E.); Yeung, Lem (.)
Cc: Diez, Timothy (T.P.)
Subject: RE: Meeting Minutes: EMC PSW Results for current production Kavlico DPFE

Lee, to further clarify what I said.

Current production Kavlico DPFE sensor should not contribute to U204 stalling in the field due to RFI.

On the issue of coupled noise from the wiring harness, the component EMC PSW data does not indicate any issues that would contribute to stalls (it passes the tests) however that does not mean a conducted issue could not exist from an unusual circumstance (such as ignition secondary breakdown or static build up on ungrounded parts).

-----Original Message-----
From: Williams, Lee (LHW.)
Sent: Wednesday, February 20, 2002 12:06 PM
To: Altoonian, Don (D.J.); Amanda, Harry (H.F.); Badgley, Joel (J.K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hurley, Robert (R.E.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald (E-mail); Jones, Andy; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Luehrsen, Eric (E.A.); Marck, Edmond (E.C.); Matese, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tom; Morishima, Shigeki (S.); Naveed Khan; Nematollahi, Sonya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powell, Cary; Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aldan (A.P.); Rothweiler, Daniel (D.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Vecchio, Anne Marie (A.); Wakenell, Ray (R.A.); Williams, Lee (LHW.); Williamson, David (D.E.); Yeung, Lem (.)
Cc: Hermann, Thomas (T.J.); Diez, Timothy (T.P.)
Subject: Meeting Minutes: EMC PSW Results for current production Kavlico DPFE

Meeting Minutes

Attendees:
Bob Dalbo (U204 V6 Calibration Supervisor)
Gilbert Fournelle (U204 V6 Calibration)
Lee Williams (U204 Calibration)
Tom Hermann (EMC Supervisor)
Tim Diez (EMC)

On Friday February 15, 2002 EMC PSW test data for current production Kavlico DPFE sensor was reviewed.

Thomas Hermann has independently investigated the behavior of this sensor. Based on his investigations and this data, he concluded that the current production Kavlico DPFE sensor should not contribute to U204 stalling in the field due to RFI and coupled noise from the wiring harness.

Regards,
Les Williams
For More, Count on Les
U204 3.0L Powertrain Calibration
Truck Engine Engineering, Suite 1AE20
Phone: (313)33-72503
Fax: (313) 32-31786

From: Bhojwani, Kamal (K.)
Sent: Wednesday, August 22, 2001 10:20 AM
To: Giles, Stuart (S.)
Subject: RE:

Stuart,
Thanks for the follow up. I'm putting a document together for the VQR next week. I should have that by this afternoon. In the meantime I have the meeting minutes from the meetings we've had so far and I have a lot of customer verbatims. Unfortunately, I don't have electronic copies of everything.
I have attached the meeting minutes and I'll forward you some Ford CQIS (customer comments) data to start with.


Vehicle Stall Meeting Minutes ...


Vehicle Stall Meeting Minutes ...

Regards,
Kamal Bhojwani
U204 3.0L Powertrain Calibration
TEE, Suite 1AE30
Phone: (313) 39-01969
Fax: (313) 32-31786

----Original Message----
From: Giles, Stuart (S.)
Sent: Tuesday, August 21, 2001 4:39 PM
To: Bhojwani, Kamal (K.)
Subject:

Kamal.
Just talked with Renuka Gokhale the E/E supervisor.The electrical guys are very keen to help.

How is this issue being tracked. (8D?)
Is there a document I could take a look at?
Thanks very much.

Stuart Giles
U204 '03 Vehicle Integration
tel: 313 323 0490
(Text) Page : 313 813 8296

EX02-027-C 2525

08/14/01 MEETING MINUTES

Attendee's: (please let me know if I've left anyone out)

Bob Fascetti
Soon Kwon (P/T)
Bob Dalbo
Kamal Bhojwani (3.0L PT Calibration)
Sandra Corbett (PT QRT)
Gary Mazzella (Black Belt)
Shinji Kanai (KCAP)
Anne-Marie Vecchio (FCSD)
Ed Marck (MNAO)
John McDonald (Visteon)

Meeting Minutes:

- Three (1 from TN, 1 from LA, 1 from GA) of the 20 Tribute buy backs arrived in Dearborn on 8/14/01. Still waiting on plates and insurance.

- Units with stalling issue scattered at dealerships across the country. Dealerships visited to this point
  - Don Altoonian on his to Philadelphia to pick up one buy back and evaluate two customer vehicle (update on 8/16).
  - Scott Moorhouse at Jackson City, MO dealer on 8/14 (update on 8/16)
  - Kamal Bhojwani picked up unit at Jorgensen Ford in Detroit for evaluation (update on 8/16). Unit at Palmer Ford in Chelsea was returned to customer by dealer (no issue found). Customer has not returned. Dealer to follow up with customer.

- Tasks for Thursday:
  - Vehicle Checklist (Kamal Bhojwani)
  - Analysis of 8 available stall units (contact names above)
  - 8D Initiated (Kamal Bhojwani, Sandy Corbett)
  - Description of contacts on Hella relay (Sandy Corbett to follow up with electrical)
  - Pictures of relays, Omron vs Hella (Kanai)
  - Hotline and Warranty Claim Details (Ed Marck, MNAO and Anne-Marie Vecchio (FCSD))

- Next meeting: Thursday August 16, 2001, 10:00 – 11:00am, TEE Bld Conf Room #2
  Call in Details: Domestic: 888-252-9164
  Ford Net: 954-1125
  International: 630-424-2074
  Pass code: 6621247#

EN62-627-C 2628

08/16/01 MEETING MINUTES

Attendee's: (please let me know if I left anyone out)

Kamal Bhojwani (3.0L PT Calibration)
Sandra Corbett (PT QRT)
Gary Mazzella (Black Belt)
Scott Moorhouse (KCAP)
Shinji Kanai (KCAP)
Bob King (FCSD)
Sonya Nematollahi (Electrical)
Ed Marck (MNAO)
John McDonald (Visteon)
Don Jordan (Lear
John Hayden (Relay's)
John Matesa (3.0L PT Calibration)
Gilbert Fournelle (3.0L PT Calibration)
Joel Badgley
Steve Limtiaco (MNAO)

Meeting Minutes:

- Preliminary vehicle checklist discussed.
  - Concern about the recommendation to change DPFE sensors and IAC valves needs to be addressed before providing checklist to dealer hotline.
  - Feedback needed from scramble teams at dealerships to finalize checklist.

- Vehicle status
  - Don Altoonian evaluated 3 units, 2 at dealerships in Pennsylvania (area described as having rolling hills) and 1 buy back.
    - First unit, 2 stalls in 1000 miles. Stall not reproduced. Dealer replaced Omron Relay with Hella EEC Relay. (Service is receiving Hella relays). Don went through checklist on unit. Vehicle returned to customer.
    - Second unit, 2 stalls in 1400 miles. Stall not reproduced. Noticed one dip in rpm, nothing else. Went through checklist and returned to customer.
    - Buyback unit returned to Dearborn. No stall reproduced. Being evaluated.
  - Scott Moorhouse evaluated 2 units, 1 dealer in Jackson City, MO and 1 in Lake Ozark, MO (both areas described as having rolling hills)
    - Jackson City Unit, 5 stalls in 5000 miles (Ford buy back). Customer claims stalls occur when coasting down steep hill (relatively cold vehicle). Scott noticed rpm drop to ~600-650, but no stall reproduced. Went through checklist, nothing found.
    - Lake Ozark, MO Unit, 3 stalls in 5000 miles. Stall not reproduced. Went through checklist, nothing found.
  - Kamal Bhojwani evaluated 4 units, 1 customer unit (Jorgensen Ford) and 3 MNAO buy back's
    - Jorgensen Ford Unit, 10+ stalls, some at Highway speeds. Unit driven around for 2 days with VDR. No stalls reoccurrence. Went through everything on checklist, replaced EEC relay (to Hella) and changed MAF sensor also. Unit returned to customer. Dealer will follow up with customer.
    - MNAO buy back's. No stalls reproduced while driving. All being driven with VDR.

    - One unit stalled numerous times while shifting from drive to reverse. This, however, was not the reason for buy back. No mention of this by customer or dealer. Stall appears to be gone after going through checklist. Still being driven with VDR.
    - Of the two remaining buy back's, one had the checklist updates. Both being driven with VDR to recreate stall.

- Other Notes:
    - Electrical is gathering data on Omron vs Hella relay (John Hayden, Don Jordan).
    - Visteon and Lear have returned PCM and Wiring Harness for evaluation (John McDonald, Don Jordan).
    - Consider putting buyback's on chassis roll for coast down simulation (Kamal Bhojwani).

- Tasks for Tuesday
    - Updated Vehicle Checklist (Kamal Bhojwani, Scott Moorhouse, Don Altoonian)
    - 8D Initiated (Kamal Bhojwani, Sandy Corbett)
    - Evaluated Vehicle Summary Sheet (Kamal Bhojwani, Joel Badgley)
    - Ford Customer Survey?? (Sandy Corbett)

- Next meeting: Tuesday, August 21, 2001, 12:00 – 1:00pm, TEE Bld Conf Room #2
  Dial In: 1 (800) 559-1235
  FordNet # and International Participants #: 954-1129, 1 (630) 424-2078
  Passcode: 7510576#

EP02-827-C 2525

From: Bhojwani, Kamal (K.)
Sent: Wednesday, October 10, 2001 5:12 PM
To: Giles, Stuart (S.)
Subject: RE: Ground wires below battery tray

Stuart,
A single ground caused a stall on a unit evaluated last week.
Today we tried to verify that on a different unit and it did not stall.
We'll try to get the first unit back and re-evaluate it.
In the meantime, our next meeting is tomorrow from 10-11 am.
Please dial in if you can...details below.

Confirmation Number: 4588601
Dial In: 1 (800) 559-1235
Alternate Dial-In:
FordNet # and International Participants #: 9-1-954-1129, 1 (630) 424-2078
Passcode: 7510576#

Regards,
Kamal Bhojwani
U204 3.0L Powertrain Calibration
TEE, Suite 1AB30
Phone: (313) 39-01969
Fax: (313) 32-31786

----Original Message----
From: Giles, Stuart (S.)
Sent: Wednesday, October 10, 2001 1:48 PM
To: Jordan, Donald (D.E.); 'tmorgan@lear.com'
Cc: Stilgenbauer, Jeffrey (J.R.); Bhojwani, Kamal (K.)
Subject: RE: Ground wires below battery tray

Isn't there also a rather fundamental flaw in the DFMEA if a single loose screw causes a vehicle to stall? (That's if I understand Kamal's note correctly - that a loose gnd can cause a stall).

----Original Message----
From: Jordan, Donald (D.E.)
Sent: Tuesday, October 09, 2001 6:02 PM
To: 'tmorgan@lear.com'
Cc: Giles, Stuart (S.); Stilgenbauer, Jeffrey (J.R.); Bhojwani, Kamal (K.)
Subject: RE: Ground wires below battery tray

Tom, Isn't it that the SDS calls for sealed connectors in engine compartment, but didn't think that there was a requirement for conductor crimp surfaces be water proofed on engine compartment electronic grounds. And, Jeff mentioned that ground failed after it was loosened. When we tried it, engine wasn't effected. Need your input.
thanks,

Donald E. Jordan
Electrical Systems, USPS & U204
(DJORDAN1) 313-24-84923(pdc), 322-5147(wpc)
Pager: T 313-795-4342

----Original Message----
From: Stilgenbauer, Jeffrey (J.R.)
Sent: Friday, October 05, 2001 6:43 PM
To: Bhojwani, Kamal (K.); Jordan, Donald (D.E.)
Cc: Giles, Stuart (S.)

Subject: FW: Ground wires below battery tray

Kamal, The current released ground screw is W707193-S300. There are two types of green ground screws (N806327-S38MG or *N805375-S36MG.)* The plant uses one of these screws if weld slag is encountered in the threaded weld nuts. The green coated screw is a case hardened thread forming screw designed to be used with non-threaded weld nuts. As the internal data indicates G104/G105 is the ground we have least trouble with. The green ground screw has better resistance to corrosion. During the launch there were many revisions to ground screws. Stuart Gile would be an excellent resource in this area. He worked very closely on this subject during the original launch.

Don, I am not an expert on corrosion. A certain amount of surface corrosion is to expected, however doesn't the SDS require that all conductor crimp surfaces be water proofed on engine compartment electronic grounds? Can you verify. Even though there appeared to be allot of corrosion the ground was good and only failed after it was loosened.

---Original Message---

From: Bhojwani, Kamal (K.)
Sent: Friday, October 05, 2001 5:02 PM
To: Moorhouse, Scott (S.R.); Stilgenbauer, Jeffrey (J.R.)
Cc: Altoonian, Don (D.I.); Dalbo, Bob (R.J.); Williams, Les (LHW.); Fournelle, Gilbert (G.)
Subject: Ground wires below battery tray

Jeff,
During some vehicle evaluations today (for the stall concern) we noticed some interesting things (btw I forwarded a note from Les Williams to you with some more detail):
The only ground wire, when disconnected (or loosened) that would make the vehicle stall was the G104/G105 ground.
Disconnecting G101 on the transmission and the ground wire on the right front sheet metal, coming off the negative pole of the battery did not lead to a stall.
Also, on the Escape the EEC case ground had a green (coated) bolt, whereas the Tribute had a brass color uncoated bolt.
Are there different bolts being used for the EEC case ground? If not, which is the correct one?
Finally, I have attached a picture of a G104/G105 ground that we saw today that was fairly corroded. This is the worst one we have seen so far. Let me know what you think.

<< File: G104_G105.JPG >>

Regards,
Kamal Bhojwani
U204 3.0L Powertrain Calibration
TBE, Suite 1AE30
Phone: (313) 39-01969
Fax: (313) 32-31786

From: Bhojwani, Kamal (K.)
Sent: Thursday, October 11, 2001 4:20 PM
To: Giles, Stuart (S.)
Subject: RE: Ground wires below battery tray

Stuart,
Thanks for your input in today's meeting!!
As for your question below, that should have been answered in the note I sent out to Inoue-san a few minutes ago (you were copied on it).
Thanks again for your input.

BTW, I'm taking a buy-back to Romeo tomorrow to get EMC tested and they have asked me to what specific tests I want done, and I'm not quite sure how to answer it. We pretty much want to check a full range of field strength's and frequencies to see if we notice any issues. Any suggestions?

Regards,
Kamal Bhojwani
U204 3.0L Powertrain Calibration
TEE, Suite 1AE30
Phone: (313) 39-01969
Fax: (313) 32-31786

----Original Message----
From: Giles, Stuart (S.)
Sent: Thursday, October 11, 2001 10:37 AM
To: Bhojwani, Kamal (K.)
Subject: RE: Ground wires below battery tray

K.
About these grds.
As part of the electrical system development, Mazda would have been pulling off grds and seeing what happens where and when. Therefore, I think it would be useful to have Mazda involved, especially when you are electrically trouble shooting. Mazda will also have the background to be able to help diagnose and provide input.
Let me know what you think.

----Original Message----
From: Bhojwani, Kamal (K.)
Sent: Wednesday, October 10, 2001 5:12 PM
To: Giles, Stuart (S.)
Subject: RE: Ground wires below battery tray

Stuart,
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Dial In: 1 (800) 559-1235
Alternate Dial-In:
FordNet # and International Participants #: 9-1-954-1129, 1 (630) 424-2078
Passcode: 7510576#

Regards,
Kamal Bhojwani

EA02-027-C 2535

U204 3.0L Powertrain Calibration
TEE, Suite 1AE30
Phone: (313) 39-01969
Fax: (313) 32-31786

—Original Message—
From: Giles, Stuart (S.)
Sent: Wednesday, October 10, 2001 1:48 PM
To: Jordan, Donald (D.E.); 'tmorgan@lear.com'
Cc: Stilgenbauer, Jeffrey (J.R.); Bhojwani, Kamal (K.)
Subject: RE: Ground wires below battery tray

Isn't there also a rather fundamental flaw in the DFMEA if a single loose screw causes a vehicle to stall? (That's if I understand Kamal's note correctly - that a loose gnd can cause a stall).

—Original Message—
From: Jordan, Donald (D.E.)
Sent: Tuesday, October 09, 2001 6:02 PM
To: 'tmorgan@lear.com'
Cc: Giles, Stuart (S.); Stilgenbauer, Jeffrey (J.R.); Bhojwani, Kamal (K.)
Subject: RE: Ground wires below battery tray

Tom, isn't it that the SDS calls for sealed connectors in engine compartment, but didn't think that there was a requirement for conductor crimp surfaces be water proofed on engine compartment electronic grounds. And, Jeff mentioned that ground failed after it was loosened. When we tried it, engine wasn't effected. Need your input.
thanks,

Donald E. Jordan
Electrical Systems, USPS & U204
(DJORDAN1) 313-24-84923(pdc), 322-5147(wpc)
Pager: T 313-795-4342

—Original Message—
From: Stilgenbauer, Jeffrey (J.R.)
Sent: Friday, October 05, 2001 6:43 PM
To: Bhojwani, Kamal (K.); Jordan, Donald (D.E.)
Cc: Giles, Stuart (S.)
Subject: FW: Ground wires below battery tray

Kamal, The current released ground screw is W707193-S300. There are two types of green ground screws (N806327-S36MG or *N805375-S36MG.)* The plant uses one of these screws if weld slag is encountered in the threaded weld nuts. The green coated screw is a case hardened thread forming screw designed to be used with non-threaded weld nuts. As the internal data indicates G104/G105 is the ground we have least trouble with. The green ground screw has better resistance to corrosion. During the launch there were many revisions to ground screws. Stuart Glie would be an excellent resource in this area. He worked very closely on this subject during the original launch.

Don, I am not an expert on corrosion. A certain amount of surface corrosion is to expected, however doesn't the SDS require that all conductor crimp surfaces be water proofed on engine compartment electronic grounds? Can you verify. Even though there appeared to be allot of corrosion the ground was good and only failed after it was loosened.

—Original Message—
From: Bhojwani, Kamal (K.)
Sent: Friday, October 05, 2001 5:02 PM
To: Moorhouse, Scott (S.R.); Stilgenbauer, Jeffrey (J.R.)
Cc: Akoonian, Don (D.J.); Delbo, Bob (R.J.); Williams, Les (LHW.); Fournelle, Gilbert (G.)
Subject: Ground wires below battery tray

Jeff,
During some vehicle evaluations today (for the stall concern) we noticed some interesting things (btw I forwarded a note from Les Williams to you with some more detail):
The only ground wire, when disconnected (or loosened) that would make the vehicle stall was the G104/G105 ground.
Disconnecting G101 on the transmission and the ground wire on the right front sheet metal, coming off the negative pole of the battery did not lead to a stall.
Also, on the Escape the EEC case ground had a green (coated) bolt, whereas the Tribute had a brass color uncoated bolt.
Are there different bolts being used for the EEC case ground? If not, which is the correct one?
Finally, I have attached a picture of a G104/G105 ground that we saw today that was fairly corroded. This is the worst one we have seen so far. Let me know what you think.

<< File: G104_G105.JPG >>
Regards,
Kamal Bhojwani
U204 3.0L Powertrain Calibration
TEB, Suite 1AE30
Phone: (313) 39-01969
Fax: (313) 32-31786

From:	Dakhlallah, Hasaan (H.A.)
Sent:	Friday, November 08, 2002 3:57 PM
To:	Sloan, Burt (B.E.); Adams, Kerry (K.N.); Sabin, Scott (S.M.); Hart, Jenny (J.); Boyk, Greg (G.J.); Lyon, Peter (P.M.); Hedges, John (J.E.); Whitehead, Joe (J.P.); Lockhart, Marek (M.C.); Perlick, Don (D.A.); Ross, Ann (A.M.)
Cc:	Lockhart, Marek (M.C.); Klarr, Jerry (G.T.); Hofman, Michael (M.V.); Corbett, Sandra (S.M.); Van Wiemeersch, John (J.R.); Adams, Kerry (K.N.); Austin, James (J.E.); Bogema, John (P.); Coffey, Dan (D.C.); Crowley, Pat (P.J.); Dakhlallah, Hasaan (H.A.); Dalbo, Bob (R.J.); Delaroderie, Jim (J.A.); Dennis, Matt (M.A.); Dixon, Mark (M.R.); Fascetti, Bob (R.J.); Fourmelle, Gilbert (G.); Gaynier, Larry (L.J.); Gibson, Patrick (P.W.); Hansen, George (G.C.); Hart, Jenny (J.); Hills, Kevin (K.T.); Kieliszewski, Mark (M.D.); King, Brian (B.M.); Kosko, Jeff (J.R.); Lewis, Marvin (M.A.); Limatta, Gary (G.D.); Liller, David (D.J.); Matkovich, Dale (D.M.); Mazzella, Gary (G.R.); McIntee, Brian (B.E.); Newman, Chris (C.W.); Perlick, Don (D.A.); Putney, Bill (W.); Ross, Ann (A.M.); Sabin, Scott (S.M.); Schwochert, Steven (S.P.); Scott, Damon (D.A.); Sloan, Burt (B.E.); Squires, Mark (D.M.); Stelmaszczak, Robert (R.); Turner, Donald (D.A.); Wettach, Bill (B.); Young, Dan (D.G.)
Subject:	U152, UP207, & U204 Drivability Team Meeting 11/13/02 Agenda

U152, UP207, & U204 Drivability Team
Nov. 13, 2002
8:00 am to 10:00 am
TEE - Conference Rm 1

Call In Phone Number: 9-1-877-877-7126
Participant Code: 6341969 #

Nov. 13, 2002 Meeting Agenda:

1) U152 Lacks Power issue	Scott Sabin
Report on strategy analysis	Kerry Adams
Root Cause of low Baro Status	Joe Whitehead
2) U152 4.0L Hesitation / Rough Running On Cold Start after engagement	Jenny Hart
Discuss Root Cause Status - Review Fishbone	Greg Boyk
Report on acquiring a Vehicle	
Report on Fuel Sample Analysis Status	
3) U152 4.6L D02 No Start	Pete Lyon/Ann Ross
Review Claims Analysis and Discuss Next Steps	
4) U152 4.6L D36 - Hes/Surge during acceleration	Pete Lyon/Ann Ross
Review July 02 Claims Analysis and Discuss Next Steps	
5) U152 4.0L D02 No Start	John Hedges
Review Claims Analysis	
6) UP207 D02 No Start	Don Perlick
Results of LAP Electrical Repairman Discussions	

ER02-627-C 2687

Oct. 30, 2002 Meeting Minutes:

1) UP207 Runs Rough / Lacks Power issue

Scott is analyzing the BP calculation process. he is developing a list of all calibration constants that effect BP and will use this list to conduct a file compare. He is also investigating hardware effects on BP. Finally, he will be simulating MAFS inputs that may trigger the low BP issue.

2) U152 4.0L Hesitation / Rough Running On Cold Start after engagement

(Vehicles start extremely rich, Issue occurs at 1,100 to 26,000 miles) Changing fuel has fixed 3 of the South Carolina vehicles. Fuel sample from those vehicles will be analyzed this week. Team is currently looking for vehicle to buy back that repeats the issue. Jenny Hart is developing a fishbone listing all of the critical X's that can cause this concern.

3) U152 4.6L Stalls NPF/RECAL Follow Up

Claims analysis did not provide enough information to determine potential root cause of issues. After review pareto of 4.6L driveability issues, Ann Ross recommended investigation of D02 - Engine Would not start since it is the top 4.6L issue. She will also be analyzing claims on D36 - Hes/Surge from July 02 production to determine reason for recent upturn in 1MIS data.

4) UP207 Stalls due to Fuel Pump Issues

Marek Lockhart reviewed claims for fuel pump replacements and determined that fuel pumps are being replaced due to low pressure when pump is turned off. Marek will contact some dealers to discuss diagnostics procedure they use to replace fuel pumps for stall condition. He will also ask visteon to analyze returned fuel pumps for stalls issue. Next report out is 11/20/02.

From:	Luehrsen, Eric (E.A.)
Sent:	Wednesday, January 23, 2002 6:24 AM
To:	Rusek, Ron (R.J.); Matsushita, Kohei (K.); Wettach, Bill (B.)
Cc:	Kosko, Jeff (J.R.); Yeung, Lem (.); Hale, Tony (A.S.); Sventickas, Ed (E.); Kwon, Soon (S.K.)
Subject:	RE: 14D-11, ISC valve failure (21C1922623)

I imagine Ted Jensen (Black belt in SRL) would like to have it.

---Original Message---

From: Rusek, Ron (R.J.)

Sent: Wednesday, January 23, 2002 7:47 AM

To: Matsushita, Kohei (K.); Wettach, Bill (B.)

Cc: Kosko, Jeff (J.R.); Yeung, Lem (.); Hale, Tony (A.S.); Sventickas, Ed (E.); Kwon, Soon (S.K.); Luehrsen, Eric (E.A.)

Subject: RE: 14D-11, ISC valve failure (21C1922623)

Wettach-san,

Bill, would you like this valve returned to Dearborn or should it be shipped to Hitachi in Japan for investigation. Also, would you confirm this is the known failure mode of sticking ISC.

Matsushita-san,

Concern number C11252737 has been issued to release a modified ISC valve with improved tolerance to deposit formation. I will make sure this concern is routed to Mazda for approval.

---Original Message---

From: Matsushita, Kohei (K.)

Sent: Wednesday, January 23, 2002 3:32 AM

To: Yeung, Lem (.); Rusek, Ron (R.J.); Hale, Tony (A.S.)

Subject: FW: 14D-11, ISC valve failure (21C1922623)

EX62-627-C 2698

Gentlemen,

This is to inform you of a new market concern.
Please confirm the information and respond to the request.

1. Defect Description
When the customer drove the highway by using the cruise control system, even if the customer did not pedal the acceleration pedal, the engine rpm could not be down under 2000rpm.

2. Investigation Results
There was no problem after ISC valve replacement.
ISC valve sticking

3. Disposal at dealer
The ISC valve was replaced.

4. Defect vehicle/part
ISC valve: YF1E-9F715-AB

5.Mazda request
Please investigate the engine and find out the root cause.

I received the failure ISC valve from Mazda.
Can I send it to you for your analysis?

Regards,

Kohei Matsushita
Duratec Liaison Engineer
Ford Hiroshima Powertrain Office
Tel: 81-82-285-3971 Ext: 24103
Fax: 81-82-285-3644

-----Original Message-----
From: R.Ayukawa [mailto:ayukawa.r@qa.mazda.co.jp]
Sent: Friday, January 11, 2002 5:40 PM
To: '"松下さん (FHO)"'
Cc: '高橋さん (購入品チーム) '
Subject: 新規市場不具合 Bランク 14D-11「IAC/バルブの作動不良」
(21C1922823)

松下さん

新規市場不具合です。
市場品質情報および図面を添付いたします。

不具合部品名は市場品質情報では「IAC/バルブ」、図面では「バイパスエアコントロールバルブ」
と名前が異なります。ご注意下さい。

1. Defect Description
クルーズコントロールを使って高速道路走行中に、アクセルを放してもエンジン回転数が
2000rpm以下に下がらない。

2. Investigation Result
IAC/バルブのスティックと推定。

3. Disposal at dealer
IAC/バルブを交換した。

4. Defect vehicle/part
IAC/バルブ AJ03-20-660A

5. MC Request
サプライヤーの検査基準書・図面スペックそれぞれの特性を検査して下さい。

Best regards,

****

Ryojiro Ayukawa
Hiroshima PT Inspection Group
Hiroshima Inspection Dept.
Mazda Motor Corporation
TEL:082-282-1111 082-252-5422(Direct)
FAX:082-252-5345
mailto:ayukawa.r@qa.mazda.co.jp
****

From: Sears, Renee (R.T.)
Sent: Tuesday, March 05, 2002 9:59 AM
To: Danes, Adam (A.V.)
Cc: Ortman, James (J.W.); Kosko, Jeff (J.R.)
Subject: RE: 3.0L Escape TSB team request for Black Belt assistance

I would like Jim Ortman to take this project on.

Jim: It looks to me as though this is a specific enough project that you would be able to get it closed in a reasonable period of time. (Looking to get your 2 projects complete this year.) As such, I think it is more appropriate than some of the other proposals we discussed in our recent 1-on-1. Do you agree to take this on? Please advise.

Regards,
Renee T. Sears
Manager - Component B Engineering
V-Engine Engineering / Powertrain Operations
MD 53 POEE Building / 845-5190
rsears2@ford.com

-----Original Message-----
From: Danes, Adam (A.V.)
Sent: Thursday, February 28, 2002 4:43 PM
To: Sears, Renee (R.T.)
Subject: FW: 3.0L Escape TSB team request for Black Belt assistance

Renee,
How about Ortman for this as a project? If not, Jules may want it. My concern with Jules is that we need a DMAIC for his first project.

-----Original Message-----
From: Kosko, Jeff (J.R.)
Sent: Thursday, February 28, 2002 4:30 PM
To: Danes, Adam (A.V.)
Subject: 3.0L Escape TSB team request for Black Belt assistance

Adam, per our meeting this afternoon of the subject above,
It was discussed that the 3.0L Duratec PCV system entry into the fresh air tube is the root cause of both IAC flow changes leading to stalls, and throttle body stick bind and grab.

I was asked to solicit a black belt candidate to help work on the PCV system entry or filtration to reduce the oil vapor entry into the fresh air tube.

Do you have any candidates looking for a project? As this team felt it would be better to attack the root cause then simply replace parts via the TSB.

Please let me know.
Thanks
Jeff Kosko
Intake Systems

From: Pepitone, Gil (J.)
Sent: Thursday, June 27, 2002 9:38 AM
To: Johnson, Jim (J.S.); Blickl, John (J.R.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.); Aynessazian, Kam (K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Chick, John (J.); Chin, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fourmelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald II, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Matsea, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiralahi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.); Yeung, Lam (.); Benintende, Robert (R.F.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Terzea, Laura (L.D.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Amely, Felix (F.A.); Bradley, Joe (J.C.); Linde, Peter (P.A.); Goering, Kimberly (K.L.); Terzea, Laura (L.D.); Benintende, Robert (R.F.); Wexler, Mark (M.A.); Amely, Felix (F.A.)
Cc: Pepitone, Gil (J.)
Subject: RE: Inspection Sheet for St. Croix Vehicle Inspection

Good Morning: Mr. Jim Johnson informed me that he was unable to review the Inspection Sheet listed within my Summary Report on Escape Drive Concerns in the Virgin Islands. It appears my use of a "shortcut" prevented the icon's data transfer.

I am providing it here as an aid. Pls review as you see fit.

[redacted]

St. Croix Escape
Vehicle Inspe...

Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" In
South Florida
Office/Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"

—Original Message—
From: Pepitone, Gil (J.)
Sent: Friday, June 14, 2002 6:50 PM
To: Dalbo, Bob (R.J.)
Cc: Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Moorhouse, Scott (S.R.); DiAngelo, Ranaldo (R.); Pepitone, Gil (J.)
Subject: RE: Inspection Sheet for St. Croix Vehicle Inspection
Importance: High

HI Bob: ok, I will not.

Question: If I have high IAC DC, what should I do?
Clean the TB?
Turn the Throttle stop in to get o the desired 32% IAC DC?
If you want me to change the TB, I'm not prepared, since I d not have any, and I expect a long delay in getting TB from the States.

However, it would be good for my tan as I wait for them.....heh, heh.....

If you do want low air flow throttle bodies, maybe a batch (5-8??) could be sent directly to the Dealership Metro Motors in St. Croix??

Please advise via voice mail since I will be disconnecting my laptop soon for packing. But send a note away since I HOPE to be able to use my laptop there. Help desk promised, but you know how that goes.....

You can leave voice mail on both my cell and office phone. I can check the office # from afar.

I will do whatever you wish: I want to get the data we need, and not just fix these Units.
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" In
South Florida
Office/Answering Machine: 954-753-9969
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"

—Original Message—
From: Dalbo, Bob (R.J.)
Sent: Friday, June 14, 2002 5:29 PM
To: Pepitone, Gil (J.)
Cc: Sanders, Muriel (M.S.)
Subject: RE: Inspection Sheet for St. Croix Vehicle Inspection

Gil,
Please don't drill out any throttle plates. For one thing, it's not approved practice, and for another, we'd like to get back any you have problems with.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Pepitone, Gil (J.)
Sent: Friday, June 14, 2002 3:23 PM
To: Johnson, Jim (J.S.); Bilicki, John (J.R.); Corbett, Sandra (S.M.); DiAngelo, Renaldo (R.); Altoonian, Don (D.J.); Ayhessazian, Kam (K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Pascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald II, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Matosa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Les (L.H.W.); Yeung, Lem (.); Benintende, Robert (R.F.); Fernandez, Ruben (R.); Bradley, Joe (J.C.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Terzea, Laura (L.D.); Martin, Mike (M.S.); Weber, Mark (M.A.); Amely, Felix (F.A.)
Cc: Pepitone, Gil (J.)
Subject: Inspection Sheet for St. Croix Vehicle Inspection

Good afternoon everyone: I have included all those that I have been in continuous communication, plus all who are part of the "Escape Stalls Team" Conference Call which I have attended.

The file below contains the form I will use. This information is a result of the feedback I have received from Mr. Altoonian, plus all existing Service Communications, both external and internal.

Please note that the items are ordered in such a way to allow me to leave the vehicle in it's original state until I

can replicate the Stalls Concern, if ever.
I intend on extensively driving these Units until I deem it impossible for Concern replication.
At that point, I will perform any modifications to at least leave the Units at the latest repair level possible.

<< File: St. Croix Escape Vehicle Inspection Sheet.doc >>

FYI...
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" In
South Florida
Office/Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"

Escape Stalls Concern Vehicle Inspection Data
In St. Croix by Gil Pepitone 6/15/-6/24/2002

Date:

Owner:

VIN:

M.Y.:

Mileage:

Conditions during Owner's experience, including heavy keys/radio towers?

Calibration level:

DTCs? If P1000, check OBD monitor status/measure KAM Pin 55 if OBD is dumb:

DPFE level (2A07 or later)

MAF level (BA?)

Relay PN level OK? (White letters NG) /Terminals go/no go?

PCM Hardware level/AXB &ATF1 Catch word is latest/ "160" or "161"?

Connectors/Grounds in order of inspection flow
C270b
G300
G104
G105
G101
C110
C133
G100
C270c
C270d
CPS pigtail contacting A/C pulley?

Rattle ignition key/engine cuts out?

Stabilized RPM Value in Park, Fan off, A/C off, no Purge flow, not prolonged idle time:

Stabilized IAC Duty Cycle Percentage in P/N, A/C off:

Does Engine stay running w/ IAC disconnected?

If so, what is base RPM?

TPS voltage {Bogie .9 +-.05}:

Relationship of EVAP % value vs. FTP Voltage ok?

If no OK, what were values?

If relation not ok, did tapping on VMV make FTP voltage jump/engine's reaction?

Position of Flapper Valve ok?

PFQS drive results/Verified?

If verified, what were conditions?

Repairs/adjustments to vehicle:
H2O witness marks/Rust in Left Kickpanel?
Restricted EVAP line?/Blew out??
Replaced Flapper Viv if web found?
New IAC D.C.?
Replaced TB?
Tightened any Ground/stalled connectors?
Changed DPFE?
Remove IAC/Inspect for sludge/Oil in rear hole?
Changed IAC?
Changed MAF?
Cleaned DTCs?

Additional Comments:

From: Pepitone, Gil (J.)
Sent: Friday, June 14, 2002 3:23 PM
To: Johnson, Jim (J.S.); Bilicki, John (J.R.); Corbett, Sandra (S.M.); DiAngelo, Renaldo (R.); Altoonian, Don (D.J.); Aynessazian, Kam (K.); Bauer, Scott (S.C.); Bhalwani, Kamal (K.); Blackburn, Thomas (T.J.); Boperna, John (P.); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Delbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diaz, Timothy (T.P.); Fascetti, Bob (R.J.); Fourmelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald II, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Koako, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilpenbauer, Jeffrey (J.R.); Suarez, Rhee (R.); Takasawa, Keith (K.D.); Takubo, Hirokhi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Les (LHW.); Yeung, Lem (.); Benintende, Robert (R.F.); Fernandez, Ruben (R.); Bradley, Joe (J.C.); Goering, Kimberly (K.L.); Suarez, Rhee (R.); Terzes, Laura (L.D.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Arnely, Felix (F.A.)
Cc: Pepitone, Gil (J.)
Subject: Inspection Sheet for St. Croix Vehicle Inspection

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[redacted]

St. Croix Escape Vehicle Inspe...

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Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" In
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Escape Stalls Concern Vehicle Inspection Data
in St. Croix by Gil Pepitone 6/15/-6/24/2002

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Mileage:

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DTCs? If P1000, check OBD monitor status/measure KAM Pin 55 if OBD is dumb:

DPFE level {2A07 or later}

MAF level {BA?}

Relay PN level OK? {White letters NG} /Terminals go/no go?

PCM Hardware level/ "160" or "161"?:

Connectors/Grounds in order of inspection flow
C270b
G300
G104

G105
G101
C110
C133
G100
C270c
C270d
CPS pigtail contacting A/C pulley?

Rattle ignition key/engine cuts out?

Stabilized RPM Value in Park, Fan off, A/C off, no Purge flow, not prolonged idle time:

Stabilized IAC Duty Cycle Percentage in P/N, A/C off:

TPS voltage {Bogie .9 +-.05}:

Relationship of EVAP % value vs. FTP Voltage ok?

If no OK, what were values?

If relation not ok, did tapping on VMV make FTP voltage jump/engine's reaction?

Position of Flapper Valve ok?

PFQS drive results/Verified?

If verified, what were conditions?

Repairs/adjustments to vehicle:
H2O witness marks/Rust in Left Kickpanel?
Restricted EVAP line?/Blew out??
Replaced Flapper Vlv if web found?
Drilled out TB plate holes? If so, what size drill bit?/New IAC D.C.?

Tightened any Ground/stalled connectors?
Changed DPFE?
Changed IAC?
Changed MAF?

Additional Comments:

From: Plante, Paul (P.G.)
Sent: Tuesday, February 05, 2002 9:10 AM
To: Kosko, Jeff (J.R.); Wettach, Bill (B.)
Subject: Escape Tribute Stalls NHTSA Inquiry Meeting

Preliminary meeting is Wed 2/6/02, 10:00-11:30, location Boardroom but nolt sure what building. You should get a meeting notice. I know you had some issues, I am free to talk Wed AM if you like. Bill wettach should get invite also.

Paul Plante
V Engine Campaign Prevention Specialist
POEE Building, Drop 20, Cube BG049, Pillar D5
Tele. 313-64-54138; Fax 39-02513
Text Pager: 734-296-1905
E Mail: pplante@ford.cm (CDS ID PPLANTE)

From: Grimes, Jeff (J.R.)
Sent: Wednesday, May 08, 2002 4:17 PM
To: Corbett, Sandra (S.M.); Kosko, Jeff (J.R.)
Subject: RE: Escape Quality PST agenda (5/10/02)

I am out on Friday, sorry

Jeff R.Grimes
Duratec Engine Programs
Ph: (313) 32-25237 Fax: (313) 59-47323
email: jgrimes1@ford.com

—Original Message—
From: Corbett, Sandra (S.M.)
Sent: Wednesday, May 08, 2002 2:21 PM
To: Grimes, Jeff (J.R.); Kosko, Jeff (J.R.)
Subject: FW: Escape Quality PST agenda (5/10/02)

Jeff Grimes,
You are invited to discuss the QSF tracker/plan with the Escape program on Friday. Please let me know your availability.

Sandy Corbett
Escape Powertrain QRT
Phone/Fax: (313)59-44351
Product Development Center 2H-E66

—Original Message—
From: Noma, Fumie (F.)
Sent: Wednesday, May 08, 2002 12:25 PM
To: Graham, Jackie (J.R.)
Cc: Moore, Bryan (B.L.); Corbett, Sandra (S.M.)
Subject: Escape Quality PST agenda (5/10/02)

Jackie - could you please forward this to the MCR/PST distribution list? Thank you.

Team,

Here is the agenda for the Escape Quality PST scheduled for 5/10/02 (PDC 2H-D66).

Sandy, Bryan - Please bring 20 copies and also forward the file to Ken Powers via e-mail if you have any material. Thank you very much for your support.

<< File: Escape_PSTAgenda_051002.doc >>

Also, you can find this agenda on the following URL:

http://homepages.ford.com/outfitteraplt/escape/siteFiles.asp?CURRDIR=%2FMeetings%2FQuality+PST

Best Regards,

Fumie Noma
U204 Escape Quality & Reliability
PDC 2H-D51

EP02-827-C 2723

Phone: 313-845-3799, Fax: 313-248-7059

ER02-627-C 2724

From:	Schuman, Howard (H.G.)
Sent:	Thursday, June 06, 2002 1:38 PM
To:	Kosko, Jeff (J.R.)
Cc:	Dalbo, Bob (R.J.); Wettach, Bill (B.); Arnold, James (J.A.); Marynowski, Jan (J.M.)
Subject:	RE: ECP 02-137 2003 U204 ISC Calibration Question

Jeff,

I shared general U204 information (supplied by Bob) with Mazda. It will help Mazda investigate this particular area of their calibration but they will still need to do a full transparency check.

Mazda just completed their transparency test for the 2.5L finned pintle valve and found no change was necessary. Once it started, that study took 5 weeks. Per Mr. Shono's Mazda doesn't have a calibrator to assign to this task. I'm sure they'll beat mid-October, but I can't guess by how much. Either way, we'll need a back up plan and we don't have much time.

Howard Schuman
MPV Duratec Engine Systems
Phone (313) 594-6662
Fax (313) 594-7323

-----Original Message-----
From: Kosko, Jeff (J.R.)
Sent: Thursday, June 06, 2002 1:28 PM
To: Schuman, Howard (H.G.); Dalbo, Bob (R.J.)
Cc: Wettach, Bill (B.)
Subject: RE: ECP 02-137 2003 U204 ISC Calibration Question

Howard, can the Ford team share with Mazda, the U204 calibration changes made to incorporate the SR IABV?
This may help Mazda's timing.
Bob, have you done this in the past?
Jeff Kosko

EA82-827-C 2725

---Original Message---
From: Schuman, Howard (H.G.)
Sent: Thursday, June 06, 2002 1:26 PM
To: Wettach, Bill (B.); Yeung, Lem (.); Grimes, Jeff (J.R.)
Cc: Fridrich, Joe (J.A.); Cominsky, Dennis (D.); Marynowski, Jan (J.M.); Arnold, James (J.A.); Kosko, Jeff (J.R.); Buettner, Steve (S.B.)
Subject: FW: ECP 02-137 2003 U204 ISC Calibration Question

The attached note from Mr. Shono of Mazda addresses the 1L8E ISC calibration study.

Mazda will have their testing completed by mid-October. That doesn't meet our timing and we asked them to improve the timing in today's pictel. Even so, the 1L8E will not be released for the J16L engine by July 15. We need to develop an alternate plan.

For now, concern C11375066 is written to delete the 1L8E-9F715-AA ISC from J16L. If CEP2 cannot handle the complexity of 2 visually identical valves, I will modify the concern to apply to U204/J14.

Please add your comments on this subject to the concern description screen.

Howard Schuman
MPV Duratec Engine Systems
Phone (313) 594-6662
Fax (313) 594-7323

---Original Message---
From: shouno.y@mazda.co.jp [mailto:shouno.y@mazda.co.jp]
Sent: Thursday, June 06, 2002 4:38 AM
To: hschuman@ford.com; jarnold3@ford.com
Subject: RE: ECP 02-137 2003 U204 ISC Calibration Question

Schuman-san,

Thank you very much for your information. I've forwarded this information to our calibration engineer directly.

As you know very well that ISC calibration may affect engine stall and drivability.
We have to check our calibration whether Ford will change the calibration or not.

I cannot tell you the details, however, we have a big issue (not Duratec) on Mazda's vehicle.
All calibration engineer who has a responsibility of ISC (not Yamamoto-san) are now belonging to this issue.

Because of the lack of engineer , we can not evaluate this ECP immediately.

You mentioned that the implementation timing of this ECP will be the middle of July. I'm afraid of the timing.

However , because of the reason above , we will not be able to start the evaluation until top of July. And we will need about 3.5 months for evaluation in case of changing calibration. (Worst case.)

Would you study the feasibility of implementation timing delay until middle of Oct.?

Regards,

Yuuji Shono
Assistant Manager
Powertrain Promotion Office
Powertrain Development Center
Mazda Motor Corporation

EN02-027-C 2727

Tel : +81-82-287-4932
Fax : +81-82-287-5115
E-mail : shouno.y@pt.mazda.co.jp

EP02-827-C 2728

Adams, Robbin (.)

From: Diez, Timothy (T.P.)
Sent: Thursday, May 09, 2002 12:57 PM
To: Dalbo, Bob (R.J.); Grandas, Joseph (J.M.); Wettach, Bill (B.); Kosko, Jeff (J.R.)
Cc: Fournelle, Gilbert (G.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); King II, Lamar (L.L.); Bodnar, Les (L.R.); Bronni, Mark (M.J.); 'bnikolai@visteon.com'; Jensen, Ted (T.E.); Bodnar, Les (L.R.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Also, Bernie Nikolai agreed to investigate the matter at the component level to see if something can be done with the EEC.

Les,
Please read below.

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

----Original Message----
From: Dalbo, Bob (R.J.)
Sent: Wednesday, May 08, 2002 4:05 PM
To: Grandas, Joseph (J.M.); Wettach, Bill (B.); Kosko, Jeff (J.R.)
Cc: Fournelle, Gilbert (G.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); King II, Lamar (L.L.); Bodnar, Les (L.R.); Diez, Timothy (T.P.); Bronni, Mark (M.J.); 'bnikolai@visteon.com'; Jensen, Ted (T.E.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Joe,
Thanks for the update on the EMC testing. Nice job.
Just one correction - someone in Mr. Kosko's shop needs to follow up on the IACV, I believe, rather than Gilbert.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

----Original Message----
From: Fournelle, Gilbert (G.)
Sent: Wednesday, May 08, 2002 3:58 PM
To: Dalbo, Bob (R.J.)
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

FYI

Gilbert Fournelle

V6 U204 Calibration Engineering
1AE27 Truck Engine Engineering (TEE)
Phone:(313)3904968 Fax:(313)3231786
----Original Message----
From: Grandas, Joseph (J.M.)
Sent: Wednesday, May 08, 2002 3:31 PM
To: Johnson, Joe (J.H.); Gates, Freeman (F.C.); King II, Lamar (L.L.)
Cc: Bodnar, Les (L.R.); Diez, Timothy (T.P.); Fournelle, Gilbert (G.); Bronni, Mark (M.J.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Results of our EMC testing today...
Findings indicate that the Motorola dPFE is not the causal of the idle stall seen at 23Mhz....
Previous vehicle tests are invalid due to incorrect dPFE wiring(LEAR) & the use of a jumper(unacceptable during EMC testing), rendering dPFE non-functional(i.e. dPFE sig.out @ 0.39v KOEO) -- same symptom at KCAP. After wiring correction(via jumper crossing), dPFE came to proper KOEO value (1V)...however the idle stall persisted.. CPS, MAF, was also looked at & results indicated these sensors not to be factors...

IAC was dis-connected w/t-plate set to 750RPM & idle stall went away. Further investigation is required to evaluate TPS & IAC-DC. Due to cell monitoring glitches, signals under field stress were unable to be measured.

Re-test will be conducted after LEAR corrects harness. Jeff Grimes notified LEAR of emergency of repair needed. J.Grandas or Mark Bronni to verify wiring integrity when complete, prior to test. Gilbert Fournelle to follow up on IAC issue to drive to root cause.

Team – please add edits where needed...Thanks.

----Original Message----
From: Grandas, Joseph (J.M.)
Sent: Wednesday, May 08, 2002 4:58 AM
To: Bodnar, Les (L.R.); Diez, Timothy (T.P.)
Cc: King II, Lamar (L.L.); Johnson, Joe (J.H.); Gates, Freeman (F.C.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

I will be onsite this AM to assist as I was unable to get to my Motorola Engineer on late notice...
I will need to collect the following data at the point of the 40v/m stall...1)speed load point of occurrence, 2)dPFE signal at occurrence... I also am prepared to do an ABA test w/a Kavlico sensor.. Just as a reference, the dPFE component is DV tested @ 200v/m & passed(both Kavlico & Motorola)...

> ----Original Message----
> **From:** Bodnar, Les (L.R.)
> **Sent:** Tuesday, May 07, 2002 5:25 PM
> **To:** Diez, Timothy (T.P.)
> **Cc:** Grandas, Joseph (J.M.)
> **Subject:** RE: ACT REQ: Duratec EMC Testing for DPFE Update
>
> Tim, FYI. . . Joe Grandas is also trying to get a representative from Motorola to support for the DPFE sensor.
>
> **Regards,**
> **Les Bodnar**
> **NAT E/E Systems & EDS - 2003 U204**
> **Phone & Fax: (313) 24-81686**

ER02-627-C 2738

E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

-----Original Message-----
From: Diez, Timothy (T.P.)
Sent: Tuesday, May 07, 2002 5:21 PM
To: Bodnar, Les (L.R.); 'Nikolai, Bernie (B.E.)'
Cc: Kwon, Soon (S.K.); Altoonian, Don (D.J.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Team,

I have gained the support of Gilbert Fournelle and Don Altoonian. I think that should suffice.

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1692
e-mail: tdiez@ford.com

-----Original Message-----
From: Bodnar, Les (L.R.)
Sent: Tuesday, May 07, 2002 3:22 PM
To: 'Nikolai, Bernie (B.E.)'
Cc: Diez, Timothy (T.P.); Bodnar, Les (L.R.); Kwon, Soon (S.K.); Altoonian, Don (D.J.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update
Importance: High

Would that be Don Altoonian?

-----Original Message-----
From: Nikolai, Bernie (B.E.) [mailto:bnikolai@visteon.com]
Sent: Tuesday, May 07, 2002 2:12 PM
To: 'Diez, Timothy (T.P.)'
Cc: Bodnar, Les (L.R.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

I'm trying to locate the correct MAFS people who should attend. Will someone be there to represent the DPFE?

Bernie Nikolai
Visteon Powertrain Control Systems
PH: 313-755-1401
FAX: 313-755-2857
bnikolai@visteon.com

-----Original Message-----
From: Diez, Timothy (T.P.) [mailto:tdiez@ford.com]

Sent: Tuesday, May 07, 2002 1:53 PM
To: 'Nikolai, Bernie (B.E.)'
Cc: Bodnar, Les (L.R.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Bernie,

We do not know what the root cause is? It could be both. Would you like to meet us at MPG tomorrow at 6:30am?

Sincerely,
Timothy Diaz
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiaz@ford.com

----Original Message----
From: Nikolai, Bernie (B.E.) [mailto:bnikolai@visteon.com]
Sent: Tuesday, May 07, 2002 1:42 PM
To: 'lbodnar2@ford.com'
Cc: 'tdiaz@ford.com'
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

Les,

Is this a DPFE or MAFS issue or both?

Bernie Nikolai
Visteon Powertrain Control Systems
PH: 313-755-1401
FAX: 313-755-2857
bnikolai@visteon.com

----Original Message----
From: Benz, Greg (G.H.) [mailto:gbenz@ford.com]
Sent: Tuesday, May 07, 2002 12:34 PM
To: Bernie Nikolai (E-mail)
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

----Original Message----
From: Kwon, Soon (S.K.)
Sent: Tuesday, May 07, 2002 11:30 AM
To: Daibo, Bob (R.J.)
Cc: Diez, Timothy (T.P.); Nematollahi, Sonya (S.); Bodnar, Les (L.R.); Williamson, David (D.E.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Bob, I left a voice mail. Electrical team is looking for P/T support in EMC diagnostics tomorrow at MPG. Tim Diez has the test room secured for 6:30 - 11:30 AM. Please

let me know if you can support.

Thanks.

Regards,
Soon Kwon
Escape/Tribute P/T OPD Supervisor
Compact Utility PTSE, TVC
2F839, MD 405, PDC Dearborn 48126
Phone (313) 322-6844, Fax
Pager (313) 795-1536, email: skwon@ford.com

——Original Message——
From: Bodnar, Les (L.R.)
Sent: Monday, May 06, 2002 4:59 PM
To: Williamson, David (D.E.); Kwon, Soon (S.K.)
Cc: Diez, Timothy (T.P.); Nematollahi, Sonya (S.); Gokhale, Renuka (R.V.)
Subject: ACT REQ: Duratec EMC Testing for DPFE Update
Importance: High

Dave/Soon, due to failures on the above vehicle resulting from DPFE and MAF Sensor, a P/T diagnostics or trouble shooting expert is being requested to help identify and maybe explain why below requirement engine performance is occurring during Radiated Immunity testing. With the new DPFE installed, "stalls" are occurring at 40 Volts/meter with the latest MAFS versus a 50 V/m stall with the old DPFE. Also, this is in comparison to 57 V/m "stumble" that was found when the new MAFS was tested last November.

As this is a very critical issue, Tim Diez is trying to get chamber time booked for this Saturday (5/11 - earliest possible open time) to diagnose the reason for the frequency value decrease. The above expert will be needed to support in this effort, which Tim will confirm the date in a later note. Can you please identify who that person will be and ask that they be prepared to support. Thanks.

Regards,
Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

Adams, Robbin (.)

From: Grandas, Joseph (J.M.)
Sent: Thursday, May 09, 2002 11:06 AM
To: Kosko, Jeff (J.R.)
Cc: King II, Lamar (L.L.)
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

Jeff, are you aware of this EMC idle stall phenomenon connected w/IAC?
—Original Message—
From: Dalbo, Bob (R.J.)
Sent: Wednesday, May 08, 2002 4:05 PM
To: Grandas, Joseph (J.M.); Wettach, Bill (B.); Kosko, Jeff (J.R.)
Cc: Fournelle, Gilbert (G.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); King II, Lamar (L.L.); Bodnar, Les (L.R.); Diez, Timothy (T.P.); Bronni, Mark (M.J.); 'bnikolai@visteon.com'; Jensen, Ted (T.E.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Joe,
Thanks for the update on the EMC testing. Nice job.
Just one correction - someone in Mr. Kosko's shop needs to follow up on the IACV, I believe, rather than Gilbert.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: *rdalbo@ford.com*

—Original Message—
From: Fournelle, Gilbert (G.)
Sent: Wednesday, May 08, 2002 3:58 PM
To: Dalbo, Bob (R.J.)
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

FYI

Gilbert Fournelle
V6 U204 Calibration Engineering
1AE27 Truck Engine Engineering (TEE)
Phone:(313)3904966 Fax:(313)3231786
—Original Message—
From: Grandas, Joseph (J.M.)
Sent: Wednesday, May 08, 2002 3:31 PM
To: Johnson, Joe (J.H.); Gates, Freeman (F.C.); King II, Lamar (L.L.)
Cc: Bodnar, Les (L.R.); Diez, Timothy (T.P.); Fournelle, Gilbert (G.); Bronni, Mark (M.J.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

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Findings indicate that the Motorola dPFE is not the causal of the idle stall seen at 23Mhz...
Previous vehicle tests are invalid due to incorrect dPFE wiring(LEAR) & the use of a jumper(unacceptable

during EMC testing), rendering dPFE non-functional(i.e. dPFE sig.out @ 0.39v KOEO) -- same symptom at KCAP. After wiring correction(via jumper crossing), dPFE came to proper KOEO value (1V)...however the idle stall persisted.. CPS, MAF, was also looked at & results indicated these sensors not to be factors...

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Team – please add edits where needed...Thanks.

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To: Bodnar, Les (L.R.); Diez, Timothy (T.P.)
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Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

I will be onsite this AM to assist as I was unable to get to my Motorola Engineer on late notice...
I will need to collect the following data at the point of the 40v/m stall...1)speed load point of occurrence, 2)dPFE signal at occurrence... I also am prepared to do an ABA test w/a Kavlico sensor.. Just as a reference, the dPFE component is DV tested @ 200v/m & passed(both Kavlico & Motorola)...

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> **Sent:** Tuesday, May 07, 2002 5:25 PM
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> **Cc:** Grandas, Joseph (J.M.)
> **Subject:** RE: ACT REQ: Duratec EMC Testing for DPFE Update
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> Tim, FYI. . . Joe Grandas is also trying to get a representative from Motorola to support for the DPFE sensor.
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> **Regards,**
> **Les Bodnar**
> **NAT E/E Systems & EDS - 2003 U204**
> **Phone & Fax: (313) 24-81686**
> **E-Mail: lbodnar2@ford.com**
> **Location: PDC 2H-F34**
>
> -----Original Message-----
> **From:** Diez, Timothy (T.P.)
> **Sent:** Tuesday, May 07, 2002 5:21 PM
> **To:** Bodnar, Les (L.R.); 'Nikolai, Bernie (B.E.)'
> **Cc:** Kwon, Soon (S.K.); Altoonian, Don (D.J.)
> **Subject:** RE: ACT REQ: Duratec EMC Testing for DPFE Update
>
> Team,
>
> I have gained the support of Gilbert Fournelle and Don Altoonian. I think that should

suffice.

Sincerely,
Timothy Diez
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

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From: Bodnar, Les (L.R.)
Sent: Tuesday, May 07, 2002 3:22 PM
To: 'Nikolai, Bernie (B.E.)'
Cc: Diez, Timothy (T.P.); Bodnar, Les (L.R.); Kwon, Soon (S.K.); Altoonian, Don (D.J.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update
Importance: High

Would that be Don Altoonian?

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Sent: Tuesday, May 07, 2002 2:12 PM
To: 'Diez, Timothy (T.P.)'
Cc: Bodnar, Les (L.R.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

I'm trying to locate the correct MAFS people who should attend. Will someone be there to represent the DPFE?

Bernie Nikolai
Visteon Powertrain Control Systems
PH: 313-755-1401
FAX: 313-755-2857
bnikolai@visteon.com

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To: 'Nikolai, Bernie (B.E.)'
Cc: Bodnar, Les (L.R.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

Bernie,

We do not know what the root cause is? It could be both. Would you like to meet us at MPG tomorrow at 6:30am?

Sincerely,
Timothy Diez

Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1892
e-mail: tdiez@ford.com

-----Original Message-----
From: Nikolai, Bernie (B.E.) [mailto:bnikolai@visteon.com]
Sent: Tuesday, May 07, 2002 1:42 PM
To: 'lbodnar2@ford.com'
Cc: 'tdiez@ford.com'
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

Lee,

Is this a DPFE or MAFS issue or both?

Bernie Nikolai
Visteon Powertrain Control Systems
PH: 313-755-1401
FAX: 313-755-2857
bnikolai@visteon.com

-----Original Message-----
From: Benz, Greg (G.H.) [mailto:gbenz@ford.com]
Sent: Tuesday, May 07, 2002 12:34 PM
To: Bernie Nikolai (E-mail)
Subject: FW: ACT REQ: Duratec EMC Testing for DPFE Update

-----Original Message-----
From: Kwon, Soon (S.K.)
Sent: Tuesday, May 07, 2002 11:30 AM
To: Dalbo, Bob (R.J.)
Cc: Diez, Timothy (T.P.); Nematollahi, Sonya (S.); Bodnar, Lee (L.R.); Williamson, David (D.E.)
Subject: RE: ACT REQ: Duratec EMC Testing for DPFE Update

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Thanks.

Regards,
Soon Kwon
Escape/Tribute P/T OPD Supervisor
Compact Utility PTSE, TVC
2FB39, MD 405, PDC Dearborn 48126
Phone (313) 322-6844, Fax
Pager (313) 795-1536, email: skwon@ford.com

-----Original Message-----

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Sent: Monday, May 06, 2002 4:59 PM
To: Williamson, David (D.E.); Kwon, Soon (S.K.)
Cc: Diez, Timothy (T.P.); Nematollahi, Sonya (S.); Gokhale, Renuka (R.V.)
Subject: ACT REQ: Duratec EMC Testing for DPFE Update
Importance: High

Dave/Soon, due to failures on the above vehicle resulting from DPFE and MAF Sensor, a P/T diagnostics or trouble shooting expert is being requested to help identify and maybe explain why below requirement engine performance is occurring during Radiated Immunity testing. With the new DPFE installed, "stalls" are occurring at 40 Volts/meter with the latest MAFS versus a 50 V/m stall with the old DPFE. Also, this is in comparison to 57 V/m "stumble" that was found when the new MAFS was tested last November.

As this is a very critical issue, Tim Diez is trying to get chamber time booked for this Saturday (5/11 - earliest possible open time) to diagnose the reason for the frequency value decrease. The above expert will be needed to support in this effort, which Tim will confirm the date in a later note. Can you please identify who that person will be and ask that they be prepared to support. Thanks.

Regards,
Les Bodnar
NAT E/E Systems & EDS - 2003 U204
Phone & Fax: (313) 24-81686
E-Mail: lbodnar2@ford.com
Location: PDC 2H-F34

From: Noteboom, Jim (J.E.)
Sent: Thursday, May 09, 2002 3:46 PM
To: Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Badgley, Joel (J.K.); Bauer, Scott (S.C.); Bholwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); 'Cary Powell'; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); 'Dan Rothweiler'; De Pena, Juan (J.E.); Diaz, Timothy (T.P.); Fasoetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); 'John McDonald'; 'Jones, Andy'; Jordan, Donald (D.E.); Kanal, Shinji (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); 'Morgan, Tom'; Morishima, Shigeki (S.); 'Naveed Khan'; Nematollahi, Sonya (S.); 'Nikolai, Bernie'; Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aidan (A.P.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Vecchio, Anne Marie (A.); Wakenell, Ray (R.A.); Wetbach, Bill (B.); Williams, Les (LHW.); Williamson, David (D.E.); Yeung, Lem (.)
Subject: RE: U204 Stall Meeting Agenda - 5/9/02

Inspection results of '02 Escape VIN: 1FMYU0414KC19492

LOCATION: John Elway West, Denver
OWNER: [redacted]
MILEAGE: 3342
BUILD DATE: 1-29-02
COMPLAINT: Stalled while driving approx. 50 mph. Noticed dash lights came on and steering became stiff; coasted to side of
road, went to crank (did not turn key off) and the engine restarted. Occured at around 2500 miles and has not
happened since.
DIAGNOSTICS: Went through the latest TSB/ISM draft; no concerns were found except for the following:

- There was battery acid in the batt. tray that had seeped down onto grounds G-104 and 105; some corrosion was evident.
- The customer's key chain contained several oz. of additional weight.

Jim Noteboom
Powertrain Field Quality Specialist/Denver
Phone: 303.674.4015 FAX: 303.674.5730
Page: 1.888.375.1980

BR02-627-C 2739

From: Noteboom, Jim (J.E.)
Sent: Tuesday, July 30, 2002 11:27 AM
To: Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); 'Cary Powell'; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); 'Dan Rothweiler'; De Pena, Juan (J.E.); Diez, Timothy (T.P.); Duvall, Allen (A.W.); Fascetti, Bob (R.J.); Foumelis, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Goodwin, William (W.R.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hoshino, Jun (J.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); 'John McDonald'; 'Jones, Andy'; Jordan, Donald (D.E.); Kanal, Shinji (S.); King, Robert (R.F.); Koako, Jeff (J.R.); Kwon, Soon (S.K.); Le, Dzung (D.H.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Mateos, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); McGee, Brett (B.L.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); 'Morgan, Tom'; Morishima, Shigeki (S.); 'Naveed Khan'; Nematollahi, Sonya (S.); 'Nikolai, Bernie'; Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.); Yeung, Lem (.)
Subject: RE: U204 Stall Investigation, 7-26-02

VEH: '02 Escape VIN: 1FMCU04112KD11749 BUILT: 4-11-02 MILES: 1650
CUSTOMER: Carol Segety / 303-252-8278 (home) LOCATION: Northglenn, Colo.
COMPLAINT: Stalls in slow traffic. Note: the stall occures in the same location (80th between Wadsworth and 36) as the previous vehicle; checked this out and there are high tension lines crossing the road there.

TSB and SSM results:

- IAC=34%
- EVAP system passed.
- DPFE and EEC relay are the latest.
- Keys do not have excessive weight.
- All related grounds were secure.

Based on the stall location and the possibility of RFI, the MAF was updated to a 1L2Z-BA.

Also on this vehicle the battery was leaking from the seam on the corner opposite the negative post (see photos). The customer stated that when the vehicle was purchased, the original batt. was dead and was replaced. This batt. was not a service piece but looked like original equipment so it's history is in question. A new service batt. was installed.

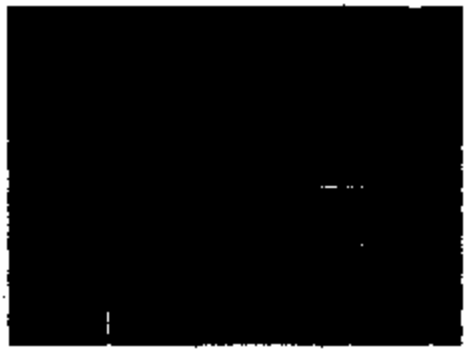
MVC-039F.JPG

Serial no.

MVC-040F.JPG

Acid drip from seam.

Jim Notaboom
Powertrain Field Quality Specialist/Denver
Phone: 303.674.4015 FAX: 303.674.5730
Cell: 303.921.2076



From: Pepitone, Gil (J.)
Sent: Monday, July 01, 2002 2:32 PM
To: Jensen, Ted (T.E.)
Cc: Johnson, Jim (J.S.); Bilicki, John (J.R.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.); Aynessazian, Kam (K.); Bauer, Scott (S.C.); Bholwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fourmelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald II, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Koako, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mendziuk, Roger (R.S.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wattach, Bill (B.); Williams, Lee (LHW.); Yeung, Lem (.); Benintende, Robert (R.F.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Terzes, Laura (L.D.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Amely, Felix (F.A.); Bradley, Joe (J.C.); Linde, Peter (P.A.); Goering, Kimberly (K.L.); Terzes, Laura (L.D.); Benintende, Robert (R.F.); Wexler, Mark (M.A.); Amely, Felix (F.A.); Pepitone, Gil (J.); DiAngelo, Renaldo (R.); Pepitone, Gil (J.); DiAngelo, Renaldo (R.)
Subject: RE: PFQS's Investigation Results of Virgin Islands Escape Driveability Concerns

HI Ted: I took the liberty of sharing my reply with all those previously cc'ed. This may influence the decision makers for the release for an Info Only Oasis Message, advising certain Markets (Caribbean, others??) to check for dirty fuel.

To answer your question : "During your visit did you visit any other OEM dealers?"
Answer; yes.
I took samples on two islands, St. Thomas and St. Croix. The majority had dirty fuel.

As for your statement: "General fuel quality could be improved by a group effort through local governmental units and business groups."
I could not agree more. If the Dealerships receive an Oasis Message, this would lend weight to push for change, not to mention the happy customers and lower Warranty numbers.

Your other statement: "I would be very surprised if this were a Ford only issue."
Again, I agree. This is NOT a Ford Only Concern, since my samples were random.
Also note this quote from one Tech named "Yantis" at St. Thomas Metro Motors: "Gas is terrible on this island".

Here's a proposed Oasis Message. Maybe you can assist me in getting some version of it generated??

Info Only Oasis Message XXX: All vehicle lines, engines. Driveability Concerns may be due to dirty fuel. Check for contamination by removing the fuel filter and blowing backwards to flow into a container, using shop air. Advise Owner to change fuel filling location[as required. If filter is found restricted, replace. This is not a Warranty chargeable item, due to Owner choice of fuel usage.

This is just a framework. I am open to suggestions and improvements. Please advise. This includes those cc'ed.

Thank you,
Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" in
South Florida

Office/Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"

—Original Message—
From: Jensen, Ted (T.E.)
Sent: Monday, July 01, 2002 8:50 AM
To: Pepitone, Gil (J.)
Subject: RE: PFQS's Investigation Results of Virgin Islands Escape Driveability Concerns

Gil,

Fuel quality should be a common factor for all OEMs. During your visit did you visit any other OEM dealers? It would be very helpful to know the experience of others. General fuel quality could be improved by a group effort through local governmental units and business groups. I would be very surprised if this were a Ford only issue.

Ted

—Original Message—
From: Pepitone, Gil (J.)
Sent: Thursday, June 27, 2002 2:11 AM
To: Johnson, Jim (J.S.); Bildd, John (J.R.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.); Ayvazsadan, Kam (K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darral (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diaz, Timothy (T.P.); Fasoldt, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald II, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aidan (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Tatsuba, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wetzach, Bill (B.); Williams, Les (L.W.); Yeung, Lem (.); Benintende, Robert (R.F.); Goering, Kimberly (K.L.); Suarez, Rhae (R.); Terzes, Laura (L.D.); Martin, Mike (M.S.); Wexler, Mark (M.A.); Amely, Felix (F.A.); Bradley, Joe (J.C.); Linde, Peter (P.A.); Goering, Kimberly (K.L.); Terzes, Laura (L.D.); Benintende, Robert (R.F.); Wexler, Mark (M.A.); Amely, Felix (F.A.)
Cc: Pepitone, Gil (J.); DiAngelo, Renaldo (R.); Barenter, Joel (J.R.);
Subject: PFQS's Investigation Results of Virgin Islands Escape Driveability Concerns
Importance: High

Good evening everyone:

Here's my report on my trip.

<< File: Results of Virgin Island Escape Decell Stalls Investigation.doc >>

I will be calling in on the Conference all at 2pm today.

Call-in info: 1-877-870-3529 or Ford net 9-1-954-1144
International Participants: 1-630-693-1704
Passcode: 7673539, then hit #

I thank the Team for all their assistance.

Gil Pepitone
Powertrain Field Quality Specialist-"PFQS" in
South Florida
Office/Answering Machine: 954-753-9989
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"With Warranty you are Paying for the Sins of the Past"

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Cc: Pepitone, Gil (J.); DiAngelo, Renaldo (R.); Berenter, Joel (J.R.); Surti, P. J. (P.J.); Noteboom, Jim (J.E.)
Subject: PFQS's Investigation Results of Virgin Islands Escape Driveability Concerns

Importance: High

Good evening everyone:

Here's my report on my trip.

[redacted]

ults of Virgin Isla
Escap...

I will be calling in on the Conference all at 2pm today.

Call-in info: 1-877-870-3529 or Ford net 9-1-954-1144
International Participants: 1-630-693-1704
Passcode: 7673538, then hit #

I thank the Team for all their assistance.

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Results of St. Croix/St. Thomas Virgin Island Investigation of 3.0L Escape

Executive Summary

A total of **22** Concern Units were inspected by Powertrain Field Quality {PFQS} Gil Pepitone from 6/15-6/25/02.

18% of inspected vehicles with certain key Service Actions applied and containing uncontaminated fuel were fully resolved for the "Stalling during Deceleration" Concern, as reported by Owners.

The vehicle population which had prior repair attempts, {55%} did not have TSB/Oasis SSM Service repairs fully applied for various reasons, including test data mis-interpretation, component ordering wait time, WDS test equipment procedures/hardware issues, and "Repair Holds" for pending Engineering visitation.

However, 67% Units had **contaminated fuel and restricted fuel filters**, which may have been a **contributor** to the unverified **Deceleration Stalling** issue.

A second Driveability Concern {which included Units that contained the latest calibration level} of **Hesitation during moderate engine temp** was listed as a Concern for 32% of the Units. The Hesitation Concern was then verified and data /reviewed or recorded by PFQS. However, resolution was not determined. Local fuel volatility and/or PCM calibration may root cause, but this is speculation. Further investigation is in progress.

An omission of a Diagnostic procedure in TSB 02-8-6 was found, involving the requirement for a drive cycle in order to prompt the start of the Purge Cycle for proper EVAP System evaluation.

The surface blistering of multiple MAF sensor's plastic case was reported, with a sample captured.
A second MAF related issue of tight MAF retaining nuts resulted in airbox lid breakage.

A third MAF sensor related issue of missing Part Number imprint was found on two Units.

Idle Air Control (IAC) Duty Cycles were found in 27% Units to be on the high end of the spec. In some cases, IAC replacements did not reduce DC. Also, there is a need for multiple improved IAC diagnostic procedures for TSB
02-8-6.

PFQS recommendations are listed at the end of this report.

Background

PFQS was contacted in early June to inspect and resolve the reported Decell Stalling Concern on a minimum of 10 3.0L 2001/02 Escapes on the Islands of St. Croix and St. Thomas, U.S. Virgin Islands. Both dealerships use the same name of Metro Motors.

Figure 1 Metro Motors, St. Croix, VI

Figure 2 Burnete Matto, Service Manager

Figure 3 Isaac, Driveability Technician

Figure 4 Service area at Metro Motors

Figure 5 Service area, alternate view

A review of Service records and Oasis repair histories as compared to the actual PFQS inspection of the 22 Units, indicated that corrective Service procedures were only partially performed on 55% of Units.
However, 18% of Units had been fully serviced per the existing Service Communications.
The remaining percentile involved Units which had not been to the Dealership for the Decell Stalls Concern prior to the Inspection period.

Both Islands are small (St. Croix, the larger, is 28x7 miles). The terrain is very hilly, with some considerable grade angles. The

Concern of Decell Stall for 3.0L Escape is reported as most common in uneven topography as evidenced from a prior PFQS review of North American CQIS data.

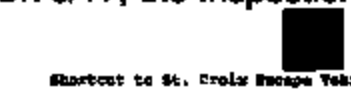
Of the 22 Units inspected, 20 were at the St. Croix location, while two were done in St. Thomas. A total of four Units were originally scheduled for St. Thomas, but two were no-shows. The majority of this report's data stems from the St. Croix Dealership.

Investigation of Decell Stall

PFQS arrived on Saturday, 6/15. Basic Inspection and VDR recorder Drive Testing began that day and throughout the weekend for the three high priority Units as designated by the Dealership.

PFQS's original plan was to first verify the Drive Concern, but soon realized that Concern replication was difficult.
None of the Units ever exhibited a Stall in any drive mode during PFQS use.

On 6/17, the Inspection worksheet,



, was started to be used.

Over the course of the investigation, some Units (18%) had arrived to the Dealership that had been "Owner Determined" as resolved because of prior service actions performed by the St. Croix Metro Motors.
Being a small Island, word of the "Ford Rep" presence prompted some Owners to return to the Dealership for a "Health Check" on their prior resolved Units.

Only one Unit was found by PFQS with the known Concern of "spider web" EVAP line restriction.

As cited, some Units had only part of the necessary Service actions completed. Also, Interpretation of some data was either misunderstood, or the existing TSB diagnostics required additional

description. On this last point, details are provided throughout Sections below.

Fuel Quality Issues

The first priority Unit investigated was described as having a different Drive Concern of **"Hesitation** after Cold Start".
Note that this Unit did **NOT** have the Concern of **Decell Stall** as part of the original listed complaint.

The heavy hesitation (lasting about 3 seconds) from a dead stop on a 30 degree upgrade acceleration, during a moderate engine temp range (approx 100F-160F) was replicated by PFQS. A fuel gauge had been installed along with a WDS VDR recorder. All parameters, including both fuel pressure and volume were confirmed as acceptable.
However, because this was a Returnless Fuel application, PFQS felt that his old method to check volume (filling 12oz bottle in 15 sec at idle) may not be valid.

As a result, the fuel filter was removed and blew backwards into a glass bottle:

Figure 6 Contaminated fuel, after sitting overnight

Figure 7 Bottom view of the fuel sample-Nasty Stuff

Figure 8 This is the fuel sample after the bottle is shaken, not stirred. This is what it looks like after you blow out the fuel filter.

PFQE then realized that perhaps local fuel is a negative influence in the generation of Decell Stalls, as well as possibly contributing to the Hesitation Concern.

From that point on, every Unit was inspected for restricted fuel filter/dirty fuel. 67% of inspected Units had restricted fuel filters and dirty fuel.

However, **32%** of the Units which had "Complete Service Actions" (see below), **PLUS** a new fuel filter, were **STILL** verified by PFQS for **the Hesitation Concern.**
Note that the latest PCM flash is included, and this includes some Units of which had the latest PCM Flash prior to PFQS visitation: the need for Adaptive Learning Strategy was NOT a factor for some of the repeatable **Hesitation** Concern Units.

It appears that the **replacement** of the restricted **fuel filter** did not resolve the **Hesitation** Concern.
However, **filter replacement** may be a **positive factor** in resolving the **Decell Stalls** Concern.

In defining "Complete Service Actions", PFQS includes a PCM Reflash to the latest available calibration level, the latest level EEC Relay, the latest level DPFE, a complete check of ALL grounds and connectors, proper evaluation of the EVAP Purge D.C. vs. FTP sensor voltage data and conformation of acceptable IAC D.C. values when observed during the PROPER conditions. Note that MAF replacement is not included unless the Owner cited a specific,

repetitive location during the Decell Stall event, implying local electrical "noise" generation (i.e. radio towers, etc).

New Concern of Moderate Engine Temp Hesitation discovered

PFQS then concluded: this repeatable Hesitation Concern could possibly be caused by one of two items, or perhaps both.

a. Local Fuel Quality (suspect volatility, not just the "dirt factor")
b. PCM Calibration

Please note that PFQS has no proof to indict either suspected root cause. PFQS is in communications with the St. Croix Service Manager for feedback of alternate fuel brand usage as recommended in an attempt to resolve those Units with the unresolved Hesitation Concern.
PFQS welcomes Engineering feedback on possible calibration issues and is willing to assist further.

In addition, a VDR recording was captured in this Hesitation drive mode on 6/25 on one Unit, which had all "Complete Service Actions" and a clean fuel filter. This data will be shared with Engineering in the very near future.

Procedural Omission in TSB 02-8-6
The Repairing Tech described the following prior repair effort.

The Tech stated that while following Step #4 of the above TSB, the EVAPVM (VMV Duty Cycle) percentage was not seen to change from Zero % at Idle (as specified by the TSB) after a one hour idle.
PFQS was able to replicate this scenario on the same Unit and also for a second Unit. The fuel tanks were above ¼ full.
During discussions with Engineering during his visitation, it was suggested that the vehicle be driven to prompt the Purge Process. As a result, the purge cycle started to increase.

While Step #4 described Purge Cycle function over 84%, it's diagnostic do not describe what must be done if the value does not change from Zero% while at prolonged Idle.

The Tech's interpretation of the lack of VMV Duty Cycle change from Zero % at idle resulted in the ordering of a VMV. The Tech mentioned that if VMV replacement did not prompt a purge cycle DC increase from Zero%, a PCM would have been considered for order. Potential TNI Warranty for both the VMV (9C915) and the PCM (12A650) exists.

MAF and Related Hardware Issues

Three different issues were experienced during this inspection. Pls note that none involved the actual FUNCTION of the MAF. DTCs were NOT set, nor were inappropriate MAF voltage values witnessed.

However, Warranty, TNI and Real, have been generated as a result.

Item #1: The Tech described prior MAF replacements based upon the observation of the blistering of the MAF's Sensor's Surface:

Figure 9 Blister on the MAF' sensor's Case

Figure 10 Close up of the Blister

The Tech cited two replacements. The Parts Dept search only produced the one item photographed here. The Tech said the other one was "worst" with multiple blisters present.

Item #2: During PFQS Inspection, one of the 3.0L Escapes MAF was found to be missing the imprinted part number on the sensor's plastic body:

Figure 11 MAF without a imprinted part number

A second Unit, a lone 2.0L Zetec Escape was presented for Inspection. This Unit (which was not supposed to be part of the Study) was reviewed as a courtesy. It too did not have a PN imprinted on it. It was not replaced. However, the Tech felt it should be, because of the uncertainly of the level of the MAF component. This Indicates that TNI Warranty may result for MAF due to the missing PN.

Item #3: During the removal of the MAF for one Unit for updates per the TSB (Owner reported Stalls in one particular location), the retaining nuts were found very tight. Hand tools, not power tools were used.
During the attempted removal, the studs started to unscrew from the airbox lid. One of the plastic bosses of the airbox stud broke as a result:

Figure 12 Airbox lid that contains MAF retaining studs

Figure 13 As stud walked out, it broke the case's boss

Figure 14 This is the rear view of the case's boss

Figure 15 A second stud walked out, but the case did not break. The witness marks are pliers on the threads.

At first PFQS suspected the nuts as over torque. A subsequent inspection found "Lock Tite" substance on the fine thread end of the studs. It is possible the adhesive is too strong.

As these MAFs are being replaced per the TSB, it is possible Warranty will be generated for the YL8U-9643-BC Airbox Lid.

Intake Airflow Control (IAC) Solenoid Duty Cycle Value Results

As part of requested Engineering data, IAC Duty Cycle values were monitored per Step #1 of TSB 02-8-6. Note that awareness of proper

conditions to determine acceptable IAC D.C. were not understood by all repair Techs interviewed. While IACs had been replaced on some Units, those were probably changed mainly as part of a general repair attempt, and not necessarily due to data acquisition.

As a result, some repeat Concern Units {46%} required IAC and in some instances, Throttle Body {TB} replacement.
Pls note, however, TBs were not available at the Dealership, and Engineering shipment did not arrive during PFQS visitation. The Engineering shipment of IACs did arrive and most were used.

Idle Air Control {IAC} Duty Cycles were found in 27% Units to be on the high end {greater than 40%} of the allowable spec.

30% of Units with IAC replacement did NOT realize a substantial change {less than 1%} for IAC D.C. value.
Other Units {8%} realized a desired small decrease in D.C., but their final value was still above acceptable range of 40% per the TSB, which would then require a TB replacement.

The high airflow D.C. after IAC replacement indicts either initial throttle body airflow set and/or plate sludge build-up.
Mileage range for unchanging D.C. values after IAC replacement were 2K-18K.

If the pending shipment of TBs arrive at Metro Motors St. Croix, PFQS is to be contacted. Concern Units will be requested for return and their TB will be replaced and then sent to PFQS, who in turn will return same to Engineering.

Additional IAC Diagnostic Improvements are provided below in the Recommendations Section.

<u>Recommendations</u>

1. A Market directed "Info Only" Oasis Broadcast Message should be generated to emphasize fuel filter/fuel quality as part of routine inspection when diagnosing all Driveability Concerns. Locations could include the Caribbean Islands and other

Markets were local Service Facilities practices come into question.

2. A review of TSV 02-8-6, Step #4 should be conducted for consideration of the inclusion of a drive cycle prior to inspection of EVAP Purge VMV Duty Cycle values. This drive cycle would only be used for those Units which do not show an increase from 0% at idle. A time factor should be provided to aid the Tech on when he should perform the drive cycle.
   Also, if fuel tank level is an influencing factor for valid EVAP evaluation, an acceptable fill range should be included in any TSB revision.

3. The three issues cited which involve MAF should be investigated by Ford Engineering and Visteon. MAF Sensor blistering, missing MAF PNs, and tight MAF retaining nut on airbox studs are subject.

4. A review of TSB 02-8-6, step #1 should be conducted to clarify and emphasize the definition of "no purge flow". This subtle reference was overlooked by all Techs interviewed. Specific reference, similar to Step #4 wording, which involves a PID definition and values {I.e.: observe IAC D.C. while EVAPVM is Zero%} is necessary to enable ALL Techs to properly diagnose the true need for IAC replacement.
   If there is confusion, the part will be replaced on an assumption, and not the result of data acquisition.

   Also, the converse is true: some Units will quickly START the purge cycle, before IAC D.C. could be read under proper conditions. A work around can be done by shutting off ignition and immediately restarting, and then waiting for all other conditions {RPM to return to 750} to be proper before reading IAC D.C. This additional procedure should be considered for inclusion to any TSB revision.

   A reference to the Catalyst Protection of a 50 RPM increase for a base idle of 800RPM should be included. Also, instructions to apply throttle briefly to reduce this RPM value to return to 750

RPM is necessary to allow the Techs to determine true IAC D.C. and is recommended for TSB revision inclusion.

5. A review for the need to spray insect/spider removal agent should be conducted. It is conceivable that the above TSB's Step #5 will temporarily remove a spider from the EVAP fresh air line, but there is nothing to prevent the return of another spider. Should we use something to stop the potential cycle of web build up?

   I will be calling into the "Escape Stalls Team" 2PM conference call on 6/27/02 to discuss my Inspection.

Gil Pepitone
Powertrain Field Quality Engineer in South Florida

gpepiton@ford.com
Office 954-753-9989
Cell 954-242-2066

From: Johnson, Jim (J.S.)
Sent: Thursday, June 27, 2002 9:12 AM
To: Peptone, Gil (J.); Blicki, John (J.R.); Corbett, Sandra (S.M.); Altoonian, Don (D.J.); Avnessazian, Kam (K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fourmelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Mcdonald II, John (J.M.); Jordan, Donald (D.E.); King, Robert (R.F.); Koako, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandzuk, Roger (R.S.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nematollahi, Sonya (S.); Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (L-H-W.); Yeung, Lem (.); Suarez, Rhae (R.); Terzea, Laura (L.D.); Martin, Mike (M.S.); Amely, Felix (F.A.); Bradley, Joe (J.C.); Linde, Peter (P.A.); Goering, Kimberly (K.L.); Terzea, Laura (L.D.); Benintende, Robert (R.F.); Kaercher, Don (D.F.)
Cc: DiAngelo, Renaldo (R.); Barenter, Joel (J.R.); Surti, P. J. (P.J.); Noteboom, Jim (J.E.)
Subject: RE: PFQS's Investigation Results of Virgin Islands Escape Drivability Concerns

Gil, thanks for the report and supporting WDMO on the trip. It appears you identified a few items that will benefit the group.

I did research Air Box replacements for the 2.0 and 3.0 engines and found the following.

3.0L PN, YL8Z-9600-BA - SALES	2.0L PN, YL8Z-9600-AE - SALES
2002 - 529	2002 - 80
2001 - 642	2001 - 104
2000 - 103	2000 - 52

It appears that YL8Z-9600-BA is in the process of being replaced by 2L8Z-9600-BA.

-----Original Message-----
From: Peptone, Gil (J.)
Sent: Thursday, June 27, 2002 2:11 AM
Cc: Peptone, Gil (J.); DiAngelo, Renaldo (R.); Barenter, Joel (J.R.); Surti, P. J. (P.J.); Noteboom, Jim (J.E.)
Subject: PFQS's Investigation Results of Virgin Islands Escape Drivability Concerns
Importance: High

Good evening everyone:

Here's my report on my trip.

<< File: Results of Virgin Island Escape Decell Stalls Investigation.doc >>

I will be calling in on the Conference all at 2pm today.

CallIn Info: 1-877-870-3629 or Ford net 9-1-954-1144
International Participants: 1-630-693-1704
Passcode: 7673538, then hit #

I thank the Team for all their assistance.

Gil Peptone
Powertrain Field Quality Specialist-"PFQS" in
South Florida

Office/Answering Machine: 954-753-9989
Cell Phone 954-242-2066
"With Warranty you are Paying for the Sins of the Past"

From:	Sloan, Burt (B.E.)
Sent:	Thursday, July 18, 2002 10:45 AM
To:	Adams, Kerry (K.N.); Bogema, John (P.); Boyk, Greg (G.J.); Coffey, Dan (D.C.); Crowley, Pat (P.J.); Dakhlallah, Haasan (H.A.); Dalbo, Bob (R.J.); Delaroderie, Jim (J.A.); Dennis, Matt (M.A.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Gaynier, Larry (L.J.); Gibson, Patrick (P.W.); Hansen, George (G.C.); Hille, Kevin (K.T.); Kieliszewski, Mark (M.D.); King, Brian (B.M.); Kosko, Jeff (J.R.); Lewis, Marvin (M.A.); Limatta, Gary (G.D.); Liller, David (D.J.); Mendziuk, Roger (R.S.); Matkovich, Dale (D.M.); Mazzella, Gary (G.R.); McIntee, Brian (B.E.); Newman, Chris (C.W.); Perlick, Don (D.A.); Putney, Bill (W.); Sabin, Scott (S.M.); Scott, Damon (D.A.); Squires, Mark (D.M.); Turner, Donald (D.A.); Ward, Sheila (S.A.); Wettach, Bill (B.); Whitehead, Joe (J.P.); Young, Dan (D.G.)
Cc:	Klarr, Jerry (G.T.); Hofman, Michael (M.V.); Corbett, Sandra (S.M.); Schmidt, Gregory (G.A.); Van Wiemeersch, John (J.R.)
Subject:	Outfitters & Ranger Engine Hesitation/Surge, Stall, and No Start Affinity Team Meetings

Outfitters & Ranger Affinity Team
Drivability
July 24, 2002
8:00 am to 9:30 am
TEE - Conference Rm 1

Call In Phone Number: 9-1-877-877-7126
Participant Code: 6341969

July 24, 2002 Meeting Agenda:

1) UP207 2002.5 Engine Stalls — Shiela Ward
   - File comparison between UP207 & U152
   - Status of VDR File
   - Discussion of Hawaii Vehicle fix

2) UP207 PS Switch Testing Status — Shiela Ward

3) U152 Stalls DOE — Scott Sabin
   - Report on follow up DOE preparations
   - Follow up on testing fuel pumps

4) Throttle Body
   - Report on EPA agreement — John Hedges
   - Report on Timing on implementing a locked down T-Body
   - Report on agreement of Throttle Body Diagnostic and Service procedures

5) IAC Ford of Europe & Jaguar stalls diagnostics procedures discussion — Jim Delaroderie

6) Engine Stalls Health Chart — Team
   - Review populated Health Chart and discuss next steps

July 10, 2002 Agreements and Assignments:

ESG2-627-C 2771

UP207 2002.5 Engine Stalls
Multiple root causes are under investigation

UP207 MAFs Discussion
Review MAFs warranty Charts
Charts show the spike occurred at 2002.5 launch, not before
MAF's does not appear to be the causal issue of the Stalls 2002.5 Spike

No Start PCM 6 Sigma Project status
SRAM Defect
Motorola is screening defects out @ KLM in Malaysia
Visteon has a second screening test at North Penn starting 7/25/02

IAC
Jim Delaroderie will bring Ford of Europe & Jaguar proceduree in for discussion next week
New Diagnostic procedure will be published in 2003 FCSD Manual

E982-827-C 2772

From: Dalbo, Bob (R.J.)
Sent: Wednesday, June 19, 2002 10:58 AM
To: Kanai, Shinji (S.); Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Aynessazian, Kam (K.); 'Badgley, Joel (J.K.)'; Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); 'Cary Powell'; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); 'John McDonald'; 'Jones, Andy'; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); 'Morgan, Tom'; Morishima, Shigeki (S.); 'Naveed Khan'; Nematollahi, Sonya (S.); 'Nikolai, Bernie'; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhea (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.); Young, Lam (.)
Subject: RE: One example of Engine quit

Kanai-san,
This is the exact problem we have been working on. If your dealer services your vehicle per the TSB and ISM we have released, we believe your issue should be resolved.

Mr. Limtiaco,
Can you please help ensure Kanai-san's vehicle is properly serviced?

Bob Dalbo
3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: rdalbo@ford.com

-----Original Message-----
From: Shinji Kanai [mailto:kanai.sh@sv.mazda.co.jp]
Sent: Wednesday, June 19, 2002 10:05 AM
To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Aynessazian, Kam (K.)'; 'Badgley, Joel (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn, Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John (J.)'; 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra (S.M.)'; 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)'; 'Diez, Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)'; 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka (R.V.)'; 'Grewal, Bill (B.S.)'; 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George (G.J.)'; 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa, Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones, Andy'; 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert (R.F.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)'; 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)'; 'Mandziuk, Roger (R.S.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John (J.)'; 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry (L.)'; 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)'; 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie'; 'Noteboom, Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price, Martin (M.)'; 'Raquepau, Alden (A.P.)'; 'Shah, Kiran (K.C.)'; 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey

(J.R.)'; 'Suarez, Rhae (R.)'; 'Takasawa, Keith (K.D.)'; 'Takubo, Hiroichi (H.)'; 'Veenstra, Tim (T.W.)'; 'Wakenell, Ray (R.A.)'; 'Wattach, Bill (B.)'; 'Williams, Les (LHW.)'; 'Yeung, Lem (.)'
Subject: One example of Engine quit

My lease vehicle 2002MY Tribute experienced engine quit last night.

4F2YU08172KM28336 Build 12/11/2001, Retail 1/11/2002
Mileage: 7360 miles Event: 6/18/2002

After 25 minutes Freeway driving, I exited and stopped traffic signal.
About 30 sec. later I started moving to left turn and stopped at traffic signal again about 50m later.
About 30 sec. later I started moving 20m and right turn.
Then I gave throttle accelerating vehicle up to 35 MPH - 40MPH at slight up hill about 200m.
Then road switched down hill, I released throttle. Usually vehicle slight increase speed up to 45MPH about 200m.
I applied throttle gently after changing road up hill. Few seconds later I realized that vehicle kept down speed and three warning lamp illuminated about 40MPH.
I did not calm enough.
I turned key to start position, but engine did not start because shifter was stayed D range.
I cycled key OFF and ON again, all warning lamp illuminated about 25MPH.
I applied brake to reduce speed and turned vehicle to left.
I shifted N range and cranked. Small gear noise (starter engagement ?) was heard but Engine started normally about 10 MPH.

I remember engine rpm dropped twice on this vehicle during last 6 month.
Possibly engine rpm drop might happen more than two, but I recognized twice.
One is same location same direction, another one was opposite direction almost same location.
No ECM like building or equipment near there, as far as I know.
This is my first V6-4WD model. Previous Tribute was I4-4WD.
I will bring this vehicle to dealer for usual scheduled (7,500 miles) maintenance this week.
I will ask dealer to reflash PCM calibration and continue to monitor.

If you have any question or comment, please feel free to contact to me.

Shinji Kanai
Manager, Tribute Plant QA
Mazda North American Operations

Ford Kansas City Assembly Plant
Plant Vehicle Team
8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
Local Text Pager: 9135677156@alphapage.airtouch.com

From: Shinji Kanai [kanai.sh@sv.mazda.co.jp]
Sent: Wednesday, June 19, 2002 10:05 AM
To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Ayvazzian, Kam (K.)'; 'Badgley, Joel (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn, Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John (J.)'; 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra (S.M.)'; 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)'; 'Diaz, Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)'; 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka (R.V.)'; 'Grewal, Bill (B.S.)'; 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George (G.J.)'; 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa, Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones, Andy'; 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert (R.F.)'; 'Koeko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)'; 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)'; 'Mandziuk, Roger (R.S.)'; 'Marck, Edmond (E.C.)'; 'Matsea, John (J.)'; 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry (L.)'; 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)'; 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie'; 'Notaboom, Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price, Martin (M.)'; 'Requespau, Alden (A.P.)'; 'Shah, Kiran (K.C.)'; 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey (J.R.)'; 'Suarez, Rhae (R.)'; 'Takasawa, Keith (K.D.)'; 'Takubo, Hiroichi (H.)'; 'Veenstra, Tim (T.W.)'; 'Wakenell, Ray (R.A.)'; 'Wettach, Bill (B.)'; 'Williams, Les (LHW.)'; 'Yeung, Lem (.)'
Subject: One example of Engine quit

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Then road switched down hill, I released throttle. Usually vehicle slight increase speed up to 45MPH about 200m.
I applied throttle gently after changing road up hill. Few seconds later I realized that vehicle kept down speed and three warning lamp illuminated about 40MPH.
I did not calm enough.
I turned key to start position, but engine did not start because shifter was stayed D range.
I cycled key OFF and ON again, all warning lamp illuminated about 25MPH.
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I shifted N range and cranked. Small gear noise (starter engagement ?) was heard but Engine started normally about 10 MPH.

I remember engine rpm dropped twice on this vehicle during last 6 month.
Possibly engine rpm drop might happen more than two, but I recognized twice.
One is same location same direction, another one was opposite direction almost same location.
No ECM like building or equipment near there, as far as I know.
This is my first V6-4WD model. Previous Tribute was I4-4WD.
I will bring this vehicle to dealer for usual scheduled (7,500 miles) maintenance this week.
I will ask dealer to reflash PCM calibration and continue to monitor.

If you have any question or comment, please feel free to contact to me.

Shinji Kanai
Manager, Tribute Plant QA
Mazda North American Operations

Ford Kansas City Assembly Plant
Plant Vehicle Team
8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
Local Text Pager: 91356771560alphapage.airtouch.com

EH02-027-C 2778

From: Shinji Kanai [kanai.sh@sv.mazda.co.jp]
Sent: Monday, April 08, 2002 10:16 PM
To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Badgley, Joel (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn, Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John (J.)'; 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra (S.M.)'; 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)'; 'Diez, Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fourmelle, Gilbert (G.)'; 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka (R.V.)'; 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George (G.J.)'; 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa, Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones, Andy'; 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert (R.F.)'; 'Klostermann, Eric (E.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)'; 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)'; 'Luehrsen, Eric (E.A.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John (J.)'; 'Maurer, James (J.S.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry (L.)'; 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)'; 'Naveed Khan'; 'Nemalolahi, Sonya (S.)'; 'Nikolai, Bernie'; 'Noteboom, Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price, Martin (M.)'; 'Raquepau, Alden (A.P.)'; 'Shah, Kiran (K.C.)'; 'Shiraishi, Masaru (M.)'; 'Stigenbauer, Jeffrey (J.R.)'; 'Suarez, Rhae (R.)'; 'Sullivan, Jamie (J.P.)'; 'Takasawa, Keith (K.D.)'; 'Takubo, Hiroichi (H.)'; 'Vecchio, Anne Marie (A.)'; 'Wakenell, Ray (R.A.)'; 'Wettach, Bill (B.)'; 'Williams, Lee (LHW.)'; 'Williamson, David (D.E.)'; 'Yeung, Lam (.)'
Subject: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

[redacted]
N0014_02.doc

I update concern which I reported Stall meeting in last week.
Failed
DPFE sensors were scrapped at dealers in all cases.

CASE 1 (Japan)
VIN: EPEW-101286, Hofu build: 2000/12/13, Retail 2000/12/26
(1) First repair 2001/4/9 4,893km
DTC P0401 and P1408 illuminated. DPFE output Voltage was 0.122V (standard 0.95 - 1.05V).
Replace DPFE sensor with new one. Problem was solved.
(2) Second repair 2001/8/20 11,084km
Engine stall during normal operating temp. Starter was clanking but engine did not start.
WDS tester could not communicate with PCM. BUS(-) terminal voltage showed 1.9V (standard 4.5V) causing NO communication.
Vref was 2.0V (standard 4.0 - 6.0V). When DPFE sensor connector was disconnected, Vref increased to 5V.
Same time Click sound was observed from Fuel pump relay and fuel pressure was increased to normal range.
Also BUS(-) terminal voltage was returned 4.5V at same time, and WDS can communicate with PCM.
Replace DPFE sensor with new one. Problem was solved.
<<<DPFE sensor lot number is unknown. According to second repair date, it might be pre CM part.>>>

CASE 2 (Taiwan)
We are contacting Taiwan continuously.

CASE 3 (Australia)
Attachment is the information from Australia (VIN: JM0YU06BY11100053, Hofu build 2001/01/09).
In addition to this report;
(1) Vref was 2.1 V (standard 4.0 ~ 6.0V) during NO start condition.

EX02-027-C 2777

(2) Vref returned standard value and engine started immediately after disconnect DPFE connector.
(3) In this DPFE internal shortage case, WDS cannot communicate to PCM. Replace DPFE sensor with new one. Problem was solved.
<<<DPFE sensor lot number is unknown. According to build date, it might be pre CM part.>>>

Shinji Kanai
Manager, Tribute Plant QA
Mazda North American Operations

Ford Kansas City Assembly Plant
Plant Vehicle Team
8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
Local Text Pager: 9135677156@alphapage.airtouch.com

Quality Report

mazda

NATIONAL SERVICE DEPT, MAZDA AUSTRALIA PTY. LTD, PH, [illegible], FAX [illegible], E-mail ([illegible]) VER: [illegible]

QR Ref No. :	NR0014/02	Trader Ref. :	DM0202	Date Submit. :	13-MAR-2002
Subject :	VEHICLE STALLED - NO RESTART			Trader Code :	M443442
Model(s) :	TRIBUTE (YU06BY)	Related :		Trader Name :	Mazda (Qld)
QR Priority :	P2 (Requires CASE)	QR Rating :	QH - High (2)	Writer's Name :	Don Mohr

V. I. N. :	JMOYU06BY11100083	Kilometres :	13,351	Date of Sale :	06-APR-2001
MC Code :	XEP10A005500XYP005000	Mod. Code :	SUVA5W5D20	Date Occurred :	05-MAR-2002
RO/Clm No. :	None	Amb Temp :	29 °C	Insp/Rep Date :	11-MAR-2002
Cause Rpted :	1 (eg: Nbr Reported)	Sym. Freq. :	C - Constant	Concern code :	1 - Claims veh undrivable
A/C Fitment :	YES (Yes / No)	Other Acc. :	Towbar (eg: alarm, phone)		
Classify Rpt. :	C1 Urgent Reply in 2 Hrs	Reason for Quality Rpt. Submission :	1 - Diagnostic Assistance with Repair		

DESCRIPTION OF SYMPTOM(S) & CONDITION(S)

Vehicle stalled at traffic lights - would not restart or even crank.

Vehicle towed to Gold Coast Mazda workshop.

Did you work on the vehicle ? (Yes / No) YES

Were the above symptoms duplicated ? (Yes / No) : YES

CAUSE OF SYMPTOM(S)

WDS diagnosis conducted - PCM would not communicate with WDS until manual entry performed. System self-test revealed DTC U1262 - SCP Communication Bus fault in system.

CORRECTIVE ACTION(S)

Followed diagnosis on pages 418-00-20 to 418-00-25 of WSM (for SCP network fault). Checked continuity on BUS + & BUS - to PCM, ICM & DLC - OK. Checked continuity on Flash EEPROM power supply circuit between DLC (pin 13) & PCM - OK.

Replaced ICM and reprogrammed new unit successfully. Fitted new PCM but programming unable to be completed due to no response from PCM. Possible causes "FEPS open circuit" or "Ign switch in position 0".

Was the concern solved ? (Yes / No) NO

If not solved, what was repair effectiveness? : 0 %

WRITER'S COMMENTS (Including expanded Reason for Report submission)

Checked the following which all passed OK: Permanent +v at PCM pin 55, ign+v at PCM pins 71 & 97, ground at pins 24, 51, 77, 103, 76, 33 & 23. All terminals on DLC checked for correct operation. The only issues that appear obvious are - 1. No communication with PCM 2. Odometer goes blank (dashes instead of numbers) when ignition is switched ON and numbers return when ignition is OFF. Assistance required urgently as customer is extremely unhappy with this situation, having purchased this vehicle as a used car only one day before it failed.

Quality Report

NATIONAL SERVICE DEPT, MAZDA AUSTRALIA PTY. LTD, PH: 03 9666 8610, FAX: 9666 2068, E-mail (service@mazda.com.au) VER: 02/08 (NR014_02.doc)

REPORT DESCRIPTION CODINGS

Category :	F - Fuel Emis. Con << Body Listing >> << Body Elect. Listing >>				
Sym Type(s) :	DRV - DRIVEABILITY		Sym code(s) :	04A - STALL, NO RESTART	
Cond code(s) :	Driving	AZA - NOT DEPENDENT ON DRV	Cond code(s) :	Eng Tmp.	FZA - NOT DEPENDENT ON ENG
	Eng Spd.	BZA - NOT DEPENDENT ON ENG		Fuel Use	HZA - NOT DEPENDENT ON FUEL
	Drv Ctrls.	CZA - NOT DEPEND ON DRV CONT		Shifting	KZA - NOT DEPENDENT ON SHFT
	Road	DZA - NOT DEPENDENT ON RD		Weather	LZA - NOT DEPENDENT ON WEA
	Eng Load	EZA - NOT DEPENDENT ON ENG		Other	MZA - NOT DEPEND ON OTHER
Dam. Type :	ELE - ELECTRICAL		Damage code :	9R - OPEN CIRCUIT	
Cause code :	SRA - OPEN CIRCUIT				

ADDITIONAL VEHICLES

	Vehicle Identification No. (VIN/-VDS-VIS)	KMS	MC Specification Code	Repair date (DD-mmm-yyyy)	Date of Sale (DD-mmm-yyyy)	Q 1, Q 2, Q 3 (Refer below)
1						
2						
3						
4						
5						
6						
7						

Q 1 : Did you work on the vehicle?
Q 2 : Did you duplicate the symptoms / conditions, as described on page 1?
Q 3 : Was the problem solved by the corrective action, as described on page 1?

PARTS INFORMATION

	Part name	Part Number	Qty	Location / Avail.
PNNC :	Unit Powertrain Control	YF24-18-881D	1	Not Avail.
Related :				

Quality Report

NATIONAL SERVICE DEPT, MAZDA AUSTRALIA PTY. LTD, PH. 03 9586 0618, FAX 9586 2699, E-mail (serviceqa@mazda.com.au) VER: 0209 (NR014_02.doc)

SUPPORTIVE MEDIA AND/OR ADDITIONAL INFO. **(eg. Photo., drawing, video, audio, additional details.)**

Photograph, Drawing or Information

NO ATTACHED IMAGES OR FILES

Comments:

PROGRESS COMMENTS **(MA USE ONLY)**

CASE Info. : 13-MAR-2002 OPEN **Database Info. :** CBR - Branch, Fw CASE (Std)

Date (dd-mmm-yyyy)	Description / Improvement Progress	Handy Codings (MA USE ONLY)
13-MAR-2002 Writer (Init) NSJLB	UNRESOLVED ISSUE FOR MC ATTENTION << URGENT ATTENTION PLEASE >> (VEHICLE OFF ROAD).	W - Forward Parts Code U - Unavailable Responsible MCJ - Mazda Japan

Edwards, Lynn (L.M.)

From: Storms, Michael (M.)
Sent: Tuesday, August 28, 2001 3:58 PM
To: Edwards, Lynn (L.M.); Oswalt, Greg (G.G.); Liu, Jane (J.)
Cc: Blasi, Gerry (G.); Williamson, Richard (E.)
Subject: 2001 Ranger, Explorer Sport, Sport Trac 4.0L Engine Stalls

As requested at last weeks truck CCRG, I have completed research of AWS, CQIS, and VOQ for additional reports regarding the ignition coil circuit shorts to the braided ground strap on the 4.0L engine.

AWS has revealed one additional claim since my original analysis of this issue. See the attached file: Ignition coil circuit claims. The new report is highlighted in blue.

A search of CQIS indicated 17 reports for Ranger and one report for the Explorer vehicle line. See the attached file: Ground strap CQIS, for the reports.

VOQ contained no reports related to this issue.

If there are any questions regarding this material please let me know.

Regards,

Michael Storms
Product Concern Analyst
Enhanced Concern Identification
500 Town Center Dr. Suite 300, Cube 35
313.248.6411
mstorms@ford.com

B4?

Edwards, Lynn (L.M.)

From: Conn, Michael (M.W.)
Sent: Friday, October 26, 2001 8:35 AM
To: Edwards, Lynn (L.M.)
Subject: FW: Alleged Vehicle Stall - Escape 3.0L

Sorry this wasnt attached previously.

-----Original Message-----
From: Smith, Kim (.)
Sent: Thursday, October 25, 2001 2:44 PM
To: Conn, Michael (M.W.)
Subject: FW: Alleged Vehicle Stall - Escape 3.0L

Mike,

Here is the not that you requested.

-----Original Message-----
From: Bilicki, John (J.R.)
Sent: Friday, October 19, 2001 3:26 PM
To: Obaid, E (E.)
Cc: Johnson, Jim (J.S.); Acharar, Fouad (F.M.)
Subject: Alleged Vehicle Stall - Escape 3.0L

Please refer to the attached WDMO product concern report alleging an intermittent stall concern on a 2001 Escape 3.0L.

John R. Bilicki
(jbilicki@ford.com)
Product Concern Supervisor
Customer Service-Worldwide Direct Market Operations
1555 Fairlane Drive, FBP 3, 142A, MD 74
Phone: 313/59-42672 Fax: 313/84-53817

EA02-627-C 2788

USE THIS FORM ONLY FOR E-MAILING CONCERNS ON NORTH AMERICAN OR EUROPEAN SOURCE VEHICLES

Product Concern Report

MANDATORY FIELDS FOR ALL VEHICLE CONCERNS - ENTER ALL DATES USING DAY/MONTH/YEAR FORMAT

Repairing Facility P&A Code: 9B0033
Vin#: 1FMCU04131KA03934

Market or Dealership: Jostan Motor Company
Mileage : 3406 (KMS / MILES)

Originator's Name : KELVIN DUENAS

Telephone : (670)234-5564

OASIS Symptom Code: 223-581-436

Customer Description of Vehicle Concern : Engine quits, stalls while driving. No signs of misfire or engine abnormal When engine quits. Engine easily restarts with no engine problems. This problem is intermittent that the problem Sometimes occurs once a month only.

Technician Description of Concern, Diagnosis and Repair: How did you diagnose the vehicle?
Test drove vehicle but could not duplicate concern. Tried to retrieve DTC but not available. While monitoring engine idle I have notice that the idle will actually go down as low as 680 to 690 when coming to a stop. While idling in gear and turning the steering wheel the idle will sometimes go down to 630 to 640 lowest peak then will go back to 750 to 820. I am sure that we have an idle control problem because most times when the problem happens is often while driving down hill on a turn during load. Can you Please give me a PCM recalibration and increase the idle so we can try elimination process.

Engine tag details (part number and serial number) _____
Transmission tag details (part number and serial number) _____
Dealer/Local Installed Accessories : _____ Fleet Vehicle? ☐ Yes ☐ No
Diagnostic Trouble Codes : _____ Ambient Temperature : ___ F / C
Repair Date: _____ Action : Replace___ Adjust___ Repair___ Clean___ No Action Taken___
Causal Part Name : _____ Causal Part Number : _____
Are replaced Part(s) Available? Yes ☐ No ☐ Was Repair Effective? Yes ☐ No ☐

MANDATORY FIELDS WHEN RELATED TO CONCERN

Engine : Capacity : _____ Type : _____ Output: _____

☐x Petrol/Gasoline ☐ Diesel ☐ Other fuel (specify) : _____

Transmission : ☐x Automatic ☐ Manual ☐ x4WD

☐ xAnti-Theft Equipment ☐x A/C ☐xPower Steering ☐ xAnti-Lock Brakes ☐ Traction Control

Body Type : _____ Build Date : 1 / 2 / 01 Model Year : 2001 Model : ESCAPE

Tyre/Tire : Size : _____ Manufacturer : _____ Model : _____

VEHICLES WITH SIMILAR CONCERNS/COMPLAINTS

VIN	MODEL	KMS / MILES
1FMYU04131KF21499	2001 ESCAPE	6128

ARE YOU SENDING DIGITAL IMAGES?
YES - SEND THIS REPORT AND IMAGES TO PCHARNEY@FORD.COM AND MGUMZ@FORD.COM
NO - SEND THIS REPORT ONLY TO PCHARNEY@FORD.COM

ER02-827-C 2798

Edwards, Lynn (L.M.)

From: Johnson, Jim (J.S.)
Sent: Thursday, January 10, 2002 2:42 PM
To: Edwards, Lynn (L.M.)
Cc: Oswalt, Greg (G.G.); Fascetti, Bob (R.J.)
Subject: FW: Engine dies out/2001 Ford Escape xlt

Lynn, following up on the 3.0 Escape we spoke about this morning. The vehicle was fixed by replacing the EEC Power Relay.

-----Original Message-----
From: Bilicki, John (J.R.)
Sent: Thursday, January 10, 2002 2:14 PM
To: Johnson, Jim (J.S.)
Subject: FW: Engine dies out/2001 Ford Escape xlt

Jim,

Per our conversation here is the confirmation on the Escape stall fix.

Regards,

John R. Bilicki
(jbilicki@ford.com)
Product Concern Supervisor
Customer Service-Worldwide Direct Market Operations
1555 Fairlane Drive, FBP 3, 142A, MD 74
Phone: 313/59-42672 Fax: 313/84-53817

-----Original Message-----
From: Lee, Chun Hoi (C.)
Sent: Thursday, October 25, 2001 3:22 AM
To: Bilicki, John (J.R.)
Cc: Ahn, Seung-Chul (S.C.)
Subject: RE: Engine dies out/2001 Ford Escape xlt

Hi John,
Triple J has found out the root cause. When they tapped on the EEC Power Relay, the engine stalled. So they replaced the relay with F0AZ-14N089-A.

For Joeten, I will let you know the result ASAP. Thanks for your great help.

CH Lee

EN02-627-C 2787

Rvwd: Folder: Images: 0
Rpt#: 1F4AV002 CQD Rpt: 06/30/2001 Odom: 7,192 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04141KE81182 Bld: 09/08/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer Id: 07430 Sturman & Larkin Ford, Inc. Ph#: (412) 892-2300
State: Pennsylvania City: Pittsburgh Orig/Caller: MARK HAYDUK
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Status: CCRG: Sts:
Fix: Caus. Comp: FUSE BOX -- RPL Condition Code: H5

Region Code: 44 Region Name: Pittsburgh - 44

---------- C O M M E N T S ----------

Type	Comments
CONCER	CUST. STATES: ENGINE WILL STALL WHILE DRIVING AT STEADY SPEED.
REPAIR	* CUST. COMPLAINED ON 4-12-01 AT 5,663 MI. THAT THE ENGINE SHUT OFF WHILE DRIVING. TECH. FOUND NO CODES AND COULD NOT DUPLICATE CONCERN. TECH. TAPPED ON ECC POWER RELAY AND ENG. DID NOT STALL. TECH. CHANGED ECC POWER RELAY AS A PRECAUTION PER HOTLINE.
	* CUST. COMPLAINED ON 6-21-01 AT 7,192 MI. THAT THE ENGINE SHUT OFF WHILE DRIVING AT A STEADY SPEED. TECH. FOUND NO CODES AND COULD NOT DUPLICATE CONCERN. FQE SUGGESTED CHANGING POWER DIST. BOX FOR POTENTIAL LOOSE PINS.
	* MARK HAYDUK - PITTSBURGH FQE - 724-822-4342

TEP01 CQIS Concern Folder

Folder: 01012023 2 MR 01 3.0L STALLS AT CRUISE
Status (T,A,C): T TRACKING CON. Status Date: 08/03/2001
Follow-up Date: 12/31/9999 Owner: [redacted]
Index Points: Part Nbr: - -
YTD Part Sales: Part Desc:
Backorder: Resp Person:
Total Reports: 75 Resp Phone: ( ) -

Folder Comments

Date	Comments

Rpt#: YJRB1014 NHL Rpt: 10/18/2000 Odom: 1,004 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04141KD97434 Bld: 07/31/2000
Engine: 3.0L DUR Calb: Trans: Axle: A/C: YES
Dealer ID: 20303 MEL CLAYTON FORD Phone: (602) 264-1611
State: Arizona City: Phoenix Orig/Caller: BOB PREBLE
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: TECH ONLY HAD A B1601 CODE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RNOWACZY Phone: 313 317-9355 Dist Cd: 71 Los Angeles - 71
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	THE VEHICLE HAS A CONCERN WITH AND INTERM. STALL, THE ONLY CODES WAS A B1601.
RECOMM	ADVISED THE TECH THAT THE B1601 WILL CAUSE A NO CRANK CONCERN. TECH NEEDS TO GET MORE INFO. ON THE CONCERN. SEE IF THE VEHICLE STALLED AT CRUISE OR AT IDLE ON DECEL. WE HAVE NO KNOWNS, SEE IF THE CONCERN HAPPENS ON LOW FUEL LEVEL.

Rpt#: YKFH8007 NHL Rpt: 11/06/2000 Odom: 1,412 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMCU03191KE76965 Bld: 08/31/2000
Engine: 3.0L DUR Calb: Trans: Axle: 3800F2.73C A/C: YES
Dealer ID: 04843 Maroone Ford Phone: (954) 564-3221
State: Florida City: Fort Lauderdale Orig/Caller: JOSE FERRI
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGE STALL AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SRIVERA5 Phone: 313 317-9354 Dist Cd: 24 Orlando - 24
Engineering: Phone: TAR:
Dir Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THE CUSTOMER ALLEGES THE VEHICLE STALLS ONCE WHILE AT A CRUISE. NO CODES ARE SET IN THE PCM. HE HAS NOT SEEN ABLE TO DUPLICATE THE CONCERN. THE CUSTOMER STATES THAT IT FELT LIKE SOMEONE SHUT THE KEY OFF. THE VEHICLE RESTARTED RIGHT AWAY. SEEKING FOR ANY KNOWNS OR ADVICE.
RECOMM	ADVISE TECH NO KNOWNS WERE AVAILABLE, ADVISE TO CHECK ALL THE POWERS AND GROUNDS FOR THE PCM, INSPECT THE EEC HARNESS AT THE RIGHT NEAR THE MOTOR MOUNT FOR POSSIBLE PINCH OR CHAFFING.
ADD-ON	01/10/2001 12:54PM DENNIS HALL MSS - FCSD - CCRG DEALER CALL WAS MADE,NO CODES DISPLAYED AND NO DEFECT FOUND.

Rpt#: YKIA2019 NHL Rpt: 11/09/2000 Odom: 37 M
Vehicle: 2001 ESCAPE 4X4,XLS ,WAGON 1FMYU02131KE88004 Bld: 09/22/2000
Engine: 3.0L DUR Calb: Trans: Axle: A/C: YES
Dealer ID: 01108 John Elway Ford West Phone: (303) 421-5350
State: Colorado City: Wheat Ridge Orig/Caller: MIKE COCHREN
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: DIED WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RLYTLE1 Phone: 313 317-9366 Dist Cd: 56 Denver - 56
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SD

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SD STATES THE CAR DIED WHILE DRIVING AND IS LOOKING FOR KNOWNS FOR THIS CONCERN.
RECOMM	ADV SD THERE IS NO KNOWNS, ADV TO DO BASIC CHECKS.
ADD-ON	01/11/2001 08:54AM DENNIS HALL MSS - FCSD - CCRG DEALER CALL MADE, TECH INDICATED THAT THE AIRFLOW METER WAS UNPLUGGED, VEHICLE WORKED OK. NO DEFECT FOUND.

Rpt#: YK2F3004 NHL Rpt: 11/28/2000 Odom: 2,757 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04101KB70468 Bld: 08/24/2000
Engine: 3.0L DUR Calb: Trans: Axle: A/C: YES
Dealer ID: 01820 Fair Oaks Ford, Inc. Phone: (630) 357-7100
State: Illinois City: Naperville Orig/Caller: JAMES MERTES
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALL AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RKOTHS Phone: 313 317-0000 Dist Cd: 41 Chicago - 41
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cds: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THAT THE CUST ALLEGES THAT THE VEH STALLED AT CRUISE. TECH STATES THAT HE CANNOT DUPLICTE THE CONCERN HE ALSO STATES THAT THERE ARE NO CODES. TECH STATES THAT HE CHECKED THE FUEL PRESSURE & IT IS AT 42 PSI. TECH LOOKING FOR KNOWNS.
RECOMM	ADVISED TECH THAT THE FUEL PRESSURE SHOULD BE 65 PSI ADVISED TECH TO REPLACE THE FUEL PUMP & TO RECHECK THE FUEL PRESSURE.

Rpt#: YLRKE006 NHL Rpt: 12/18/2000 Odom: 399 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMCU03111KF45003 Bld: 11/02/2000
Engine: 3.0L DUR Calb: Trans: Axle: 3800F2.73C A/C: YES
Dealer ID: 04843 Maroone Ford Phone: (954) 564-3221
State: Florida City: Fort Lauderdale Orig/Caller: JOSE FERRI
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: CUSTOMER ALLEDGES STALL Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RSMIT287 Phone: 313 317-9132 Dist Cd: 24 Orlando - 24
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUSTOMER ALLEDGES VEHICLE STALLED, RESTARTED NORMALLY, TECH UNABLE TO VERIFY CONCERN, HAS DRIVEN 40 MILES.
RECOMM	ADVISE CHECK PCM POWER AND GROUND CIRCUITS, BATTERY JUNCTION BOX CONNECTIONS AND TAP ON PCM. NO KNOWNS ON THIS CONCERN AT THIS TIME.
ADD-ON	01/11/2001 09:36AM DENNIS HALL MSS - FCSD - CCRG DEALER CALL MADE NO DEFECT FOUND NO CODES DISPLAYED.

Rpt#: 1BEDS001 NHL Rpt: 02/05/2001 Odom: 4,067 M
Vehicle: 2001 ESCAPE 4X4,XLS ,WAGON 1FMYU02191KD97030 Bld: 07/26/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 20024 STRONGHURST FORD MERCURY CO Phone: (309) 924-1611
State: Illinois City: Stronghurst Orig/Caller: KEVIN DOWD
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS AT CRUSIE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SRIVERA5 Phone: 313 317-9354 Dist Cd: 41 Chicago - 41
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THE CUSTOMER ALLEGES THE VEHICLE STALLS WHILE DRIVING THE VEHICLE LOOSES ALL ELECTRICAL POWER. WHEN THE CONCERN IS PRESENT THE VEHICLE WILL NOT CRANK, THE LIGHTS ON THE DASH, THE RADIO OR THE HEAD LIGHT ARE ALSO INOP. THE ONLY THING THAT DOES WORK ARE THE POWER DOOR LOCKS. HE HAS WIGGLE THE HARNESS AND HAS FOUND NOTHING WRONG. HE ALSO INSPECTED THE IGNITION SWITCH AND IT SEEMS FINE. SEEKING FOR ANY KNOWNS OR ADVICE.
RECOMM	ADVISE TECH NO KNOWNS WERE AVAILABLE, ADVISE HIM TO CHECK THE CENTRAL JUNCTION BOX FOR POSSIBLE WATER INTRUSION, IF FOUND RESEAL THE WINDSHEILD. ALSO INSPECT THE MAIN LOOM AT THE POWER DIST.BOX AS IT ENTERS THE LEFT FENDER FOR POSSIBLE CHAFFING.

Rpt#: 1BIKY009 NHL Rpt: 02/09/2001 Odom: 3,333 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KD92807 Bld: 07/19/2000
Engine: 3.0L DUR Calb: Trans: Axle: A/C: YES
Dealer ID: 01675 Stadium Ford, L.L.C. Phone: (201) 935-2400
State: New Jersey City: Rutherford Orig/Caller: PETER HALONSKI
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: @GWCLE LOW COMPRESSION CYL #4 Images: 0
Fix: Y Caus. Comp: ENGINE ASSEMBLIES -- RPR Condition Code:
Hotliner: RKOTHS Phone: 313 317-0000 Dist Cd: 13 New York -13
Engineering: Phone: TAR: CLD
Dlr Contact: Phone: Title Cde: SD

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SD STATES THAT THE VEH WAS TOWED IN FOR A STALLING CONCERN WHILE DRIVING ALSO IT HAS CODE P0304. TECH STATES THAT HE DID REPLACE THE SPARK PLUG ON CYLINDER #4 HE ALSO STATES THAT HE HAS DRIVEN THE VEH & CANNOT DUPLICATE THE STALLING CONCERN. HE STATES THAT IT HAS BEEN IN A COUPLE OF TIMES FOR THIS CONCERN & THEY CANNOT DUPLICATE IT. HE ALSO STATES THAT THE VEH HAS A DEALER INSTALLED REMOTE START.SD LOOKING FOR KNOWNS.
RECOMM	ADVISED SD OF NO KNOWNS. ALSO ADVISED SD TO CHECK WHERE THE TECH HOOKED UP THE TACH LED & SEE IF IT IS ON THE #4 COIL ON PLUG OR INJECTOR. ALSO ADVISED SD TO GET MORE INFORMATION FROM THE CUST ALSO TO TRY & DUPLICATE THE CONCERN.
REPAIR	02/15/2001 11:30AM ROBERT SMITHJR. MSS - FCSD - TECH SVC HOTLINE FSE CALL BACK, STATES VERIFIED MISSFIRE ON CYLINDER #4, FAILED RELATIV E COMPRESSION TESTS. RUN MANUAL COMPRESSION TESTS, #4 @125 PSI DRY, AL L OTHERS AROUND 175PSI. REMOVED VALVE COVER AND INSPECT VALVE TRIAN, O K. TECH RETEST COMPRESSION, WET, #4 JUMPED TO 200PSI. SEEKING ENGINE E XCHANGE. CUSTOMER REQUEST VEHICLE REPAIRED ASAP, THIS HAS BEEN AND ONG OING PROBLEM SINCE NEW.
RECOMM	SHIPPING ADDRESS: STADIUM AUTO MALL 55 STATE HWY 17 RUTHERFORD, NJ 07070 ENGINE PART #: 1G 754 AA ENGINE SERIAL #: S11600039 ENGINE BUILD DATE: 6/29/2000 R.O #: 26360 WARRANTY START DATE: 9/20/2000 PHONE #: (201)-935-2400 FAX #: (201)-460-2350 SHIPING PRIORITY: HIGH PRIORITY, CUSTOMER WANTS VEHICLE ASAP! VEHICLE USAGE: PERSONAL USE LIFTGATE: NONE REQUIRED COMPLETE MAINT HIST: NEW UNIT, WELL MAINTAINED, NO SIGNS OF OVERHEAT. ADVISE FORWARD REQUEST TO CLEVELAND ENGINE PLANT FOR ENGINE EXCHANGE
ADD-ON	02/15/2001 04:59PM ROBERT SMITHJR. MSS - FCSD - TECH SVC HOTLINE CONTACT PETER HALONSKI FOR MORE INFO PER JOE FERLINE, VERIFIED HAS REM OTE START SYSTEM PROPERLY INSTALLED, IS AN AFTERMARKET SYSTEM, BYPASSE S PATS. TACH PICKUP IS OFF CYLINDR #6, NOT #4. REMOTE START SYSTEM IS NOT INTERFERING WITH VEHICLE OPERATION, MISSFIRE CONCERN HAS BEEN PRES ENT SINCE NEW, REMOTE START SYSTEM RECENTLY INSTALLED. VERIFIED CYLIND ER #4 WAS NOT WASHED DOWN WITH FUEL DURING COMPRESSION TESTS, ALL CYLI NDERS WERE DRY.
AUDIT	02/15/2001 10:58PM CARNOLD4 APPROVED FOR TECH ASSIST REFERRAL PROCESSING BY CARNOLD4
ADD-ON	02/15/2001 10:59PM CARNOLD4 INSPECTED VEHICLE DURING CONTACT. TEST DROVE COULD NOT DUPLICATE STALLING CONCERN. FOUND THAT CYL #4 WAS WEEK DURING CYL BALANCE TEST. SWAPPED IGN COIL, NO DIFFERENCE. PERFORMED COMPRESSION TESTS PER

Rpt#: 1BIEY009 NHL Rpt: 02/09/2001

---------- C O M M E N T S ----------

Type	Comments
	ABOVE COMMENTS AND PULLED VAVLE COVER OFF TO INSPECT VAVLE TRAIN. NO DEFECT WAS FOUND. ALSO VERIFIED THAT REMOTE START SYSTEM WAS NOT INTERFERING WITH CYL #4.

Rpt#: 1BPGH006 NHL Rpt: 02/16/2001 Odom: 1,887 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04121KF62994 Bld: 12/09/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 00905 PARKWAY FORD INC Phone: (336) 724-5921
State: North Caroli City: Winston Salem Orig/Caller: CHRIS WARREN
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALLED ONE TIME AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: JMORRI40 Phone: 313 317-9394 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THAT THE CUSTOMER STATES THAT THE VEH STALL ONE TIME AT CRUISE, THE VEH IMMEDIATELY RESTARTED AFTER PULLING OVER AND STOPPING. THE TECH HAS DRIVEN THE VEHICLE FOR TWO DAYS AND HAS NOT BEEN ABLE TO VERIFY THE CONCERN. CALLING FOR SUGGESTIONS.
RECOMM	ISM 00-12-026 CK FOR STICKING SHUT OR STUCK OPEN EGR VALVE ADVISED THE TECH OF THE ABOVE, THE CONCERN WILL HAVE TO BE VERIFIED BEFORE FURTHER DIAG WILL BE EFFECTIVE.
REPAIR	04/12/2001 08:55AM BENJAMIN UFIMZEFF MSS - FCSD - TECH SVC HOTLINE TECH CALLING ON STALLING CONCERN INTERNITTENTLY,HAS NOT VERIFIED,HOWEVER THE CUSTOMER HAS EXPERIENCED SEVERAL TIMES NOW WHILE AT 45 MPH.
RECOMM	SUGGEST TECH TO REPLACE THE PCM POWER RELAY.HAVE HAD SOME REPORTS OF PCM POWER RELAY ISSUES.ALSO MAY CK THE POWER DISTRIBUTION BOX FOR WATER ENTRY.(SME)JAKE.
REPAIR	04/12/2001 10:56AM THOMAS BRUGGER MSS - FCSD - TECH SVC HOTLINE THE TECH CALLED BACK STATING THAT THE VEHICLE DOES HAVE A SUNROOF. SEEKING KNOWNS ON THE CONCERN.
RECOMM	ADVISED THE TECH TO INSPECT THE POWER DISTRIBUTION BOX FOR WATER INTRUSION, REPAIR OR REPLACE AS NECESSARY.
REPAIR	06/07/2001 11:49AM RYAN MORRISON MSS - FCSD - TECH SVC HOTLINE TECH STATES THAT THE CUSTOMER IS STILL COMPLAINING OF AN INT STALL CONCERN, THE VEHICLE AWLAYS RESTARTS. THEY CAN NOT DUPLICATE THE CONCERN. CALLING FOR FURTHER SUGGESTIONS.
RECOMM	ADVISED THE TECH THAT THERE ARE STILL NO COMMON CONCERNS, WE HAVE SEEN A FEW DPFE SENSOR CONCERNS, STICK IAC OR EGR VALVE CONCERNS. THE BEST THING WOULD BE TO VERIFY THE CONCERN.

Rpt#: 1B2FN034 NHL Rpt: 02/28/2001 Odom: 11,000 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU03151KE81053 Bld: 09/21/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: 3800F2.73C A/C: YES
Dealer ID: 04867 Mike Shad Ford Phone: (904) 777-3673
State: Florida City: Jacksonville Orig/Caller: TOM BUBE
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INT STALLS Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: MPRICE2B Phone: 313 317-9133 Dist Cd: 24 Orlando - 24
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS THAT INTERMITTENTLY VEHICLE WILL STALL, TECH HAS ONLY HAD IT HAPPEN TO HIM ONCE, NO CODES, HAS MONITORED PIDS AND TEST DROVE, SEEKI NG KNOWNS/ADVICE
RECOMM	ADV TECH NO KNOWNS, WIGGLE TEST PCM HARNESS, SJB CONNECTIONS, MONITOR FRP, PIP, RPM

Rpt#: 1CFGQ010 NHL Rpt: 03/06/2001 Odom: 3,900 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04191KE97853 Bld: 09/22/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 04166 McMahon Ford Phone: (203) 838-4801
State: Connecticut City: Norwalk Orig/Caller: RICH VINCENT
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALEDGED STALL AND RESTART Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHEBSTR1 Phone: 313 317-0000 Dist Cd: 13 New York -13
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS CUSTOMER ALEDGES VEHICLE STALLS AND RESTARTS AND TECH STS HAS NOT BEEN ABLE TO VERIFY CONCERN AND HAS NO OTHER INFOMATION ON VEH ICLE . AND IS SEEKING KNOWNS
RECOMM	ADVISE TECH TO VERIFY WITH CUSTOMER FUEL LEVEL AND SPEED OF VEHICLE TU RNING OR STOPING OR ACCLERATING HOT OR COLD CK FUEL PRESSURE AT IDLE A ND WOT ,

Rpt#: 1CMAN002 FOJTHL--or-- FJ 200100000933 Rpt: 03/13/2001 Odom: 167 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON EPFWF100269 Bld:
Engine: 3.0L DUR Calb: Trans: CD4E E Axle: 3800F2.73C A/C:
Dealer ID: A0A00 Ford Japan Limited Phone:
Country: JAPAN City: Minato-Ku, Tokyo Orig/Caller: HIROSHI IDE
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: Images: 0
Fix: Y Caus. Comp: VACUUM HOSE -- ADJ Condition Code:

Region Code: 9H Region Name: FCSD REGION-9H

---------- C O M M E N T S ----------

Type	Comments
CONCER	SUDDENLY, THE ENGINE STALLED DURING CRUISE AT 40 KM/HOUR. THE CUSTOMER EXPERIENCED NO-BRAKE ASSIST DUE TO THE ENGINE STALLING.
TECH/C	TECHNICIAN FOUND THAT A VACUUM-HOSE BETWEEN SURGE TANK AND PCV VALVE WAS REMOVED FROM SURGE TANK NOZZLE.
AUDIT	PART_NBR 13 CHANGED TO VAC/HOSE BY PCHARNEY

Rpt#: 1DEAE006 FOJTHL--or-- FJ 200100000985 Rpt: 04/05/2001 Odom: 372 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON EPFWF100845 Bld:
Engine: 3.0L DUR Calb: Trans: CD4E E Axle: 3800F2.73C A/C:
Dealer ID: A0A00 Ford Japan Limited Phone:
Country: JAPAN City: Minato-Ku, Tokyo Orig/Caller: HIROSHI IDE
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: Images: 0
Fix: Y Caus. Comp: HOSE -- RPR Condition Code:

Region Code: 9H Region Name: FCSD REGION-9H

---------- C O M M E N T S ----------

Type	Comments
CONCER	SUDDENLY A 'POW' SOUND HAPPENED AROUND ENGINE DURING CRUISE, THEN ENGINE STALLED. THOUGH ENGINE COULD RE-START, IT WOULD STALL IMMEDIATELY.
TECH/C	TECHNICIAN FOUND THAT A RUBBER HOSE WHICH CONNECTED WITH PCV VALVE CAME OFF IT. IT MADE THE ENGINE INHALE TOO MUCH AIR.
AUDIT	PART_NBR 13 CHANGED TO HOSE BY PCHARNEY

Rpt#: 1DEA7005 NHL Rpt: 04/05/2001 Odom: 548 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU03141KA36898 Bld: 02/12/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: 3600P2.73C A/C: YES
Dealer ID: 04410 NORTHSIDE FORD Phone: (210) 525-1135
State: Texas City: San Antonio Orig/Caller: JEFF WOOD
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: B1352,INT DIES WHEN DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RLYTLE1 Phone: 313 317-9366 Dist Cd: 52 Southwest - 52
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH IS LOOKING FOR KNOWNS ON DIES WHILE DRIVING. TECH STATES THERE IS A P1000 CODE IN THE PCM, AND IN THE HEC THERE IS LIGHTING CODES.
RECOMM	ADV TECH TO CHECK THE CONECTOR IN THE LEFT KICK PANEL FOR WATER, ADV TO REPAIR AS NEEDED. ADV TO CHECK THE HEC RELAY.
REPAIR	04/10/2001 09:56AM CHOU LOH MSS - FCSD - TECH SVC HOTLINE TECH STATES THAT B1352 WAS SET IN ICM TWO TIMES, SEEKING KNOWNS.
RECOMM	TRANSFERRED TO LFWD.
ADD-ON	05/18/2001 09:22AM WESLEY MALIK(FSH) MSS - FCSD - REG - SOUTHWEST KEY TRANSPONDER FIXED UNIT. ALSO HAD BAD POWER RELAY.

Rpt#: 1DFBW008 NHL Rpt: 04/06/2001 Odom: 7,886 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04151KB61178 Bld: 09/08/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 04831 Thomasville Sales Company Phone: (912) 226-5133
State: Georgia City: Thomasville Orig/Caller: BEN WESTMORELAND
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS AT CRUISE. Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BUFIMZBF Phone: 313 317-7067 Dist Cd: 24 Orlando - 24
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THE VEHICLE HAS CRUISE,HAPPENED FOR THE CUSTOMER 2 TIMES. TECH HAS NOT VERIFIED,NO CODES,RESTARTS FINE.SEEKING SUGGESTIONS/KNOWN S.
RECOMM	ADVISED TECH TO A FEW CONCERNS,CK THE PCM POWER RELAY,REPLACE AND CK T HE WIRING,ALSO ADVISED OF POSSIBLE WATER ENTRY AT LEFT KICK PANEL.

Rpt#: 1DKGJ012 NHL Rpt: 04/11/2001 Odom: 7,427 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04171KF31721 Bld: 10/27/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 02782 Dunnahoe-Shaw Ford-Mercury, In Phone: (828) 586-0900
State: North Caroli City: Sylva Orig/Caller: STEVE CASEBOLT
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGE STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: CLOH2 Phone: 313 317-9134 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUST ALLEGE THAT VEHICLE STALLED WHILE DRIVING. TECH HAS NOT VERIFIED CONCERN, NO CODES SET AND STATES THAT PIDS ARE READING NORMAL. TECH SEEKING KNOWNS.
RECOMM	ADIVSED TECH OF NO KNOWNS. ADVISED TECH TO FIND OUT MORE ABOUT CONCERN FROM CUST, CHECK FOR OVERFILLING CONCERN,....

Rpt#: 1DME8004 NHL Rpt: 04/13/2001 Odom: 5,663 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04141KE81182 Bld: 09/08/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 07430 Sturman & Larkin Ford, Inc. Phone: (412) 892-2300
State: Pennsylvania City: Pittsburgh Orig/Caller: GARY DEANGELIS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGED DIES WHILE DRIVING Images: 0
Fix: Y Caus. Comp: SENSOR - CRANKSHAFT POSITION -- RPL Condition Code:
Hotliner: JOWENS28 Phone: 313 317-4276 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR: CLD
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STS HAS ALLEGED STALL WHILE DRIVING. THE VEHICLE WILL RESTART. HAS NO CODES IN PCM. HAS NOT BEEN ABLE TO DUPLICATE CONCERN. SEEKING ADV.
RECOMM	ADV SM TO TAP ON THE PCM POWER RELAY WHILE RUNNING. IF IT STALLS, REPLACE THE RELAY. ALSO CHECK POWER DIOD FOR LOOSE TERMINALS.
REPAIR	06/22/2001 01:49PM KEITH MENTGEN MSS - PCSD - TECH SVC HOTLINE TECH STATES CUSTOMER WAS DRIVING VEHICLE AND ALLEGEDLY STALLED AND CUSTOMER LOSTED POWER STEERING. ADVISED TECH REPORT WILL BE PROCESSED FOR TECH ASSIST AS FOR CUSTOMER SATISFACTION ON REPEAT STALL CONCERN.
RECOMM	ADVISED TECH WHILE WAITING FOR PSE CHECK G101 AND G100, AS WELL AT PIN 21/22 FOR CKP SENSOR FOR POOR CONNECTIONS.
ADD-ON	07/12/2001 01:42PM JOE NIGRA(FSE) MSS - PCSD - RBG - PITTSBURGH WENT TO DEALERSHIP ON 6/27/01 AND SPOKE WITH TECHNICIAN (BRAD) AND SM (GARY DIANGELIS) ON THIS CONCERN. CONCERN HAPPENED FOR THE CUSTOME R A COUPLE OF TIMES IN INTERVALS OF APPROX 1000 MILES. WE WERE NOT AB LE TO VERIFY CONCERN, BUT IT WAS DISCOVERED THAT + TERMINAL GOING TO P OWER DISTRIBUTION BOX DID NOT SEEM TO BE SUPPORTED PROPERLY. THERE WA S SOME MOVEMENT AT BOX AND 20 AMP FUEL PUMP FUSE MOVED WHEN CABLE WAS WIGGLED. WIGGLE TEST AT POW DIST BOX DID NOT REPEAT CONCERN. FROM HO TLINE'S SUGGESTIONS, R & R'D CKP SENSOR, WENT OVER G100 & G101 & POWER DISTRIBUTION BOX. FOLLOWED UP ON THIS VEH ON 7/9/01. CUST HAS BEEN DRIVING VEH AND HAS N OT HAD STALL CONCERN, ACCORDING TO SERV WRITER (CHUCK). CLOSE TAR.

Rpt#: 1DPHJ009 NHL Rpt: 04/16/2001 Odom: 7,802 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04191KE59376 Bld: 08/21/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 05739 Ted Russell Ford Inc Phone: (865) 693-7707
State: Tennessee City: Knoxville Orig/Caller: DAVID LEDFORD
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINES TEMP
Addl Sym: STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHINES6 Phone: 313 317-9377 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
CONCER	1X STALL AT CRUISE. VEHICLE RESTARTED IMMEDIATELY.
REPAIR	CAN NOT VERIFY CONCERN. NO CODES, SEEKING KNOWNS
RECOMM	NO KNOWNS, CHECK ODOMETER FOR PCM COMMUNICATION AT TIME OF CONCERN.

Rpt#: 1DQE8001 NHL Rpt: 04/17/2001 Odom: 496 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU031X1KA99939 Bld: 03/20/2001
Engine: 3.0L DUR Calb: Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 00277 CAREY PAUL FORD Phone: (770) 987-9000
State: Georgia City: Decatur Orig/Caller: JESSE MIRANDA
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALL AT CRUISE REPORTED Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: WDOW Phone: 313 317-9292 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUSTOMER REPORTS ENGINE STALLED WHILE DRIVING. RESTARTED OK. FOREMAN STATES NO CODES PRESENT (PASS). VEHICLE DRIVEN SIXTY MILES WITHOUT DUPLICATING CONCERN.
RECOMM	RECOMMENDED INSPECTION OF ENGINE CONTROL WIRING HARNESSES AND CONNECTORS. INSPECT CENTRAL JUNCTION BOX AND WIRING FOR LOOSE CONNECTIONS OR WATER ENTRY.

Rpt#: 1DKDY008 MHL Rpt: 04/24/2001 Odom: 6,352 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04121KD91700 Bld: 06/29/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 03130 Phil Long Ford of Denver, LLC Phone: (303) 932-2277
State: Colorado City: Denver Orig/Caller: MIKE FICCA
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALEDGED STALLS WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHEBSTR1 Phone: 313 317-0000 Dist Cd: S6 Denver - S6
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STS CUSTOMER ALEDGES VEHICLE STALLS WHILE DRIVING AND RESTARTS AND SM STS HAS NOT BEEN ABLE TO VERIFY CONCERN AND HAS FSE AT DEALER AND I S GOING TO LET FSE TAKE VEHICLE IN ATTEMPT TO VERIFY CONCERN
RECOMM	ADVISE SM NO REPORTED KNOWNS FOR CONCERN AT THIS TIME AND IF FSE WANTS TO ATTEMPT TO VERIFY CONCERN THIS IS OK

Rpt#: 1ECIP02$ NHL Rpt: 05/03/2001 Odom: 2,989 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04121KF85945 Bld: 12/11/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 00987 Ciener-Woods Ford Phone: (336) 996-3700
State: North Caroli City: Kernersville Orig/Caller: BRAD QUEEN
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: INTERMITTENT STALL Images: 0
Fix: N Caus. Comp: -- Condition Code:
Hotliner: TBRUGGER Phone: 313 317-4384 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	THE TECH STATES THAT THE CUSTOMER STATED THAT THE VEHICLE STALLED WHILE CRUISING AT 45 MPH. THE VEHICLE THEN RESTARTED. FUEL LEVEL IS ABOUT 1/2 TANK AND THERE ARE NO CODES. SEEKING FOR KNOWNS.
RECOMM	ISM 00-12-026 CK FOR STICKING SHUT OR STUCK OPEN EGR VALVE ADVISED THE TECH TO INSPECT THE EGR SYSTEM FOR POSSIBLE STICKING EGR VALVE OR FAULTY DPFE SENSOR. REPAIR OR REPLACE AS NECESSARY.
TECH/C	06/19/2001 07:20AM SURVEY ENTRY MSS - FCSD - TECH SVC HOTLINE COULD NOT VERIFY

Rpt#: 1EGFS007 NHL Rpt: 05/07/2001 Odom: 150 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04101KB27438 Bld: 04/10/2001
Engine: 3.0L DUR Calb: 0N11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 03701 JACK TREBOUR FORD Phone: (973) 927-6700
State: New Jersey City: Randolph Orig/Caller: PETER ROZANTIS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGED STALL AND RESTERT Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: JOWENS28 Phone: 313 317-4276 Dist Cd: 13 New York -13
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS HAS A REMOTE START SYSTEM. CUSTOMER STS WHEN THEY WERE DRIVING AND THE OIL LIGHT AND BATTERY LIGHT CAME ON AND THE VEHICLE DIED. CUSTOMER WAS ABLE TO GET THE ENGINE STARTED. TECH HAS NOT VERIFIED THE CONCERN. SEEKING ADVICE
RECOMM	ADV TECH TO CHECK THE PCM POWER RELAY. POSSIBLE UNLATCHING CAUSING PCM TO LOOSE POWER. ALSO ADV TECH TO CHECK FOE LOSS OF RPM SIGNAL. ADV THE TECH TO DUPLICATE THE CONCERN AND ALSO MONITOR THE MIL LIGHT.

Rpt#: 1EGHD013 NHL Rpt: 05/07/2001 Odom: 15,165 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04101KD84920 Bld: 05/18/2000
Engine: 3.0L DUR Calb: Trans: Axle: A/C: YES
Dealer ID: 05021 Laird Noller, Inc. Phone: (913) 334-0011
State: Kansas City: Kansas City Orig/Caller: JOHN SIMS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEDGED STALLING CONCERN Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BKREIN Phone: 313 248-2930 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS THAT CUSTOMER COMPLAINT IS A STALLING CONCERN WHILE GOING DOWN THE ROAD. TECH STS THAT HE HASN'T VERIFIED THE CONCERN. TECH SEEKING ANY KNOWNS.
RECOMM	ADVISED THE TECH OF NO KNOWNS. ADVISED THE TECH TO MONITOR THE PPC AND FRP. INSTALL A FUEL PRESSURE GAUGE AND VERIFY THE CONCERN. ADVISED TECH TO CHECK THE CKP AND TRIGGER WHEEL.

Rpt#: 1EKA9011 NHL Rpt: 05/11/2001 Odom: 5,380 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU03151KF53546 Bld: 11/02/2000
Engine: 3.0L DUR Calb: DM11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 02923 Maxwell Ford Phone: (512) 443-5000
State: Texas City: Austin Orig/Caller: DAVID ADAMS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS AT 45 MPH INTER, Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BUF1MZEF Phone: 313 317-7067 Dist Cd: 52 Southwest - 52
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUSTOMER STATES THE VEHICLE HAS STALLING CONCERN WHILE DRIVING.TECH HAS NOT BEEN ABLE TO DUPLICATE THE CONCERN.VEHICLE RESTARTS FINE.
RECOMM	SUGGEST DEALER TO REPLACE THE PCM POWER RELAY AND CK PRIMARY GROUND G104 AND CLEAN AS NECESSARY.
REPAIR	05/23/2001 04:53PM KEVIN HINES MSS - FCSD - TECH SVC HOTLINE HAS RECHECKED DRIVING 100 MILES TOTAL DRIVE WITH NO CODES STILL CANNOT DUPLICATE CONCERN.
RECOMM	RECC TO DISSCONNECT DPFE VALVE AND RETEST. CHECK TO SEE IF ODOMETER GOES TO ALL DASHES DUE TO LOSS PCM CONNECTION
REPAIR	05/25/2001 06:09PM KENNETH HEBSTRIET MSS - FCSD - TECH SVC HOTLINE SF STS LAST TIME VEHICLE STALLED HAD 1/4 TANK OF FUEL BUT STARTED RIGH T BACK UP PER CUSTOMER THEN VEHICLE STALLED AGAIN AND CUSTOMER HAD VEH ICLE TOWED IN
RECOMM	ADVISE SF TO INSPECT FOR CONTAMINATION IN FUEL TANK AND POSSABLE CLOGG ED FUEL RESIVOER

Rpt#: 1EOFH009 NHL Rpt: 05/15/2001 Odom: 761 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMCU03181KB40658 Bld: 04/18/2001
Engine: 3.0L DUR Calb: Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 00478 WADE FORD INC Phone: (770) 436-1200
State: Georgia City: Smyrna Orig/Caller: TIM BLACK
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGE STALL WHILE DRIVING Images: 0
Fix: N Caus. Comp: -- Condition Code:
Hotliner: CLOH2 Phone: 313 317-9134 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SD

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUST ALLEGES THAT VEHICLE STALLS WHILE DRIVING. SD HAS NOT VERIFIED CONCERN AND IS SEEKING KNOWNS.
RECOMM	ISM 96-02-036 VAPOR LOCK CAUSED BY "WINTER BLEND" FUELS ADVISED SD OF NO KNOWNS. ADVISED SD NOT TO ATTEMPT REPAIR UNLESS CONCERN IS VERIFIED. ADVISED SD TO CALL CUST AND CHECK IF CUST FILLS THE GAS TANK PRIOR TO CONCERN, SUSPECT OVERFILLING.
TECH/C	06/11/2001 07:54AM SURVEY ENTRY MSS - FCSD - TECH SVC HOTLINE NO PROBLEM FOUND FOR CUSTOMERS STALLING OUT CONCERN.

Rpt#: 1EOFQ005 NHL Rpt: 05/15/2001 Odom: 7,697 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KE81258 Bld: 09/08/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E S Axle: A/C: YES
Dealer ID: 01414 FAULKNER FORD, INC. Phone: (610) 444-6500
State: Pennsylvania City: Kennett Square Orig/Caller: BOB GIULIANI
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGED STALL CONCERN Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: TROOT Phone: 313 317-9332 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECHNICIAN BOB STATES THAT THE VEHICLE HAS AN ALLEGED STALL CONCERN. THE CUSTOMER STATES THAT HE VEHICLE LOST POWER, AND THE CHECK ENGINE LIGHT AND OIL LIGHT CAME ON. THE VEHICLE STALLED, AND THEY PULLED ON TO THE SIDE OF THE ROAD. THE VEHICLE STARTED FINE, AND THE CONCERN WAS GONE. NOW THE VEHICLE IS BACK WITH THE SAME CONCERN. THE FIRST TIME THE CONCERN HAPPENED WAS AT 626 MILES AND THE SECOND TIME WAS AT 7230 MILES. THE TECHNICIAN TOOK THE VEHICLE ON A 20 MILE TEST DRIVE, AND WASN'T ABLE TO DUPLICATE THE CONCERN. THERE ARE NO CODES, AND THE VEHICLE IS WORKING CORRECTLY AT THIS TIME. TECHNICIAN SEEKING ANY KNOWNS...
RECOMM	ADVISED TECHNICIAN THAT THERE ARE NO KNOWNS FOR THIS CONCERN. ADVISED TECHNICIAN TO MAKE SURE THAT HE PCM IS AT THE LATEST CALIBRATION. ADVISED TECHNICIAN TO CHECK THE FUEL PRESSURE AND TO MAKE SURE THAT IT ISN'T BLEEDING DOWN. ADVISED TECHNICIAN NOT TO ATTEMPT ANY REPAIRS UNLESS THE CONCERN CAN BE DUPLICATED. ADVISED TECHNICIAN TO CALL BACK IF NEEDING ANY FURTHER ASSISTANCE....

Rpt#: 1EQDP006 NHL Rpt: 05/17/2001 Odom: 1,700 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMCU03191KB27126 Bld: 04/10/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 00472 Jim Tidwell's World Ford Phone: (770) 427-5531
State: Georgia City: Kennesaw Orig/Caller: MIKE MORONEY
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: INTERM. STALL/RESTARTS/NO CODE Images: 0
Fix: N Caus. Comp: -- Condition Code:
Hotliner: RNOWACZY Phone: 313 317-9355 Dist Cd: 21 Atlanta - 21
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	R/O#76647, THIS VEHICLE HAS A VERY INTERM. CONCERN OF STALL AT CRUISE /NO CODES. THE TECH HAS NOT BEEN BALE TO VERIFY THE CONCERN.
RECOMM	ADVISED THE TECH TO CHECK POWERS AND GROUNDS TO THE PCM. TRY AN REPRODUCE THE CONCERN WITH THE NGS OR WDS.
TECH/C	06/18/2001 08:18AM SURVEY ENTRY MSS - FCSD - TECH SVC HOTLINE COULD NOT DUPLICATE CONCERN

Rpt#: 1ERGD017 NHL Rpt: 05/18/2001 Odom: 4,460 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU041X1KF88601 Bld: 01/10/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01972 WOODY SANDER FORD INC Phone: (513) 541-5586
State: Ohio City: Cincinnati Orig/Caller: MARTY BEYER
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEDGED INTERMITTENT STALLING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BKRBIN Phone: 313 248-2930 Dist Cd: 47 Cincinnati - 47
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS THAT HE HAS AN INTERMITTENT STALLING CONCERN. TECH STS THAT HE IS UNABLE TO VERIFY THE CONCERN. TECH SEEKING KNOWNS FOR A INTERMITTENT STALLING CONCERN.
RECOMM	ADVISED THE TECH TO TRY TAPPING ON THE EEC POWER RELAY. ADVISED TECH THAT HE MAY HAVE A LOOSE PIN ON THE RELAY. ADVISED THE TECH TO VERIFY THE CONCERN.

Rpt#: 1EUEV008 NHL Rpt: 05/21/2001 Odom: 1,518 M
Vehicle: 2001 ESCAPE 4X2,XLS ,WAGON 1FMYU01151KA58847 Bld: 01/29/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 04977 World Ford/Pembroke Pines Phone: (954) 443-7000
State: Florida City: Pembroke Pines Orig/Caller: JOE SASSIN
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: ALLEGE SHUTS-OFF WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: CLOH2 Phone: 313 317-9134 Dist Cd: 24 Orlando - 24
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUST ALLEGE THAT VEHICLE SHUTS-OFF WHILE DRIVING WHEN ENGINE IS HOT. SM HAS NOT VERIFIED CONCERN, HAS NO CODES AND IS SEEKING KNOWNS.
RECOMM	ISM 96-02-036 VAPOR LOCK CAUSED BY "WINTER BLEND" FUELS ADVISED SM OF NO KNOWNS. ADVISED SM TO CHECK FUEL QUALITY AND NOT TO ATTEMPT REPAIR UNLESS CONCERN IS VERIFIED.

Rpt#: 1E3EL006 NKL Rpt: 05/29/2001 Odom: 11,666 M
Vehicle: 2001 ESCAPE 4X2,XLS ,WAGON 1FMYU01181KA19475 Bld: 12/11/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 05615 LESTER MOTORS INC Phone: (502) 754-1634
State: Kentucky City: Central City Orig/Caller: DAVID SHELTON
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: UNVERIFIED STALL Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: WDOW Phone: 313 317-9292 Dist Cd: 47 Cincinnati - 47
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SERVICE MANAGER LOOKING FOR "KNOWNS" FOR UNVERIFIED STALL/QUIT CONCERN VEHICLE NOT PRESENTLY AT DEALER REPORTED MILAGE WAR RECORDED 05/05/01.
RECOMM	ADVISED MANAGER HAVE DRIVE TECH USE WDS TO DETERMINE CODE STATUS WHEN VEHICLE IS SCHEDULED INTO SHOP.
REPAIR	05/31/2001 12:34PM JEFFREY WILLIS MSS - FCSD - TECH SVC HOTLINE TECH STATES THAT THE VEHICLE IS IN NOW AND THE MILEAGE IS 12,256. TECH HAS INSPECTED FUEL PRESSURE (33 PSI), IAC 43.8%. TECH UNABLE TO DUPLICATE CONCERN. TECH SEEKING DIRECTION.
RECOMM	ADVISED THE DLR TO REPLACE PCM POWER RELAY AND TO INSTALL A FLIGHT REC ORDER IN THE VEHICLE. ADVISED TO MONITOR VREF, VPWR, IAC, ETC.

Rpt#: 1E4KL021 NHL Rpt: 05/30/2001 Odom: 640 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04131KA03934 Bld: 01/02/2001
Engine: 3.0L DUR Calb: Trans: CD4E E Axle: A/C: YES
Dealer ID: 80D33 Joeten Motor Company Phone: (670) 234-5568
Country: NORTHERN MAR City: Saipan Orig/Caller: KELVIN DUENES
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALLS AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: JDEMBL1 Phone: 313 317-9363 Dist Cd: 9K FCSD REGION 9K
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SERVICE MANAGER STATED THAT HAS A CONCERN OF STALLS AT CRUISE, PULLS OVER AND STARTS UP- CAN NOT VERIFY THE CONCERN, NO CODES, FREEZE FRAME DATA.
RECOMM	ADVISED THE SERVICE MANAGER TO VERIFY THE CONCERN. PER SME- TO CHECK THE POWERS AND GROUNDS TO THE PCM- TO PERFORM A TAP TEST ON THE PCM, TO SWAP IN A KNOWN GOOD DPFE.

Rpt#: 1FEE7014 NHL Rpt: 06/05/2001 Odom: 3,368 M
Vehicle: 2001 ESCAPE 4X4,XLS ,WAGON 1FMYU02141KF99192 Bld: 12/08/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01972 WOODY SANDER FORD INC Phone: (513) 541-5586
State: Ohio City: Cincinnati Orig/Caller: DALE SCHEINER
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALEDGED STALLS AT CRUSE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHEBSTR1 Phone: 313 317-0000 Dist Cd: 47 Cincinnati - 47
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS CUSTOMER ALEDGES VEHICLE WILL STALL WITH CRUSE ON AND TECH ST S HAS NOT BEEN ABLE TO VERIFY CONCERN AND IS SEEKING ANY KNOWNS FOR CO NCERN
RECOMM	ADVISE TECH THERE ARE NO KNOWNS FOR ALEDGED CONCERN AND HE WILL NEED T O ATTEMPT TO VERIFY CONCERN AND SUBMITH EDSR WITH FINDINGS

Rpt#: 1FEG6001 NHL Rpt: 06/05/2001 Odom: 160 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU03191KB83430 Bld: 05/23/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 02923 Maxwell Ford Phone: (512) 443-5000
State: Texas City: Austin Orig/Caller: DAVE ADAMS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INT STALL ON DIPS/HILLS Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: MSCHMI56 Phone: 313 317-4280 Dist Cd: 52 Southwest - S2
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SF STATES THE VEHICLE IS AN ALLEGED STALL CONCERN ONLY IN ONE AREA. IT WILL ALLEGEDLY STALL ON A DIP IN THE ROAD. THE SF HAS DRIVEN THE VEHICLE IN THIS AREA AND HE CANNOT DUPLICATE THE CONCERN. HE IS LOOKIN LOOKING FOR ANY KNOWNS ON THIS CONCERN. THIS IS THE SECOND VEHICLE THE CUSTOMER HAS HAD THIS CONCERN WITH. THE FIRST VEHICLE WAS BOUGHT BACK AND SHE WAS PUT INTO A NEW ESCAPE. NOW THIS VEHICLE IS DOING THE SAME THING.
RECOMM	ADVISED SF TO TRY TO DUPLICATE THE CONCERN. DUE TO THE CIRCUMSTANCES INVOLVED, HE MAY NEED TO GET THE ZONE INVOLVED. IF HE CANNOT DUPLICATE AFTER REPETED TESTING, HE SHOULD CONTACT HIS ZONE REP OR RECONTACT US FOR A TECH ASSIST REFERRAL.
ADD-ON	06/07/2001 04:14PM WESLEY MALIK(FSE) MSS - FCSD - REG - SOUTHWEST SHOP FORMAN REDROVE UNIT TO SAME LOCATION AND CAN DUPLICATE STALL BY DOING FOLLOWING: LONG DECEL DOWN HILL, AT BOTTOM START TO ACCELERATE AND ENGINE STALLS. IMMEDIATE RESTART. UNABLE TO DETERMINE CAUSE.\

Rpt#: 1FGEQ00β NHL Rpt: 06/07/2001 Odom: 11,645 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04161KE70562 Bld: 08/23/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 02175 Mathews Ford Wooster, Inc. Phone: (330) 345-6600
State: Ohio City: Wooster Orig/Caller: TOM JACKSON
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALEDGED STALLS AT CRUSE Images: 0
Fix: N Caus. Comp: -- Condition Code:
Hotliner: KHEBSTR1 Phone: 313 317-0000 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS CUSTOMER ALEDGES VEHICLE WILL STALL AT CRUSE SPEEDS AND HAS T O STOP VEHICLE TO RESTART AND TECFH STS HE HAS NOT BEEN ABLE TO VERIF Y CONCERN AND IS SEEKING KNOWNS FOR THIS ALEDGED CONCERN
RECOMM	ADVISE TECH THAT THERE ARE NO KNOWNS FOR STALL AT CRUSE SPEEDS AND TRY TO VERIFY CONCERN AND RETRIVE ANY DTC'S AND REVIEW DATA IF ANY THING FOUND SUBMITTE EDSR
TECH/C	07/09/2001 09:13AM SURVEY ENTRY MSS - FCSD - TECH SVC HOTLINE UNABLE TO DUPLICATE CONCERN
REPAIR	07/25/2001 02:08PM KEVIN AVERY MSS - FCSD - TECH SVC HOTLINE TECH STS SAME CONCERN, CANNOT VERIFY, SEEKING KNOWNS.
RECOMM	ISM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S ADV TECH CHECK FOR LATEST PCM CALIBRATION.

Rpt#: 1FGE3001 NHL Rpt: 06/07/2001 Odom: 10,501 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KF57755 Bld: 11/15/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 03558 OKC Auto Collection Phone:
State: Oklahoma City: Edmond Orig/Caller: BILL JOHNSON
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Syn: INT STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHINES6 Phone: 313 317-9377 Dist Cd: ????????????????????
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
CONCER	INT STALL AT CRUISE. SEEMS TO HAPPEN MORE ON DOWN HILLS. HAPPENS WITH IN FIRST 5-6 MILES OF DRIVE.
REPAIR	HAS NOT BEEN ABLE TO DUPLICATE ON MULTIPLE TEST DRIVES. NO CODES.
RECOMM	REPORT #: 1EGFS010 - RESET BASE IDLE CHECK BASE IDLE. ADVISED THIS IS A KNOWN CONCERN AND IS UNDER INVESTI GATION. THERE IS NO OTHER FIX AVAILABLE AT THIS TIME.

Rpt#: 1FHFC00S NHL Rpt: 06/08/2001 Odom: 10,815 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04191KF31588 Bld: 10/31/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 08178 Pundmann Motor Company Phone: (636) 946-6611
State: Missouri City: St Charles Orig/Caller: RICH SHAPIRO
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALL AT CRUISE/RESTARTS Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: MFRICH28 Phone: 313 317-9133 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS CUSTOMER & PORTER STS THAT VEHICLE BOGGED DOWN AND STALLED AT CRUISE, TECH HASN'T BEEN ABLE TO DUPLICATE, NO CODES IN PCM , SEEKING KNOWNS
RECOMM	ADV TECH NO KNOWNS, CHECK OTHER MODULES FOR CODES FOR POSSIBLE PCM POWER OR GROUND ISSUE, CHECK FUEL PUMP CIRCUIT, MONITOR IAC%, MAF, BARO, FUEL TRIMS

Rpt#: 1FLFR005 NHL Rpt: 06/12/2001 Odom: 3,078 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04181KF31653 Bld: 10/26/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 00048 Ted Britt Ford Sls Inc Phone: (703) 591-8484
State: Virginia City: Fairfax Orig/Caller: JOHN DUBNOWSKI
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SMURRAY8 Phone: 313 317-0000 Dist Cd: 27 Washington - 27
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH CALLED STATING THE VEHICLE INTERMITTENTLY STALLED. THERE ARE NO CODES AND CANNOT VERIFY THE CONCERN. THERE IS CURRENTLY A 1/2 TANK OF FUEL IN THE VEHICLE, BUT DOES NOT KNOW HOW MUCH WAS IN AT THE TIME OF CONCERN. THE CUSTOMER EXPLAINED IT FELT LIKE THE VEHICLE LOSS POWER BEFORE THE STALL. THERE WAS ONE TIME WHERE IT STARTED TO LOSE POWER AND PRESSED ON THE GAS TO GET IT GOING AGAIN. WHEN THE VEHICLE DID STALL, IT HAD TO SIT FOR ABOUT 10 MINUTES BEFORE IT STARTED. THE FUEL TRIMS ARE SITTING AT ABOUT 0 AND IS LOOKING FOR ADVICE.
RECOMM	ADVISED HE MAY HAVE TO VERIFY THE CONCERN TO DIAGNOSE. ADVISED TO CHECK THE FUEL PRESSURE. CHECK G402.

Rpt#: 1FMAC308 EDSR --or-- Q 413621 Rpt: 06/14/2001 Odom: 1,369 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04161KB69130 Bld: 05/08/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 81390 FREEWAY FORD SALES LIMITED Phone: (416) 293-0975
Province Ontario City: Scarborough Orig/Caller: RON LAPIERRE
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Images: 0
Fix: Caus. Comp: -- Condition Code:

Region Code: 01 Region Name: 01 FCSD REGION-CANADA

---------- C O M M E N T S ----------

Type	Comments
CONCER	THE VEHICLE STALLED WHILE DRIVING AT APPROX. 80 KILOS ON DECELERATION. ALSO THE FOLLOWING DAY THE ENGINE CRANKED AND WOULD NOT START. THE CUSTOMER WAITED ABOUT AN HOUR AND THE VEHICLE STARTED. THE SAME CONDITION EXISTED THE NEXT DAY. AFTER THE VEHICLE STALLED ON THE HIGHWAY IT RESTARTED AFTER CUSTOMER CAME TO A STOP.
TECH/C	WE ROAD TESTED VEHICLE AND TESTED THE EEC. AFTER DRIVING FOR APPROX. 80 KILOMETERS THE CONCERN COULD NOT BE DUPLICATED BY US. WE RELEASED THE VEHICLE TO THE CUSTOMER AND SHE WILL MONITOR. THE CUSTOMER IS NERVOUS DRIVING THIS VEHICLE NOW.
AUDIT	VIN 1FMYU04161KB69130 CHANGED TO 1FMYU04161KB69130 BY DSTELTER SYMPTOM_CODE 607000 CHANGED TO 607692 BY DSTELTER

Rpt#: 1FSGB017 NHL Rpt: 06/19/2001 Odom: 4,610 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU03121KA16276 Bld: 01/11/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 06494 NEW SOUTH FORD Phone: (601) 693-6821
State: Mississippi City: Meridian Orig/Caller: STEVE DEAN
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALL NO CRANK PATS? Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: JOWENS28 Phone: 313 317-4276 Dist Cd: 23 Memphis - 23
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STS HAS ALLEGED STALL AND NO CRANK. THE CUSTOMER HAS HAD THE CONCERN FOR A WHILE AND HAS TRADED THE VEHICLE IN. SM STS THEY CAN'T VERIFY THE CONCERN. SEEKING ADVICE
RECOMM	ADV SM TO VERIFY THE CONCERN. CHECK PCM POWERS AND GROUNDS. POSSIBLE PCM POWER RELAY. ADV TO ALSO MONITOR THE PATS LIGHT AT THE TIME OF THE CONCERN.

Rpt#: 1FTA2020 NHL Rpt: 06/20/2001 Odom: 4,461 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04111KF87434 Bld: 01/10/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 00797 DICK MILHAM FORD Phone: (610) 253-9191
State: Pennsylvania City: Easton Orig/Caller: STUART PUDGE
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: REPEAT STALLIN AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SRIVERAS Phone: 323 317-9354 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THE CUSTOMER ALLEGES THE VEHICLE STALLS AT A CRUISE. NO CODES ARE STORED IN THE PCM AND HE HAS NOT BEEN ABLE TO DUPLICATE THE CONCERN. THE CUSTOMER STATES THE VEHICLE STARTS RIGHT BACK UP WITH NO PROBLEM AT ALL. SEEKING FOR ANY KNOWNS OR ADVICE.
RECOMM	ADVISE TECH NO KNOWNS WERE AVAILABLE, ADVISE TO TAP ON THE EEC RELAY AND SEE IF IT STALLS, CHECK FOR LOOSE PINS AT THE POWER DIST. BOX AS WELL.

Rpt#: 1FUPW014 NHL Rpt: 06/21/2001 Odom: 650 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04161KB73303 Bld: 05/18/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 02624 Lithia Ford of Concord Phone: (925) 686-5000
State: California City: Concord Orig/Caller: GREG OSBORN
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALEDGED STALLS WHILE CRUSE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHBESTRI Phone: 313 317-0000 Dist Cd: 72 San Francisco - 72
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS CUSTOMER ALEDGES VEHICLE STALLED WHILE DRIVING AND RESTARTED WITHOUT PROBLEM AND TECH IS UN ABLE TO VERIFY CONCERN AND IS SEEKING K NOWNS FOR CONCERN
RECOMM	ADVISE TECH THAT THERE ARE NO KNOWNS FOR CONCERN AT THIS TIME AND TO TRY TO VERIFY CONCERN

Rpt#: 1FZI8014 NHL Rpt: 06/26/2001 Odom: 5,359 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04181KF16439 Bld: 10/12/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01972 WOODY SANDER FORD INC Phone: (513) 541-5586
State: Ohio City: Cincinnati Orig/Caller: LEN WILKIN
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: INT STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RKOTHS Phone: 313 317-0000 Dist Cd: 47 Cincinnati - 47
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STATES THAT THE CUST ALLEGES THAT THE ENG STALLED WHILE DRIVING & IT STARTED RIGHT UP. SM STATES THAT THEY CANNOT DUPLICATE THE CONCERN & THERE ARE NO CODES. SM LOOKING FOR KNOWNS.
RECOMM	ADVISED SM OF NO KNOWNS. ALSO ADVISED SM TO CHECK THE FUEL PRESSURE & IT SHOULD BE 65 PSI ALSO TO DRIVE THE VEH & TO MONITOR FUEL PRESSURE & RIDE & TRY TO DUPLICATE THE CONCERN.

Rpt#: 1F1EW002 NHL Rpt: 06/27/2001 Odom: 315 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04101KA34077 Bld: 01/25/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 03982 Barber Ford, Inc. Phone: (570) 654-3351
State: Pennsylvania City: Exeter Orig/Caller: STEVE TONKIN
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALLED AND RESTARTED Images: 0
Fix: N Caus. Comp: -- Condition Code:
Hotliner: SMURRAYS Phone: 313 317-0000 Dist Cd: 16 Philadelphia -16
Enginnering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH CALLED STATING THE CUSTOMER WAS DRIVING THE VEHICLE AND IT STALLED. STATED THE VEHICLE WAS BEING DRIVEN AT LOW SPEEDS. THE AMBIENT TEMP IS VERY WARM. CUSTOMER COASTED TO THE SIDE OF THE ROAD AND THE VEHICLE STARTED WITH NO PROBLEM. TECH DROVE THE VEHICLE 10 MILES AND NO PROBLEM FOUND. THERE ARE NO CODES. LOOKING FOR ADVICE. STATED THE FUEL GAGE IS ON A LITTLE OVER 1/4 TANK.
RECOMM	ADVISED TO CHECK THE PCM CONNECTIONS. ADVISED TO CHECK THE CONNECTIONS IN THE POWER DISTRIBUTION BOX AND AT THE EEC RELAY.
TECH/C	07/24/2001 12:39PM SURVEY ENTRY MSG - FCSD - TECH SVC HOTLINE UNABLE TO DUPLICATE CONCERN
REPAIR	08/09/2001 03:59PM JEFFREY WILLIS MSG - FCSD - TECH SVC HOTLINE SM STATES THAT THE VEHICLE HAS THE RETURNED WITH THE CONCERN. SM IS UNABLE TO DUPLICATE THE CONCER. SM SEEKING KNOWNS.
RECOMM	ADVISED THE SM TO CHECK THE BASE IDLE WITH THE IAC UNPLUGGED. ADVISED IT SHOULD BE 550 RPMS AND IF IT NEEDS ADJUSTING TO RESET THE KAM. ADVISED SM TO ALSO CHECK GRND G140 AND G105 UNDER THE BATTERY TRAY. ADVISED SM TO TRY TAPPING ON THE EEC RELAY AND IF THE VEHICLE STALL THEN REPLACE THE RELAY.

Rpt#: 1F3BQ012 MHL Rpt: 06/29/2001 Odom: 637 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04191KB90537 Bld: 05/30/2001
Engine: 3.0L DUR Calb: 0M12A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01436 Palmer H. Reed Motor, Inc. Phone: (570) 682-3397
State: Pennsylvania City: Valley View Orig/Caller: ERNEST WITMER
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Add1 Sym: STALLED WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BUPIMZEF Phone: 313 317-7067 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUSTOMER STATES THE VEHICLE STALLED WHILE DRIVING.WOULD NOT RESTART. HAS NO CODES,WAS TOWED IN AND TECH HAS NOT DUPLICATED.
RECOMM	SUGGEST TECH TO CK FOR WATER ENTRY NEAR THE DRIVERS KICK PANEL,CK PCM POWER RELAY AND CONNECTIONS,CK DPFE FOR SHORTING OUT VREF.(SME)MARTI.
REPAIR	07/30/2001 10:54AM KEVIN HINES MSS - PCSD - TECH SVC HOTLINE SAME CONCERN. FOUND NO WATER INTRUSION NEAR OR AROUND FUSE PANEL. REPLACED PCM RELAY TO NO AVAIL. HAS NOT BEEN ABLE TO DUPLICATE STALL. NO CODES. THIS TIME, VEHICLE RESTARTED FINE.
RECOMM	SWAP DPFE AND CHECK ENGINE COMPARTMENT GROUNDS - CHECK G104 UNDER BATTERY TRAY.
REPAIR	08/09/2001 01:43PM WIN DOW MSS - PCSD - TECH SVC HOTLINE TECH CALLED TO REPORT CUSTOMER ALLEGES ENGINE STALLED WHILE DECENDING GRADE. TECH STATES NO CODES PRESENT.DPFE SENSOR PREVIOUSLY REPLACED TECH STATES THE VEHICLE IS NOT PRESENTLY AT DEALER.
RECOMM	ASKED TECH TO RECONTACT THE HOTLINE WHEN THE VEHICLE WAS AT THE DEALER ASKED TECH TO ATTEMPT TO VERIFY ALLEGED STALL RATHER THAN SPECULATE AS TO WHAT MAY HAVE CAUSED ALLEGED STALL

Rpt#: 1F4AV001 CQD Rpt: 06/30/2001 Odom: 5,701 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04151KF43646 Bld: 11/13/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07430 Sturman & Larkin Ford, Inc. Phone: (412) 892-2300
State: Pennsylvania City: Pittsburgh Orig/Caller: MARK HAYDUK
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Images: 0
Fix: Caus. Comp: RELAY ASSY -- RPL Condition Code: 42

Region Code: 44 Region Name: Pittsburgh - 44

---------- C O M M E N T S ----------

Type	Comments
CONCER	CUST. STATES: VEH. STALLS WHILE DRIVING AT STEADY SPEED OF 45 MPH.
REPAIR	* ON 4-20-01 CUST. COMPLAINED THAT VEH. QUITS WHILE DRIVING. HOTLINE DIRECTED TECH. TO TAP ECC POWER RELAY, VEH. STALLED. TECH. REPLACED ECC POWER RELAY. * ON 5-3-01 CUST. COMPLAINED THAT VEH. QUITS WHILE DRIVING. HOTLINE DIRECTED TO CHECK VARIOUS ITEMS, TECH. REPLACED FUSE BOX DIODE. * ON 6-6-01 CUST. COMPLAINED THAT VEH. QUIT WHILE DRIVING AT STEADY SPEED OF 45 MPH. REGION TRADED CUST. OUT OF VEHICLE. * ROOT CAUSE NOT DETERMINED. * MARK HAYDUK - PITTSBURGH FQE - 724-822-4342

Rpt#: 1F4AV002 CQD Rpt: 06/30/2001 Odom: 7,192 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04141KE81182 Bld: 09/06/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: Axle: A/C: YES
Dealer ID: 07430 Sturman & Larkin Ford, Inc. Phone: (412) 892-2300
State: Pennsylvania City: Pittsburgh Orig/Caller: MARK HAYDUK
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Images: 0
Fix: Caus. Comp: FUSE BOX -- RPL Condition Code: H5

Region Code: 44 Region Name: Pittsburgh - 44

---------- C O M M E N T S ----------

Type	Comments
CONCER	CUST. STATES: ENGINE WILL STALL WHILE DRIVING AT STEADY SPEED.
REPAIR	* CUST. COMPLAINED ON 4-12-01 AT 5,663 MI. THAT THE ENGINE SHUT OFF WHILE DRIVING. TECH. FOUND NO CODES AND COULD NOT DUPLICATE CONCERN. TECH. TAPPED ON ECC POWER RELAY AND ENG. DID NOT STALL. TECH. CHANGED ECC POWER RELAY AS A PRECAUTION PER HOTLINE. * CUST. COMPLAINED ON 6-21-01 AT 7,192 MI. THAT THE ENGINE SHUT OFF WHILE DRIVING AT A STEADY SPEED. TECH. FOUND NO CODES AND COULD NOT DUPLICATE CONCERN. FQE SUGGESTED CHANGING POWER DIST. BOX FOR POTENTIAL LOOSE PINS. * MARK HAYDUK - PITTSBURGH FQE - 724-822-4342

Rpt#: 1F4AY002 NHL Rpt: 06/30/2001 Odom: 333 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04161KC00795 Bld: 06/11/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07130 ATCHLEY FORD INC Phone: (402) 571-8632
State: Nebraska City: Omaha Orig/Caller: DENNIS ZOUCHA
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALEDGED STALLS AND QUITS Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHEBSTR1 Phone: 313 317-0000 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STS HAS VEHICLE THAT CUSTOMER ALEDGES STALLS WHILE AT CRUSE SPEED AND SM HAS NOT BEEN ABLE TO VERIFY CONCERN AND IS SEEKING KNOWNS FOR CONCERN
RECOMM	ADVISE SM TO PERFORM SHOCK TEST ON POWER RELAY AND IF ENGINE DIES THEN REPLACE RELAY AND CK PINS AND ALSO CK FOR ANY DTC'S IF P1000 PRESENT THEN CK FOR BASE POWERS AND GROUNDS

Rpt#: 1GBJX001 NHL Rpt: 07/02/2001 Odom: 169 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04101KB91988 Bld: 06/01/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01363 John Kennedy Ford Phone: (610) 279-1700
State: Pennsylvania City: Conshohocken Orig/Caller: TIM GREGOIRE
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALL AT CRUISE, NO CODES Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHINES6 Phone: 313 317-9377 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
CONCER	CUSTOMER PURCHASED A NEW ESCAPE SEVERAL WEEKS AGO. DURING THE FIRST C OUPLE HUNDRED MILES IT STALLED 2X AT CRUISE. COULD NOT FIND ANYTHING W RONG, SO DEALER GAVE CUSTOMER A DIFFERENT ESCAPE. THIS ONE HAS NOW STA LLED 1X AT CRUISE. SEEMS TO HAPPEN WITHIN A 2 MILE STRETCH OF HIGHWAY THAT IS KNOWN FOR RADIO INTERFERENCE (CELL PHONES GO OUT). VEHICLE RE STARTS FINE.
REPAIR	HAS NOT VERIFIED OR DUPLICATED CONCERN. ATTEMPTED 1HR ROAD TEST IN TH AT 2 MILE STRETCH OF HIGHWAY TO NO AVAIL.
RECOMM	KNOWN CONCERN. UNDER INVESTIGATION. ATTEMPT TO DUPLIACTE CONCERN FURTH ER. CHECK FOR PCM POWER, GROUND, COMMUNICATION. MAY WANT TO SHIELD CKP WIRING FROM C110 TO PCM.

Rpt#: 1GCAC481 EDSR --or-- Q 418572 Rpt: 07/05/2001 Odom: 9,960 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04181KP61123 Bld: 12/04/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07457 Chenoweth Ford, Inc. Phone: (800) 344-1108
State: West Virgini City: Clarksburg Orig/Caller: ED KYLE
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Images: 0
Fix: U Caus. Comp: -- Condition Code:

Region Code: 44 Region Name: Pittsburgh - 44

---------- C O M M E N T S ----------

Type	Comments
CONCER	THE VEHICLE STALLS AND WILL NOT RESTART. THE ENGINE QUIT WHILE DRIVING AT 45 MPH AND WOULD NOT RESTART. SECOND TIME I LET IT SIT FOR A HALF HOUR AND IT RESTARTED.
TECH/C	COULD NOT VERIFY CONCERN, NO CODES. TEST DROVE APPROXIMATELY 100 MILES AND COULD NOT VERIFY CONCERN.
AUDIT	SRV_DLR_CODE 84010 CHANGED TO 07457 BY SDAVIS20 SYMPTOM_CODE 607600 CHANGED TO 607692 BY SDAVIS20

Rpt#: 1GCAT009 NHL Rpt: 07/03/2001 Odom: 7,655 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04161KE69136 Bld: 09/15/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E B Axle: A/C: YES
Dealer ID: B1393 FINES FORD MERCURY SALES LTD Phone: (905) 857-1252
Province Ontario City: Bolton Orig/Caller: TONY TRIGIANI
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS WHILE DRIVING, ONCE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KPIETRZA Phone: 313 317-9000 Dist Cd: 01 01 FCSD REGION-CANADA
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cd: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUST STATES STALLED WHILE DRIVING. TECH STATES CANNOT VERIFY CONCERN AT THIS TIME. NO MIL CODES, RUNS FINE. SEEKING IF ANY KNOWNS
RECOMM	REPORT #: 1EAHI027 TECH/C 06/02/2001 08:56AM SURVEY ENTRY MSS - FCSD - TECH SV REPLACED IAC VALVE. ISM 01-05-025 HESITATION/STUMBLE ON TIP-IN, UPDATE (PCM) CALI TO R12 ADVISED TECH TO CHECK AND SEE IF PCM IS AT LATEST CALIBRATION, PER ISM CHECK IAC AND EGR VALVE FOR STICKING.

Rpt#: 1GCAT014 NHL Rpt: 07/03/2001 Odom: 9,960 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04181KF61123 Bld: 12/04/2000
Engine: 3.0L DUR Calb: 0M1LA30A Trans: CD4E S Axle: A/C: YES
Dealer ID: 07457 Chenoweth Ford, Inc. Phone: (800) 344-1108
State: West Virgini City: Clarksburg Orig/Caller: ED KYLE
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALLS, HARD RESTART Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KPIETRZA Phone: 313 317-9000 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUST STATES STALLS AT CRUISE, CRANKS, BUT DOES NOT RESTART. LET SIT 1/2 HOUR AND VEHICLE STARTS UP. HAPPENED TWICE. SF STATES ALWAYS START S AT DEALER AND CANNOT VERIFY ANY STALL CONCERN. CUST STATES HAS ENGIN E KNOCK ALSO, SF STATES UNABLE TO VERIFY THAT CONCERN ALSO. SEEKING IF ANY KNOWNS
RECOMM	ADVISED SF TO VERIFY CONCERN BEFORE ANY REPAIRS ARE MADE. CHECK FUEL PRESSURE, JUNCTION BOX CONNECTIONS, CHECK FOR EGR VALVE STICKING. NO KNOWNS AT THIS TIME

Rpt#: 1GJFU001 CQD Rpt: 07/10/2001 Odom: 5,427 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04181KF08549 Bld: 10/10/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 02771 Jack Demmer Ford, Inc. Phone: (734) 721-2600
State: Michigan City: Wayne Orig/Caller: JOHN DOMKA
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: Images: 0
Fix: Caus. Comp: RELAY ASSY -- RPL Condition Code: 08

Region Code: 48 Region Name: Detroit - 48

---------- C O M M E N T S ----------

Type	Comments
CONCER	ALL ELECTRIC GAGES GO CRAZY AND ENGINE STALLS AT ALL SPEED.
REPAIR	APPEARED THAT THE PCM WAS LOOSING POWER. CHECKED WIRING LOOM FOR CHAFING AT POWER DIST BOX, BOX ITSELF AND THROUGHOUT ENTIRE LOOM IN FENDER WELL AND UNDER DASH. REPLACED PSM RELAY (HORIZONTAL POINTS) WITH PCM RELAY WITH VERTICAL POINTS (F0AZ 14N089 A). VEHICLE BACK TO CUSTOMER. NO REPEAT STALLING FOR ONE WEEK. POINTS POSSIBLY LOOSING CONNECTION, NOT HOLDING.
	WILL HOLD SUSPECT COMPONENT FOR 30 DAYS.
	MICHIGAN FQE - JOHN DOMKA
	313-433-7910

Rpt#: 1GJGD008 NHL Rpt: 07/10/2001 Odom: 2,065 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04151KB91785 Bld: 05/23/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07130 ATCHLEY FORD INC Phone: (402) 571-8832
State: Nebraska City: Omaha Orig/Caller: JIM BAIER
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS AT CRUISE/NO RESTART Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: MPRICE28 Phone: 313 317-9133 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SD

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SD STS CUSTOMER STS THAT VEHICLE STALLED 3X AT CRUISE AND WOULDN'T RES TART UNLESS THEY LET IT SIT AWHILE, SD HASN'T VERIFIED CONCERN, SEEKIN G KNOWNS/ADVICE
RECOMM	ADV SD TO CHECK BJB CONNECTIONS, TAP ON RELAYS, CHECK PCM HARNESS, DIS CONNECT IAC AND MAKE SURE ENGINE STILL IDLES, IF NOT RESET THROTTLE ST OP SO ENGINE IDLES BETWEEN 500-550 RPM W/IAC DISCONNECTED, SUBMIT EDSE
ADD-ON	07/30/2001 02:17PM NORMAN CLAY MSS - FCSD - TECH SVC HOTLINE SD CALLING BACK STATES HAS NOT BEEN ABLE TO DUPLICATE THE CONCERN. STATES IS LOOKING FOR A DIRECTION. ADVISED TO CHECK FOR GOOD CONNECTIO N ON GROUNDS 105 AND 104. ADVISED TO TRY TO DUPLICATE THE CONCERN. ADVISED HARD TO MAKE A REPAIR IF NOT KNOWING WHAT IS GOING ON WITH THE VEHICLE. ADVISED IF ABLE TO DUPLICATE AND NEED MORE ASSISTANCE TO CALL BACK.

Rpt#: 1GJGQ008 NHL Rpt: 07/10/2001 Odom: 1,023 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04191KB61152 Bld: 05/10/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 06636 NELSON FORD INC Phone: (540) 629-2521
State: Virginia City: Stanleytown Orig/Caller: JAMES EDWARDS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INTERMITTENT STALL Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SMURRAY8 Phone: 313 317-0000 Dist Cd: 27 Washington - 27
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SHOP FOREMAN CALLED STATING THE VEHICLE INTERMITTENTLY STALLS. STATED THEY CANNOT VERIFY THE CONCERN. STATED THERE ARE NO CODES. STATED THE VEHICLE STALLED ON DECEL AT CRUISE. STATED THE CUSTOMER PULLS OFF TO THE SIDE OF THE ROAD AND THE VEHICLE RESTARTS. STATED THE LONG AND SHORT FUEL TRIMS ARE AROUND 0, PLUS OR MINUS A COUPLE PERCENT. LOOKING FOR ADVICE.
RECOMM	REPORT #: 1FLHF023 REPORT #: 1EGFS010 ADV TECH TO VERIFY THE CONCERN. ADV THE PCM LEVEL IS NOT CURRENT. ADV TO CHECK AND SET BASE IDLE IF NEEDED. ALSO LOOK FOR LOSS OF CKP SIGNAL ADV TECH OF THE ABOVE REPORT. ADV TO CHECK AND ADJUST BASE IDLE IF NEEDED. ALSO VERIFY PCM POWERS AND GROUNDS. REPORT #: 1EGFS010 ADV TECH TO VERIFY THE CONCERN. ADV THE PCM LEVEL IS NOT CURRENT. ADV TO CHECK AND SET BASE IDLE IF NEEDED. ALSO LOOK FOR LOSS OF CKP SIGNAL ADVISED OF THE ABOVE REPORTS. ADVISED TO DISCONNECT THE IAC AND SET THE BASE IDLE TO 500-550 RPM. ADVISED TO RESET THE KAM.

Rpt#: 1GJHY010 NHL Rpt: 07/10/2001 Odom: 4,650 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04161KA79203 Bld: 02/26/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01337 Dunphy Motors, Inc. Phone: (215) 335-5628
State: Pennsylvania City: Philadelphia Orig/Caller: WALT GROHS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGED STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: JOWENS28 Phone: 313 317-4276 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS HAS ALLEGED STALL WHILE DRIVING. HAS NO CODES AND FUEL PRESSURE IS 40 PSI. TECH CAN'T VERIFY THE CONCERN. SEEKING KNOWNS
RECOMM	REPORT #: 1ECHL005 REPLACE PROCESSOR ASSY REPORT #: 1EAHI027 ADV TECH TO UNPLUG THE IAC. CHECK THE RPM READING AND COMPARE TO COMPLAINT RPM. IF THE RPM MATCHES, LOOK FOR LOSS OF POWER OR GROUND TO IAC. ALSO MAY HAVE A STICKING IAC OR PCM CONCERN. ..... ADV TECH THE REPORTS SEEM TO BE STALLING AT IDLE OR ON DECEL. ADV TECH TO VERIFY THE CONCERN PRIOR TO ANY REPAIRS.

Rpt#: 1GKBG013 NHL Rpt: 07/11/2001 Odom: 5,872 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04171KF55369 Bld: 11/29/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 02370 Mullinax Ford North Canton, In Phone: (330) 497-9100
State: Ohio City: N Canton Orig/Caller: DAVID GUSTAFSON
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGE STALL AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SRIVERA5 Phone: 313 317-9354 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THE CUSTOMER ALLEGES THE VEHICLE STALLS AT A STEADY CRUISE NO CODES IN THE PCM AND HE HAS NOT BEEN ABLE TO DUPLICATE THE CONCERN. THE CUSTOMER ALLEGES THAT IT FELT AS IF SOMEONE SHUT THE KEY OFF. THE CUSTOMER ALSO ALLEGES THE BATTERY LIGHT COMES ON WHILE DRIVING AT A CRUISE INTERMITTENTLY. SEEKING FOR ANY KNOWNS OR ADVICE.
RECOMM	ISM 01-06-013 ESCAPE 3.0L CHRGNG SYSTEM, CALL NUMBER LISTED BELOW ADVISE TECH TO GET MORE INFORMATION REGARDING THE ALLEGE BATTERY LIGHT COMING ON AT A CRUISE, IF HE CAN VERIFY THEN CALL TONY C. AT THE #ABOVE LISTED IN THE ISM. AS FOR THE ALLEGE STALL CHECK THE EEC POWER RELAY, HE CAN TAP ON IT AND SEE IF IT STALLS.

Rpt#: 1GKBG014 NEL Rpt: 07/11/2001 Odom: 630 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KB91909 Bld: 05/31/2001
Engine: 3.0L DOR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01474 Maguire's Ford, Inc. Phone: (717) 834-3111
State: Pennsylvania City: Duncannon Orig/Caller: STEVE SMILEY
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGE STALL AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SRIVERA5 Phone: 313 317-9354 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: AS

---------- C O M M E N T S ----------

Type	Comments
REPAIR	AS STATES THE VEHICLE STALLS AT A CRUISE. THEY HAVE BEEN ABLE TO DUPLICATE THE CONCERN. THE VEHICLE RESTARTS FINE. NO CODES IN THE PCM. SEEKING FOR ANY KNOWNS OR ADVICE.
RECOMM	ADVISE TECH TO CHECK THE SEC POWER RELAY, THEY CAN TAP ON IT AND SEE IF THE VEHICLE STALLS.

Rpt#: 1GKD6010 NHL Rpt: 07/11/2001 Odom: 10,571 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMCU03181KD97464 Bld: 07/24/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 04437 Covert Ford, Inc. Phone: (512) 345-6070
State: Texas City: Austin Orig/Caller: DALE COX
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALL AT CRUISE/NO CODES Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SMORRAYS Phone: 313 317-0000 Dist Cd: 52 Southwest - 52
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SERVICE MANAGER CALLED STATING THE VEHICLE STALLS AT CRUISE INTERMITTENTLY. THEY CANNOT VERIFY THE CONCERN. STATED THERE ARE NO CODES. THE CUSTOMER NOTICES THE STALL WHEN THE STEERING GETS STIFF. LOOKS DOWN AT THE TACH AND IT IS AT 0. PULLS OFF TO THE SIDE OF THE ROAD AND THE VEHICLE WILL RESTART WITH NO PROBLEM. LOOKING FOR ADVICE.
RECOMM	ADVISED TO CHECK THE IAC CONNECTIONS. ADVISED TO CHECK THE EEC RELAY CONNECTIONS AND THE HARNESS THROUGH THE GROMMET AT THE POWER DISTRIBUTION BOX. ADVISED TO RESET THE BASE IDLE TO 500-550 RPM. ADVISED TO SUBMIT AN EDSR OR CALL THE HOTLINE BACK IF THEY FIND THE ROOT CAUSE.
REPAIR	07/24/2001 09:17AM JOSE CHACON MSS - FCSD - TECH SVC HOTLINE THE TECNICIAN IS LOOKIG FOR ADDITIONAL INFORMATION ON THIS VEHICLE, THE CUSTOMER ALLEGES THE VEHICLE JUST STALLS AND QUITS WHILE DRIVING. ANY ADDITIONA KNOWNS? REQUESTING ADDITIONAL TECHNICAL INFORMATION.
RECOMM	ISM 01-06-013 ESCAPE 3.0L CHRGNG SYSTEM, CALL NUMBER LISTED BELOW ADVISED TECHNICIAN FOR THIS COCERN NO OTHER UPDATES, ONLY ONE CONFIRM FIX WITH LOOSE GROUNDS G104/G105. THESE GROUNDS ARE LOCATED BELOW THE BATTERY TRAY. TRY TO DRIVE THE VEHICLE WITH ALL THE ELECTRICAL LOADS ON AND CHECK IF THE CONCERN IS PRESENT. IF ABLE TO DUPLICATE THE CONCERN SUGGEST TO CONTACT THE FOLLOWING FIELD QUALITY ENGINEERS, FORD IS CURRENTLY REVIEWING THIS UNITS. TEXAS / DAN HAMMACK / 713-681-4003 / 713-542-4186 TEXAS / DAVE PILGRIM / 972-318-1059 / 972-571-8407 TEXAS / LYNN SORENSEN / 281-443-6582 / 281-384-0617

Rpt#: 1GRAD003 NHL Rpt: 07/18/2001 Odom: 90 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04171KC18989 Bld: 06/19/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 03658 DOWLING FORD INC Phone: (203) 272-2772
State: Connecticut City: Cheshire Orig/Caller: MARK JANDRAU
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALLED Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: NCLAY3 Phone: 313 317-9122 Dist Cd: 13 New York -13
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES CUSTOMER COMPLAINT OF STALLED WHILE DRIVING. STATES HAS NOT REPRODUCED THE CONCERN. STATES LOOKING FOR ANY KNOWNS.
RECOMM	ADVISED TECH TO REFLASH THE PCM TO 1L8U-AC AND SEE IF THE WILL HELP. ADVISED COULD HAVE FELT A HESITATION OR STUMBLE. ADVISED TO REFLASH THEN RETEST.

Rpt#: 1GRBA001 NHL Rpt: 07/18/2001 Odom: 11,563 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04141KA46278 Bld: 02/06/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 03568 Winchester Ford, Inc. Phone: (540) 667-4434
State: Virginia City: Winchester Orig/Caller: RICK SCHIFFLETT
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALL AT CRUISE, RESTARTS. Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHINES6 Phone: 313 317-9377 Dist Cd: 27 Washington - 27
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
CONCER	INTERMITTANT STALL AT CRUISE. VEHICLE RESTARTS FINE.
REPAIR	CANNOT DUPLICATE CONCERN. NO CODES.
RECOMM	INSPECT CKP SENSOR AND HARNESS. CHECK DPFE. CONCERN IS UNDER INVESTIGATION. VERIFY CONCERN BEFORE ATTEMPTING REPAIR. CHECK FUEL PUMP GROUND.

Rpt#: 1G8A3008 NHL Rpt: 07/19/2001 Odom: 8,023 M
Vehicle: 2001 ESCAPE 4X2,XLT ,WAGON 1FMYU03171KF86015 Bld: 12/21/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer ID: 01850 Joplin Ford Lincoln Mercury, I Phone: (417) 623-5660
State: Missouri City: Joplin Orig/Caller: MARK SEELA
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS, WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KPIETRZA Phone: 313 317-9000 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SW

---------- C O M M E N T S ----------

Type	Comments
REPAIR	CUST STATES VEHICLE WILL STALL AT CRUISE. CYCLE KEY AND VEHICLE STARTS . SW STATES NO MIL CODES, (PASS), HAS CHECKED ALL WIRING FOR CONCENS A ND NONE FOUND. SEEKING IF ANY KNOWNS
RECOMM	ADVISED SW TO CHECK PIN FIT ON BATTERY JUNCTION BOX. TAP TEST PCM POWE R RELAY. POSSIBLY REPLACE PCM RELAY.

Rpt#: 1GSCR002 CQD Rpt: 07/19/2001 Odom: 4,228 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04111KE74552 Bld: 09/07/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E 8 Axle: A/C: YES
Dealer ID: 04920 World Ford/Kendall Phone: (305) 234-2667
State: Florida City: Miami Orig/Caller: RON TROWER
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Images: 0
Fix: Caus. Comp: UNKNOWN -- GSA Condition Code:

Region Code: 24 Region Name: Orlando - 24

---------- C O M M E N T S ----------

Type	Comments
CONCER	CUSTOMER REPORTS VEHICLE STALLED WHILE DRIVING 3 TIMES SINCE TAKING DELIVERY.
REPAIR	CUSTOMER REPORTS VEHICLE WAS BEING DRIVEN AT NIGHT IN OR NEAR MIAMI FL WHEN THE LIGHTS BEGAN TO DIM. AFTER A FEW MINUTES OF DRIVING WITH DIM LIGHTS, THE VEH BEGAN TO RUN ROUGH FOR A FEW SECONDS AND STALLED. AT THIS TIME THE CUSTOMER ATTEMPTED A RESTART. HE ONLY HEARD A FAINT CLICK,CLICK, CLICK FROM THE ENGINE AS HE TURNED THE IGN KEY. CUST CALLED ROADSIDE ASSISTANCE. TWO HOURS LATER ROADSIDE ASSISTANCE APPEARED AND ATTEMPTED RESTART. VEHICLE RESTARTED AT THAT POINT AND CUST DROVE APPROX 8 BLKS TO DEALERSHIP. VEHICLE WAS LEFT FOR DLR TO REPAIR THE NEXT DAY. TECH STARTED VEH NORMALLY AND DROVE INTO HIS STALL. BATTERY EYE WAS GREEN AT THIS POINT. TECH TESTED BATTERY AND CHARGING SYSTEM- SYSTEM PASSED ALL TESTS. CUSTOMER REPORTED THAT THEY DRIVE IN CITY MOSTLY WITH A/C ON AT STOP/GO CONDITIONS.

Rpt#: 1GWCR010 NHL Rpt: 07/23/2001 Odom: 2,416 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04171KB29445 Bld: 04/10/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 01281 HALDEMAN FORD, KUTZTOWN Phone: (610) 683-3673
State: Pennsylvania City: Kutztown Orig/Caller: DOUG DIETRICH
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: STALLS WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RLYTLE1 Phone: 313 317-9366 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STATES HE HAS A STALLS WHILE DRIVING CONCERN. SM WANTS TO KNOW HOW TO TELL WHAT THE SOFTWARE LEVEL IS.// B14.// AFTER LAN SETUP HE HAS B14.6
RECOMM	ADV HOW TO CHECK THE SOFTWARE LEVEL.// ADV SM HOW TO SETUP THE LAN.// ADV SM HOW TO BLIND REFLASH A PCM.

Rpt#: 1GXB4003 CQD Rpt: 07/24/2001 Odom: 15,687 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04161KF54276 Bld: 11/28/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 03016 Kenny Ross Ford South, Inc. Phone: (412) 881-0001
State: Pennsylvania City: Pittsburgh Orig/Caller: MARK HAYDUK
Symptom: 6 07 6 92 DRVABL,STALL/QUITS,AT CRUISE,HOT ENGINE
Addl Sym: Images: 0
Fix: Caus. Comp: GASKET-INTAKE MANIFO -- RPL Condition Code: 77

Region Code: 44 Region Name: Pittsburgh - 44

---------- C O M M E N T S ----------

Type	Comments
CONCER	CUST. STATES: STALLS WHEN DRIVING. WHEN STARTED BACK UP, SMELLS ODOR OF GAS IN CAR.
REPAIR	* TECH. COULD NOT CONFIRM THAT THE VEHICLE WOULD STALL WHILE DRIVING. TECH. FOUND FUEL ODOR COMING FROM THE LOWER INTAKE AREA & CHANGED THE LOWER INTAKE GASKETS TO CORRECT THE FUEL ODOR CONCERN AND THOUGHT THAT CHANGING THE GASKETS MAY CORRECT THE STALL CONCERN SINCE THAT IS WHERE THE FUEL ODOR WAS COMING FROM. NO CODES WERE SET. * MARK HAYDK - PITTSBURGH FQE - 724-822-4342

Rpt#: 1GXGP003 NHL Rpt: 07/24/2001 Odom: 6,883 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04121KB25474 Bld: 04/11/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07457 Chenoweth Ford, Inc. Phone: (800) 344-1108
State: West Virgini City: Clarksburg Orig/Caller: ED KYLE
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INT STALL AT CRUISE, RESTARTS Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: JMORRI40 Phone: 313 317-9394 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SF

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES THAT THE VEH INT STALLS AT CRUISE AND WILL RESTART. THEY CAN NOT DUPLICATE THE CONCERN. CALLING FOR KNOWNS OR SUGGESTIONS.
RECOMM	ISM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S
	ISM 00-12-026 CK FOR STICKING SHUT OR STUCK OPEN EGR VALVE
	REPORT #: 1ECIP010
	REPORT #: 1DME8004 REPLACE SENSOR - CRANKSHAFT POSITION -
	ADVISED OF THE ABOVE.

Rpt#: 1GZC101] NHL Rpt: 07/26/2001 Odom: 5,615 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KA45087 Bld: 02/05/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 06339 Montgomery Ford Phone: (513) 891-0500
State: Ohio City: Montgomery Orig/Caller: BILL SMITH
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS WHILE DRIVING. Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: RMELSO28 Phone: 313 317-9375 Dist Cd: 47 Cincinnati - 47
Engineering: Phone: TAR:
Dlr Contact: CONFIRMED 07 26 01 Phone: 513 891-0500 Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STATES, CUST STATES VEH STALLS AT TIMES WHILE HOT NO DTC.PRESENT. NO APPARENT AFTERMARKET ACCESSORIES, NO APPARENT PHYSICAL DAMAGE.
RECOMM	ISM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S ADVISED TO MONITOR FUEL PRESSURES, POSSIBLE FUEL DELIVERY ISSUES, W/ N O P1000 IN PCM DISREGUARD PCM OR PATS ISSUES.
REPAIR	08/06/2001 01:31PM THOMAS BRUGGER MSS - FCSD - TECH SVC HOTLINE THE TECH CALLED BACK STATING THAT HE CAN NOT DUPLICATE THE CONCERN AND STATES THAT THE CUSTOMER COMPLAINS THAT THE ENGINE STALLS INTERMITTENT LY WHEN LETTING OFF THE GAS. SEEKING FURTHER ADVICE.
RECOMM	ADVISED THE TECH TO ADJUST BASE IDLE SO THE ENGINE WILL IDLE WITH THE IAC UNPLUGGED, AND RETEST THE VEHICLE.

Rpt#: 1GEDD021 NHL Rpt: 07/26/2001 Odom: 26 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KC36895 Bld: 07/16/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 05158 Metro Ford, Inc. Phone: (816) 254-9803
State: Missouri City: Independence Orig/Caller: CORY THOMPSON
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGE STALL WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: CLOH2 Phone: 313 317-9134 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STATES THAT HE HAS 2 VEHICLES WITH THE SAME CONCERN, STALL WHILE DRIVING LIKE TURNING IGNITION OFF. SM HAS NOT VERIFIED CONCERN AND IS SEEKING KNOWNS.
RECOMM	ISM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S ADVISED SM PER ISM 01-07-038.
REPAIR	07/27/2001 12:44PM ROBERT KOTHS MSS - FCSD - TECH SVC HOTLINE SM STATES THAT HE DID GET MORE INFORMATION FROM THE CUST ON THE OTHER LIKE VEH WITH 17,000 MILES. HE STATES THAT THE CUST ALLEGES THAT THE VEH HAS STALLED 7 TIMES ALSO IT ONLY HAPPENS AT CRUISE BETWEEN 35 & 40 MPH & IT DOES NOT MATTER IF IT IS HOT OR COLD OR HOW LONG YOU DRIVE THE VEH, ALSO IT DOES NOT HAPPEN WHEN IT IS ABOVE 40 MPH. SM STATES THAT HE HAS NOT BEEN ABLE TO DUPLICATE THE CONCERN IN EITHER VEH ALSO STATES THAT HE DID CHECK THE GROUNDS G104 & G106 IN BOTH VEHS & THERE OK. HE ALSO STATES THAT HE FILED EDSR ON BOTH VEHS.
RECOMM	ADVISED SM TO CHECK THE PCM POWERS & GROUNDS G100,G101 ALSO WHILE RUNNING TAP ON THE PCM RELAY & SEE IF IT WILL STALL. ALSO TO CHECK THE RELAY & FUSE TERMINALS FOR DAMAGE OR PUSH OUTS & TO CHECK THE 3 CONNECTORS IN THE DRIVER SIDE KICK PANEL FOR WATER INTRUSION. ALSO ADVISED SM IF HE DOES REPAIR THE VEH TO CALL BACK WITH THE REPAIR & TO FILE A EDSR FOR THE REPAIR.

Rpt#: 1G1HB006 NHL Rpt: 07/27/2001 Odom: 219 M
Vehicle: 2001 MAZDA TRIBUTE 4X2,LX ,WAGO 4F2YU09191KM68432 Bld: 06/26/2001
Engine: 3.0L DUR Calb: 0M11C30A Trans: CD4E S Axle: A/C: YES
Dealer ID: 10056 Reynolds Lincoln-Mercury, Inc. Phone: (405) 321-4488
State: Oklahoma City: Norman Orig/Caller: RICK DOUGHTERY
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALLS AT CRUISE NO CODES Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: TROOT Phone: 313 317-9332 Dist Cd: 52 Southwest - 52
Engineering: Phone: TAR:
Dir Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SERVICE MANAGER RICK STATES THAT THE VEHICLE STALLS A CRUISE INTERMITTENTLY. THERE ARE NO CODES WITH THE CONCERN. SERIVCE MANAGER SEEKING ANY KNOWNS...
RECOMM	ADVISED SERVICE MANAGER TO CHECK GROUNDS G104 AND G105 UNDER THE BATTERY TRAY. ADVISED SERVICE MANAGER TO CHECK THE PCM POWER RELAY FOR ANY CONNECTION CONCERNS. ADVISED SERIVCE MANAGER THAT THERE ARE NO OTHER KNOWNS AT THIS TIME. ADVISED SERVICE MANAGER TO CALL BACK IF NEEDING ANY FURTHER ASSISTANCE...

Rpt#: 1G4DD002 NHL Rpt: 07/30/2001 Odom: 9,621 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04131KF16963 Bld: 10/14/2000
Engine: 3.0L DUR Calb: Trans: Axle: A/C: YES
Dealer ID: 01373 Garnet Ford Inc Phone: (610) 358-5600
State: Pennsylvania City: Chadds Ford Orig/Caller: GEORGE MARGETICH
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: STALL AT 35 MPH CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHINES6 Phone: 313 317-9377 Dist Cd: 16 Philadelphia -16
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	INT STALL AT CRUISE. 35 MPH. TECH HAS NOT VERIFIED CONCERN. ACCORDING TO THE CUSTOMER IT HAS ONLY HAPPENED 1X. TECH HAS SEEN 3 VEHICLE WITH SAME CONCERN. NO CODES.
RECOMM	REPORT #: 1DMS8004 REPLACE SENSOR - CRANKSHAFT POSITION - INSPECT CKP SENSOR AND CONNECTOR. INSPECT ENGINE COMPARTMENT GROUNDS - NEXT TO PCM, UNDER BATTERY TRAY, AND GROUND STRAP NEAR RIGHT SIDE ENGINE MOUNT.

Rpt#: 1G4F3005 NHL Rpt: 07/30/2001 Odom: 13,329 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04151KE57298 Bld: 08/14/2000
Engine: 3.0L DUR Calb: 0M1LA30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07305 COLONIAL FORD Phone: (724) 537-7723
State: Pennsylvania City: Latrobe Orig/Caller: TOM MOSS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INTERMITTENT STALL CONCERN Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BTHOMP52 Phone: 313 317-9339 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SM STATES THE CUSTOMER IS ALEDGING A STALL AT CRUISE WHILE ON A DOWNHI LL GRADE. THE CONCERN HAS ONLY OCCURED ONCE, SM HAS NOT BEEN ABLE TO V ERIFY. THE VEHICLE RESTARTED IMMEDIATELY
RECOMM	ADVISED SM TO CHECK FOR ANY DTCS. IF CONCERN IS VERIFIED CHECK FUEL PR ESSURE, IAC, MAF, BARO, DPFE AT TIME OF FAULT. CHECK FOR LOW FUEL LEVE L. CHECK MODE 6 DATA FOR ANY PARAMETERS THAT MAY BE CLOSE TO DTC THRES HHOLD. CONCERN MUST BE VERIFIED.
REPAIR	07/30/2001 12:04PM MARTIN PRICE MSS - FCSD - TECH SVC HOTLINE TECH STS HE CHECKED MODE 6 AND SEVERAL WERE IN THE RED, HIS FRONT HEGO SWITCH RATE AND HIS REAR TO FRONT SWITCH RATE, ALSO VMV, TECH CANNOT DUPLICATE STALL, PREVIOUSLY THE PCV AND EGR LINES WERE BLOWN OFF OF TH E INTAKE MANIFOLD, SEEKING ADVICE
RECOMM	ADV TECH TO CHECK G104/105, CHECK EEC POWER RELAY, BJB AND PCM CONNECT IONS, CHECK PCM CALIBRATION, CAN CLAMP PCV LINE IF NECESSARY IEM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S

Rpt#: 1G4HW013 NHL Rpt: 07/30/2001 Odom: 13,362 M
Vehicle: 2001 ESCAPE 4X4,XLS ,WAGON 1FMYU02B51KF45098 Bld: 10/26/2000
Engine: 2.0L ZTECH Calb: 0M12A20A Trans: Axle: A/C: YES
Dealer ID: 08524 Westlie Ford Mercury Inc Phone: (360) 834-2113
State: Washington City: Camas Orig/Caller: GARY SOLLMAN
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEDGED INTERMITTENT STALL Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: BKREIN Phone: 313 248-2930 Dist Cd: 74 Northwest - 74
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS THAT CUSTOMER IS COMPLAINING OF A STALLING CONCERN WHILE CRUISING DOWN THE ROAD. TECH STS THAT THE CUSTOMER COMPLAINED THAT AFTER THE VEHICLE STALLED IT WOULDN'T CRANK. AFTER A FEW MINUTES THE VEHICLE RESTARTED. TECH STS THAT HE IS UNABLE TO VERIFY THE CONCERN. TECH SEEKING KNOWNS.
RECOMM	ADVISED TECH THAT HE HAVE A POOR GROUND CONNECTION ON G104/105. ADVISED TECH TO REMOVE THE BATTERY AND TRAY. ADVISED TECH THAT THE GROUND IS UNDER THE TRAY. MAKE SURE THAT THE CONNECTION IS CLEAN AND TIGHT.

Rpt#: 1HAD7002 NHL Rpt: 08/01/2001 Odom: 2,234 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04101KB40572 Bld: 04/21/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 00048 Ted Britt Ford Sls Inc Phone: (703) 591-8484
State: Virginia City: Fairfax Orig/Caller: PHIL STEWART
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INTERMITTENT STALL/NO CODES Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: SMURRAY8 Phone: 313 317-0000 Dist Cd: 27 Washington - 27
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH CALLED STATING THE VEHICLE INTERMITTENTLY STALLS AT CRUISE. STATED THERE ARE NO CODES AND CANNOT VERIFY THE CONCERN. STATED HE CHECKED AND WIGGLED THE ENGINE HARNESS IN ATTEMPT TO VERIFY THE CONCERN. LOOKING FOR ADVICE.
RECOMM	ISM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S ADVISED OF THE ABOVE INFORMATION. ADVISED TO CHECK THE EEC RELAY CONNECTIONS. ADVISED HE MAY WANT TO TRY AND SET UP THE BASE IDLE AND RESET THE KAM.

Rpt#: 1HAEP012 MHL Rpt: 08/01/2001 Odom: 16,632 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04111KE81971 Bld: 09/15/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 08054 Sellers-Sexton, Inc. Phone: (573) 336-2000
State: Missouri City: Saint Robert Orig/Caller: LEE SUTTON
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: DIED WHILE DRIVING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: KHINES6 Phone: 313 317-9377 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SM

C O M M E N T S

Type	Comments
CONCER	2X VEHICLE HAS STALLED WHILE DRIVING. COAST TO SIDE OF ROAD, VEHICLE R ESTARTED. HAS HAPPENED TWICE IN LAST 3 MONTHS. FUEL LEVEL WAS AROUND 1/2 TANK EACH TIME. AMBIENT TEMP WAS MID 90S WITH 99% HUMIDITY. FIRS T TIME STALL OCCURRED, WAS A TYPICAL SPRING DAY IN APRIL - NOT TOO HOT BUT NOT COLD EITHER.
REPAIR	HAS NOT VERIFIED CONCERN. NO CODES. FUEL PRESSURE OK.
RECOMM	CHECK ENGINE COMPARTMENT GROUNDS. REMOVE BATTERY TRAY TO ACCESS G104/ G105. POSSIBLE DPFE SHORTING VREF OUT, BUT UNLIKELY SINCE VEHICLE REST ARTS IMMEDIATELY. KNOWN CONCERN, UNDER INVESTIGATION.

Rpt#: 1HAGR011 NHL Rpt: 08/01/2001 Odom: 1,111 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMCU04151KD97579 Bld: 07/26/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 65160 FORD MOTOR CO (DIAG SVC CTR) Phone:
State: Michigan City: Allen Park Orig/Caller: MARK HAYDUK
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INTERMITTENT STALLING Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: EKREIN Phone: 313 248-2930 Dist Cd: ??????????????????????
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: FS

---------- C O M M E N T S ----------

Type	Comments
REPAIR	FSE CALLING IN. FSE STS THAT HE HAS AN INTERMITTENT STALLING CONCERN. FSE STS THAT IF HE TAPS ON THE PCM POWER RELAY THE VEHICLE WILL STALL. FSE WANTS TO KNOW IF THERE IS A PROBLEM WITH THE POWER DISTRIBUTION BOX.
RECOMM	ADVISED FSE TO CHECK GROUND 104/105. ADVISED FSE THAT THIS GROUND IS FOR THE PCM POWER RELAY. MAKE SURE THAT THE PINS ARE TIGHT IN THE POWER DISTRIBUTUION BOX.

Rpt#: 1HAG4010 NHL Rpt: 08/01/2001 Odom: 3,886 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04161KB70052 Bld: 05/07/2001
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 08178 Pundmann Motor Company Phone: (636) 946-6611
State: Missouri City: St Charles Orig/Caller: JOHN SCHOTTENHAML
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: ALLEGED STALL CONCERN Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: TROOT Phone: 313 317-9332 Dist Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: SN

---------- C O M M E N T S ----------

Type	Comments
REPAIR	SERVICE WRITER JOHN STATES THAT THE CUSTOMER ALLEGES THAT THEY WERE DRIVING THE VEHICLE AROUND 30 TO 40 MPH, AND IT STALLED LIKE THE KEY WAS SHUT OFF. THE VEHICLE WAS ABLE TO THEN BE RESTARTED IMMIDIATLY. SERVICE WRITER STATES THAT HE ALSO HAS ANOTHER VEHICLE WITH A SIMILAR CONCERN. SERIVCE WRITER SEEKING ANY KNOWNS...
RECOMM	REPORT #: 1DMEB004 REPLACE SENSOR - CRANKSHAFT POSITION - ADVISED SERVICE WRITER OF THE INFORMATION IN THE ABOVE REPORT. ADVISED SERVICE WRITER TO CHECK GROUNDS G100, G101, G104, AND G105 FOR LOSENESS. ADVISED SERVICE WRITER THAT THERE ARE NO OTHER KNOWNS AT THIS TIME, AND TO CALL BACK IF NEEDING ANY FURTHER ASSISTANCE...
REPAIR	08/06/2001 03:18PM ROLF STEGEMANN MSS - FCSD - TECH SVC HOTLINE TECH CALLING BAC. ALLEDGED STALL HASHAD VEHICLE FOR A WEEK CANNOT DUPLICATE CONCERN.
RECOMM	REPORT #: 1FLHF023 REPORT #: 1EGFS010 SUGGESTED TO MAKE SURE TECHS CHECKED G104. MAKE SURE IS TIGHT.

Rpt#: 1HBBS011 NHL Rpt: 08/02/2001 Odom: 11,036 M
Vehicle: 2001 ESCAPE 4X4,XLT ,WAGON 1FMYU04101KB72844 Bld: 11/15/2000
Engine: 3.0L DUR Calb: 0M11A30A Trans: CD4E E Axle: A/C: YES
Dealer ID: 07552 Dean Oneil Ford Inc Phone: (814) 634-5921
State: Pennsylvania City: Meyersdale Orig/Caller: ROBERT MEYERS
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: INTERMITTENT STALL AT CRUISE Images: 0
Fix: Caus. Comp: -- Condition Code:
Hotliner: HHEISNER Phone: 313 317-7060 Dist Cd: 44 Pittsburgh - 44
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T

---------- C O M M E N T S ----------

Type	Comments
REPAIR	TECH STS VEHICLE HAS AN ALLEGED STALLING CONCERN AT CRUISE. TECH HAS NOT BEEN ABLE TO DUPLICATE CONCERN. NO CODES IN PCM. BATTERY AND CHARGING SYSTEM HAS CHECKED GOOD. SEEKING KNOWNS.
RECOMM	ISM 01-07-038 CK GNDS 104 & 105, SEND EDSR'S
	ISM 00-12-026 CK FOR STICKING SHUT OR STUCK OPEN EGR VALVE

From: Terzes, Laura (L.D.)
Sent: Tuesday, July 16, 2002 5:53 PM
To: Corbett, Sandra (S.M.); Fascetti, Bob (R.J.); Dalbo, Bob (R.J.)
Cc: Fast, Mathew (M.F.); Suarez, Rhae (R.); Klarr, Jerry (G.T.)
Subject: FW: Stalling Escapes

Follow Up Flag: Follow up
Due By: Wednesday, July 17, 2002 5:00 PM
Flag Status: Flagged

Sandra, Bob or Bob: Please let Rick Grossman the FSE know directly (copy to me) if you want to utilize this vehicle to test the newest fix (calibration and h/w chgs.). I confirmed with Rick, the dealer has performed the latest TSB 02-11-06 and ISM 02-05-043, and the stalling concern has returned. One other troubling point, this customer is in their 2nd Escape. We bought back the first vehicle for the same concern. A quick response would be helpful, as Rick needs to decide how to manage the customer and dealer. I have conveyed to him, the approximate new calibration timing. PLS. ADVISE.

Laura Terzes
Manager, Outfitters Concerns
FCSD, Customer Service Engineering
PDC TVC 1JF56
(313) 32-36572 / fax (313) 24-86161 / lterzes.ford.com

---Original Message---
From: Grossmann, Richard (R.A.)
Sent: Tuesday, July 16, 2002 5:02 PM
To: Terzes, Laura (L.D.)
Cc: MacRitchie, Jenice (J.V.); Hellesen, Kevin (K.J.)
Subject: FW: Stalling Escapes

Laura,

Neither service manager has been contacted by anyone at the Kansas City Assembly Plant, so I assume someone has resolved this concern and does not need to inspect any vehicles. However, the final resolution has not been communicated to our dealers. This is a problem because the customer that owns Escape 1FMCU03172KB22346 reports the vehicle still stalls and we don't know how to repair it. We need immediate help on this or we will be buying this vehicle back. You may contact me by E-mail, by phone at cell phone 816-678-6004 or directly contact Metro Ford Service Manager Cory Thompson at 816-254-9800. Thank you.

---Original Message---
From: Terzes, Laura (L.D.)
Sent: Thursday, June 13, 2002 7:30 AM
To: Grossmann, Richard (R.A.); Suarez, Rhae (R.)
Subject: RE: Stalling Escapes

Richard, there is a conf. call today on Escape Stalls, we will bring this info into the mtg. and Rhae has sent same to the engineers working on the Stalls team, Powertrain engineers at KCAP. You should hear something soon regarding further investigation of these units. Thanks for the help. We really need more hands on to get the final root cause.

Laura Terzes
Manager, Outfitters Concerns
FCSD, Customer Service Engineering
PDC TVC 1JF56
(313) 32-36572 / fax (313) 24-86161 / lterzes.ford.com

---Original Message---
From: Grossmann, Richard (R.A.)
Sent: Wednesday, June 12, 2002 11:56 PM
To: Suarez, Rhae (R.)

Cc: Terzes, Laura (L.D.)
Subject: FW: Stalling Escapes

Rhea,

Since Bob is out, you may be interested in this.

----Original Message----
From: Grossmann, Richard (R.A.)
Sent: Wednesday, June 12, 2002 10:53 PM
To: Terzes, Laura (L.D.); King, Robert (R.F.)
Cc: MacRitchie, Janice (J.V.)
Subject: Stalling Escapes

Bob and Laura,

Cory Thompson, service manager at Metro Ford (816-254-9800), tells me the Escape listed below is in the process of being required since it has been to the dealer multiple times for stalling. TSB 02-05-043 and ISM 02-05-043 have been performed on the vehicle.

Mike Hawes, service manager a Bill Woods Ford (816-454-4200), reports he has an Escape that reportedly stalls after TSB 02-05-043 and ISM 02-05-043 have been performed. Please see the CQIS report listed below. I asked Mike to put the VDR on that vehicle and try to get a recording of the stall.

As both of these vehicles are close to the Kansas City Assembly Plant, and both reports indicate the latest fix is not effective, I thought you might be interested in taking a look at them.

Please let me know if you wish to inspect these vehicles.

Rpt#: 2E3CY004 NHL Rpt: 05/29/2002 Odom: 2,615 M
Rvwd: File: _ Folder: _____ Images: 0 Print Smy/Disp Detail(P/D): _
Vehicle: 2002 ESCAPE 4X2,XLT ,WAGON 1FMCU03172KB22346 Bld: 11/09/2001
Engine: 3.0L DUR Calb: 2M11A30A Trans: CD4E E Axle: 3800F2.73C A/C: YES
Dealer Id: 05158 Metro Ford, Inc. Ph#: (816) 254-9803
State: Missouri City: Independence Orig/Caller: JOHN LARGENT
Symptom: 6 07 7 00 DRVABL,STALL/QUITS,DECELERATION,OTHER-CODE NA
Addl Sym: ALLEDGED STALLS St: CCRG/EPRC: _ Rvwd: Dt:
Fix: Caus. Comp: – Condition Code:
Hotliner: RSTEGEMA Phone: 313 317-0000 Regn Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T
REPAIR VEHICLE WAS BROUGHT IN FOR A STALL CONCERN EVE AFTER TSB 02-08-06 WAS PERFORMED. TECH IS UNABEL TO DUPLICATE CONCERN. SEEKING ADVICE.
RECOMM ISM 02-05-043 VEH STALL AFT TSB 02-08-06, R&R MAF, CK DPFE, CK G300, SUGGESTED OF ISM ABOVE.
ADD-ON 06/12/2002 11:32PM RICK GROSSMAN(FSE) MSS - FCSD - REG - KANSAS CTY SERVICE MANAGER CORY THOMPSON REPORTS AFTER DILLEGENTLY PERFORMING TSB 02-08-06 AND ISM 02-05-043, CUSTOMER REPORTS VEHICLE STILL INTERMITTE NTLY STALLS. DUE TO THE NUMBER OF TIMES IN FOR THIS CONCERN, CORY REPO RTS THE COMPANY HAS AGREED TO RAV THE VEHICLE.

==> _____ 1 of 1
Rpt#: 2FFA7020 NHL Rpt: 06/06/2002 Odom: 2,163 M
Rvwd: File: _ Folder: _____ Images: 0 Print Smy/Disp Detail(P/D): _
Vehicle: 2002 ESCAPE 4X4,XLT ,WAGON 1FMYU04192KD11746 Bld: 04/11/2002
Engine: 3.0L DUR Calb: 2M11A30A Trans: CD4E E Axle: 3800F2.73L A/C: YES
Dealer Id: 05079 Bill Woods Ford Ph#: (816) 454-4200

State: Missouri City: Kansas City Orig/Caller: TOM WOODROOF
Symptom: 6 07 0 00 DRVABL,STALL/QUITS,OTHER-CODE NA,OTHER-CODE NA
Addl Sym: INT STALLS, NO CODES St: CCRG/EPRC: _ Rvwd: Dt
Fix: Caus. Comp: – Condition Code:
Hotliner: KAVERY3 Phone: 313 317-9356 Regn Cd: 53 Kansas City - 53
Engineering: Phone: TAR:
Dlr Contact: Phone: Title Cde: T
REPAIR TECH STATES CUST ALLEGES INT STALLS, CANNOT GET FROM CUST ANY DETAILS AS TO CONDITIONS WHEN VEHICLE STALLS, DID TSB 02-11-06 AND CANNOT VERIFY, PASSES TSB, SEEKING KNOWNS.
RECOMM TSB 02-11-06 PERFORM NORMAL DIAG, RE-FLASH THE (PCM) ADV TECH NO FURTHER KNOWNS, ADV TRY TO DETERMINE VEH SPEED AT TIME OF CONCERN, IF ACCEL/DECEL/CRUISE, AND IF GOING DOWNHILL/UPHILL/LEVEL GROUND.
REPAIR 06/06/2002 03:33PM ANDREW BARNES MSS - FCSD - TECH SVC HOTLINE SM IS CALLING BACK AND HAD REMEMBERED SOME OTHER GROUNDS AND STUFF THAT WE HAVE TOLD THEN TO CHECK ON.
RECOMM ISM 02-05-043 VEH STALL AFT TSB 02-06-06, R&R MAF, CK DPFE, CK G300, ADVISED THE SM OF THE INFO LISTED IN THE ABOVE ISM.

Rick Grossmann

Field Service Engineer
913-541-4883

From:	Tracy, Lynn (L.J.) on behalf of Klarr, Jerry (G.T.)
Sent:	Thursday, August 22, 2002 10:05 AM
To:	Fascetti, Bob (R.J.); Garrett, Bruce (B.); Beck, Mike (M.C.); Judge, Surinder (S.S.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.); Faulk, William (W.R.); Takasawa, Keith (K.D.)
Subject:	RE: Heads Up: ESCAPE September 23rd NAQPAM

Suggest we only do an update on stalls, not another deepdive.

G. T. Klarr (Jerry)
Chief P/T Engineer - Outfitters
PH: 32-28669/Fax: 62-18063
PDC/MD #205/Cube 1BA45/Internet: gklarr@ford.com
(Admin. L. Tracy x38205)

-----Original Message-----

From:	Fascetti, Bob (R.J.)
Sent:	Wednesday, August 21, 2002 9:17 AM
To:	Klarr, Jerry (G.T.); Garrett, Bruce (B.); Beck, Mike (M.C.); Judge, Surinder (S.S.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.)
Subject:	RE: Heads Up: ESCAPE September 23rd NAQPAM

After reading Mike's comments, I don't think we should be covering Escape stalls at the NAQPAM. All of our fixes will be in production by then.

My point is, this will be another "no help required" review. Also, they have been through it already.

Bob Fascetti
Outfitters Calibration Manager

-----Original Message-----

From:	Tracy, Lynn (L.J.) On Behalf Of Klarr, Jerry (G.T.)
Sent:	Wednesday, August 21, 2002 8:25 AM
To:	Fascetti, Bob (R.J.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.)
Subject:	FW: Heads Up: ESCAPE September 23rd NAQPAM
Importance:	High

FYI. Focus of review needs to be on verification of fixes.

Sandy: Please se tup pre-review.

G. T. Klarr (Jerry)
Chief P/T Engineer - Outfitters
PH: 32-28669/Fax: 62-18063
PDC/MD #205/Cube 1BA45/Internet: gklarr@ford.com
(Admin. L. Tracy x38205)

-----Original Message-----

From:	Garrett, Bruce (B.)
Sent:	Tuesday, August 20, 2002 4:53 PM
To:	Klarr, Jerry (G.T.); Cosenza, Pat (P.D.); Himes, Bill (B.L.); Turner, Donald (D.A.); Corbett, Sandra (S.M.)
Cc:	Takasawa, Keith (K.D.); Powers, Ken (K.W.); Sauer, Robert (R.M.); Noma, Fumie (F.); Yost, Mark (M.F.); Desormeaux, Joseph (J.L.); Gathotra, Kumar (A.); McDaniel, Keith (R.K.); Savchetz, David (D.W.); Lee, David (D.A.); Judge, Surinder (S.S.)
Subject:	Heads Up: ESCAPE September 23rd NAQPAM
Importance:	High

Heads Up. The agenda deep-dives for the Sept 23rd NAQPAM will be: Stalls(Klarr) #7 on SA; and Audio-

CDX6 (Cosenza) #10 on SA. These deep-dives should be in the Storyboard format that we are currently using in the PDQOR. The Rest of the Agenda will follow the standard NAQPAM format. We are targeting to have all of the inputs by Sept 17th, and use the Sept 18th PDQOR as our final dry-run.

-----Original Message-----
From: Bernard, Theresa (T.) **On Behalf Of** Judge, Surinder (S.S.)
Sent: Tuesday, August 13, 2002 3:10 PM
To: Kiarr, Jerry (G.T.)
Cc: Garrett, Bruce (B.)
Subject: RE: LKG OCM Outcome

Jerry,
Bruce Garrett is in process and will advise shortly after Escape VQR this Thursday.

Thanks
Surinder

-----Original Message-----
From: Kiarr, Jerry (G.T.)
Sent: Monday, August 12, 2002 10:52 PM
To: Judge, Surinder (S.S.)
Cc: Powers, Ken (K.W.); Takasawa, Keith (K.D.)
Subject: RE: LKG OCM Outcome

Has the Escape items been selected?

G. T. Kiarr (Jerry)
P/T Chief Engineer: PH: 32-28668/Cube: 1BA45
PDC/MD #205/FAX: 62-18063/gkiarr@ford.com

-----Original Message-----
From: Judge, Surinder (S.S.)
Sent: Monday, August 12, 2002 6:54 PM
To: Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.)
Cc: Curran, Judith (J.M.); Takasawa, Keith (K.D.); Krefcik, John (J.F.); Himes, Bob (R.S.); Grewal, Bil (B.S.); Himes, Bill (B.L.); Jocz, Warren (W.S.); Le, Dzung (D.H.); Tokarski, Michael (M.J.); Cole, Joanne (J.); Cosenza, Pat (P.D.); DeDeppo, Lynn (L.D.); Fusco, Frank (F.D.); Jammoul, Ali (A.); Kiarr, Jerry (G.T.); von Foerster, Steve (S.)
Subject: FW: LKG OCM Outcome

fyi for future NAQPAM.
We will need to push on the SAQ items in order of priority.
Thx.

Surinder Judge
Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

-----Original Message-----
From: Faulk, William (W.R.)
Sent: Friday, August 09, 2002 6:31 PM
To: Judge, Surinder (S.S.); Wang, Amber (A.X.)
Subject: FW: LKG OCM Outcome

I will also need your assistance in selecting future items for deep dives as Mike has discussed in his attached note

-----Original Message-----
From: Beck, Mike (M.C.)
Sent: Tuesday, August 06, 2002 4:16 PM

DS02-027-C 2943

To: Zhou, Jianhua (J.); Brown, Dennis (D.C.); Nelson, Don (D.F.)
Cc: Stork, Gary (G.A.); Faulk, William (W.R.)
Subject: UKG OCM Outcome

Debbe Yeager shared today in L. Goeser's OCM a change in NAQPAM meeting format. This is in response to a survey / set of interviews that was done with the V.P.s that attend the meeting. I will share the document with you, but wanted to give you one heads up. One change that will be implemented is that the selection of the deep dive items will be done by me and Bill Faulk. The reason for this change is feedback from the V.P.s that they think they are hearing too much "good news" issues, not enough of the ones where help is required. The V.P.s want to focus more time on concerns that are unresolved, to focus on barriers and assistance needed.

To do a good job selecting, I will need to ask each of your assistance. Let's plan to talk about the practical aspects of how to make this change.

The other main change is to have more time between repeated visits for a given vehicle line.

Regards,

Mike Beck

Director - Quality and Customer Satisfaction
Ford N.A. Product Development
PDC1, 1C A07
Phone: 313-337-6471 Fax:313-323-9323

ER62-627-C 2944

From: Judge, Surinder (S.S.)
Sent: Monday, August 19, 2002 5:51 PM
To: Garrett, Bruce (B.)
Subject: RE: LKG OCM Outcome

OK. Proceed.

Surinder Judge
Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

-----Original Message-----
From: Garrett, Bruce (B.)
Sent: Monday, August 19, 2002 2:50 PM
To: Judge, Surinder (S.S.)
Subject: RE: LKG OCM Outcome

Surinder, I have met with Keith and Ken as to which deep-dives to present at NAQPAM. Our recommendation is to present Stalls(Klarr) #7 on SA; and Audio-COX6 (Cosenza) #10 on SA. Please discuss with Bill Faulk so that we can get the ball rolling. Thanks.

-----Original Message-----
From: Bernard, Theresa (T.) **On Behalf Of** Judge, Surinder (S.S.)
Sent: Tuesday, August 13, 2002 3:10 PM
To: Klarr, Jerry (G.T.)
Cc: Garrett, Bruce (B.)
Subject: RE: LKG OCM Outcome

Jerry,
Bruce Garrett is in process and will advise shortly after Escape VQR this Thursday.

Thanks
Surinder

-----Original Message-----
From: Klarr, Jerry (G.T.)
Sent: Monday, August 12, 2002 10:52 PM
To: Judge, Surinder (S.S.)
Cc: Powers, Ken (K.W.); Takasawa, Keith (K.D.)
Subject: RE: LKG OCM Outcome

Has the Escape items been selected?

G. T. Klarr (Jerry)
P/T Chief Engineer: PH: 32-28669/Cube: 1BA45
PDC/MD #205/FAX: 32-18063/gklarr@ford.com

-----Original Message-----
From: Judge, Surinder (S.S.)
Sent: Monday, August 12, 2002 6:54 PM
To: Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.)
Cc: Curran, Judith (J.M.); Takasawa, Keith (K.D.); Krafcik, John (J.F.); Himes, Bob (R.S.); Grewal, Bill (B.S.); Himes, Bill (B.L.); Jocz, Warren (W.S.); Le, Dzung (D.N.); Tokarski, Michael (M.J.); Cole, Joanne (J.); Cosenza, Pat (P.D.); DiDeppo, Lynn (L.D.); Fusco, Frank (F.D.); Jammoul, Ali (A.); Klarr, Jerry (G.T.); von Foerster, Steve (S.)

ER62-827-C 2945

Subject: FW: LKG OCM Outcome

fyi for future NAQPAM.
We will need to push on the SAQ items in order of priority.
Thx.

Surinder Judge
Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

----Original Message----
From: Faulk, William (W.R.)
Sent: Friday, August 09, 2002 6:31 PM
To: Judge, Surinder (S.S.); Wang, Amber (A.X.)
Subject: FW: LKG OCM Outcome

I will also need your assistance in selecting future items for deep dives as Mike has discussed in his attached note

----Original Message----
From: Beck, Mike (M.C.)
Sent: Tuesday, August 06, 2002 4:16 PM
To: Zhou, Jianhua (J.); Brown, Dennis (D.C.); Nelson, Don (D.F.)
Cc: Stork, Gary (G.A.); Faulk, William (W.R.)
Subject: LKG OCM Outcome

Debbe Yeager shared today in L. Goeser's OCM a change in NAQPAM meeting format. This is in response to a survey / set of interviews that was done with the V.P.s that attend the meeting. I will share the document with you, but wanted to give you one heads up. One change that will be implemented is that the selection of the deep dive items will be done by me and Bill Faulk. The reason for this change is feedback from the V.P.s that they think they are hearing too much "good news" issues, not enough of the ones where help is required. The V.P.s want to focus more time on concerns that are unresolved, to focus on barriers and assistance needed.

To do a good job selecting, I will need to ask each of your assistance. Let's plan to talk about the practical aspects of how to make this change.

The other main change is to have more time between repeated visits for a given vehicle line.

Regards,

Mike Beck
Director - Quality and Customer Satisfaction
Ford N.A. Product Development
PDC1, 1C A07
Phone: 313-337-6471 Fax:313-323-9323

5982-827-C 2946

From:	Fascetti, Bob (R.J.)
Sent:	Wednesday, August 21, 2002 9:17 AM
To:	Klarr, Jerry (G.T.); Garrett, Bruce (B.); Back, Mike (M.C.); Judge, Surinder (S.S.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.)
Subject:	RE: Heads Up: ESCAPE September 23rd NAQPAM

After reading Mike's comments, I don't think we should be covering Escape stalls at the NAQPAM. All of our fixes will be in production by then.

My point is, this will be another "no help required" review. Also, they have been through it already.

Bob Fascetti
Outfitters Calibration Manager

-----Original Message-----

From:	Tracy, Lynn (L.J.) On Behalf Of Klarr, Jerry (G.T.)
Sent:	Wednesday, August 21, 2002 8:25 AM
To:	Fascetti, Bob (R.J.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.)
Subject:	FW: Heads Up: ESCAPE September 23rd NAQPAM
Importance:	High

FYI. Focus of review needs to be on verification of fixes.

Sandy: Please se tup pre-review.

G. T. Klarr (Jerry)
Chief P/T Engineer - Outfitters
PH: 32-25869/Fax: 62-18063
PDC/MD #205/Cube 1BA45/Internet: gklarr@ford.com
(Admin. L. Tracy x36205)

-----Original Message-----

From:	Garrett, Bruce (B.)
Sent:	Tuesday, August 20, 2002 4:53 PM
To:	Klarr, Jerry (G.T.); Cosenza, Pat (P.D.); Himes, Bill (B.L.); Turner, Donald (D.A.); Corbett, Sandra (S.M.)
Cc:	Takasawa, Keith (K.D.); Powers, Ken (K.W.); Sauer, Robert (R.M.); Noma, Fumie (F.); Yost, Mark (M.F.); Desormeaux, Joseph (J.L.); Gathotra, Kumar (A.); McDaniel, Keith (R.K.); Sawchetz, David (D.W.); Lee, David (D.A.); Judge, Surinder (S.S.)
Subject:	Heads Up: ESCAPE September 23rd NAQPAM
Importance:	High

Heads Up. The agenda deep-dives for the Sept 23rd NAQPAM will be: Stalls(Klarr) #7 on SA; and Audio-CDX6 (Cosenza) #10 on SA. These deep-dives should be in the Storyboard format that we are currently using in the PDQOR. The Rest of the Agenda will follow the standard NAQPAM format. We are targeting to have all of the inputs by Sept 17th, and use the Sept 18th PDQOR as our final dry-run.

-----Original Message-----

From:	Bamard, Theresa (T.) On Behalf Of Judge, Surinder (S.S.)
Sent:	Tuesday, August 13, 2002 3:10 PM
To:	Klarr, Jerry (G.T.)
Cc:	Garrett, Bruce (B.)
Subject:	RE: LXG OCM Outcome

Jerry,
Bruce Garrett is in process and will advise shortly after Escape VQR this Thursday.

Thanks
Surinder

ER02-627-C 2947

---Original Message---
From: Klarr, Jerry (G.T.)
Sent: Monday, August 12, 2002 10:52 PM
To: Judge, Surinder (S.S.)
Cc: Powers, Ken (K.W.); Takasawa, Keith (K.D.)
Subject: RE: LKG OCM Outcome

Has the Escape items been selected?

G. T. Klarr (Jerry)
P/T Chief Engineer. PH: 32-28669/Cube: 1BA45
PDC/MD #205/FAX: 62-18063/gklarr@ford.com

---Original Message---
From: Judge, Surinder (S.S.)
Sent: Monday, August 12, 2002 6:54 PM
To: Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.)
Cc: Curran, Judith (J.M.); Takasawa, Keith (K.D.); Krafcik, John (J.F.); Himes, Bob (R.S.); Grewal, Bil (B.S.); Himes, Bill (B.L.); Jocz, Warren (W.S.); Le, Daung (D.H.); Tokarski, Michael (M.J.); Cole, Joanne (J.); Cosenza, Pat (P.D.); DeDeppo, Lynn (L.D.); Fusco, Frank (F.D.); Jammoul, Ali (A.); Klarr, Jerry (G.T.); von Foerster, Steve (S.)
Subject: FW: LKG OCM Outcome

fyi for future NAQPAM.
We will need to push on the SAQ items in order of priority.
Thx.

Surinder Judge
Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

---Original Message---
From: Faulk, William (W.R.)
Sent: Friday, August 09, 2002 6:31 PM
To: Judge, Surinder (S.S.); Wang, Amber (A.X.)
Subject: FW: LKG OCM Outcome

I will also need your assistance in selecting future items for deep dives as Mike has discussed in his attached note

---Original Message---
From: Beck, Mike (M.C.)
Sent: Tuesday, August 06, 2002 4:16 PM
To: Zhou, Jianhua (J.); Brown, Dennis (D.C.); Nelson, Don (D.F.)
Cc: Stork, Gary (G.A.); Faulk, William (W.R.)
Subject: LKG OCM Outcome

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Regards,

Mike Beck

Director - Quality and Customer Satisfaction
Ford N.A. Product Development
PDC1, 1C A07
Phone: 313-337-6471 Fax:313-323-9323

From:	Beck, Mike (M.C.)
Sent:	Thursday, August 22, 2002 10:50 AM
To:	Klarr, Jerry (G.T.); Fascetti, Bob (R.J.); Garrett, Bruce (B.); Judge, Surinder (S.S.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.); Faulk, William (W.R.); Takasawa, Keith (K.D.)
Subject:	RE: Heads Up: ESCAPE September 23rd NAQPAM

I agree with Jerry Klarr - an update would be appropriate (not full deep dive).

Mike Beck

Director - Quality and Customer Satisfaction
Ford N.A. Product Development
PDC1, 1C A07
Phone: 313-337-6471 Fax:313-323-9323

-----Original Message-----

From:	Tracy, Lynn (L.J.) On Behalf Of Klarr, Jerry (G.T.)
Sent:	Thursday, August 22, 2002 10:05 AM
To:	Fascetti, Bob (R.J.); Garrett, Bruce (B.); Beck, Mike (M.C.); Judge, Surinder (S.S.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.); Faulk, William (W.R.); Takasawa, Keith (K.D.)
Subject:	RE: Heads Up: ESCAPE September 23rd NAQPAM

Suggest we only do an update on stalls, not another deepdive.

G. T. Klarr (Jerry)
Chief P/T Engineer - Outfitters
PH: 32-26669/Fax: 62-18063
PDC/MD #205/Cube 1BA45/Internet: gklarr@ford.com
(Admin. L. Tracy x38205)

-----Original Message-----

From:	Fascetti, Bob (R.J.)
Sent:	Wednesday, August 21, 2002 9:17 AM
To:	Klarr, Jerry (G.T.); Garrett, Bruce (B.); Beck, Mike (M.C.); Judge, Surinder (S.S.)
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Bob Fascetti
Outfitters Calibration Manager

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To:	Fascetti, Bob (R.J.)
Cc:	Grewal, Bill (B.S.); Corbett, Sandra (S.M.)
Subject:	FW: Heads Up: ESCAPE September 23rd NAQPAM
Importance:	High

FYI. Focus of review needs to be on verification of fixes.

ER02-627-C 2958

Sandy: Please se tup pre-review.

G. T. Klarr (Jerry)
Chief P/T Engineer - Outfitters
PH: 32-26669/Fax: 62-18063
PDC/MD #205/Cube 1BA45/Internet: gklarr@ford.com
(Admin. L. Tracy x36205)

—Original Message—
From: Garrett, Bruce (B.)
Sent: Tuesday, August 20, 2002 4:53 PM
To: Klarr, Jerry (G.T.); Cosenza, Pat (P.D.); Himes, Bill (B.L.); Turner, Donald (D.A.); Corbett, Sandra (S.M.)
Cc: Takasawa, Keith (K.D.); Powers, Ken (K.W.); Sauer, Robert (R.M.); Noma, Fumie (F.); Yost, Mark (M.F.); Desormeaux, Joseph (J.L.); Galhotra, Kumar (A.); McDaniel, Keith (K.K.); Savchetz, David (D.W.); Lee, David (D.A.); Judge, Surinder (S.S.)
Subject: Heads Up: ESCAPE September 23rd NAQPAM
Importance: High

Heads Up. The agenda deep-dives for the Sept 23rd NAQPAM will be: Stalls(Klarr) #7 on SA; and Audio-CDX8 (Cosenza) #10 on SA. These deep-dives should be in the Storyboard format that we are currently using in the PDQOR. The Rest of the Agenda will follow the standard NAQPAM format. We are targeting to have all of the inputs by Sept 17th, and use the Sept 18th PDQOR as our final dry-run.

—Original Message—
From: Barnard, Theresa (T.) **On Behalf Of** Judge, Surinder (S.S.)
Sent: Tuesday, August 13, 2002 3:10 PM
To: Klarr, Jerry (G.T.)
Cc: Garrett, Bruce (B.)
Subject: RE: LXG OCN Outcome

Jerry,
Bruce Garrett is in process and will advise shortly after Escape VQR this Thursday.

Thanks
Surinder

—Original Message—
From: Klarr, Jerry (G.T.)
Sent: Monday, August 12, 2002 10:52 PM
To: Judge, Surinder (S.S.)
Cc: Powers, Ken (K.W.); Takasawa, Keith (K.D.)
Subject: RE: LXG OCN Outcome

Has the Escape items been selected?

G. T. Klarr (Jerry)
P/T Chief Engineer: PH: 32-26669/Cube: 1BA45
PDC/MD #205/FAX: 62-18063/gklarr@ford.com

—Original Message—
From: Judge, Surinder (S.S.)
Sent: Monday, August 12, 2002 6:54 PM
To: Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.)
Cc: Curran, Judith (J.M.); Takasawa, Keith (K.D.); Kraftik, John (J.F.); Himes, Bob (R.S.); Grewal, Bill (B.S.); Himes, Bill (B.L.); Jocz, Warren (W.S.); Le, Dzung (D.H.); Tokarski, Michael (M.J.); Cota, Joanne (J.); Cosenza, Pat (P.D.); DeDeppo, Lynn (L.D.); Fusco, Frank (F.D.); Jammoul, Ali (A.); Klarr, Jerry (G.T.); von Foerster, Steve (S.)
Subject: FW: LXG OCN Outcome

fyi for future NAQPAM.
We will need to push on the SAQ items in order of priority.
Thx.

Surinder Judge

Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

---Original Message---
From: Faulk, William (W.R.)
Sent: Friday, August 09, 2002 6:31 PM
To: Judge, Surinder (S.S.); Wang, Amber (A.X.)
Subject: FW: LXG OCM Outcome

I will also need your assistance in selecting future items for deep dives as Mike has discussed in his attached note

---Original Message---
From: Beck, Mike (M.C.)
Sent: Tuesday, August 06, 2002 4:16 PM
To: Zhou, Jianhua (J.); Brown, Dennis (D.C.); Nelson, Don (D.F.)
Cc: Stork, Gary (G.A.); Faulk, William (W.R.)
Subject: LXG OCM Outcome

Debbe Yeager shared today in L. Goeser's OCM a change in NAQPAM meeting format. This is in response to a survey / set of interviews that was done with the V.P.s that attend the meeting. I will share the document with you, but wanted to give you one heads up. One change that will be implemented is that the selection of the deep dive items will be done by me and Bill Faulk. The reason for this change is feedback from the V.P.s that they think they are hearing too much "good news" issues, not enough of the ones where help is required. The V.P.s want to focus more time on concerns that are unresolved, to focus on barriers and assistance needed.

To do a good job selecting, I will need to ask each of your aseistance. Let's plan to talk about the practical aspects of how to make this change.

The other main change is to have more time between repeated visits for a given vehicle line.

Regards,

Mike Beck

Director - Quality and Customer Satisfaction
Ford N.A. Product Development
PDC1, 1C A07
Phone: 313-337-6471 Fax:313-323-9323

EX62-627-C 2962

From:	Preston, Carla Traci (C.T.)
Sent:	Wednesday, April 17, 2002 7:32 AM
To:	Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.); Edmondson, Tammy (T.L.); Hatten, Ophelia (O.); Khan, Asad (A.); Noma, Fumie (F.)
Subject:	FW: Cross Cluster Assignment #26 (from 2.26.02 Explorer NAQPAM)

FYI

Carla

----Original Message----

From:	Tracy, Lynn (L.J.) On Behalf Of Klarr, Jerry (G.T.)
Sent:	Wednesday, April 17, 2002 7:24 AM
To:	Kapp, Dan (Daniel R.); Javor, Les (L.D.); Wolfe, Brian (B.C.); Klarr, Jerry (G.T.); Pascetti, Bob (R.J.); Himes, Bob (R.S.); Hallauer, Julie (J.A.)
Cc:	Preston, Carla Traci (C.T.); Wade, Wally (W.R.); Wright, Robin (R.A.)
Subject:	RE: Cross Cluster Assignment #26 (from 2.25.02 Explorer NAQPAM)

We plan on presenting the Outfitters "No Stalls" team status at a future Bob Himes PDQOS meeting (powertrain rotation). We can then report into Brian Wolfe's driveability affinity meeting our findings and potential application to other vehicle lines.

G. T. Klarr (Jerry)
Chief P/T Engineer - Outfitters
PH: 32-29669/Fax: 62-16083
PDC/MD #205/Cube 1BA45/Internet: gklarr@ford.com
(Admin. L. Tracy x38205)

----Original Message----

From:	Kapp, Dan (Daniel R.)
Sent:	Tuesday, April 16, 2002 6:34 AM
To:	Javor, Les (L.D.); Wolfe, Brian (B.C.); Klarr, Jerry (G.T.); Pascetti, Bob (R.J.); Himes, Bob (R.S.); Hallauer, Julie (J.A.)
Cc:	Preston, Carla Traci (C.T.); Wade, Wally (W.R.); Wright, Robin (R.A.)
Subject:	RE: Cross Cluster Assignment #26 (from 2.25.02 Explorer NAQPAM)

There is an existing effort within Outfitters addressing stalls (reporting back through Brian Wolfe's driveability affinity team as well as the vehicle line) based on issues encountered on Explorer and Escape. My understanding of the assignment below based on discussion with Bob Himes is that there was concern raised at the NAQPAM that there may be a chronic concern. I'll review the cross-carline data in my Quality meeting next week as well as the efforts and findings from Outfitters. Brian Wolfe's (formerly mine) GCE org has taken on lead of 3 Affinity Teams to date (hes/surge, idle and more recently MIL as an added starter) and can't continue to add these on without resource help. If driven by the cross carline data, stalls projects would have to prioritized /handled within the existing driveability affinity team. If it appears to be predominantly Outfitters driven by 4.0L Explorer and Escape special cause issues, the existing approach by Outfitters powertrain (with support from CAPE) would seem appropriate.

----Original Message----

From:	Javor, Les (L.D.)
Sent:	Wednesday, April 10, 2002 4:58 PM
To:	Kapp, Dan (Daniel R.)
Cc:	Preston, Carla Traci (C.T.)
Subject:	Cross Cluster Assignment #26 (from 2.25.02 Explorer NAQPAM)

You were identified as the assignee for the following item captured during the Explorer NAQPAM meeting.

Look at addressing engine stalls as an affinity project.

EM2-827-C 2953

What is requested:

- Identify and notify a contact person from your team who will be responsible for resolving the issue
    - They should provide me with an estimated closure date along w/ a brief update (suitable for inclusion in an Excel Open/Status block) regarding the plan to close or where the process is at, if it is too early to predict a closure date.
    - Additionally, please note that open items are to be reviewed at the vehicle lines next NAQPAM meeting. Explorer's next meeting is 4/29.

Please cc Carla Preston as well. She will be following-up and ensuring that this item is resolved in a timely manner.

Regards,

Les Javer

Quality Strategy
Phone & Fax:
313.248.9170

From:	Klarr, Jerry (G.T.)
Sent:	Saturday, April 20, 2002 1:08 PM
To:	Preston, Carla Traci (C.T.); Fusco, Frank (F.D.); von Foerster, Steve (S.); Terzes, Laura (L.D.); Jammoul, Ali (A.); Le, Dzung (D.H.); Hilborn, Theresa (T.O.); Kuhn, Gregory (G.F.); Pennington, Brian (K.); Powers, Ken (K.W.)
Cc:	Grewal, Bill (B.S.); Madhavan, Ranganathan (R.); Sharkey, Patricia (P.); Judge, Surinder (S.S.); Edmondson, Tammy (T.L.); Hatten, Ophelia (O.); Khan, Asad (A.); Noma, Fumie (F.); Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.); Brennan, Patrick (P.M.); Fascetti, Bob (R.J.); Holman, Michael (M.V.); Layden, Kevin (K.E.); McCoy, Julie (J.); Stephens, Craig (C.); Watson, Tom (T.M.)
Subject:	RE: Action Required: 1 May 2002 PDQOS

Our plan is the following for the powertrain report out:

1) Review updates to each vehicle line single agenda (SAQ's, QSF's, etc)
2) Focus review on Escape Stalls. Will include Outfitters Stalls task force status including Explorer.
3) Stationary Components Warranty Deep Dive

G. T. Klarr (Jerry)
P/T Chief Engineer: PH: 32-26669/Cube: 1BA45
PDC/MD #205/FAX: 82-18063/gklarr@ford.com

—Original Message—

From:	Preston, Carla Traci (C.T.)
Sent:	Wednesday, April 17, 2002 6:36 PM
To:	Klarr, Jerry (G.T.); Fusco, Frank (F.D.); von Foerster, Steve (S.); Terzes, Laura (L.D.); Jammoul, Ali (A.); Le, Dzung (D.H.); Hilborn, Theresa (T.O.); Kuhn, Gregory (G.F.); Pennington, Brian (K.); Powers, Ken (K.W.)
Cc:	Grewal, Bill (B.S.); Madhavan, Ranganathan (R.); Sharkey, Patricia (P.); Judge, Surinder (S.S.); Edmondson, Tammy (T.L.); Hatten, Ophelia (O.); Khan, Asad (A.); Noma, Fumie (F.); Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.)
Subject:	Action Required: 1 May 2002 PDQOS

Hello All,

In an effort to be more efficient, the team will be distributing the agenda for the 1 May 2002 PDQOS meeting on Monday, 22 April 2002. It has been helpful for the PVT Managers and the CNEs to know what topics will be discussed at the meeting. **Please, provide your response to Asad Khan (AKHAN20) by Friday, 19 April 2002.**

Jerry, Ali and Frank:

Powertrain, Climate Control, and Chassis are scheduled as the functional highlight areas for the 1 May 2002 Outfitters PDQOS meeting. Please advise as follows:

- what specific topics you will be discussing by nameplate as well as specific issues (QSFs, HI Mileage , Warranty
- how long you will need

Theresa, Brian, Greg and Ken:

- Bob has requested that each PVT manager prepare and discuss the Single Agenda similar to the Escape BB Monitor Support sheet. Ken is sending a copy to each PVT Manager
- Theresa / Brian, the team also liked the manner in which Explorer highlighted and discussed open VQR BB issues. All PVTs should have similar VQR information

ER82-627-C 2955

- FCPA needs to be reported at the 1 May 2002 meeting

Steve

- Per our discussion VE will be allocated 1 hour at each meeting. Please advise as to your specific agenda topics.

Laura and Mike

- FCSD and Finance are standing agenda topics. Please advise of how much time you will both need.

Carla

EH02-027-C 2956

From: Judge, Surinder (S.S.)
Sent: Wednesday, August 28, 2002 11:24 AM
To: Hall, Brenda (B.S.)
Cc: Garrett, Bruce (B.)
Subject: FW: Heads Up: ESCAPE September 23rd NAQPAM

Follow Up Flag: Follow up
Flag Status: Flagged

I understand the issue...not the request. PL clarify....thx.

Surinder Judge
Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

-----Original Message-----
From: Hall, Brenda (B.S.)
Sent: Wednesday, August 28, 2002 11:02 AM
To: Judge, Surinder (S.S.)
Subject: FW: Heads Up: ESCAPE September 23rd NAQPAM

Surinder,

See Dave McNamara's request below . . .

Brenda S. Hall (bhall55@ford.com <mailto:bhall55@ford.com>)
Admin. Asst. to David McNamara
Multimedia and Adv. E/E Systems Dept.
and
Admin. Asst. to Benny Vann
DI/Climate Department
Research and Vehicle Technology
Ph (313) 59-43999
Fax (313) 621-4426

-----Original Message-----
From: McNamara, David (D.A.)
Sent: Wednesday, August 28, 2002 7:42 AM
To: bhall55@ford.com
Cc: Shecter, Lisa (L.A.)
Subject: FW: Heads Up: ESCAPE September 23rd NAQPAM

Please contact Lisa Shecter to get the 9-18 PDQOR and 9-23 NAQPAM on our agenda..please make sure Bill Garrett and Julie are invited also..thanks.

-----Original Message-----
From: Khangura, Ken (K.)
Sent: Monday, August 26, 2002 7:54 PM
To: Himes, Bob (R.S.)
Cc: Cosenza, Pat (P.D.); Wilson, Cary (C.A.); McNamara, David (D.A.)
Subject: RE: Heads Up: ESCAPE September 23rd NAQPAM

EH02-627-C 2957

Bob, We will handle. Dave McNamara will report on the issue.

-----Original Message-----
From: Himes, Bob (R.S.)
Sent: Wednesday, August 21, 2002 7:56 PM
To: Khangura, Kan (K.)
Cc: Cosenza, Pat (P.D.); Wilson, Cary (C.A.)
Subject: FW: Heads Up: ESCAPE September 23rd NAQPAM
Importance: High

PER OUR DISCUSSION YESTERDAY. YOURS.

Bob Himes
ENGINEERING DIRECTOR, TRUCK OUTFITTERS
Rm 2C-B13; MD 338 PDC Building
Phone: (313) 39-07632 Fax: (313) 84-58293
email: bhimes@ford.com

-----Original Message-----
From: Cosenza, Pat (P.D.)
Sent: Wednesday, August 21, 2002 12:18 PM
To: Himes, Bob (R.S.)
Subject: FW: Heads Up: ESCAPE September 23rd NAQPAM
Importance: High

Bob,

I expect to be in Sweden with Cary on Sept. 23. Rather than have Gary Jablonski report on this issue, I'd like to let Ken K. or Dave McNamara (or Visteon) make the pitch. I will still work with RVT and Visteon to review the project beforehand at my Quality meeting. Agreed?

-----Original Message-----
From: Garrett, Bruce (B.)
Sent: Tuesday, August 20, 2002 4:53 PM
To: Klarr, Jerry (G.T.); Cosenza, Pat (P.D.); Himes, Bill (B.L.); Turner, Donald (D.A.); Corbett, Sandra (S.M.)
Cc: Takasawa, Keith (K.D.); Powers, Ken (K.W.); Sauer, Robert (R.M.); Nowa, Funsie (F.); Yost, Mark (N.F.); Desormeaux, Joseph (J.L.); Gallotra, Kumar (A.); McDaniel, Keith (R.K.); Savchetz, David (D.W.); Lee, David (D.A.); Judge, Surinder (S.S.)
Subject: Heads Up: ESCAPE September 23rd NAQPAM
Importance: High

Heads Up. The agenda deep-dives for the Sept 23rd NAQPAM will be: Stalls(Klarr) #7 on SA; and Audio-CDX6 (Cosenza) #10 on SA. These deep-dives should be in the Storyboard format that we are currently using in the PDQOR. The Rest of the Agenda will follow the standard NAQPAM format. We are targeting to have all of the inputs by Sept 17th, and use the Sept 18th PDQOR as our final dry-run.

-----Original Message-----
From: Barnard, Theresa (T.) On Behalf Of Judge, Surinder (S.S.)
Sent: Tuesday, August 13, 2002 3:10 PM
To: Klarr, Jerry (G.T.)
Cc: Garrett, Bruce (B.)
Subject: RE: LKG OCM Outcome

Jerry,
Bruce Garrett is in process and will advise shortly after Escape VQR this Thursday.

Thanks
Surinder

-----Original Message-----
From: Klarr, Jerry (G.T.)
Sent: Monday, August 12, 2002 10:52 PM
To: Judge, Surinder (S.S.)
Cc: Powers, Ken (K.W.); Takasawa, Keith (K.D.)

Subject: RE: LKG OCM Outcome

Has the Escape items been selected?

G. T. Klarr (Jerry)
P/T Chief Engineer: PH: 32-28669/Cube: 1BA45
PDC/MD #205/FAX: 62-18063/gklarr@ford.com

—Original Message—
From: Judge, Surinder (S.S.)
Sent: Monday, August 12, 2002 6:54 PM
To: Cuper, Dennis (D.P.); Fukuda, Neil (N.P.); Garrett, Bruce (B.); Smith, Alan (A.R.)
Cc: Curran, Judith (J.M.); Takasawa, Keith (K.D.); Krafcik, John (J.F.); Himes, Bob (R.S.); Grewal, Bill (B.S.); Himes, Bill (B.L.); Jocz, Warren (W.S.); Le, Dzung (D.H.); Tokarski, Michael (M.J.); Cole, Joanne (J.); Cosenza, Pat (P.D.); DeDeppo, Lynn (L.D.); Fusco, Frank (F.D.); Jammoul, Ali (A.); Klarr, Jerry (G.T.); von Foerster, Steve (S.)
Subject: FW: LKG OCM Outcome

fyi for future NAQPAM.
We will need to push on the SAQ items in order of priority.
Thx.

Surinder Judge
Manager - Engineering Reliability - Outfitters, NA Trucks
ASQ Certified Reliability Engineer
Tel: (313) 248-5741. Fax: (313) 317-7296
Txt Pager - sjudge

—Original Message—
From: Faulk, William (W.R.)
Sent: Friday, August 09, 2002 6:31 PM
To: Judge, Surinder (S.S.); Wang, Amber (A.X.)
Subject: FW: LKG OCM Outcome

I will also need your assistance in selecting future items for deep dives as Mike has discussed in his attached note

—Original Message—
From: Beck, Mike (M.C.)
Sent: Tuesday, August 06, 2002 4:16 PM
To: Zhou, Jianhua (J.); Brown, Dennis (D.C.); Nelson, Don (D.F.)
Cc: Stork, Gary (G.A.); Faulk, William (W.R.)
Subject: LKG OCM Outcome

Debbe Yeager shared today in L. Goeser's OCM a change in NAQPAM meeting format. This is in response to a survey / set of interviews that was done with the V.P.s that attend the meeting. I will share the document with you, but wanted to give you one heads up. One change that will be implemented is that the selection of the deep dive items will be done by me and Bill Faulk. The reason for this change is feedback from the V.P.s that they think they are hearing too much "good news" issues, not enough of the ones where help is required. The V.P.s want to focus more time on concerns that are unresolved, to focus on barriers and assistance needed.

To do a good job selecting, I will need to ask each of your assistance. Let's plan to talk about the practical aspects of how to make this change.

The other main change is to have more time between repeated visits for a given vehicle line.

Regards,

EN02-027-C 2959

Mike Beck

Director - Quality and Customer Satisfaction
Ford N.A. Product Development
PDC1, 1C A07
Phone: 313-337-6471 Fax:313-323-9323

From: Nematollahi, Sonya (S.)
Sent: Wednesday, May 15, 2002 3:48 PM
To: Lipa, Jeffrey (J.A.); Dalbo, Bob (R.J.)
Cc: Takasawa, Keith (K.D.); Powers, Ken (K.W.); Cless, Craig (C.M.); Bodnar, Les (L.R.); Diez, Timothy (T.P.); Cless, Craig (C.M.)
Subject: RE: Action Req: Escape EMF

Jeff,

There is a Stall team (cross functional) addressing all stall issues, Powertrain is leading those meetings, Electrical have been supporting when needed. Number of root causes have been identified for the stall issues, we have taken some actions and the team is still working on this issue. I have attached a couple of meeting minutes and a note from our EMC engineer regarding this issue.

Bob, can someone from your team contact this dealership and request more information to ensure that this is not a new issue. Please let me know. Thanks.

[redacted] [redacted] [redacted]

Summary of EMC results on Powe... | 204 Stalls Meeting Minutes - ... | 204 Stall Meeting Minutes - 5...

Sonya Nematollahi
Escape/Tribute/Maverick Electrical Team Leader
Phone: 33-79969
Pager: Text, 313-795-8932
email: snematol@ford.com

---Original Message---
From: Lipa, Jeffrey (J.A.)
Sent: Monday, May 13, 2002 8:51 AM
To: Bodnar, Les (L.R.); Nematollahi, Sonya (S.)
Cc: Takasawa, Keith (K.D.); Powers, Ken (K.W.); Cless, Craig (C.M.)
Subject: Action Req: Escape EMF

Sonya/Les,
Can you please investigate these vehicles with the dealer and assess if we have an issue lurking?

Jeffrey A. Lipa
Escape Vehicle Engineering Manager
Phone: 313-39-48010
Pager: 313-813-1482

---Original Message---
From: Cless, Craig (C.M.)
Sent: Monday, May 13, 2002 8:45 AM
To: Lipa, Jeffrey (J.A.)
Subject: Escape EMF

Jeff,

I got your name from the U204 website and thought that you might like to know about this.

I am sending you this note because a relative of mine informed me that a dealership in New Holland, PA has found that there were several vehicles that they had to tow into the service department because they stalled on the road. The funny thing is that they all stalled in the same area, near a water tower. After looking at the vehicles and having them restart when they got back to the dealership, they believe that there is an EMF near the tower that is shutting the ignition systems down. Just thought that you should know about this. If you have further questions, please let me know and I will get you any information that I can. Thanks for your time and effort.

Craig M. Close

Ford Motor Company
GCE - TASE - Heat Management Technical Specialist

- Location: ASC Cube 4507, Mail Drop 68
- Phone : 313-84-54158
- Fax : 313-39-05083
- E-Mail : mailto:cclose@ford.com
- TASE Web: http://www-tase.ford.com
- HM Web : http://www-tase.ford.com/heatmgt

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, November 04, 2002 6:04 PM
To: O'Neall, Jim (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: FW: dPFE - recommended engineer to review layout

Contact information for substrate layout person.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

----Original Message----
From: Koszewnik, John (J.J.)
Sent: Sunday, November 03, 2002 6:18 PM
To: Freeland, Mark (M.)
Subject: RE: dPFE - recommended engineer to review layout

Mark,

Thanks for the info. I'll see what we can do when I meet with Kavlico later this week.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 39-09670
jkoszewn@ford.com

----Original Message----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:25 PM
To: Koszewnik, John (J.J.)
Cc: Hermann, Thomas (T.J.)
Subject: dPFE - recommended engineer to review layout

John,

I met with the EMC supervisor (Tom Hermann) this afternoon to get his recommendations on the testing we discussed yesterday.

I also asked him to recommend the best engineer we have to discuss design layout guidelines and to review Kavlico's layout. He recommended Jarek Tracz (jtracz@ford.com).

I would suggest we get Jarek together with Kavlico's designer before they start the layout.

Regards

Mark Freeland

Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EP92-027-C 2963

Freeland, Mark (M.)

From: Koszewnik, John (J.J.)
Sent: Sunday, November 03, 2002 6:18 PM
To: Freeland, Mark (M.)
Subject: RE: dPFE - recommended engineer to review layout

Mark,

Thanks for the info. I'll see what we can do when I meet with Kavlico later this week.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 39-09670
jkoszewn@ford.com

—Original Message—
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:25 PM
To: Koszewnik, John (J.J.)
Cc: Hermann, Thomas (T.J.)
Subject: dPFE - recommended engineer to review layout

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Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Koszewnik, John (J.J.)
Sent: Sunday, November 03, 2002 6:16 PM
To: Freeland, Mark (M.)
Subject: RE: dPFE - recommended engineer to review layout

Mark,

Thanks for the info. I'll see what we can do when I meet with Kavlico later this week.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 39-09670
jkoszewn@ford.com

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From: Freeland, Mark (M.)
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To: Koszewnik, John (J.J.)
Cc: Hermann, Thomas (T.J.)
Subject: dPFE - recommended engineer to review layout

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Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EX62-827-C 2985

Freeland, Mark (M.)

From: Davis, George (G.C.)
Sent: Friday, November 01, 2002 3:56 PM
To: Freeland, Mark (M.)
Subject: RE: dPFE - recommended engineer to review layout

Mark,
sorry I missed the meeting yesterday. I was on vacation and got tied up. I see no problem to continue working on this project for a while. How much time is involved? I would like to get your update as well. Thanks.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:44 PM
To: Davis, George (G.C.)
Subject: FW: dPFE - recommended engineer to review layout

George,

I met with John yesterday as arranged. I have a package I gave him (final recommendation on circuit and supporting data) which I would like to review with you when you have time. He asked if I was still available to continue work, I said I was available to continue as long as it's OK with you. He has a special "test" he wants conducted.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:25 PM
To: Kaszewik, John (J.J.)
Cc: Hermann, Thomas (T.J.)
Subject: dPFE - recommended engineer to review layout

John,

I met with the EMC supervisor (Tom Hermann) this afternoon to get his recommendations on the testing we discussed yesterday.

I also asked him to recommend the best engineer we have to discuss design layout guidelines and to review Kavlico's layout. He recommended Jarek Tracz (jtracz@ford.com).

I would suggest we get Jarek together with Kavlico's designer before they start the layout.

Regards

EX62-627-C 2966

Mark Freeland

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EA82-827-C 2987

Bldg. 5529
Conf 54348

Freeland, Mark (M.)

Full Name:	Hermann, Thomas (T.J.)
Last Name:	Hermann
First Name:	Thomas
Job Title:	Section Supervisor
Department:	5100T411 - E/E Appl& Tech - EMC
Company:	Ford, EESE
Business Address:	2A102 MD5011 DEARBORN, MI 48121
Business:	(313) 337-5410
Business 2:	+1 (313) 337-5410
Assistant:	+1 (313) 621-4862
Home:	
Home 2:	+1 (248) 539-4853
Mobile:	08513613
Pager:	
Other Fax:	(313) 621-4862
E-mail:	Hermann, Thomas (T.J.)
Assistant:	20000 ROTUNDA DRIVE
Categories:	6 Sigma DPFE
PalmPilot Category:	6 Sigma DPFE

CHINCHI CHIN
08688
CCHEN4

& JAREK TRACZ

Freeland, Mark (M.)

From:	O'Neall, Jim (J.D.)
Sent:	Friday, November 22, 2002 1:58 PM
To:	Gates, Freeman (F.C.); Hermann, Thomas (T.J.); 'kpark@kavlico.com'
Cc:	Freeland, Mark (M.)
Subject:	FW: Travel to Kavlico to Review Electrical Schematics for Transient Voltage Improvements

Freeman - please work with Tom Hermann's group and Mark Freeland to review these drawings, once they arrive.
Kyong - thanks.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Friday, November 22, 2002 12:32 PM
To: O'Neall, Jim (J.D.)
Subject: RE: Travel to Kavlico to Review Electrical Schematics for Transient Voltage Improvements

Jim,
I will send drawings to you by FedEx P1.
Kyong

-----Original Message-----
From: O'Neall, Jim (J.D.) [mailto:joneall@ford.com]
Sent: Friday, November 22, 2002 9:29 AM
To: Hubbard, Rick; Park, Kyong
Cc: Gates, Freeman (F.C.)
Subject: Travel to Kavlico to Review Electrical Schematics for Transient Voltage Improvements

It appears that we will not be able to visit Kavlico on Monday, Nov 18th to review the Electrical Schematics for Transient Voltage Improvements. Our EMC expert, Jarek Tracz, is on personal vacation and won't return until Dec 2nd. I would suggest one of the alternatives:

* Is it possible to forward the schematics to Jarek for his review in Dearborn on Dec 2nd and then follow up with a phone conference with Kavlico later that day or Dec 3rd?
* If you do not feel comfortable forwarding the drawings then we will have to delay our visit until the week of Dec 2nd.

Let us know.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

E982-827-C 2869

Freeland, Mark (M.)

From: Adams, Jim (J.A.)
Sent: Monday, November 25, 2002 10:08 AM
To: Power, James (J.H.)
Cc: Saloka, George (G.S.); Freeland, Mark (M.); Bauer, David (D.R.)
Subject: electrical noise from ignition system

Hello James,

I work in the Materials Science Department at FRL in a group that focuses on durability and reliability issues. Recently, members of my group had a discussion with Mark Freeland in which he mentioned there may be a problem with electrical noise from the ignition system, specifically the spark plugs. I would like to discuss this further with you to see what help we might be able to offer you in terms of experimental testing and/or materials analysis such as SEM. I will be out of the office after today until 12-03-02, so perhaps we can get together next week for ½ hour to discuss this further.

Regards,

Jim Adams
X40932

ER02-827-C 2878

Freeland, Mark (M.)

om:	Freeland, Mark (M.)
ent:	Monday, November 18, 2002 5:32 PM
To:	Awad, Mahmoud (M.I.); Maurer, James (J.B.)
Cc:	Gates, Freeman (F.C.)
Subject:	RE: Taurus 00 repairs

Mahmoud,

Thanks for the Taurus data. I have included it in the study I showed you last week.

If you look at the Taurus data, it seems that there may be a seasonal effect, or the second peak is repeat repairs of the same population of vehicles in the first peak? What do you think?

Regards

Mark Freeland

6-Sigma Black Belt
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E-mail: mfreela1@ford.com
Tel.: (313) 594-7645

----Original Message----

From:	Awad, Mahmoud (M.I.)
Sent:	Monday, November 18, 2002 8:39 AM
To:	Freeland, Mark (M.); Maurer, James (J.B.)
Subject:	Taurus 00 repairs

Mark,
Attached is the number of repairs by month of repair for the Taurus-Sable 00 MY.
Jim,
since 00 MY had a different part number (prefix and suffix), I don't think that it was included in our last report.
<< File: Taurus00 repairs.xls >>

Best Regards
Mahmoud Awad
Reliability Implementation Engineer
FMEI Department Support
Phone: (313) 24-83869
e-mail: mawad@ford.com

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, November 25, 2002 2:24 PM
To: Giordano, Mike (M.A.)
Subject: Repeat dPFE Repair Analysis of 2.0L Zetec FOcus

Mike,

I was taking a look at the Repeat Repairs for the dPFE, print out the attached workbook and take a look. Then perhaps we can discuss after you have digested.

I will be out of the office until next Tuesday, so take you're time.

[redacted]
20021114 All Forms
RR analysis...

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EXHIBIT 827-C 2872

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 10:06 AM
To: Bryant, Bruce (B.D.); Jensen, Ted (T.E.)
Cc: Verner, Carol (C.J.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs

Importance: High

Bruce ot Ted,

Do you know if we use the GPIRS system to order parts here at SRL, if so can you point me to someone who has access and knows how to do it.

Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Verner, Carol (C.J.)
Sent: Friday, November 01, 2002 9:33 AM
To: Freeland, Mark (M.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Mark,

Do you know if Sci-Lab uses the GPIRS system to order parts. POEngineEngineering does not use GPIRS. North Penn will not ship the PCMs unless the order is in GPIRS. I am thinking that if SCILAB uses GPIRS then I will try to find out if you may order them and uses our department number.

Carol

-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Wednesday, October 30, 2002 4:53 PM
To: Verner, Carol (C.J.)
Cc: Maurer, James (J.B.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Go for it. If you don't know how to execute a GPIRS order please call Joe Ray.

2002-627-C 2573

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Rey, Joseph (J.A.) [mailto:jrey1@visteon.com]
Sent: Wednesday, October 30, 2002 3:21 PM
To: 'O'Neall,Jim'
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Jim,

I'm sorry to hear that Carol has had such difficulty getting this orders processed. If Carol resubmits the order as a GPIRS order then North Penn will ship within 48 hours of receiving this order. See note below from Alan Trilling at North Penn. If you need any additional assistance don't hesitate to call.

Thanks,

> Joe Rey
Sales Manager
Powertrain Electronics
Visteon Corporation
Phone: 313-755-5295
Fax: 313-755-8075
Cell: 313-378-1817

-----Original Message-----
From: Trilling, Alan (A.S.)
Sent: Wednesday, October 30, 2002 7:03 AM
To: Rey, Joseph (J.A.); Dean, Breck (B.G.); D'Arcy, William (W.)
Cc: Ridgway, Robert (R.W.); Pad, Richard (R.M.)
Subject: RE: Orders for Engineering Parts: Mazda Tribute PCMs

Joe:

I recommend that Jim place a GPIRS order, in which NPEF could fill within 48 hours of receipt.

Regards,

Alan S. Trilling

Visteon - North Penn Electronics Facility, LLC
Material Planning Specialist
Phone #: (610) 584-7942
Fax #: (610) 584-7145
E-Mail: ATRILLIN@VISTEON.COM

-----Original Message-----
From: O'Neall, Jim (J.D.) [mailto:joneall@ford.com]
Sent: Friday, October 25, 2002 7:16 AM

To: 'cweed@visteon.com'
Cc: Verner, Carol (C.J.); Maurer, James (J.B.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs

Craig - we could sure use your help on this one to forward it to the right Visteon contact. We need a specific PCM that we have been trying to order out of North Penn for months. This PCM is needed for a Mazda Tribute, a buy back vehicle. This vehicle is parked and until we get the PCM, it cannot be auctioned off. You can see from the string of notes below some of the details including the part number. Any help that you can provide would be appreciated. For a contact on our side please contact Carol Verner. Thanks.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

> -----Original Message-----
> From: Verner, Carol (C.J.)
> Sent: Tuesday, October 22, 2002 1:40 PM
> To: O'Neall, Jim (J.D.)
> Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
>
> Jim,
>
> I spoke with Jim Simpson this morning and he said that we cannot use the FAB account to allow Ford of Taiwan to purchase a PCM for a buyback Mazda Tribute to replace the one sent to Mark Freeland. Jim recommended I ask you to send a note to Powertrain Purchasing Manager for assistance to get Visteon (North Penn) to ship the modules. The original RPS # 200200913 was placed back around the May 1.2002 time frame. The buyer and I were not sucessful getting Visteon to ship so Kristen asked for assistance from her supervisor Tom Kotz prior to his retirement. As of this afternoon, the CMMS parts inventory system still shows that the modules have not been shipped. Taiwan is waiting for the replacement PCM in order to repair the vehicle for auction.
>
> Regards,
> Carol
>
> -----Original Message-----
> From: Kotz, Tom (T.S.)
> Sent: Wednesday, June 19, 2002 10:57 AM
> To: 'atrillin@visteon.com'
> Cc: Bullock, Kristen (K.); Verner, Carol (C.J.)
> Subject: Orders for Engineering Parts
>
> Alan,
>
> I have tried to reach you without success. I did receive your voice mail message to contact Joe Ray and have left several messages for him without success. I am told that you have an issue with the ZZ part numbers and are unwilling to ship our requirements because you do not have a print showing the ZZ part number.
>
> Below is a screen copy of a bulletin on the CMMS bulletin board dated 10/25/01 titled "PTO PrototypeSuppliers: Reminders/Hints" - it is republished approximately every 6 months - that instructs all suppliers how to handle the ZZ in the fourth position of the part number.

>
> Powertrain has been using CMMS for ordering prototype parts for nearly 3 years now and this is not a problem for our other suppliers. In fact, all of the other Visteon locations that supply prototypes, including Rawsonville and El Jarudo, do not seem to have any issue with this.
>
> May I politely request that you please ship us our requirements in line witrh your releases?
>
> This includes ; Y8LA-12A650-AA-ZZ 1 PC.
> 2L8A-12A650-AD-ZZ 2 PC.
> 2L8A-12A650-CD-ZZ 1 PC.
>
> If you have any questions or do not agree with these instructions, it is very important that you contact me immediately.
>
>
> CMMSAH0A BULLETIN BOARD TOPIC DETAIL 06/19/02 10:30:27
> ==> _____ _____ LOCATION CMMS
> TOPIC: PTO PROTOTYPE SUPPLIERS: REMINDERS/HINTS Delete Date: 11/24/03
> Func Cat: DDL Func Cat Desc: Direct Data Link for Suppliers
> Change Request/Problem Report Number: _____ Sponsoring Organization: ____
> Updated By: SCHERER, RON Phone: (313) 32-36811
>
> Narrative
>
>
> 5. Releases for part numbers with 'ZZ' in the fourth position (control
>
> code) part number field are to be treated exactly as the Prefix-Base-Suffix part, including prints, purchase order, etc. These parts are ordered by Engineering and the 'ZZ' allows unique ship directions to suppliers, as well as internal inventory control.
>
>
>
>
> Tom Kotz
> Supervisor Powertrain PPM
> Suite 500
> Fairlane Plaza North
> Telephone (313) 206-4421 - Fax (313) 594-1337
> Mail to: tkotz@ford.com
>
>

ER02-827-C 2978

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 11:00 AM
To: Gale, Allan (A.R.)
Subject: RE: Focus

Allan,
Do you know what month the vehicle it came out of was manufactured, so I can look at the warranty data for the month to se if it is worth pursuing. (I have a lot on my plate and need to avoid too many diversions unless they are good strong leads).

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Gale, Allan (A.R.)
Sent: Wednesday, October 30, 2002 5:08 PM
To: Freeland, Mark (M.)
Subject: FW: Focus

This is what we have. Any help?

-----Original Message-----
From: Jaura, Arun (A.K.)
Sent: Wednesday, October 30, 2002 4:04 PM
To: Gale, Allan (A.R.)
Cc: Burrows, Neil (N.R.)
Subject: RE: Focus

Allan: We do not have a 09/2000 engine, but have one that was built in 2000. Call Neil at 58743.

-----Original Message-----
From: Gale, Allan (A.R.)
Sent: Wednesday, October 30, 2002 3:21 PM
To: Jaura, Arun (A.K.)
Subject: Focus

Arun, I have an FRL colleague that is looking for Zetec engines from Focuses built in Sept 2000. Do any of our engines fit that bill or do you know of any?

Allan R. Gale
Sr. Technical Specialist-Electric Drives
VES

Tel: (313)390-4639 Fax: (313)390-2267

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 11:47 AM
To: Cvetkovski, Peter (P.)
Subject: FW: Spark Plugs

Peter, did you look at spark plug resistances on the 2.0L Zetec Focus?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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-----Original Message-----
From: Oboza, Doran (D.)
Sent: Friday, November 01, 2002 10:33 AM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

There was a BB project on spark plugs completed by Peter Cvetkovski for powertrain but I do not know if it addressed the issue you are talking about.

I believe his project was with the spark plug gap and if it was being compromised by some processes at the supplier.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 10:15 AM
To: Oboza, Doran (D.)
Subject: Spark Plugs

Doran,

Do you know if there has been any issue with low resistance spark plugs associated with the 2.0L Zetec Focus during 2001 and 2002 MY. I am asking because I have measured the cold resistance of 60 spark plugs which were removed from ten Buy Back (for stalls) 3.0L DOHC Mazda Tributes. 33% of the plugs were out of spec on the low side, some near the LSL others were way off.

<< OLE Object: Microsoft Excel Chart >>

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department

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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:06 PM
To: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

Peter,

Yes, please can you let me have the plug resistance data you have. What sort of variability did you look at, part to part, lot to lot, shift to shift, part number to part number, etc.. It would all be of interest to me.

When would be a good time to get together?

Regards

Mark Freeland

6-Sigma Black Belt
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Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

----Original Message----
From: Cvetkovski, Peter (P.)
Sent: Friday, November 01, 2002 2:20 PM
To: Freeland, Mark (M.)
Cc: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

No, I did not look at the resistance, although I know that the specs were 2k-20k and they like to run on the low 5-7-8k range. When I was there I saw their process of filling up the cavity to create the desired resistance and it was not very accurate. We made them aware of that and they said they will look into it.
I have resistance data on a bunch of plugs (We took this data even though we were not going to use it) when we did the GAGE R&R on the GAP GAGE, you can have it if you want but give me some time to find it.

Please call me if you need more info.

Peter Cvetkovski
Technical Specialist - Statistical Methods
Certified Six Sigma Black Belt
Tel: 313-248-9604
E-mail: pcvetkov@ford.com
Text Pager: 313-796-8307

----Original Message----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 11:47 AM
To: Cvetkovski, Peter (P.)

Subject: FW: Spark Plugs

Peter, did you look at spark plug resistances on the 2.0L Zetec Focus?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Oboza, Doran (D.)
Sent: Friday, November 01, 2002 10:33 AM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

There was a BB project on spark plugs completed by Peter Cvetkovski for powertrain but I do not know if it addressed the issue you are talking about.

I believe his project was with the spark plug gap and if it was being compromised by some processes at the supplier.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 10:15 AM
To: Oboza, Doran (D.)
Subject: Spark Plugs

Doran,

Do you know if there has been any issue with low resistance spark plugs associated with the 2.0L Zetec Focus during 2001 and 2002 MY. I am asking because I have measured the cold resistance of 60 spark plugs which were removed from ten Buy Back (for stalls) 3.0L DOHC Mazda Tributes. 33% of the plugs were out of spec on the low side, some near the LSL others were way off.

<< OLE Object: Microsoft Excel Chart >>

Regards

Mark Freeland

6-Sigma Black Belt
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email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Friday, November 01, 2002 3:25 PM
To:	Koszewnik, John (J.)
Cc:	Hermann, Thomas (T.J.)
Subject:	dPFE - recommended engineer to review layout

John,

I met with the EMC supervisor (Tom Hermann) this afternoon to get his recommendations on the testing we discussed yesterday.

I also asked him to recommend the best engineer we have to discuss design layout guidelines and to review Kavlico's layout. He recommended Jarek Tracz (jtracz@ford.com).

I would suggest we get Jarek together with Kavlico's designer before they start the layout.

Regards

Mark Freeland

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ER62-627-0 2965

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:44 PM
To: Davis, George (G.C.)
Subject: FW: dPFE - recommended engineer to review layout

George,

I met with John yesterday as arranged. I have a package I gave him (final recommendation on circuit and supporting data) which I would like to review with you when you have time. He asked if I was still available to continue work, I said I was available to continue as long as it's OK with you. He has a special "test" he wants conducted.

Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:25 PM
To: Kaszewski, John (J.L.)
Cc: Hermann, Thomas (T.J.)
Subject: dPFE - recommended engineer to review layout

John,

I met with the EMC supervisor (Tom Hermann) this afternoon to get his recommendations on the testing we discussed yesterday.

I also asked him to recommend the best engineer we have to discuss design layout guidelines and to review Kavlico's layout. He recommended Jarek Tracz (jtracz@ford.com).

I would suggest we get Jarek together with Kavlico's designer before they start the layout.

Regards

Mark Freeland

6-Sigma Black Belt
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Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, November 04, 2002 4:33 PM
To: Kotwicki, Allan (A.J.)
Subject: Final Circuit needs to be made into a pdf, please

Al, could you please make me a pdf from this .ps file, will call you with details.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, November 04, 2002 6:08 PM
To: Kotwicki, Allan (A.J.)
Subject: RE: filter20.pdf

Thanks Al, Got it.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Kotwicki, Allan (A.J.)
Sent: Monday, November 04, 2002 4:57 PM
To: Freeland, Mark (M.)
Subject: filter20.pdf

the file is in the share drive at /allshare/akotwick

Thanks in advance for your help,

Allan J. Kotwicki
313-69-41277
313-337-5639 FAX
akotwick@ford.com
MD 3619 SRL

EP62-627-C 2989

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, November 04, 2002 6:26 PM
To: Davis, George (G.C.)
Subject: RE: dPFE - recommended engineer to review layout

OK George. I will try and get with you on Wednesday and give you an update.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Davis, George (G.C.)
Sent: Friday, November 01, 2002 3:55 PM
To: Freeland, Mark (M.)
Subject: RE: dPFE - recommended engineer to review layout

Mark,
sorry I missed the meeting yesterday. I was on vacation and got tied up. I see no problem to continue working on this project for a while. How much time is involved? I would like to get your update as well. Thanks.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:44 PM
To: Davis, George (G.C.)
Subject: RE: dPFE - recommended engineer to review layout

George,

I met with John yesterday as arranged. I have a package I gave him (final recommendation on circuit and supporting data) which I would like to review with you when you have time. He asked if I was still available to continue work, I said I was available to continue as long as it's OK with you. He has a special "test" he wants conducted.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517

Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:25 PM
To: Koszewnik, John (J.J.)
Cc: Hermann, Thomas (T.J.)
Subject: dPFE - recommended engineer to review layout

John,

I met with the EMC supervisor (Tom Hermann) this afternoon to get his recommendations on the testing we discussed yesterday.

I also asked him to recommend the best engineer we have to discuss design layout guidelines and to review Kavlico's layout. He recommended Jarek Tracz (jtracz@ford.com).

I would suggest we get Jarek together with Kavlico's designer before they start the layout.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EN82-027-C 2991

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, November 06, 2002 12:22 PM
To: Bryant, Bruce (B.D.); Hamilton, Tom (T.C.)
Subject: RE: Orders for Engineering Parts: Mazda Tribute PCMs

Thanks for the follow up, but I think they are going a different rout now. So, stand easy.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Bryant, Bruce (B.D.)
Sent: Monday, November 04, 2002 10:56 AM
To: Hamilton, Tom (T.C.)
Cc: Freeland, Mark (M.)
Subject: RE: Orders for Engineering Parts: Mazda Tribute PCMs

Okay, thanks. I'll direct him to Rose.

Mark - Rose's e-mail is MGOSSMAN.

Cordially,
Bruce Bryant, 6 Sigma Master Blackbelt, Ford Research Laboratory
bbryant2@ford.com 001-313-390-6750

-----Original Message-----
From: Hamilton, Tom (T.C.)
Sent: Monday, November 04, 2002 10:16 AM
To: Bryant, Bruce (B.D.)
Subject: RE: Orders for Engineering Parts: Mazda Tribute PCMs

Rose Gossman has some experience with GPIRS. I don't. Tom

-----Original Message-----
From: Bryant, Bruce (B.D.)
Sent: Sunday, November 03, 2002 1:42 PM
To: Freeland, Mark (M.)
Cc: Hamilton, Tom (T.C.)
Subject: RE: Orders for Engineering Parts: Mazda Tribute PCMs

Mark - I don't know, but Tom Hamilton should know - I'm ccing him.

Bruce

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 10:06 AM
To: Bryant, Bruce (B.D.); Jensen, Ted (T.E.)
Cc: Verner, Carol (C.J.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Bruce ot Ted,

Do you know if we use the GPIRS system to order parts here at SRL, if so can you point me to someone who has access and knows how to do it.

Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Verner, Carol (C.J.)
Sent: Friday, November 01, 2002 9:33 AM
To: Freeland, Mark (M.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Mark,

Do you know if Sci-Lab uses the GPIRS system to order parts. POEnginaEngineering does not use GPIRS. North Penn will not ship the PCMs unless the order is in GPIRS. I am thinking that if SCILAB uses GPIRS then I will try to find out if you may order them and uses our department number.

Carol

-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Wednesday, October 30, 2002 4:53 PM
To: Verner, Carol (C.J.)
Cc: Maurer, James (J.B.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Go for it. If you don't know how to execute a GPIRS order please call Joe Rey.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Rey, Joseph (J.A.) [mailto:jrey1@visteon.com]
Sent: Wednesday, October 30, 2002 3:21 PM
To: 'O'Neall,Jim'
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
Importance: High

Jim,

I'm sorry to hear that Carol has had such difficulty getting this orders processed. If Carol resubmits the order as a GPIRS order then North Penn will ship within 48 hours of receiving this order. See note below from Alan Trilling at North Penn. If you need any additional assistance don't hesitate to call.

Thanks,

> Joe Rey
Sales Manager
Powertrain Electronics
Visteon Corporation
Phone: 313-755-5295
Fax: 313-755-8075
Cell: 313-378-1817

-----Original Message-----
From: Trilling, Alan (A.S.)
Sent: Wednesday, October 30, 2002 7:03 AM
To: Rey, Joseph (J.A.); Dean, Breck (B.G.); D'Arcy, William (W.)
Cc: Ridgway, Robert (R.W.); Pad, Richard (R.M.)
Subject: RE: Orders for Engineering Parts: Mazda Tribute PCMs

Joe:

I recommend that Jim place a GPIRS order, in which NPEF could fill within 48 hours of receipt.

Regards,

Alan S. Trilling

Visteon - North Penn Electronics Facility, LLC
Material Planning Specialist
Phone #: (610) 584-7942
Fax #: (610) 584-7145
E-Mail: ATRILLIN@VISTEON.COM

-----Original Message-----
From: O'Neall, Jim (J.D.) [mailto:joneall@ford.com]
Sent: Friday, October 25, 2002 7:16 AM
To: 'cweed@visteon.com'
Cc: Verner, Carol (C.J.); Maurer, James (J.B.)
Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs

Craig - we could sure use your help on this one to forward it to the right Visteon contact. We need a specific PCM that we have been trying to order out of North Penn for months. This PCM is needed for a Mazda Tribute, a buy back vehicle. This vehicle is parked and until we get the PCM, it cannot be auctioned off. You can see from the string of notes below some of the details including the part number. Any help that you can provide would be appreciated. For a contact on our side please contact Carol Verner. Thanks.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

> -----Original Message-----
> From: Verner, Carol (C.J.)
> Sent: Tuesday, October 22, 2002 1:40 PM
> To: O'Neall, Jim (J.D.)
> Subject: FW: Orders for Engineering Parts: Mazda Tribute PCMs
>
> Jim,
>
> I spoke with Jim Simpson this morning and he said that we cannot use the FAB account to allow Ford of Taiwan to purchase a PCM for a buyback Mazda Tribute to replace the one sent to Mark Freeland. Jim recommended I ask you to send a note to Powertrain Purchasing Manager for assistance to get Visteon (North Penn) to ship the modules. The original RPS # 200200913 was placed back around the May 1.2002 time frame. The buyer and I were not sucessful getting Visteon to ship so Kristen asked for assistance from her supervisor Tom Kotz prior to his retirement. As of this afternoon, the CMMS parts inventory system still shows that the modules have not been shipped. Taiwan is waiting for the replacement PCM in order to repair the vehicle for auction.
>
> Regards,
> Carol
>
> -----Original Message-----
> From: Kotz, Tom (T.S.)
> Sent: Wednesday, June 19, 2002 10:57 AM
> To: 'atrillin@visteon.com'
> Cc: Bullock, Kristen (K.); Verner, Carol (C.J.)
> Subject: Orders for Engineering Parts
>
> Alan,
>
> I have tried to reach you without success. I did receive your voice mail message to contact Joe Ray and have left several messages for him without success. I am told that you have an issue with the ZZ part numbers and are unwilling to ship our requirements because you do not have a print showing the ZZ part number.
>
> Below is a screen copy of a bulletin on the CMMS bulletin board dated 10/25/01

titled 'PTO PrototypeSuppliers: Reminders/Hints' - it is republished approximately every 6 months - that instructs all suppliers how to handle the ZZ in the fourth position of the part number.
>
> Powertrain has been using CMMS for ordering prototype parts for nearly 3 years now and this is not a problem for our other suppliers. In fact, all of the other Visteon locations that supply prototypes, including Rawsonville and El Jarudo, do not seem to have any issue with this.
>
> May I politely request that you please ship us our requirements in line witrh your releases?
>
> This includes ; Y8LA-12A650-AA-ZZ 1 PC.
> 2L8A-12A650-AD-ZZ 2 PC.
> 2L8A-12A650-CD-ZZ 1 PC.
>
> If you have any questions or do not agree with these instructions, it is very important that you contact me immediately.
>
>
> CMMSAH0A BULLETIN BOARD TOPIC DETAIL 06/19/02 10:30:27
> ==> _____ _____ LOCATION CMMS
> TOPIC: PTO PROTOTYPE SUPPLIERS: REMINDERS/HINTS Delete Date: 11/24/03
> Func Cat: DDL Func Cat Desc: Direct Data Link for Suppliers
> Change Request/Problem Report Number: _____ Sponsoring Organization: ____
> Updated By: SCHERER, RON Phone: (313) 32-36811
>
> Narrative
>
>
> 5. Releases for part numbers with 'ZZ' in the fourth position (control
>
> code) part number field are to be treated exactly as the Prefix-Base-Suffix part, including prints, purchase order, etc. These parts are ordered by Engineering and the 'ZZ' allows unique ship directions to suppliers, as well as internal inventory control.
>
>
>
>
> Tom Kotz
> Supervisor Powertrain PPM
> Suite 500
> Fairlane Plaza North
> Telephone (313) 206-4421 - Fax (313) 594-1337
> Mail to: tkotz@ford.com
>
>

EP02-027-C 2696

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, November 07, 2002 9:50 AM
To: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

Peter,

Thanks for the data, took me a few days to get to put it in minitab. Quite an unstable process.
Do you know if there is continuous tweaking of the process going on during the period the data was taken?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

----Original Message----
From: Cvetkovski, Peter (P.)
Sent: Friday, November 01, 2002 4:06 PM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

Mark, here is the info..

<< File: capability data for resistance.xls >>
As I said before I did not do any capability etc. I just took the data in case I need it.

If you need assistance in interpreting the data please call me WED. I am of MON.
Se up a meeting anytime, I try my best to keep my calendar empty.. Except on MONDAYS (I am off every MONDAY. I work 4 day, 10 hr schedule)

Peter Cvetkovski
Technical Specialist - Statistical Methods
Certified Six Sigma Black Belt
Tel: 313-248-9804
E-mail: pcvetkov@ford.com
Text Pager: 313-796-8307

----Original Message----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:06 PM
To: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

EN02-627-C 2987

Peter,

Yes, please can you let me have the plug resistance data you have. What sort of variability did you look at, part to part, lot to lot, shift to shift, part number to part number, etc.. It would all be of interest to me.

When would be a good time to get together?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

—Original Message—
From: Cvetkovski, Peter (P.)
Sent: Friday, November 01, 2002 2:20 PM
To: Freeland, Mark (M.)
Cc: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

No, I did not look at the resistance, although I know that the specs were 2k-20k and they like to run on the low 5-7-8k range. When I was there I saw their process of filling up the cavity to create the desired resistance and it was not very accurate. We made them aware of that and they said they will look into it.
I have resistance data on a bunch of plugs (We took this data even though we were not going to use it) when we did the GAGE R&R on the GAP GAGE, you can have it if you want but give me some time to find it.

Please call me if you need more info.

Peter Cvetkovski
Technical Specialist - Statistical Methods
Certified Six Sigma Black Belt
Tel: 313-248-9604
E-mail: pcvetkov@ford.com
Text Pager: 313-796-8307

—Original Message—
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 11:47 AM
To: Cvetkovski, Peter (P.)
Subject: FW: Spark Plugs

Peter, did you look at spark plug resistances on the 2.0L Zetec Focus?

Thanks

Regards

EA02-027-C 2005

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Oboza, Doran (D.)
Sent: Friday, November 01, 2002 10:33 AM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

There was a BB project on spark plugs completed by Peter Cvetkovski for powertrain but I do not know if it addressed the issue you are talking about.

I believe his project was with the spark plug gap and if it was being compromised by some processes at the supplier.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 10:15 AM
To: Oboza, Doran (D.)
Subject: Spark Plugs

Doran,

Do you know if there has been any issue with low resistance spark plugs associated with the 2.0L Zetec Focus during 2001 and 2002 MY. I am asking because I have measured the cold resistance of 60 spark plugs which were removed from ten Buy Back (for stalls) 3.0L DOHC Mazda Tributes. 33% of the plugs were out of spec on the low side, some near the LSL others were way off.

<< OLE Object: Microsoft Excel Chart >>

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EP02-627-C 2999

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Thursday, November 07, 2002 5:50 PM
To:	Hangas, Jon (.)

[redacted] [redacted]

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, November 11, 2002 9:43 AM
To: Platta, Sharl Finn (S.F.); Power, James (J.H.); Elwell, Fred (F.)
Subject: FW: Spark Plugs

Just some loose correspondence for info which may give some clues. Like "when filling the charge, how much of the black powder actually goes into the hole"?

No response expected.

Let me know how you get on at Honeywell on Wednesday.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreelal @ford.com
Tel.: (313) 594-7645

----Original Message----
From: Cvetkovski, Peter (P.)
Sent: Friday, November 08, 2002 7:30 PM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

No, I do not remember, but what I do remember it was not very structured... that is, when the plug was being filled some of it may fall out and not go in nto the cavity itself while other times the entire mixture went in.

Peter

----Original Message----
From: Freeland, Mark (M.)
Sent: Thursday, November 07, 2002 9:50 AM
To: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

Peter,

Thanks for the data, took me a few days to get to put it in minitab. Quite an unstable process.
Do you know if there is continuous tweaking of the process going on during the period the data was taken?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

----Original Message----
From: Cvetkovski, Peter (P.)
Sent: Friday, November 01, 2002 4:06 PM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

Mark, here is the info..

<< File: capability data for resistance.xls >>
As I said before I did not do any capability etc. I just took the data in case I need it.

If you need assistance in interpreting the data please call me WED. I am of MON.
Se up a meeting anytime, I try my best to keep my calendar empty.. Except on MONDAYS (I am off every MONDAY. I work 4 day, 10 hr schedule)

Peter Cvetkovski
Technical Specialist - Statistical Methods
Certified Six Sigma Black Belt
Tel: 313-248-9604
E-mail: pcvetkov@ford.com
Text Pager: 313-796-8307

----Original Message----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 3:06 PM
To: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

Peter,

Yes, please can you let me have the plug resistance data you have. What sort of variability did you look at, part to part, lot to lot, shift to shift, part number to part number, etc.. It would all be of interest to me.

When would be a good time to get together?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517

Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

—Original Message—
From: Cvetkovski, Peter (P.)
Sent: Friday, November 01, 2002 2:20 PM
To: Freeland, Mark (M.)
Cc: Cvetkovski, Peter (P.)
Subject: RE: Spark Plugs

No, I did not look at the resistance, although I know that the specs were 2k-20k and they like to run on the low 5-7-8k range. When I was there I saw their process of filling up the cavity to create the desired resistance and it was not very accurate. We made them aware of that and they said they will look into it.
I have resistance data on a bunch of plugs (We took this data even though we were not going to use it) when we did the GAGE R&R on the GAP GAGE, you can have it if you want but give me some time to find it.

Please call me if you need more info.

Peter Cvetkovski
Technical Specialist - Statistical Methods
Certified Six Sigma Black Belt
Tel: 313-248-9604
E-mail: pcvetkov@ford.com
Text Pager: 313-796-8307

—Original Message—
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 11:47 AM
To: Cvetkovski, Peter (P.)
Subject: FW: Spark Plugs

Peter, did you look at spark plug resistances on the 2.0L Zetec Focus?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

—Original Message—
From: Oboza, Dorsn (D.)
Sent: Friday, November 01, 2002 10:33 AM
To: Freeland, Mark (M.)
Subject: RE: Spark Plugs

There was a BB project on spark plugs completed by Peter Cvetkovski for powertrain but I do not know if it addressed the issue you are talking about.

I believe his project was with the spark plug gap and if it was being compromised by some processes at the supplier.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 10:15 AM
To: Obozs, Doran (D.)
Subject: Spark Plugs

Doran,

Do you know if there has been any issue with low resistance spark plugs associated with the 2.0L Zetec Focus during 2001 and 2002 MY. I am asking because I have measured the cold resistance of 60 spark plugs which were removed from ten Buy Back (for stalls) 3.0L DOHC Mazda Tributes. 33% of the plugs were out of spec on the low side, some near the LSL others were way off.

<< OLE Object: Microsoft Excel Chart >>

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
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email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Tuesday, November 12, 2002 12:52 PM
To:	Rutkowski, Brian (B.D.)
Subject:	Mazda Data

Mazda Plug
Installation updated...

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Tuesday, November 12, 2002 4:03 PM
To:	Koszewnik, John (J.)
Cc:	Davis, George (G.C.)
Subject:	dPFE Bench Testing.

John,

As a follow up to our last meeting I now have some bench test results from subjecting the sensors to spark generated RF which I would like to share with you. When would be a good time to meet with you?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

TAURUS SABLE 2V & 4V

4.2L ECON & F SERIES

4.6L F SERIES

GQRS T.G.W.

Freeland, Mark (M.)

From: Mark Clifford [MClifford@kavlico.com]
Sent: Wednesday, November 21, 2001 6:52 PM
To: Freeland, Mark (M.)
Subject: RE: Transient Voltage Susceptibility Testing

I don't understand the comparison tables exactly. Does this match the Kavlico results? I thought that Kavlico's results on the new "modified" circuit were higher.

The latch-up threshold is inversely proportional to the transient pulse duration (the threshold for a 5 usecond pulse is larger than a 10 usecond
pulse).

I was looking at the waveforms. Does the large spike correlate with another
vehicle event? Could the small bursts in the current correlate with a sensor oscillator frequency?

Mark

> -----Original Message-----
> From: Freeland, Mark (M.) [SMTP:mfreela1@ford.com]
> Sent: Wednesday, November 21, 2001 11:26 AM
> To: Donald Ayers (E-mail); Akins, Mary (M.); Grant Heliker (E-mail);
> Mark Clifford (E-mail); Roger Houston (E-mail)
> Cc: Kyong Park (E-mail)
> Subject: Transient Voltage Susceptibility Testing
>
> The attached file contains the comparison between the sensor types I
was
> testing. (I have eliminated the Motorola test data for obvious
reasons).
>
> In addition I am attaching two data files of transient voltage spikes
> recorded on the buy back Focus which I have been working with.
> Unfortunately we need a faster data acquisition system to get the true
> waveform (it was installed today). But this should give you a measure
of
> what is frequently occurring on the vehicle. The largest transient on
> Vref captured to date has a P to P amplitude of about 90 Volts, but
the
> duration is much shorter than that required to latch a sensor.
>
> Please call to discuss after you have had a chance to digest the data.
>
> <<Summary of Kavlico Sensor Transient Testing.xls>> <<1115001.xls>>
> <<E1115001.xls>>
>
>
> Regards
>
> Mark Freeland
>
> > 6-Sigma Black Belt Candidate

EN02-027-C 3828

> >,Physics Department
> > Ford Research Laboratory
> > P.O. Box 2053
> > MD 3028 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7645
> << File: Summary of Kavlico Sensor Transient Testing.xls >> << File:
> 1115001.xls >> << File: E1115001.xls >>

Sign-in Sheet

Name	Organization	CDS
Kurt Schieding	PTO Quality	KSCHIED1
Bruce Garrett	Escape Quality	BGARRET1
Julie Hallaner	PTO Quality	JHallaney
Howard Lowman	PTSE Range FISD	HLOWMAN
ERIC TECH	F-SERIES AVT	ETECH
MARK FREELAND	F.R.L.	MFREELA1
KAREN OWENS	EGR Systems-V-Engine	KOWENS
JOE JOHNSON	EGR Systems-V-Engine	JJOHNSON
KEN KLOSTERMEYER	V ENGINE FMEI	KKLOSTE
FRANK FSADNI	V-Eng Comp	FFSADNI
Freeman Gaddis	FMEI	FGADDIS
KARL KLOMP	FMEI	KKLOMP
Tim Davis	Q	tdavis5
Carol Verner	V-Engine / Romeo Engine Plant	CVerner

MINUTES FROM 9/26/01 DPFE MEETING

Attendees

M. Giordano	B. Zigler
M. Montini	T. Hermann
M. Freeland	R. Jantz
R. Reichenbach	D. Popoff
T. Rozema	K. Owens

Review of Open Assignments

DV testing of 11/19 Dash Mounted design will be conducted by Karen Owens. Brad Zigler and Ian King to work with Karen to develop.

A system FMEA should be completed by Zetec Engine Systems for the dash mounted design. Brad Zigler and Karen Owens to determine who should lead.

Any activities needing prototype parts to test should send requirements to Carol Verner.

How should DPFE system be signed off in the future? Carol Verner to provide Draft copy available 10/3.

Tom Rozema to insure that the harness routing near coil tower for the Dash Mounted design will provide as much clearance as possible. – Dash Mounted sensor take out location on harness is closer to the dash and will not violate 100mm design standard. Tube Mounted harness routing will provide about 50 – 60mm clearance. This routing will be in effect when Wayne resumes production. Pictures taken to forward to Hermosillo. CLOSED

Karen Owens to write CR to release Tube Mounted design for service with diode and resistor. – Karen, Ian King and Mike Giordano to determine if CR should be written by Ian who will release the service fix for 2001.

Karen Owens to develop workplan for release of Tube Mounted design with diode and resistor. – Work in progress, draft to be available 9/27.

CALL MARY Direct *

M. Akins to provide Mark Freeland with Kavlico Dash Mounted ceramic sensor EMC test results. K. Owens to follow up with Mary Akins. 10/5

Determine if there are any differences in 2000 SPI Dash Mounted warranty (with Motorola Sensor) vs. Kavlico? Review of M. Freeland analysis indicates no significant difference based on 2000 MY data. High 1st quarter difference most likely due to assembly issues. To be closed after detailed claims review (in progress) is complete. Mike Giordano

Do we need to change "R" level on 11/19 for Dash mounted design? Ron Reichenbach indicated new R level not required. CLOSED

Mary Akins to provide tube mounted DPFE parts with diode and resistor for testing. To be available in 1 1/2 weeks. PTAE requirements have been forwarded to K. Owens. 10/2 PAST TO 4 WEEKS

Mary Akins to provide Kavlico timing plan for tube mounted diode/resistor DPFE starting from time SREA is signed to availability in service. Closed

Buyback vehicle status – FCSD will help dealer involved to prepare buyback proposal. Need to investigate acquiring other vehicles. Matt Montini to provide VIN nos. of possible buyback vehicles with no start/no crank condition for review. Mike Giordano to provide vehicle history of selected vehicles.

Curt Swick to provide history of what ES testing has been completed. No Update

Karen Owens to provide Ron Reichenbach with vehicle level test requirements for revised tube mounted design.

9/27/01
D.Popoff

Freeland, Mark (M.)

From:	Grant Heliker [GHeliker@kavlico.com]
Sent:	Tuesday, October 02, 2001 12:18 PM
To:	mfreela1@ford.com
Cc:	Naushad Hossain
Subject:	FW: A Mark Freeland Theory

FYI. Probably nothing that you weren't going to do anyway, but here it is.

> -----Original Message-----
> From: Roger Houston
> Sent: Tuesday, October 02, 2001 9:10 AM
> To: Grant Heliker
> Subject: RE: A Mark Freeland Theory
>
> ESD generated by the gas tank is feasible; I just do not know if it is
> probable. Ford should have experts that could address this question.
> Aerospace vehicles would have the same problems and with their own
> experts.
>
> Sometimes the EOS transient effects are similar to ESD. I have no idea if
> they can be separated by inspection.
>
> Focus vehicle: The obvious would be monitoring the 5VIN/ Rtn and the
> Vout/ Rtn. We should be able to sync a scope to engine generated noise.
> If ESD is the culprit, we would be extremely lucky to catch it. It is
> real quick and short. A very fast digital scope powered by a battery
> should be used [a printer attached to the scope would be very helpful in
> documentation].. The wiring harness length should be examined for any
> other possible close encounters to a noise source, ie, motors, switches,
> relays, and solenoids. Also for any parallel paths next to VBat or
> VSwitched. If the car has an abnormal or excessive transient environment,
> it could be caused by Load Dump or Alternator spiking. These lines should
> also be monitored.
>
>
> -----Original Message-----
> From: Grant Heliker
> Sent: Monday, October 01, 2001 2:08 PM
> To: Mark Clifford; Roger Houston
> Cc: Kyong Park; Brady Davies; Naushad Hossain
> Subject: A Mark Freeland Theory
>
> Mark had a theory he wanted me to share with you and get your opinions
> on...

> '
> What if the gasoline sloshing around in the plastic gas tank is
building
> up a static charge that is eventually by some means being discharged
via a
> sensor in the gas tank, which is connected to the same Vref and Gnd
lines
> as our sensor. This might then result in an ESD across Vref and Gnd
of
> our sensor.
>
> MF's first question: How does this sound to you, in general?
>
> MF's second question: Would there be a difference in the effect of a
> transient, as we've been investigating, or this proposed ESD? Could
we
> tell the difference?
>
> Also, Mark reports that Ford may be able to get its hands on a Ford
Focus
> which has been home to 3 sensors that have failed with the No Crank
> failure mode. If they are successful in getting the vehicle, Ford
will be
> performing its own tests, but MF wonders if there is anything specific
we
> would like to have looked at or tested?
>
> thx,
> -grant
>

Freeland, Mark (M.)

From: Grant Heliker [GHeliker@kavlico.com]
Sent: Tuesday, October 02, 2001 12:18 PM
To: mfreela1@ford.com
Cc: Naushad Hossain
Subject: FW: A Mark Freeland Theory

Mark had a slightly different take than Roger on the Freeland Gas Tank Theory.

> -----Original Message-----
> From: Mark Clifford
> Sent: Monday, October 01, 2001 3:32 PM
> To: Grant Heliker
> Subject: RE: A Mark Freeland Theory
>
> 1. Sounds pretty unlikely. I doubt that ESD charge is causing the
> problems.
>
> 2. The ESD transient is far less severe. The long, low impedance
> transients have much more energy.
>
> 3. I'll ask Roger for suggestions on what to examine.
>
> Mark C.
>
> -----Original Message-----
> From: Grant Heliker
> Sent: Monday, October 01, 2001 2:08 PM
> To: Mark Clifford; Roger Houston
> Cc: Kyong Park; Brady Davies; Naushad Hossain
> Subject: A Mark Freeland Theory
>
> Mark had a theory he wanted me to share with you and get your opinions
> on...
>
> What if the gasoline sloshing around in the plastic gas tank is
building
> up a static charge that is eventually by some means being discharged
via a
> sensor in the gas tank, which is connected to the same Vref and Gnd
lines
> as our sensor. This might then result in an ESD across Vref and Gnd
of
> our sensor.
>
> MF's first question: How does this sound to you, in general?
>
> MF's second question: Would there be a difference in the effect of a
> transient, as we've been investigating, or this proposed ESD? Could
we
> tell the difference?
>
> Also, Mark reports that Ford may be able to get its hands on a Ford
Focus
> which has been home to 3 sensors that have failed with the No Crank

5082-627-C 3042

> failure mode. If they are successful in getting the vehicle, Ford will be
> performing its own tests, but MF wonders if there is anything specific we
would like to have looked at or tested?
>
> thx,
> -grant
>

MINUTES FROM 9/19/01 DPFE MEETING

Attendees

M. Giordano
O. Kunde
C. Verner
M. Freeland
A. Brune
T. Rozema
C. Swick
R. Whitworth
D. Dhaliwal
B. Zigler

M. Akins - Kavlico
M. Clifford - Kavlico
B. Bugaj - Kavlico
D. Ayers - Kavlico
J. Zaremski - Kavlico

Outcome/Agreements

The 2001 Zetec service fix will be the diode & resistor design. Testing to date has indicated the addition of diode and resistor to the current tube mounted design is an acceptable service fix to correct no start/stall concerns related to latched DPFE sensor.

Curt Swick confirmed the 11/19 Dash mounted wiring package is the same as the 2000 Model Year Dash mounted system. The only difference is the connector change (Motorola vs. Kavlico).

Rudy Whitworth stated that line trials at Wayne Assembly Plant are required for the 11/19 dash mounted change.

Rudy Whitworth stated that the production implementation of the new SPI DPFE hoses should not be implemented at the same time as the 11/19 dash mounted change for the Zetec.

Implement color coding of DPFE Hoses for SPI and Zetec. - ??

Assignments

How should DPFE system be signed off in the future? - Carl Verner

Determine if there are any differences in 2000 SPI Dash Mounted warranty (with Motorola Sensor) vs Kavlico? - Mike Giordano

Kavlico to provide tube mounted DPFE parts with diode and resistor for testing. To be available 1 ½ weeks. - Mary Akins

Do we need to change "R" level on 11/19 for Dash mounted design? – Steve Stump

Kavlico to provide Mark Freeland Dash Mounted Ceramic sensor EMC test results. – Mary Akins

Kavlico to provide timing plan for tube mount diode/resistor DPFE starting from time SREA is signed to availability in service. – M. Akins

SREA to be revised to include reelstor. M. Akins

Schedule next meeting. Dan Popoff

MINUTES FROM 9/20/01 DPFE MEETING

Attendees
O. Kunde
M. Giordano
C. Verner
M. Freeland
A. Bruno
T. Rozema
K. Owens
D. Popoff
I. King

Outcome/Agreements
Karen Owens is the Kavlico DPFE Component Supervisor and will interface with Kavlico.

2001 Service Part to be released by I. King

The 2001 Zetec service fix will be the diode & resistor design. Testing to date has indicated the addition of diode and resistor to the current tube mounted design is an acceptable service fix to correct no start/stall concerns related to latched DPFE sensor.

DV testing of 11/19 Dash mounted design will be conducted by Karen Owens

A system FMEA should be completed by Zetec Engine Systems for the dash mounted design.

Assignments
How should DPFE system be signed off in the future? - Carol Verner

Tom Rozema to insure that the harness routing near coil tower for the Dash mounted design will provide as much clearance as possible.

Karen Owens activity to write CR to release tube mounted design for service with diode and resistor.

Karen Owens to develop workplan for release of tube mounted design with diode and resistor.

Dan Popoff to schedule next meeting.

Freeland, Mark (M.)

From:	Hardy, Bill (W.R.) [whardy@visteon.com]
Sent:	Friday, August 17, 2001 10:50 AM
To:	'Freeland, Mark (M.)'
Subject:	RE: 2001MY 2.0L Zetec Focus Vref noise

Mark,

I took a look at the traces you have sent, and have a few comments.

First, I can't say I have ever observed any noise of that type on the 5V line of a PCM. Most noise observed on the PCM would typically be in the 1usec to 10usec and higher range, and would be on the order of several hundred millivolts.

Second, I don't think the noise you are seeing on these lines is actually there. For example, the amplitude and pulse width of the noise is such that the current that would be induced by the dv/dt would be great enough to destroy the PCM. Typically when you see noise of that frequency, what you are picking up is noise being radiated into the test instrumentation ground lead. I'm not sure what equipment was used, and where the signal and ground references were connected at, but you may want to consider making a differential measurement if possible. The fact that you observe noise when the horn is blown supports a radiated mechanism as well. Loads such as horns that are controlled by relays are big EMI radiators as there is ionization around the relay contacts as they open/close. You would need to look at the vehicle wiring diagrams to be sure, but the horn circuit should be pretty well isolated from the PCM circuits, on both the ground and supply sides. Of course, if the horn did share some common impedance on either the supply or ground side, you could get some conducted noise into the PCM, but due to the wiring inductance and capacitance in the PCM, it would be of a much lower frequency and amplitude.

I don't have a whole bunch of experience of making noise measurements at the vehicle level. I do know that when we are measuring noise at the PCM level, if we are unable to make a differential measurement, we must be very careful where we ground the instrument, keeping the ground lead as short as possible, and making sure we do not form a physical loop between the ground

lead and the signal probe.

As far as the power supplies go between the Focus and Explorer, the numbers
you got for external resistance to ground that causes the PCM to shut down
are consistent with those designs. The difference you have observed is primarily due to the fact the PCMs for these two vehicles have entirely different power supply designs, and different internal 5V loading.

I hope this helps.

Regards,

Bill Hardy
PCM Core Electrical Design
Electronics Product Line Department
Visteon Energy Management Systems
B130 VEMA (313) 75-52952
mailto:whardy@visteon.com

-----Original Message-----
From: Freeland, Mark (M.) [mailto:mfreela1@ford.com]
Sent: Thursday, August 16, 2001 10:30 AM
To: 'whardy@visteon.com'
Cc: Potter, Timothy (T.J.); Mozurkewich, George (G.); Kyong Park (E-mail); Naushad Hossain (E-mail)
Subject: 2001MY 2.0L Zetec Focus Vref noise

Bill,

The attached document contains the traces of the high frequency noise signals on the DPFE power and signal lines which we discussed on Tuesday. I
thought you would like to take a look at the traces, incase it would give
you any additional clues. Please let me know what you think. <<Noise signals recorded on Tim Potter.doc>>

Regards

Mark Freeland

> 6-Sigma Black Belt Candidate
> Physics Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 3028 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EP82-027-C 3065

Subj: Trip to SMI
Date: 4/20/01 4:42:44 PM Eastern Daylight Time
From: smccart3@ford.com (McCarthy, Shaun (S.L.))
To: mfreela1@ford.com (Freeland, Mark (M.)), mfsopwith@cs.com ('mfsopwith@cs.com')

Hi Mark,
The trip to SMI was very fruitful. I gave your card to Mark Flower (Dir. of Plant Operations) and Tom Pumo (Engineering Head) and mentioned that you will be coming out and helping them with their process. They were both very enthusiastic and open about getting help.
We got there two hours late because our early morning flight was cancelled due to high winds at LaGuardia.
When we got there they gave us the usual company introduction, a plant tour and a discussion of the auto alignment process.
Present at the meeting were: Joe Johnson, Freeman Davies, Tim Zuraw (Ford STA), Randy Ray (new Kavlico Automotive program manager), Brady Davies (Kavlico, Director Silicon Products), Robert Wellcal (new Kavlico quality manager), George Grippo (SMI General Manager), and Gene Bark (SMI Director of Marketing and Sales). Tom Pumo joined us on Thursday.

In the company introduction: Kavlico is the largest customer for SMI at the Hauppauge plant. Here they process 4" wafers. They also have one other production customer - a biomedical application. They are also doing a lot of development work to bring MEMS product to commercialization. The facility was originally part of Standard Microelectronics which made chips for the computer industry. But, in 1999 they had to go to larger wafers and so sold the 4" fab facility to a group of investors and changed the name to Standard MEMS. All the equipment and facilities was sold "lock stock and barrel". Tom Pumo worked for Standard Microelectronics and went along. A number of old employees also stayed. The management, however, has changed. The general manager, George Grippo has been there 6 months and came from biomedical sensor manufacturing. Mark Flowers has been there since October and came from the printed circuit board industry as a manufacturing engineer..

Their fab maximum capacity is around 100,000 wafers a year, but they are running around 35-40% capacity with two shifts. Besides the Kavlico and bio application production they are also doing development in silicon-based photonics and biomedical sensors.

The company also has a fab they purchased in California from Xicor, Inc. - a 6" fab line.

The home office is in Burlington, MA and the total employee population is around 300.

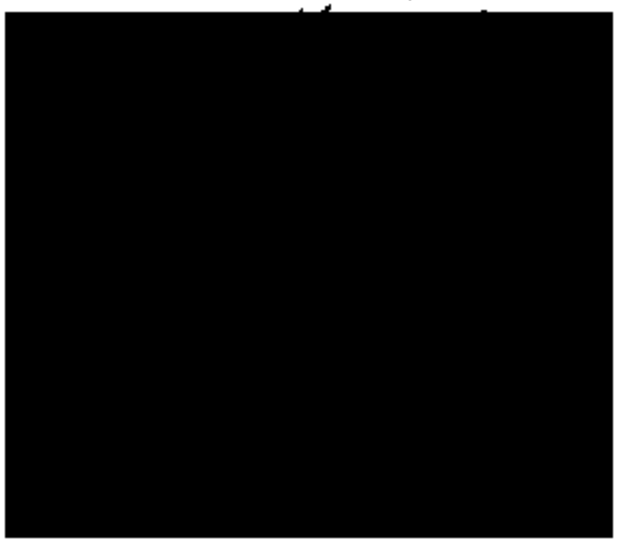
The plant tour showed a fab of vintage design - pre - 1983 - yet effective. Old equipment in some areas, but they are incorporating new equipment such as plasma etcher and surface scan for particle detection. All production level equipment.

One important system they have is the PROMIS system. This is a wafer tracking system that keeps track of each lot through the process and collects data on monitor wafers and test wafers characterizing the performance of the lot process. Also it controls equipment preventive

maintenance scheduling and equipment operation data over time. This tool is very powerful. We used in the Ford IC lab so I have a little familiarity with it. I am not sure that they are utilizing the full potential of it to track equipment variation and uniformity. It is capable in doing that. Mark Flowers mentioned specifically that they have accumulated a lot of data that they haven't had a chance to analyze and they look forward to your coming out to help them with that. This system, I believe will be an important resource for you. One could easily use it to set up DOEs.

They are currently working at trying to reduce particulate induced defects on the wafers. They need to do more work on characterizing the particle counts in the clean room. Also, unfortunately, I did not have a chance to look at their water system and its distribution system. Bacteria is always a concern and can introduce particles. UV lamps to kill them and final filters do the job. They say their yields are quite high - above 90% at the wafer level before going to Kavlico - so they must being doing the right things, in general.

Hope this helps. I will be back in the office on May 7. Let me know if I can be of further assistance. And good luck.



1.

Freeland, Mark (M.)

From: Soltis, Richard (R.E.)
Sent: Friday, July 13, 2001 1:14 PM
To: Freeland, Mark (M.)
Subject: FW: Electrical lab

Mark,
I'm sure we can set you up. I believe there is a curve tracer up in the monitor that I can retrieve. Let me know when you would like to get started.

Rick Saltis
Physics Department
MD 3028/SRL
PH: (313) 323-1708
FAX: (313) 322-7044

—Original Message—
From: Davis, Craig (L.C.)
Sent: Friday, July 13, 2001 11:56 AM
To: Soltis, Richard (R.E.)
Subject: FW: Electrical lab

Rick,
Can you help Mark?
Craig

—Original Message—
From: Freeland, Mark (M.)
Sent: Friday, July 13, 2001 10:08 AM
To: Davis, Craig (L.C.); Helms, Jeffrey (J.H.)
Subject: Electrical lab

Jeff & Craig,

I need access to an electrical lab to do some device characterization on some field return sensors and on a transient voltage suppressor (tiny surface mount part removed from a sensor).

I will need the following equipment, power supply, volt meter, mille-ammeter, digital storage scope, and possibly a curve tracer if available.

Can either of you recommend whose lab in SRL I could try and get some time in? Thanks.

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EH02-027-C 3663

Focus Powertrain
No Start/Stalls Agenda
August 9th' 2001

QRT Review

Rudy Whitworth – Review the WSAP QRT meeting and discuss future report outs

PQR

Roles & Responsibilities

Mike Giordano Robert Wilkins – Discuss team member participation in the warranty reduction process related to No Start/Stall VPG. Define team member ownership of components and processes related to No Start/Stall quality. Establish support from the various team members in an effort to reduce warranty cost and improve satisfaction

Top 100 List

Robert Wilkins - Review the current top 100 warranty concerns at WSAP. Discuss ways to address and reduce early warranty.

AWS Data Review

Robert Wilkins - Review the latest AWS data at or below one month in service designated as Focus No Start / Stall claims

Walk in

Freeland, Mark (M.)

From: Rozema, Thomas (T.M.)
Sent: Tuesday, July 10, 2001 12:03 PM
To: Freeland, Mark (M.)
Subject: FW: DPFE shorting V-Ref

-----Original Message-----
From: Montini, Matthew (M.J.)
To: Rozema, Thomas (T.M.)
Cc: Colatruglio, Vince (V.E.)
Sent: 7/6/01 3:40 PM
Subject: DPFE shorting V-Ref

Tom,

Don't know if you are interested in another DPFE vehicle but this one is in Michigan.
This is a cut/paste of the CQIS report. The tech is on vacation until Monday.

CSQI500 CQIS Indicator Summary 07/06/01 15:22:36
==> _____ _____ 196 of 358
Rpt#: 1GBC1011 NHL Rpt: 07/02/2001 Odom: 0,000 M
Rvwd: _ File: _ Folder: 00000140 2 Images: 0 Print Smy/Disp Detail(P/D): _
Vehicle: 2001 FOCUS,SE ,SEDAN 1FAFP34351W107741 Bld: 09/08/2000
Engine: 2.0L ZTECH Calb: 1AK1AZ0A Trans: FN 4SPD Axle: FWD 3.904 A/C: YES
Dealer Id: 02703 Bob Thibodeau, Inc. Ph#: (810) 755-2100

State: Michigan City: Centerline Orig/Caller: WADE BOZICK

Symptom: 2 04 2 19 ELECT.,INSTR/DISPLAY ,ANALOG,ODOMETER

Addl Sym: ODMETER DASHES NO START St: CCRG/EPRC: _ Rvwd: Dt:

Fix: Caus. Comp: -- Condition Code:
Hotliner: DKAPLA Phone: 313 248-2923 Regn Cd: 48 Detroit - 48

Engineering: Phone: TAR:

Dlr Contact: Phone: Title Cde: T
REPAIR RO# 186221

TECH STS THE ODOMETER SHOWS ALL DASHES. ENGINE WILL NOT CRANK, HAS NO
COMMUNICATION WITH ANY MODULE. WHEN ON PHONE TECH UNPLUGGED DPFE AND

EN02-827-C 3888

ALL IS OK.

RECOMM SSM 14977 P0401,R&R DPFE SENSOR W/YS4Z-9J460-AA. SEE BELOW

ADVISED TECH OF SSM 14977 DPFE SHORTING VREF TO GROUND. IF COMMUNICATI
ON IS POSS WITH DPFE UNPLUGGED REPLACE DPFE W/YS4Z-9J460-AA.

Matthew Montini
Product Concern Engineer (Focus/Escort)
PVT & Field Support (FCSD)
MMontini@Ford.Com
(313) 206-4534

Gary Sellers made another request for Push/Pull test for electrical connections – 7/25/01.

Agenda for 8/1/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Seron/Poirier
Top ECATS MIL	Oboza/Singley/August
P0705 – TRS	J. Rezaee
Starter and Battery Connections	B. Gilmour
Trans Noisy – MTX	E. Moses
Rough Idle – EOL Calibration	C. Trombetta
Wiring Grounds/Weld Nut Issues	T. Gwozdek/P. Cvetkovski/J. Walsh/S. King/L. Marsac
D50 – Other Engine Trouble	J. Brooks/B. Zigler
Road Map Review	D. Oboza
VFG 44 Overview	G. MacDonald

Agenda for 8/8/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Seron/Poirier
Top ECATS MIL	Oboza/Singley/August
New 1 and 3 MIS data	D. Oboza
Pedal Box Switches	C. Swick
Clipless Clamps Update	H. Lee
FEAD Improvements	M. Vargo
VFG 47 – Difficult to Shift (MTX)	E. Moses/H. Lee/I. Odum
Taillight Grounds	J. Rezaee/J. Walsh/S. King/L. Marsac
VFG 42/43 Overview	M. Giordano/B. Wilkins

Agenda for 8/15/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Seron/Poirier
Top ECATS MIL	Oboza/Singley/August
VFG 49 – Top Issue	B. Mihora
Spark Plugs and Wires	P. Cvetkovski
EVR (9J459)	D. Oboza
DPFE (9J460)	T. Rozema/Kavlico
Hes and Surge – Top Issue	M. Mazjoub
No Start/Stall – Top Issue	M. Giordano/B. Wilkins
P0455 – Gross EVAP Leak	B. Tobis

Agenda for 8/22/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Seron/Poirier
Top ECATS MIL	Oboza/Singley/August
Alternator	J. Chigas
VFG 49 – Engine Noisy	B. Mihora
Wiring Grounds – Weld Nut Issues	T. Gwozdek/P. Cvetkovski/L. Marsac
VFG 48 – Top Issue	J. Cendivre
Rough Idle – EOL Calibration	C. Trombetta

Agenda for 8/15/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Majzoub/Poirier
Top ECATS MIL	Oboza/Singley/August
VFG 49 – Top Issue	B. Mihora
Spark Plugs and Wires	P. Cvetkovski
EVR (9J460)	D. Oboza
DPFE (9J460)	T. Rozema/Kavlico
Hes and Surge – Top Issue	M. Mazjoub
No Start/Stall – Top Issue	M. Giordano/B. Wilkins

Agenda for 8/22/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Majzoub/Poirier
Top ECATS MIL	Oboza/Singley/August
Alternator	J. Chigas
VFG 49 – Engine Noisy	B. Mihora
Wiring Grounds – Weld Nut Issues	T. Gwozdek/P. Cvetkovski/L. Marsac
VFG 48 – Top Issue	J. Cantilvre
Rough Idle – EOL Calibration	C. Trombella
Starter and Battery Connections	B. Gilmour

Agenda for 9/5/01

Containment Review	Kinnie/Rollin
ECATS	Kinnie/Rollin
Top ECATS (TBD)	Kinnie/Rollins/Majzoub/Poirier
Top ECATS MIL	Oboza/Singley/August
VFG 42/43 Start/Stall Overview	R. Wilkins/M. Giordano
P0705 – TRS	J. Rezaee
Taillight Grounds	J. Rezaee/S. King/L. Marsac
P0455 – Gross EVAP Leak	B. Tobis
IAC – 9F715	K. Coryea/Vendor
Starter	J. Chigas/K. Singh
Fuel Pump	J. Schneider

Focus Powertrain
No Start/Stalls Agenda
August 2nd, 2001

Introductions

Rudy Whitworth - Brief introduction of the team members

Overview

Rudy Whitworth Robert Wilkins – Define the team goals and objectives. Discuss how these objectives align with the VRT assignments.

Roles & Responsibilities

Mike Giordano Robert Wilkins – Discuss team member participation in the warranty reduction process related to No Start/Stall VPG. Define team member ownership of components and processes related to No Start/Stall quality. Establish support from the various team members in an effort to reduce warranty cost and improve satisfaction

No Start / Stall Top 10

Robert Wilkins - Review the current top ten warranty concerns at the Customer Concern Level and relate them to components

AWS Data Review

Robert Wilkins - Review the latest AWS data at or below one month in service designated as Focus No Start / Stall claims

Walk in

Freeland, Mark (M.)

From:	Whitworth, Rudy (A.R.)
Sent:	Thursday, August 09, 2001 5:02 PM
To:	Freeland, Mark (M.)
Cc:	Rozema, Thomas (T.M.); Wilkins, Robert (R.)
Subject:	Short to Vref - DPFE

Per our discussion inthe VFG 42/43 Start/Stall meeting today, I promised to send you the names of the 3 Black Belts that are working on the Grounds Issues on Focus.
Ton Gwozdek
Peter Cvetkovski
John Rezaee

Rudy Whitworth
PTSE Resident Engineer - Wayne Assembly Plant
Phone 734-467-2024
Fax 734-467-0489
E-mail AWHITWOR

ER02-627-C 3978

Sport / Sport Trac Weekly Quality Review
July 25, 2001
Dial in # 1-877-322-9654 / Participant Code: 529817

Note: Suppliers are on line for the duration of the call. Please be sensitive in sharing confidential information.

- **Supplier quality issues**
  - Hayes Lemmerz – 4X2 spindle quality — Hayes Lemmerz
    (Update on stop ship)
  - Horn sticking — TRW (Al Saberan)
    (Update timing status for production implementation)
  - IP center finish panel peeling – Summit Polymers — Summit / C. Brendel
    (Update on root cause definition)

- **Quality overview from prior week**
  - ICCD — J. Boerger
    - Sport Trac weekly concerns
    - Sport weekly concerns
  - PCPA — S. Redding
    - High / low / mean from prior week
    - A / blitz calls
    - Dynamic audit results
  - In-plant indicators (no data this week due to plant shut down) — S. Redding
    - Wind audit
    - Water audit
    - Squeak and rattle
    - Air leakage
    - Electrical (1st run QLS)

- **Stop Shipment Status**
  - G.E. high beam quality concern (quality hold)
    (Closed)

- **Urgent assembly plant issues**
  - See supplier quality issues (above)
  - Maumee fender quality — Mike Stevens

- **Sport / Sport Trac Top 25**
  - Dents and Dings
    - Doors — Mary Maki
    - Hoods — Dave Davis

- **Emerging issue review (CQIS/ICCD)**
  - 4.0 L no crank
    PCM "no communication" to PATS — S. Bartolucci
    Starter failures — C. Berge / Visteon
  - Rocker molding loose (ICCD concern) — C. Bishoff / T. Crenshaw
    (Implement projects over vacation)

- **Issues Under Monitor Status**
  - Sport Trac glass out of channel — D. Kleinke / T. Crenshaw
    (Upcoming trial week of 7/23/2001 - monitor)
  - Fuel gage accuracy / fluctuation — Marek Lockhart
    (Monitor OQRS reports through August, 2001 - PVT)

- **PCPA Roll-in Calls** — Therran Hilborn / Jim Boerger

J G Boerger
Electronic file: c: // Word / Agenda 05 23 2001

Freeland, Mark (M.)

From:	sats@ford.com
Sent:	Friday, July 06, 2001 9:34 AM
To:	MFREELA1@ford.com
Subject:	RE VSC Appointment Confirmation

[redacted]

As you requested, your appointment has been scheduled at: RESEARCH AND ENGINEERING VEHICLE SERVICE CENTER VSC for this date: 7/9/01.
You requested the following on the repair order write up:

Tag #: 527L159, Model: EXPLORER 4X4, 2DR, VIN #: 1FMCU70E21UB80254

Concern(s): ENGINE, CHECK ENGINE LIGHT ON

Recall(s): 01B77

Please note: This confirmation does not list the comments that you typed.
You may view or change your Comments and Appointment Information at the SATS customer home page:
http://www.hrsys.ford.com/sats Select: Review, Change or Cancel Existing Appointment.

Because of the write-up details, this repair order has been flagged as a "repair of interest" and individuals within Product Development and PCSD have been notified.

Thank you,

The RESEARCH AND ENGINEERING VEHICLE SERVICE CENTER Vehicle Service Team

EN02-827-C 3874

Mark's

Bansek, Catherine (C.K.)

Subject:	Explorer/Sport/Sport Trac PTQRT Agenda
Location:	Teleconference
Start:	Tue 7/17/01 8:00 AM
End:	Tue 7/17/01 10:00 AM
Recurrence:	(none)
Meeting Status:	Meeting organizer
Required Attendees:	Bansek, Catherine (C.K.); Freeland, Mark (M.)

TUES DAY 8:45A

Catherine, Please call in to the meeting or stop by 1KS01 by about 8:45 am. Based on the topics ahead of yours on the agenda we should get to the DPFE by 8:45 ish. If you call in please identify yourself so we know you are on line and waiting for your topic. (we can always jump to your topic if we run over on something else.) Thanks!

Quality comes first....
Linda F. Nehasil
Explorer Powertrain Quality
32-38671

Mark, Are you available to attend/call in?
Please let me know.

Catherine Koay Bansek
Fax: 313-390-4084
Phone: 313-323-8101
Product Design Engineer, EGR Valve
V-Engine Engineering, Ford Motor Company
Text Pager: cbansek2 (313-796-5245)

Cathy, please attend this meeting with Dennis. I think you should also take Mark Freeland if he is available.

Joe Johnson
Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 69
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

-----Original Message-----

From:	Nehasil, Linda (L.F.)
Sent:	Wednesday, July 11, 2001 10:10 AM
To:	Johnson, Joseph (J.H.); Toms, Rani (R.N.); Danes, Adam (A.V.); Ward, Sheila (S.A.); Chitler, Nestka (N.); Blount, Brian (B.W.); Warren, Dennis (D.A.); Fine, Sheri (S.L.); Wilkins, Marc (M.T.); Johnson, David (D.M.); Pallon, David (D.W.); Janakiraman, Ram (V.); 'rweber@yazaki-na.com'; Fischer, Troy (T.A.); Wrock, James (J.H.); Aldea Raquepas; Andre Blanchard; Andy Kumwar; Anthony Pasieus; Bradley Southwood; Burt Sloan; Charles Billingsley; Charles Lang; Cheryl Nicholowicz; Christina Nichols; Dan Myers; Dana Kalmes; Dave Hollister; Dennis Huntington; Dieter Perchow; Dieter Plesch; Edvin Caballero; Elmer Foster Jr.; Fouad Achour; Gary Berringer; Gary Glowacz; Gary Godula; Gary Routh; Gil Pepitone; Greg Boyle; Harold Mitchell; Hassan Dakhlallah; James Wrock; Jeffrey Decker; Jeong Lee; Jim Boerger; Jim Nolebaum; Jim Walker; John Rosenald; John Shanahan; Joseph Wolosz;

EP02-827-C 3875

Juan Gomez; Kerry Adams; Kimberly Pittel; Larry Turski; Laurel Feldmeier; Linda Nehasil; Maria Lovelace; Mark Heddlesey; Mark Yagelo; Michael Boomer; Michael Hofman; P. J. Surti; Paul Richards; Rachel Hafner; Randall Stec; Ronaldo DiAngelo; Robert Bailey; Sebastien Jofroic; Stephen Davidson; Terri Shipp; Terry Trudeau; Terry Vandenbrink; 'Thomas W. Hoffman'; Wolfgang Loosen

Subject: Explorer/Sport/Sport Trac PTQRT Agenda for July 17, 2001

Explorer/Sport/Sport Trac PTQRT Agenda
July 17, 2001
8:00 am to 10:00 am
PDC - 1KS01

Phone Number: 9-1-877-877-7131
Participant Code: 1161534 #

Cross Vehicle Line Issues:

VMV Return Part Status (Ohio Dealer Part and 2 U152 Parts) - Reni Tome

KEP Engine Failure Analysis, Monthly Status - Wolfgang Loosen

IAC Interim Action Strategy Change Status - Adam Danes, Sheila Ward

U/P 207 Issues:

Thermostat Corrosion Six Sigma Status - Ram Janakiraman

U152 Issues:

Water Pump Design Status (Duplicate Field Failure in Lab Test) - Neetika Chhillar

Rear Axle Whine - Brian Blount
- Oasis message status
- Investigation status, plans to analyze vehicles in field

U152 Top Warranty Category - Check Engine Light, Top 3 Causal Parts:

1. Delta PFE
   Effectiveness of Containment Actions Implemented 11/27/2000 - Joseph Johnson, Dennis Vroman
2. Hego
   Status of Root Cause Investigation:
   Design Actions - Troy Fischer, James Wrock
   Plant Actions (Plant to review process week of 7/16 discuss results at 7/24 PTQRT) - Jeong Lee, Tom Hoffman
3. Spark Plug
   Warranty Return Analysis - Shari Finn, Dave Johnson

6R55W Transmission Issue Status:

- Transmission/Transfer Case Vent Tube Separation Status - Marc Wilkins, Mark Heddlesey, Dave Phillon
- P0713, Transmission Bulk Head Connector Update - Ralph Weber, Mark Heddlesey
- Servo Cover Tick - Harold Mitchell
- 4.6L Torque Converter Buzz - Harold Mitchell

ER62-027-C 3678

Status of 5R55W Corrective Action Plan (Presented at 6/19 FTQRT) - Steve Davidson, Sebastien Jofrolx
- Delayed Engagement
- No Engagement
  Neutrals Out
- Slips Forward
- Whine Noise
- Contamination Actions

Quality comes first....
Linda F. Nehasil
Explorer Powertrain Quality
32-38671

EXS2-627-C 3877

Freeland, Mark (M.)

From: Maurer, James (J.B.)
Sent: Thursday, May 31, 2001 3:15 PM
To: Freeland, Mark (M.)
Subject: Wafer Yields and Burned Sensors

Just a note to let you know what we're up to:

We asked Don Ayers to come up with a report that showed individual wafer yields for each day for the months of May through October. May and October are the month before and the month after the mask misalignment issue, with the intervening months having the high warranty. Individual yields were asked for instead of daily averages so that I could figure the number of die used and look at things like range of yield and variation. Per the request of the 3.0L group, I will see if I can get a good correlation between wafer yield and warranty parts and make a very rough guess as to how many will fail assuming the failed warranty parts came from low yielding wafers. (A big leap of faith). I don't think that Don will have any data in time for you to bring back.

I have 2 burned sensors, 1 from a Mustang and the other from an Escape. Evidence indicates the O rings were installed in one sensor, the other had the whole top burned off. I have been told that both failures could have been caused by a hose being off because both started melting on the high pressure side near that port. No need to retrieve any more parts that have that appearance.

At Wayne Assy. yesterday, they stated that they had 5 sensors that had caused no starts because they shorted out the Vref from the processor. Kathy Grant was supposed to be getting these according to Wayne Assy., but she hasn't seen any of them. If we get any, we'll let you know what we find. We are searching for the parts at Wayne and at the Quality center.

Regards,

Jim Maurer

James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4064
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

EP82-827-C 3882

Freeland, Mark (M.)

From: Bob Weikal [BWeikal@kavlico.com]
Sent: Friday, May 18, 2001 10:25 AM
To: Freeland, Mark (M.)
Cc: Kyong Park; Brady Davies; Karen Tackman; Naushad Hossain
Subject: RE: Meeting Agenda

Good morning Mark.

Please ask for Naushad when you arrive. Should he miss hearing the page, ask for Karen Tackman (Dr. Park's assistant) or Brady.

Naushad will arrange for you to review the evaluation results on the customer return that you gave us, sometime on Monday.

See you Monday.

Bob

PS: Naushad, please agree on a time with Don Ayers.

-----Original Message-----
From: Freeland, Mark (M.) [SMTP:mfreela1@ford.com]
Sent: Friday, May 18, 2001 6:13 AM
To: 'Bob Weikal'
Subject: RE: Meeting Agenda

OK Bob see you Monday morning. Should I call you first when I arrive, or Brady.

One small reminder. Remember the part I gave you for analysis? Well, I would like to review the findings on that part when I am with you.

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Etching Metal Films

Wet Chemical Etching

(all ratios are by volume unless noted otherwise)

Ag Al Au Cr Cu Ni Sb

- Aluminum
  - "metal etch" (3:3:1:1 H3PO4:HNO3:CH3COOH:H2O) 8.7 angstrom/sec@RT "metal etch" (3:3:1:1 H3PO4:HNO3:CH3COOH:H2O)<4min/micron@40C
  - "Al fine line etch 1" (4:1:4:1 H3PO4:HNO3:CH3COOH:H2O) 30min/micron
  - "Al fine line etch 2" (1:2 HCl:H2O)
  - "Al fast etch" (17:1:3 H3PO4:HNO3:CH3COOH:H2) ~5 min/micron
  -
- Antimony
  - "metal etch" (3:3:1:1 H3PO4:HNO3:CH3COOH:H2O) <<3min/1000A@50C
- Chromium
  - "Cyantek CR-7s" (Perchloric based) 7 min/micron (24A/s new)
  - "Cr acid etch" (1:1 HCl:glycerine) 12min/micron after depassivation
  - "Cr base etch" (1:3 [50gNaOH+100mlH2O]:[30g K3Fe(CN)6+100mlH2O]) 1hr/micron
- Gold
  - "Aqua Regia" (3:1 HCl:HNO3) ~1.5 seconds/micron
  - "Au mask etch" (10g KI, 2.5g I2, 100ml H2O) 1min/micron
- Copper
  - 150g Sodium persulfate:1000ml H2O ~20s/micron @ 45C
    Use only as a last step outside of the microengineering lab. When free of Fe, this solution is selective for Cu against Ni (added iron salts will cause Ni corrosion)
- Nickel
  - "metal etch" (3:3:1:1 H3PO4:HNO3:CH3COOH:H2O) ~15min/micron@RT with air exposure every 15 seconds
- Silver
  - "dilute metal etch" (3:3:23:1 H3PO4:HNO3:CH3COOH:H2O) ~10min/100A "silver base etch" (1:1:4 NH4OH:H2O2:CH3OH) .36micron/min resist ok but rinse rapidly after etching

Titanium etch 2" (1:9 HF:H2O) 5s/micron@32C

Dry Etching

...under construction...

"Armin Kuebelbeck" , mems-co@ISI.EDU There are several different Aluminium etchants know. Most of them are based on Phosphoric Acid 85%(about 60 to 90 parts per volume) and Nitric Acid 70% (about 2 to 10 parts per volume). Sometimes people add Acetic Acid (about 10-30 parts per volume) for better wetting behaviour and lower viskosity. Merck Corporation has about 10 different Aluminium etchants.

Development Of An Etchant For Selectively Etching $TiWN_X$ In The Presence of Electroplated 95%Pb-5%Sn solder

Lakshmi N.Ramanathan and Doug Mitchell

Final Manufacturing Technology Center, Motorola Inc.

1300 N.Alma School Road, Chandler, AZ 85224

R37378@email.sps.mot.com and

R13073@email.sps.mot.com

Abstract

Shrinking die sizes and increasing I/O density is motivating the push towards flip chip packages. A flip chip interconnection system with a under bump metallurgy stack containing sputtered $TiWN_X$ /sputtered Cu/eletroplated Cu stud/electroplated 95%Pb-5%Sn was developed. An important step in the above process is the selective etching of the sputtered Cu bus layer and the $TiWN_X$ barrier layer, in the presence of the Pb-Sn solder. The Cu bus layer was selectively etched using commercial etchants. However, no commercial etchants were available for selectively etching the $TiWN_X$ layer. H_2O_2-NH_4OH based etching systems, popularly known as Standard Clean-1 cleaning solutions, have been extensively used to clean silicon wafers in front end wafer fabrication where only trace metal contamination exists. Since metals like lead, copper, titanium, tin and tungsten catalyse the heterogeneous decomposition of the peroxide, the unstable H_2O_2-NH_4OH based etching systems are rarely used to etch metal films. In this paper the development of a H_2O_2-NH_4OH based etchant to selectively etch the sputtered $TiWN_X$ films in the presence of electroplated 95%Pb-5%Sn solder bumps is discussed. A 2^3 full factorial experiment with mid point was conducted to establish the etchant composition, as well as process temperature, that give satisfactory responses with respect to etch time, permissable undercut of the Cu stud (caused by the NH_4OH), and acceptable bump shape after reflow. Statistical analysis was used to understand the significant factors influencing the etch rate and undercut. An etchant containing 6% by volume of 30%-H_2O_2 and 0.75 % by volume of 30%-NH_4OH operated at a temperature of 37°C was found to give satisfactory results.

E982-827-C 3685

Tier 123 #24310

Kavlico Corp.

Moorpark, CA 4/23 –4/24/01

Lean Manufacturing Process Review

1. Introductions
2. Ford's Lean Efforts – Tier 123 Overview – Lean Measureables
3. Ford Buyer's Comments
4. Kalvico's Plant Background, Mfg. Process overview and current work in Lean Mfg./ Continuous Improvement
5. A Kavlico lead wide aisle tour.
6. A Discussion of Waste
7. A Plant Floor Waste (identify waste)
8. Process Mapping Overview
   - Process Flow Chart
   - Process Flow Diagram
   - ***Brainstorm***
   - Process Flow Summary Matrix
   - ***Brainstorm***
9. Value Stream Mapping
   - Current State Map
   - ***Brainstorm***
   - Future State Map

10. Create an ACTION PLAN!
11. Wrap-up

R. Keeney
Ford Lean Mfg.

Mark -

I found this
paperwork in my
Focus problem.

Craig

5982-827-C 3887

Ford Motor Co. Canada

R & E VEHICLE SERVICE CENTER

18751 OAKWOOD
DEARBORN, MICHIGAN 48124
PARTS DEPARTMENT 845-1940

DATE 11-27-00

LESSEE NAME STEPHAN

LEASE NUMBER 061 L 119

PHONE EXT. 72586

QTY.	DESCRIPTION	PART NUMBER
1	COIL	XS8Z-12029-AA

Dear Lessee:

It was necessary for us to SPECIAL order the above part(s) for your vehicle. As soon as they arrive you will be notified. These parts will be held in stock for a period of 3 weeks only. Please call Parts Department at (313) 845-1940 with any questions.

Thank You

6415 RAE 09/00

CUSTOMER COPY

E982-627-C 3884

Unprotected Area Damage Investigation

B BARTH 1

Kavlico TM dPFE Sensor
14D Core Team Meeting
Tuesday, January 8, 2002
Time: 1-2:30 p.m.
Conf. Room: DI-196

Attendees: M. Akins, S. Alles, M. Awad, M. Freeland, F. Gates, J. Johnson, D. Muter, J. O'Neall, K. Owens, C. Panaretos, P. Plante, D. Popoff, R. Rossi, J. Smythe, C. Verner, J. Jahsan, K. Arnold, B. Perry, J. Deeb, B. Bugaj, L. Williams

Meeting Minutes:

1. **Introduce new members (all):** New team members/presenters attended are: Doreen Muter, Dan Popoff, Joe Smythe, John Jahshan, Ken Arnold, Brian Perry, Joseph Deeb, Barry Bugaj (Kavlico) and Lee Williams. Paul Plante gave a brief overview of project status. Reviewed roster to ensure the key players are involved.
2. **Overview discussion of issue for new members from Summary One Pager (Paul Plante):** One page Field Action Summary Paper was reviewed by team. Mark Freeland gave overview, 30% of problem is still TBD. Some items could still be in "catch all". Meeting with Kavlico took place last Friday at FRL to review transient damage.
3. **Pick "best of best" comparator vehicle (Mahmoud Awad):** 2002 MY 4.0L SOHC Explorer/Mountaineer is "best of best". Presented overheads on EGR Sensor Risk Assessments: All dPFE Sensor Warranty by Application (R/1000 @ 3 MIS; Correlation between 2.0L zetec Focus stalls and sensors; 3.0L stalls and no starts and sensor repairs; 2.0L stalls and no starts and sensor repairs; D21 Engine Stalls Study; 2.0L Zetec Focus concerns; F150 4.6L concerns; 3.0L Escape concerns.
4. **Bob Dalbo (Lee Williams) review of 3.0L Escape stalls concern.** Electrical actions with calibration were reviewed and implemented successfully. Lee shared the Is-Is Not and Fishbone diagrams that showed Phantom Stall (EEC, Wiring Harness, EVAP Assembly) and addressed work in progress. Anything that can cause stall was put on chart.
5. **Leaders Issues: (1) Karen Owens:** Meeting minutes will contain assignments. We will manage the meetings and project to issues deck. Please submit data to Chris, subject to Karen's review. **(2) Chris Panaretos:** Would like to put all documents on a shared drive; (3) Need to know exact day of offsite. Will discuss both at next meeting.

Next meeting (1/10/02, 1-3:00 p.m., D196 Conf. Room) preliminary agenda items:

- **Kavlico field return parts analysis/binning (Mark Freeland/Mary Akins):** All Focus analyzed (except 6/01). Now having problem matching to part. Take parts and see if we can find to fit into category.
- **Discussion of shared drive access and offsite date (Karen Owens)**
- **Further discussion of Field Action Summary paper (All)**

*** NOTE: Please bring handouts to meeting if you are planning to present***

Assignments:

- **All:** Review open issues and return updates with estimated action item completion dates to Chris Panaretos by 1/11/02.
- **Mary Akins:** Provide a clean date (e-mail from Kavlico Ca. office) and part numbers for transient voltage spike protection sensor.

3/02

Freeland, Mark (M.)

From: Dan Rothweiler [DRothwei@mazdausa.com]
Sent: Thursday, February 28, 2002 9:47 AM
To: 'Freeland, Mark (M.)'
Subject: RE: dPFE sensor evaluation

I'll see if I can get the hard copies of the repair orders faxed to me. Funny we (Mazda Corp.) just got a customers request for repurchase on a 2001
Tribute with 4 separate DPFE failures. If I recommend to them to write the
check, then you can have that one. Its in Nashua NH. Feel free if you want
to call me, we can discuss.

732-868-2135

Talk to you soon,
Danny

-----Original Message-----
From: Freeland, Mark (M.) [mailto:mfreela1@ford.com]
Sent: Monday, February 25, 2002 6:58 PM
To: Rothweiler, Daniel (D.)
Cc: Maurer, James (J.B.)
Subject: FW: dPFE sensor evaluation

<< File: CRV Tribute Inventory Stall Test Results.xls >> Dan,

Thanks for your prompt reply regarding the buy back Tributes.

I am looking for the detailed dealer reports (all information available, including customer and tech. comments, PCM Codes etc.) on the two vehicles
referred to in my note, (for all visits to the dealer, not just the "stalls"
visits). Can you get these reports either electronically or hard copies?

I would love to come to NJ, but don't have the time to have fun right now!
Also, it would require a couple of days to appropriately instrument the vehicles to measure the signals we are interested in. My instrumentation is
currently in another vehicle and would need to be swapped out and swapped
back again.

When will you're people be done with the vehicles? Might there be an opportunity to get one of them after Mazda have finished with them.

Regards

Mark Freeland

> 6-Sigma Black Belt

ER02-627-C 3173

> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Dan Rothweiler [mailto:DRothwei@mazdausa.com]
Sent: Monday, February 25, 2002 3:24 PM
To: 'James Maurer'
Cc: 'Mark Freeland'
Subject: FW: dPFE sensor evaluation

Jim, I sent this note to Mark this morning. It doesn't look like I can help you except to refer your request to corporate Mazda. If you would like to visit NJ I can make either of these vehicles available to either you or Mark. Let me know if you would like to do that.

-----Original Message-----
From: Dan Rothweiler
Sent: Monday, February 25, 2002 11:59 AM
To: 'Freeland, Mark (M.)'
Cc: Steven Limtiaco; 'Don Altoonian'; 'Les Williams'; George Golfieri; Eileen Kelly-Douglas
Subject: RE: dPFE sensor evaluation

Mark, Both of those Tributes are currently being driven by employees of the regional office here in NJ. They have somewhere between 500 and 1000 more miles then the actual miles on the attached form. Neither vehicle has stalled yet, that I know of. The repair histories of both vehicles are summarized in the attachment. If you need more than that, let me know. I cannot comment on how to go about getting these 2 trucks to you. I must refer you to Steve Limtiaco at Technical Services in Irvine California. He should be able to assist you as I believe that they have arranged this for other vehicles in the past.

<<CRV Tribute Inventory Stall Test Results.xls>>

Thanks,
Dan Rothweiler
MNAO

-----Original Message-----
From: Freeland, Mark (M.) [mailto:mfreela1@ford.com]
Sent: Friday, February 22, 2002 7:17 PM
To: Rothweiler, Daniel (D.)
Cc: Verner, Carol (C.J.); Plante, Paul (P.G.); Gates, Freeman (F.C.); Maurer, James (J.B.)

Subject: FW: dPFE sensor evaluation

Daniel,
Can you tell me what the disposition of the Tribute Buy Back vehicles is:
#2 VIN 4F2CU09131KM01092
#7 VIN 4F2YU09121KM24319

Can you also tell me how we can get the complete vehicle service history, as
I can't look them up in AWS.
The dPFE task force would like to have the use of the stalling Tributes that
the two suspect dPFE sensors came from for a period of time, if that is possible.

Regards
Mark Freeland
> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Jensen, Ted (T.E.)
Sent: Thursday, February 21, 2002 3:22 PM
To: Freeland, Mark (M.)
Subject: FW: dPFE sensor evaluation

FYI

-----Original Message-----
From: Dan Rothweiler [mailto:DRothwei@mazdausa.com]
Sent: Thursday, February 21, 2002 3:20 PM
To: 'Jensen, Ted (T.E.)'
Cc: 'Don Altoonian'; 'Les Williams'
Subject: RE: dPFE sensor evaluation

Ted, Thanks for the info. Vehicle #2 interestingly had already received a
new DPFE at low mileage. I guess I don't find that to be too strange though
considering that some vehicles have received more than one as well. Neither
2 or 7 had any DTC's to make us suspicious of a bad DPFE. I guess I'm glad
that we decided to change all of them except vehicle's that had one
installed in very recent repair history. Also, so far none of the units have
stalled. Yet.....

Regards,

EA02-827-C 3175

Dan Rothweiler
MNAO

-----Original Message-----
From: Jensen, Ted (T.E.) [mailto:tjensen2@ford.com]
Sent: Thursday, February 21, 2002 2:59 PM
To: Rothweiler, Daniel (D.)
Cc: Williams, Les (LHW.); Luehrsen, Eric (E.A.)
Subject: dPFE sensor evaluation

Dan,

Eight dPFE sensors, from buy back vehicles at your location, were delivered
to Mark Freeland for evaluation. The preliminary evaluation is back. Two
of the eight sensors were bad. All eight sensors are being sent to
Californai, to the supplier, for additional analysis. The vehicles that the
bad sensors were removed from are:

#2 VIN 4F2CU09131KM01092
#7 VIN 4F2YU09121KM24319

The sensor from vehicle #7 is more seriously out of spec than the one from
vehicle #2. The other six sensors are TNI, or good.

Best Regards,

Ted Jensen

[redacted]

[redacted]

There are some other interesting flying-capacitor chips. The MAX680 from Maxim is a dual supply that generates ±10 volts (up to 10mA) from +5 volts (Fig. 6.60). The similar LT1026 from LTC operates to ±20 volts output (up to 20mA) and uses smaller capacitors (1μF instead of 20μF). The LT1054 from LTC combines a flying-capacitor converter with a linear regulator to provide a stiff regulated output up to 100mA (at lower efficiency, of course). The MAX232 series and the LT1080 combine a ±10 volt switched-capacitor supply with an RS-232C digital serial port (see Chapter 11), eliminating the need for bipolarity supplies in many computer boards; some chips in the MAX232 series even have built-in capacitors. And the LTC1043 is an uncommitted flying-capacitor building block, which you can use to do all kinds of magic. For example, you can use a flying capacitor to transfer a voltage drop measured at an inconvenient potential (e.g., a current-sensing resistor at the positive supply voltage) down to ground, where you can easily use it. The LTC1043 data sheet has 8 pages of similar clever applications.

6.24 Constant-current supplies

In Sections 2.06 and 2.14 we described some methods for generating constant currents within a circuit, including voltage-programmed currents with floating or grounded loads and various forms of current mirrors. In Section 3.06 we showed how to use FETs to construct some simple current-source circuits, including "current-regulator diodes" (a JFET with gate tied to source) such as the 1N5283 series. In Section 4.07 we showed how to get improved performance (at low frequencies, anyway) by using op-amps to construct current sources. And in Section 6.15 we mentioned the convenient LM334 3-terminal current source IC. There is often a need, however, for a flexible constant-current supply, which can supply substantial voltage and current, as a complete instrument. In this section we will look at some of the more successful circuit techniques.

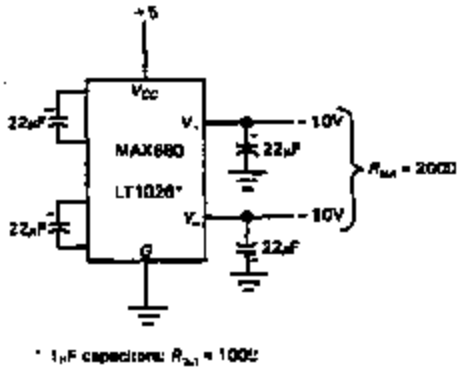


Figure 6.60. Flying-capacitor dual supply. The LT1026 is similar, but has $R_{out} \approx 100$ ohms and requires only 1μF capacitors.

☐ *Three-terminal regulator*

In Section 6.18 we showed how you can use a 3-terminal adjustable regulator to make a delightfully simple current source. The 317-type regulator, for example, maintains a constant 1.25 volts (bandgap) between its output and its "ADJ" pin; by putting a resistor across these pins, you form a 2-terminal constant-current device (Fig. 6.38), which can be used as a sink or source. Performance degrades with less than about 3 volts across the circuit, since the regulator itself has a dropout voltage near 2 volts.

This type of current source is suitable for moderate to high currents: The LM317 has a maximum current of 1.5 amps and can operate with up to 37 volts drop. Its high-voltage cousin, the LM317HVK, can withstand 57 volts drop. Higher-current versions are available, e.g., the LM338 (5A) and LM396 (10A), although these have lower voltage ratings. Three-terminal regulators won't work as current sources below about 10mA, the worst-case quiescent current. However, note that the

latter is not a source of current error, since it flows from input pin to output pin; the much smaller current that flows out of the ADJ pin (50μA, nominal) varies about 20% over the operating temperature range and is negligible by comparison.

In ancient times, before 3-terminal adjustable regulators were available, people sometimes used 5 volt *fixed* regulators (e.g., the 7805) as current sources in a similar arrangement (substituting "GND" for "ADJ"). This is an inferior circuit, because at low output currents the regulator's quiescent current (8mA max) contributes a large error, and at high currents the 5 volt drop across the current-setting resistor results in unnecessary power dissipation.

☐ *Supply-line sensing*

A simple technique that yields good performance involves constructing a conventional series pass regulator, with current sensing at the input to the pass transistor (Fig. 6.61). R_2 is the current-sensing

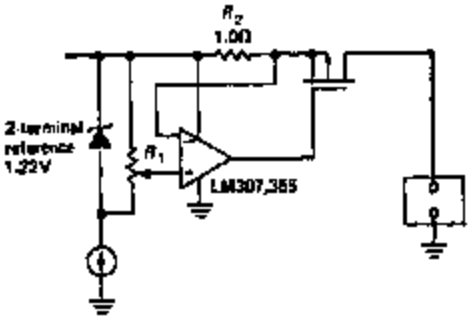


Figure 6.61. Input-rail current sensing.

resistor, preferably a low-temperature-coefficient type. For very high current or high-precision applications, you should use a 4-wire resistor, intended for current-sensing applications, in which the sensing leads are connected internally. The sensing voltage does not then depend on the connection resistance of the joints to the current-carrying leads, which for clarity are drawn with heavy lines in this schematic.

For this circuit you must use an op-amp that has an input common-mode range all the way to the positive supply (the 307, 355, and 441 have this virtue), unless, of course, you power the op-amp with a more positive auxiliary supply. The MOSFET in this circuit could be replaced by a *pnp* pass transistor; however, since the output current would then include the base current, you should use a Darlington connection to minimize that error. Note that an *n*-channel output transistor (connected as a follower) can be used instead of the *p*-channel shown, if the input connections to the op-amp are reversed. However, the current source will then have an undesirably low output impedance at frequencies approaching f_T of the op-amp loop, since the output is actually a source follower. This is a common error in current-source design, since the dc analysis shows correct performance.

☐ *Return-line current sensing*

A good way to make a precise current source is to sense the voltage across a precision resistor directly in series with the load, since this makes it easier to meet the simple criterion for eliminating current-source errors due to base drive currents; the base drive current must either pass through both the load and sense amplifier, or pass through neither. However, to meet this criterion it is necessary to "float" either the load or the power supply by at least the voltage drop across the current-sensing resistor. Figure 6.62 shows a couple of circuits that use floating loads.

The first circuit is a conventional series pass circuit, with the error signal derived from the drop across the small resistor in the load's return path to ground. The high-current path is again drawn with bold lines. The Darlington connection is used here

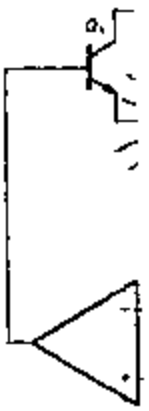


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Figure 6.62. R

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form used in preserving wood; disinfecting stables, slaughterhouses, etc.; refining crude oil; dyeing fabrics; manuf parchment paper.

MED USE: The *hexahydrate* form topically, 10 to 25% soln as deodorant, sphidrotic. *Human Toxicity: See* Aluminum Subacetate Solution. *Anhydrous* form is a strong irritant.

Aluminum Diacetate. *Hydroxybis(acetato)aluminum; basic aluminum acetate; aluminum subacetate; aluminum hydroxyacetate;* Lanicol; Cassil; Essitol. $Al(OH)(CH_3CO_2)_2$; mol wt 162.08. $C_4H_7AlO_5$; C 29.64%, H 4.36%, Al 16.64%, O 49.36%. Prepd from aluminum hydroxide and acetic acid or from sodium acetate and aluminum chloride hexahydrate: Hood, Ihde, *J. Am. Chem. Soc.* 72, 2094 (1950). Other methods of prepn: L. Gmelin, *Handbuch der anorganischen Chemie*, no. 33, part B (Verlag Chemie, Berlin 1934), p 296. Also prepd in aqueous solution, see Aluminum Subacetate Solution.

White curdy precipitate or white amorphous powder. Material that has been oven-dried at 110° is practically insoluble in water. Freshly prepared material forms numerous hydrates and is quite soluble in water. The greatest solubility is obtained by formation in solution. The pharmacist's stock soln (see Aluminum Subacetate Solution) contains about 8% $Al(OH)(CH_3CO_2)_2$, while commercial solns used for waterproofing, contain 22 to 25% $Al(OH)(CH_3CO_2)_2$. When heated, the salt loses acetic acid and aluminum to oxygen bonding occurs, resulting in a very insoluble compd of diffused nature, *see* Gmelin, *op. cit.* and Thomas, *Paper Trade J.* 180, 36 (1933). Aq solns are generally acid to litmus; gradually become turbid and gelatinous. Sometimes a more basic salt precipitates out and settles to the bottom of the container. Increasing the pH to a marked degree will clear up an old soln due to formation of sodium acetate and sodium aluminate. Urea and thiourea have been suggested as stabilizers for aq solns.

USE: Manuf color lakes; mordant in dyeing; in waterproofing and fireproofing fabrics (solns for these purposes are known as *red liquor* or *aluminum rouge* because they were originally used for preparing red color lakes); in antiperspirant formulations; as disinfectant by embalmers.

MED USE: Has been used as deodorant and deodorant dusting powder.

Aluminum Ethoxide. Aluminum ethylate. $Al(OC_2H_5)_3$; mol wt 162.15. $C_6H_{15}AlO_3$. C 44.44%, H 9.33%, Al 16.63%, O 29.60%. Prepd by reacting aluminum powder with absolute ethanol in xylene using small amounts of mercuric chloride and iodine as catalysts: Meerwein, Schmidt, *Ann.* 444, 232 (1925); *Newer Methods of Preparative Organic Chemistry*, p 132 (Interscience, New York, 1948); *see also Farbenfabriken vorm.* Meister, Lucius und Brüning, Ger. pat. 256,896; *J. Soc. Chem. Ind.* (London) 34, 1168 (1915); Adkins, *J. Am. Chem. Soc.* 44, 2178 (1922). Laboratory procedure: Gattermann-Wieland, *Praxis der organischen Chemiker*, 40th ed (de Gruyter, Berlin 1961), p 313.

Liquid, bp$_{0.5}$ 200°; bp 175–180°. Slowly solidifies to a white solid, mp 140°. May crystallize with alcohol of crystallization. Decomposed by water. Slightly soluble in hot xylene, chlorobenzene; other high boiling solvents.

USE: In the reduction of aldehydes and ketones; as catalyst for polymerizations. *Human Toxicity:* No specific data. Alkyl aluminums are highly reactive, hence are potentially dangerous to health; can cause skin burns, severe pneumonitis.

Aluminum Fluoride. Aluminum trifluoride. AlF_3; mol wt 83.98. Al 32.13%, F 67.87%. Prepd by heating $(NH_4)_3AlF_6$ to red heat in a stream of nitrogen: Kwestroh (in *Handbook of Preparative Inorganic Chemistry*, G. Brauer, Ed. (Academic Press, 1963) vol. 1, p 225; Emeléus in *Fluorine Chemistry I*, Simons, Ed. (Academic Press, 1950) vol. 1, p 39.

Hexagonal crystals. sp above 1260°; sublimes$_{760}$ 1260°, d 2.882. Solubility in water at 25° = 0.559 g/100 ml. Sparingly soluble in acids and alkalies, even hot concd H_2SO_4 has little effect. Hydrolyzed by superheated steam at 308–400°.

Monohydrate, $AlF_3.H_2O$, *fluellite*, orthorhombic crystals, d 2.17.

Trihydrate, $AlF_3.3H_2O$, usually $AlF_3.3.1H_2O$. Prepn: Ehret, Frere, *J. Am. Chem. Soc.* 67, 64 (1945). Loses water at 100°, more at 200°. It does not seem possible to obtain the anhydrous compd free from oxides by dehydration of the hydrates.

USE: In ceramics, as flux in metallurgy, in aluminum manuf, as inhibitor of fermentation, as catalyst in organic reactions. *Human Toxicity:* Less toxic on ingestion than other fluorides because of slight solubility. *See* Sodium Fluoride and Fluorine.

Aluminum Hexafluorosilicate. Aluminum fluosilicate; aluminum silicofluoride. $Al_2(SiF_6)_3$; mol wt 480.23. $Al_2F_{18}Si_3$; Al 11.24%, F 71.22%, Si 17.55%. Occurs in nature as cryst, $Al_2SiO_4(OH,F)_2$. Prepn: Sanfourche, Krapivine, *Compt. Rend.* 208, 2080 (1939).

Nonahydrate, $Al_2(SiF_6)_3.9H_2O$; Hexagonal prisms. Easily sol in water; aq solution decomposes on heating or neutralization. Solid loses water on heating to temperatures below 500°, leaving a hexahydrate form; decomposes completely on heating to 1000°.

USE: Protection and preservation of construction materials; manuf of glass. *Human Toxicity: See* Sodium Fluoride. Reactions less intense.

Aluminum Hexaurea Sulfide Triiodide. Aluminum benzenethamide sulfate triiodide; Herodius-S; Alura. $Al[CO(NH_2)_2]_6SO_4I_3$; mol wt 864.14. $C_7H_{36}AlI_3N_{12}O_7S$; C 9.54%, H 2.80%, Al 3.12%, I 44.06%, N 19.45%, O 18.52%, S 3.71%, active iodine 29.4%. Prepn: Barbieri, *Atti reale accad. Lincei* 24, 919 (1915); Morris *et al., Ind. Eng. Chem.* 45, 1013 (1953).

Crystals. Solubility in water at 25° = 590 g/l.

USE: Decontamination of drinking water in emergencies. Used in amounts sufficient to yield 8 ppm of active iodine. A tablet some 20 mg plus 82 mg $Na_2H_2PO_7$ plus 4 mg talc will decontaminate one quart of water. Such tablets after 7 days' storage at 60° retained 97% of their original active iodine. More stable than tetraglycine hydroperiodide.

Aluminum Hydride. AlH_3; mol wt 29.99; Al 89.92%, H 10.08%. Prepared by treating an ether solution of lithium hydride with aluminum chloride, $4LiH + AlCl_3 \rightarrow LiAlH_4 + 3LiCl$; $3LiAlH_4 + AlCl_3 \rightarrow 4AlH_3 + 3LiCl$: Finholt, Bond, Schlesinger, *J. Am. Chem. Soc.* 69, 1199–1203 (1947).

Colorless solid, nonvolatile, probably highly polymerized and containing residual ether which cannot be completely removed.

USE: As catalyst for polymerizations; reducing agent. Lithium aluminum hydride is a more useful reagent because of its greater solubility.

Aluminum Hydroxide. Aluminum hydrate; aluminum trihydrate; hydrated alumina. $Al(OH)_3$; mol wt 77.98. Al 34.59%, H 3.88%, O 61.54%. Preps and properties: *Gmelin's Handb. anorg. Chem., System no. 28 (Aluminum)*, part B, 8th ed, pp 94–132 (1934); Becher in *Handbook of Preparative Inorganic Chemistry*, G. Brauer, Ed., 2nd ed (Academic Press, 1963), p 830–831; Wagner, *ibid.*, p 1632–1634; Dominé-Berges, *Ann. chim.* [12], 5, 106 (1950); Hendry, *Chem. Tech.* 1, 66 (1949); *C.A.* 44, 9651 (1950).

Usually obtained as a white, bulky, amorphous powder. Practically insoluble in water, but soluble in alkalies to form soln or in HCl, H_2SO_4 and other strong acids in the presence of some water. Forms gels on prolonged contact with water. Absorbs acids, CO_2.

USE: Adsorbent; emulsifier; ion-exchanger; in chromatography; mordant in dyeing; filtering medium; manuf glass, fire clay, paper, pottery, printing inks, lubricating compositions, detergents; waterproofing fabrics; in antiperspirants, dentifrices; used in pharmacy as the gel or dried gel. Some commercial names for such preps are: *Creamalin; Creamalin Chelators; Al-D-Cedes; Alcasil; Alcasil Amphojel; Alhagel; Colloseal; Alkrus; Hyasil; Hydrolene; Pepsamar; Plangel; Gelusina; Vanagel.*

MED USE: Gastric antacid. *Dose:* Oral 4 to 30 ml as gel, 0.3 to 2.4 g as dried gel. *Side Effects:* May cause constipation.

VET USE: As an adjuvant in bacterins and vaccines; in gel form occasionally used as a gastric antacid and protective in gastroenteritis in dogs.

Aluminum Hydroxychloride. *Aluminum chloride hydroxide;* aluminum chlorohydroxide; aluminum chlorohydrate; Chlorhydrol; Astringen. $Al_2(OH)_5Cl.2H_2O$ or $[Al(OH)_2Cl]_x$ or $Al_2(OH)_5Cl_2$. The commercial product (50% soln) contains 23 to 24% Al_2O_3 and 7.3 to 8.3% Cl. Prepd by electrolysing solns of suitable Al salts: Fr. pat.

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form used in preserving wood; disinfecting stables, slaughterhouses, etc.; refining crude oil; dyeing fabrics; manuf parchment paper.

MED USE: The *hexahydrate* form topically, 10 to 25% soln as deodorant, sahidrotic. *Human Toxicity:* See Aluminum Subacetate Solution. *Anhydrous* form is a strong irritant.

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Usually obtained as a white, bulky, amorphous powder. Practically insoluble in water, but soluble in alkaline soins or in HCl, H_2SO_4 and other strong acids in the presence of some water. Forms gels on prolonged contact with water. Absorbs acids, CO_2.

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MED USE: Gastric antacid. *Dose:* Oral 4 to 30 ml as gel, 0.1 to 2.4 g as dried gel. *Side Effects:* May cause constipation.

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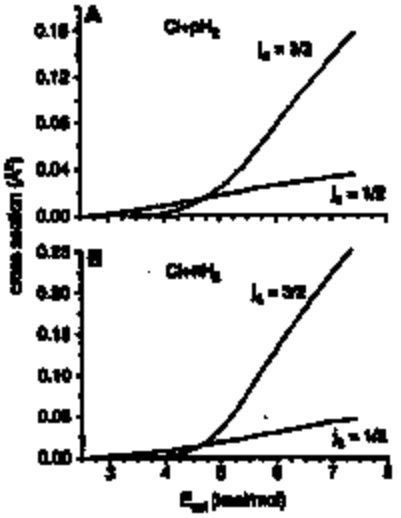

Fig. 5. (A) Integral cross sections for reaction of Cl in its ground ($j_a = 3/2$) and excited ($j_a = 1/2$) SO state with p-H_2. (B) Similar integral cross sections for reaction with n-H_2. The relative rotational state populations of the $J = 0, 1$ and 2 H_2 rotational levels were taken from (4–6).

count in Fig. 5, the observed reactivity of the excited SO state will be a factor of 2 less than predicted by Fig. 5.

We predict, fully in agreement with the body of available experimental evidence on other reactions (*15*, *28*), that the adiabatically allowed $[Cl(^2P_{3/2}) + H_2]$ reaction will dominate the adiabatically forbidden reaction $[Cl(^2P_{1/2}) + H_2]$, except for collision energies below 5 kcal/mol. This prediction is in direct contrast with the recent work of Lin and coworkers (*4*–*6*). This disagreement is one of the major currently unsolved problems in the dynamics of elementary chemical reactions.

Although we predict the reactivity of the adiabatically forbidden channel to be small, we conclude that the breakdown in the BO approximation nevertheless plays an important role in the $Cl + H_2$ reaction. The coupling between the electronic-orbital angular momentum and the overall orbital motion of the reactants opens up a inelastic channel that competes with reaction. The predicted reactive cross sections are smaller than those calculated from more traditional treatments, in which these nonadiabatic inelastic processes are not taken into account.

We have shown that nonadiabatic processes influence the $Cl + H_2$ reaction dynamics in subtle and as yet not fully understood ways. In the ab initio calculations of Capecchi and Werner, the nonreactive Π states were characterized only in the reactant arrangement, where these states lie relatively close in energy to the reactive Σ state. It may be that additional electronic couplings at (or inside) the reaction barrier underlie the discrepancy with Lin's experiments. The need for further studies, both theoretical and experimental, is clear.

References and Notes
1. T. C. Allison *et al.*, in *Gas-Phase Reaction Systems: Experiments and Models 100 Years after Max Bodenstein*, H.-R. V. J. Wolfrum, R. Rannacher, J. Warnatz, Eds. (Springer, Heidelberg, Germany, 1996), pp. 111–124.
2. P. Casavecchia, *Rep. Prog. Phys.* **63**, 355 (2000).
3. M. Alagia *et al.*, *Science* **273**, 1519 (1996).
4. S.-H. Lee, L.-H. Lai, K. Liu, H. Chang, *J. Chem. Phys.* **110**, 8229 (1999).
5. S.-H. Lee, K. Liu, *J. Chem. Phys.* **111**, 6253 (1999).
6. F. Dong, S.-H. Lee, K. Liu, *J. Chem. Phys.* **113**, 3197 (2000).
7. F. J. Aoiz, L. Bañares, *J. Phys. Chem.* **100**, 18108 (1996).
8. S. C. Hobbs, T. C. Allison, D. G. Truhlar, D. W. Schwenke, *J. Phys. Chem.* **100**, 13568 (1996).
9. H. Wang, W. H. Thompson, W. H. Miller, *J. Chem. Phys.* **107**, 7194 (1997).
10. D. Skouteris *et al.*, *Science* **286**, 1713 (1999).
11. U. Manthe, W. Bian, H.-J. Werner, *Chem. Phys. Lett.* **318**, 647 (1999).
12. N. Balucani *et al.*, *Chem. Phys. Lett.* **336**, 500 (2000).
13. S.-H. Yang, H.-T. Gan, S.-L. Han, J. Z. H. Zhang, *J. Chem. Phys.* **113**, 1434 (2000).
14. D. Skouteris *et al.*, *J. Chem. Phys.* **114**, 10662 (2001).
15. F. J. Aoiz *et al.*, *J. Chem. Phys.* **115**, 2074 (2001).
16. C. Shan, T. Wu, G. Ju, W. Bian, *Chem. Phys.* **272**, 61 (2001).
17. T. C. Allison, G. C. Lynch, D. G. Truhlar, M. S. Gordon, *J. Phys. Chem.* **100**, 13575 (1996).
18. W. Bian, H.-J. Werner, *J. Chem. Phys.* **112**, 220 (2000).
19. F. Rebentrost, W. A. Lester Jr., *J. Chem. Phys.* **63**, 3737 (1975).
20. V. Aquilanti, S. Cavalli, D. De Fazio, A. Volpi, *J. Chem. Phys.* **109**, 3805 (1998).
21. M. H. Alexander, D. E. Manolopoulos, H. J. Werner, *J. Chem. Phys.* **113**, 11084 (2000).
22. M. H. Alexander, B. Pouilly, T. Duhoo, *J. Chem. Phys.* **99**, 1752 (1993).
23. C. E. Moore, *Atomic Energy Levels*, NSRDS-NBS 35 (U. S. Government Printing Office, Washington, DC, 1971).
24. E. E. Shuler, *J. Chem. Phys.* **21**, 624 (1953).
25. R. J. Donovan, D. Husain, *Chem. Rev.* **70**, 489 (1970).
26. D. M. Neumark, A. M. Wodtke, G. N. Robinson, C. C. Hayden, Y. T. Lee, *J. Chem. Phys.* **82**, 3045 (1985).
27. M. Faubel *et al.*, *J. Chem. Phys.* **101**, 2100 (1994).
28. P. J. Dagdigian, M. L. Campbell, *Chem. Rev.* **87**, 1 (1987).
29. G. Capecchi, H.-J. Werner, in preparation.
30. H.-J. Werner, P. J. Knowles, *J. Chem. Phys.* **89**, 5803 (1988).
31. P. J. Knowles, H.-J. Werner, *Chem. Phys. Lett.* **145**, 514 (1988).
32. G. C. Schatz, *J. Phys. Chem.* **99**, 7522 (1995).
33. K. Stark, H.-J. Werner, *J. Chem. Phys.* **104**, 6515 (1996).
34. R. Hertel, H.-J. Werner, *Chem. Phys. Lett.* **268**, 450 (1997).
35. J. F. Castillo, D. E. Manolopoulos, K. Stark, H.-J. Werner, *J. Chem. Phys.* **104**, 6531 (1996).
36. D. Skouteris, J. F. Castillo, D. E. Manolopoulos, *Comput. Phys. Commun.* **133**, 128 (2000).
37. F. J. Aoiz, L. Bañares, J. F. Castillo, *J. Chem. Phys.* **111**, 4013 (1999).
38. B. Pouilly, T. Orlikowski, M. H. Alexander, *J. Phys. B* **16**, 1053 (1983).
39. H. Lefebvre-Brion, R. W. Field, *Perturbations in the Spectra of Diatomic Molecules* (Academic Press, New York, 1986), pp. 118–181.
40. M.H.A. is grateful to NSF for support under grant CHE-9973810. H.J.W. was supported by the Deutsche Forschungsgemeinschaft and the Fonds der Chemischen Industrie. G.C. was supported by a fellowship as a participant in the European Union-Training and Mobility of Researchers network 'Reaction Dynamics' contract no. HPRN-CT-1999-00007. Finally, the authors are grateful to K. Liu and D. Manolopoulos for their encouragement and for many productive discussions.

1 February 2002; accepted 19 March 2002

Dynamic Aggregation of Chiral Spinners

Bartosz A. Grzybowski* and George M. Whitesides*

An object spinning at the surface of a liquid creates a chiral vortex. If the spinning object is itself chiral, its shape modifies the characteristics of the vortex; interactions between that vortex and other vortices then depend on the chirality of the objects that produce them. This paper describes the aggregation of millimeter-sized, chiral magnetized plates floating at a liquid-air interface and rotating under the influence of a rotating external magnetic field. This external field confines all the plates at densities that cause the vortices they generate to interact strongly. For one set of plates investigated, plates of one chirality attract one another, and plates of the other chirality repel other plates of both chiralities.

The properties and interactions of chiral molecules are a central concern in chemistry, with applications in chromatographic separations, asymmetric catalysis, and medicinal chemistry (*1*, *2*). Chiral interactions between molecules are conceptually well understood (*3*, *4*). Interactions between chiral objects larger than molecules are, however, less well explored or exploited. Here, we describe a study of the interactions between millimeter-scale vortices generated in a fluid by the rotation of chiral objects floating at the surface of that fluid. This system has the characteristic that it is dynamic (*5*–*10*)—that is, the interacting objects (the vortices) exist only when there is a flux of energy into the system—and that both the vortices and the objects that generate them are macroscopic. The system consists of magnetically doped

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BRYNN ANN

Theoretical Study of the Validity of the Born-Oppenheimer Approximation in the Cl + H_2 → HCl + H Reaction

Millard H. Alexander,[1]* Gabriella Capecchi,[2] Hans-Joachim Werner[2]*

Reactivity of the excited spin-orbit state of Cl with H_2 to yield ground-state HCl products is forbidden by the Born-Oppenheimer (BO) approximation. We used new ab initio potential energy surfaces and exact quantum scattering calculations to explore the extent of electronic nonadiabaticity in this reaction. In direct contrast to recent experiments, we predict that the BO-allowed reaction of the ground spin-orbit state will be much more efficient than the BO-forbidden reaction of the excited spin-orbit state. Also, Coriolis coupling opens up an electronically nonadiabatic inelastic channel, which competes substantially with reaction.

The kinetics of the Cl + H_2 reaction has been the object of study for more than a century (*1*, *2*). The reaction has played an important role in the development of transition state theory, has provided verification of the kinetic isotope effect, and is the paradigm for the reaction of Cl with hydrocarbons, which is of importance in many atmospheric environments. Recently, molecular beam techniques have been used to yield information on this reaction at well-defined collision energies (*3*–*6*). Quasi-classical trajectory and precise quantum scattering investigations have been reported (*7*–*16*) on several potential energy surfaces (PESs) (*17*, *18*). All previous theoretical work has been based on the approximation that only a single PES governs the reaction and that the open-shell character of the Cl atom plays no role in the dynamics.

The approach of molecular hydrogen to an atom in a ^2P electronic state splits the degeneracy of this state, giving rise to three PESs (*18*–*21*). Of these only the lowest, which corresponds to the lower state of A' symmetry in C_s geometry (Σ symmetry in collinear geometry), correlates with the electronic ground state of the products [H + HCl($X^1\Sigma^+$)]. The PESs of the two other states (the higher state of A' symmetry and the unique state of A'' symmetry) correlate with HCl products in the $a^3\Pi$ electronic state, which is considerably higher in energy (*22*) (Fig. 1).

The excited spin-orbit (SO) state of the Cl atom ($^2P_{1/2}$), which lies 880 cm^{-1} (2.52 kcal/mol) above the ground SO state (*23*), does not correlate adiabatically with the electronic ground state of the reaction products. Thus, if the reaction were to proceed adiabatically on a single PES, as would be predicted by the Born-Oppenheimer (BO) approximation, then the excited SO state would not react (*24*, *25*). For the chemically similar F + H_2 reaction, both theory (*21*) and experiment (*26*, *27*) agree that the reactivity of the excited SO state is, at most, 10% of that of the ground state. The Cl + H_2 reaction differs in two respects: (i) the spin-orbit splitting is more than a factor of 2 greater (*23*) and (ii) the barrier height is much higher. The larger SO splitting suggests that the breakdown in the BO approximation would be less important in the Cl + H_2 reaction. However, because the internal SO energy might help to overcome the higher barrier, nonadiabaticity might be more important in Cl + H_2.

In recent molecular beam experiments, Liu and co-workers (*4*–*6*) used two different Cl atom sources to characterize the reactivity of the two SO states of the Cl atom. Except at the lowest collision energies, they conclude that the excited SO state has a substantially larger reactive cross section. This result is surprising, because the body of prior experimental work indicates that BO-allowed (adiabatically allowed) pathways always dominate (*23*, *28*).

This breakdown in the BO approximation inferred by Liu and co-workers (*4*–*6*) demands further theoretical investigation. Two questions must be answered: (i) How large is the reactivity of the adiabatically forbidden channel [Cl($^2P_{1/2}$) + H_2], and (ii) how well can the reactivity of the adiabatically allowed channel [Cl($^2P_{3/2}$) + H_2] be predicted by standard scattering calculations (*7*–*16*), based on a single PES in which nonadiabatic effects are of necessity neglected. We used exact quantum scattering calculations to answer these questions.

We first need accurate PESs for the three electronic states mentioned above. For the subsequent scattering calculations, it is necessary to transform the two states of A' symmetry into an electronically diabatic basis, in which the orientation of the missing 3p electron on the Cl atom remains unchanged in the body frame (*21*). Capecchi and Werner (*29*) have carried out internally contracted, multireference, configuration-interaction calculations (*30*, *31*) of these PESs and the SO coupling matrix elements. Transformation into the diabatic basis results in four PESs. Capecchi and Werner subsequently developed multiparameter global fits (*29*) to these

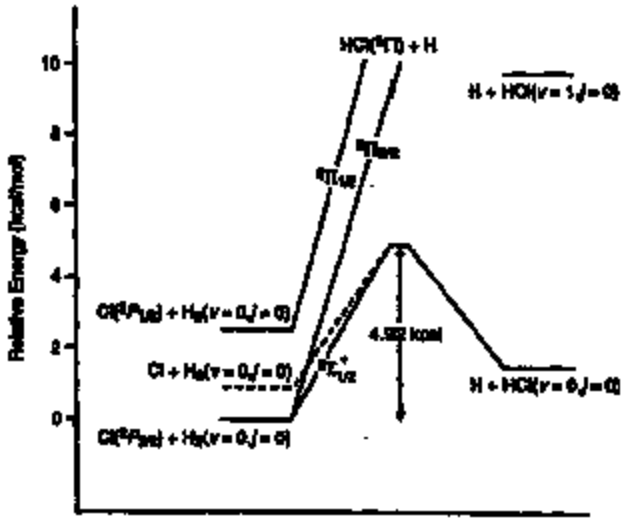

Fig. 1. Schematic plot of the energetics of the Cl + H_2 reaction. The relative reactant energies, the position of the barrier, and the position of the indicated HCl product channels are drawn to scale. All energies include zero-point corrections; those for the barrier were determined from the constants published by Stark and Werner [table II of (*18*)]. Linear-molecule Σ and Π state labels are used, which is appropriate for a collinear transition state. The dashed line indicates the schematic reaction profile for single-surface calculations based on the BW2 PES, in which the SO Hamiltonian is not included.

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PESs and to the two SO coupling functions (*21*). Their calculations extend the earlier work of Bian and Werner (*18*), which was limited to the lowest electronically adiabatic ClH_2 PES.

In the Cl + H_2 arrangement, there are six electronic states. These correspond to the three spatial orientations of the 3*p* hole on the Cl atom and the two possible spin-projection quantum numbers. In each H + HCl product arrangement, we neglect the high-lying Π states of HCl (*22*). In general, outside the reactant arrangement, the description of the Cl + H_2 system is unchanged from the original BW2 fit (*18*), which was limited to the lowest electronically adiabatic PES.

If the sum of the electronic interaction Hamiltonian plus the SO coupling in the 6 × 6 electronic basis is diagonalized at each value of the coordinates, the lowest root will define what we will call the fully (electronic + SO) adiabatic Capecchi-Werner (CWad) PES and corresponds to the reactive PES illustrated schematically in Fig. 1. This PES differs from the BW2 PES (*18*), which is obtained by diagonalizing only the electrostatic Hamiltonian, without inclusion of the SO Hamiltonian.

The SO Hamiltonian couples the reactive PES ($^2\Sigma_{1/2}$ in linear geometry) with the two repulsive PESs ($^2\Pi_{3/2}$ and $^2\Pi_{1/2}$ in linear geometry). Because the latter are so much higher in energy at the barrier, inclusion of the SO coupling has a negligible effect at the barrier. However, inclusion of the SO coupling in the asymptotic reactant region lowers the lowest adiabatic PES by ≈1/3 the SO splitting of the Cl atom. Thus, when compared to the BW2 PES, the barrier to reaction on the CWad PES is ≈0.84 kcal/mol higher (*18*, *21*, *32*–*34*).

In addition to the electrostatic and SO Hamiltonians, it is also necessary to determine matrix elements of the orbital angular momentum of the triatomic system $L^2 = (J - l - s - j)^2$, where J is the total angular momentum, j is the rotational angular momentum of the diatomic moiety, and l and s are the electronic orbital and spin angular momenta (*21*).

With the required ClH_2 PESs in the diabatic basis, it is possible to carry out complete quantum scattering calculations. We draw from the formalism presented by Schatz on the Cl + HCl exchange reaction (*37*) and use the algorithms and computer program developed over the past decade by Manolopoulos and co-workers (*35*, *36*), extended, as we have described previously (*21*), to treat abstraction reactions involving an atom in a ^2P electronic state. The choice of integration parameters was identical to those adopted in the single-state studies of the Cl + H_2 reaction (*14*).

We obtain, at each value of the total angular momentum J, probabilities for transition from a given initial state to any particular final state of either the reactants (an inelastic collision) or products (a reactive collision). By summing the latter over all accessible product states and averaging over the rotational ($2j + 1$) and electronic ($2j_a + 1$) degeneracy of the initial state ($j_a = 3/2$ or $1/2$), one extracts a total probability for reaction.

In Fig. 2 we compare, at the lowest value of the total angular momentum ($J = 0.5$), the calculated total probabilities for reaction of H_2 in $v = 0$, $j = 0$ (the lowest rotational level of *para*-H_2). The multistate results, determined with the full set of diabatic PESs, are compared in Fig. 2 with the $J = 0$ transition probabilities, as predicted by single-state calculations on the CWad PES. In the latter calculation, both the SO and electronic-orbital angular momenta of the Cl atom were neglected, as in any standard single-state treatment of a triatomic reaction (*13*, *14*, *35*, *36*). The reaction probabilities are plotted as a function of collision energy, which is the fundamental dynamical variable in a molecular beam experiment. Thermal rate constants could then be obtained by integration over a Maxwellian distribution of collision velocities, although an equally valid expression involves integration over the total (collision + internal) energy of the "cumulative reaction probability" (*32*).

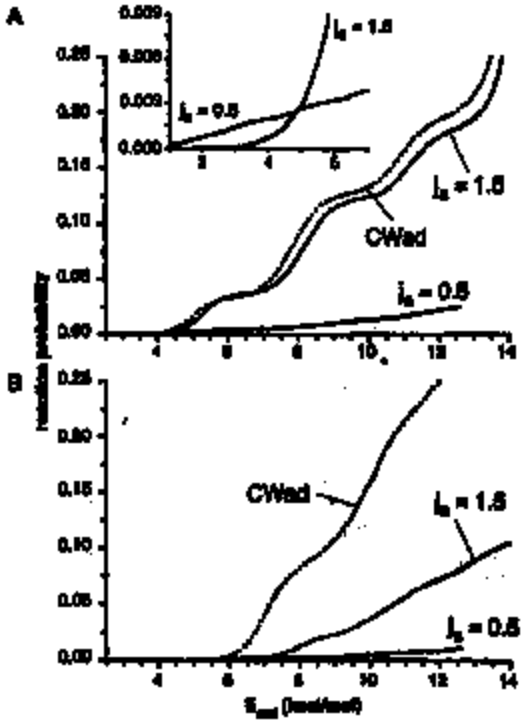

Fig. 2. (A) Probabilities for reaction of Cl in the $j_a = 3/2$ ($^2P_{3/2}$) and $j_a = 1/2$ ($^2P_{1/2}$) SO states with H_2 ($v = j = 0$) for $J = 0.5$. The abscissa is the collision energy. Also shown are reaction probabilities determined from single-state calculations based on the fully adiabatic (CWad) PESs for $J = 0$ but divided by a factor of 2. (Inset) The low-energy behavior of the multistate probabilities. (B) Similar reaction probabilities, but for $J = 17.5$.

In the multistate treatment, four states correlate with the ground-state reactants Cl($^2P_{3/2}$) + H_2; namely, as seen in Fig. 1, $\Sigma_{a1/2}$ and $\Pi_{a,3/2}$. Of these, the Π states are unreactive, within the BO approximation, so that, to zeroth order, only 50% of the reactants will approach on a PES that leads to reaction. However, in the single-state calculations, one assumes that all (100%) of the reactants will approach on the reactive PES. To take into account this fundamental difference, previous investigators (*21*, *37*) have divided the single-state results by a factor of 2 to compare with the cross sections and probabilities for reaction out of the $j_a = 3/2$ level of a ^2P atom obtained from multistate calculations.

The probability for (adiabatically forbidden) reaction out of the excited ($j_a = 1/2$) SO state of Cl is much smaller than the probability for the adiabatically allowed reaction of the ground SO state. Only at collision energies below the zero-point corrected barrier to reaction [$E_{coll} < 4.93$ kcal/mol (Fig. 1)] does the adiabatically forbidden channel start to dominate, because the threshold for reaction of the excited SO state is 2.52 kcal/mol lower.

We also observe that the reaction probabilities predicted by single-state calculations on the fully adiabatic CWad PES agree very well with the multistate probabilities for the adiabatically allowed channel. As discussed above, the single-state probabilities have been divided by 2. Because the excited Π states are very high in energy in the region of the barrier, the topology of the barrier, which controls the flux from reactants to products, is virtually identical in the multistate and single-state calculations.

The pronounced sawtooth-like structure in the reaction probability out of the lower (adi-

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abatically allowed) SO state corresponds to the successive opening of additional vibrational states at the barrier.

The lower panel of Fig. 2 displays similar reactive transition probabilities, but for J = 17.5. Again, the CWad probabilities have been divided by 2. At this higher angular momentum, the centrifugal barrier has increased. Consequently, the threshold for reaction occurs at a higher collision energy. At J = 17.5, the multistate reactions are now substantially smaller than those predicted by the single-state CWad calculations, even after division by 2. Similar comparisons at other values of J reveal that as J increases, the multistate reaction probabilities become increasingly smaller than the comparable single-state probabilities. Because the discrepancy grows roughly linearly with J, Coriolis coupling would seem to be responsible.

In the single-state calculations, only three outcomes of a collision are possible: (i) elastic scattering, (ii) inelastic scattering on the reactive PES, or (iii) reactive scattering. In the multistate calculations, additional inelastic channels are present for collisions of Cl in its ground SO state with H_2, namely (Fig. 1) (iv) elastic and inelastic scattering on the repulsive ($^2\Pi_{3/2}$) PES; (v) inelastic scattering from the ($^2\Sigma_{1/2}$) PES to the ($^2\Pi_{1/2}$) PES, which will be accompanied by SO excitation of the Cl atom without reaction; and (vi) inelastic scattering from the reactive ($^2\Sigma_{1/2}$) PES back to the $^2\Pi_{3/2}$ PES. The last process will yield Cl in its ground SO state, accompanied by rotational and/or vibrational excitation of the H_2. At low J, these additional inelastic channels do not seem to deplete the reactive scattering, because the single- and multistate reaction probabilities shown in Fig. 2A are virtually identical. However, a difference between the single-state and multistate probabilities for reaction of Cl($^2P_{3/2}$) does emerge as J increases (Fig. 2B). It is the inelastic channels that are responsible for this difference.

We find that the sum of the reactive and inelastic transition probabilities as predicted by the multistate calculations at J = 0.5 and 17.5 agrees very closely with a similar sum, but divided by a factor of 2, of the inelastic and reactive probabilities predicted by the single-state CWad calculations at J = 0 and 17. Because this agreement is obtained by dividing the single-state results by a factor of 2, we conclude that incoming flux on the repulsive $^2\Pi_{3/2}$ PES (Fig. 1) has an insignificant probability of either reaction (as discussed above) or inelastic scattering.

Because at higher J the summed (inelastic + reactive) probabilities agree whereas the reactive probabilities are significantly lower for the multistate (as compared to the single-state) calculations (Fig. 2), we conclude that, at higher J, the multistate inelastic probabilities must exceed those predicted by the single-state calculations. This is indeed the case, as illustrated in Fig. 3.

At low energy, below the barrier to reaction, the multistate calculations at J = 17.5 reveal a pronounced oscillatory structure. This structure is the manifestation of quantum interference between trajectories that undergo an inelastic transition from the less repulsive $^2\Sigma_{1/2}$ PES to the more repulsive $^2\Pi_{3/2}$ PES when the system passes through the zone of strong nonadiabatic coupling as the atoms approach and then again as they recede, having bounced off the barrier to reaction (*38*).

As the collision energy rises above the barrier, the inelastic probabilities predicted by the CWad single-state calculations remain relatively independent of J. However, the multistate inelastic transition probabilities show a pronounced increase. This is a consequence of the presence of an additional electronic channel(s), not present in the single-state calculations.

In a linear molecule, the non-BO coupling between $^2\Sigma_{1/2}$ and $^2\Pi_{3/2}$ states is due to "L-uncoupling" (*39*), which arises from the J-L term in expansion of the L^2 operator. Further investigation shows that the J-dependent enhancement of the inelastic probabilities in the multistate calculations can be attributed predominately to rovibrational excitation of the H_2 molecule without excitation of the Cl atom and hence corresponds (Fig. 1) to transitions from the $^2\Sigma_{1/2}$ to the $^2\Pi_{3/2}$ PESs.

Integral cross sections are proportional to the sum over J of the transition probabilities weighted by $(2J + 1)$ (*21*). In general, as the collision energy increases, successively greater values of J contribute. Because the multistate reaction probabilities are increasingly depressed at higher J (compared to the single-state probabilities), we expect that the increase of the multistate reactive cross sections with increasing collision energy will be smaller than the prediction from single-state calculations on the CWad PES. This is indeed the case, as shown in Fig. 4.

In the experiments of Liu and co-workers (*4–6*), only the lowest three (j = 0, 1, and 2) rotational levels of H_2 are present in the beam. By weighting the cross sections out of each j level by the experimental populations of these levels, we can obtain reactive cross sections appropriate to the experiments with p-H_2 or n-H_2 (Fig. 5).

We observe, similarly to the transition probabilities, that the cross section for the adiabatically forbidden reaction of Cl in its excited SO state is small in comparison with that for reaction of the ground SO state, which is adiabatically allowed. Only at very low collision energy, where the adiabatically allowed reaction is throttled off by the large barrier, does the adiabatically forbidden reaction begin to dominate. This is a consequence of the greater internal energy of the excited SO state, which does, albeit inefficiently, allow the barrier to be surmounted. Figure 5 is qualitatively similar to our earlier predictions of the relative reactivity of the two SO states of the F atom (*21*).

Because the statistical degeneracy of the ground SO state of Cl is twice as large as that of the excited state, which is not taken into ac-

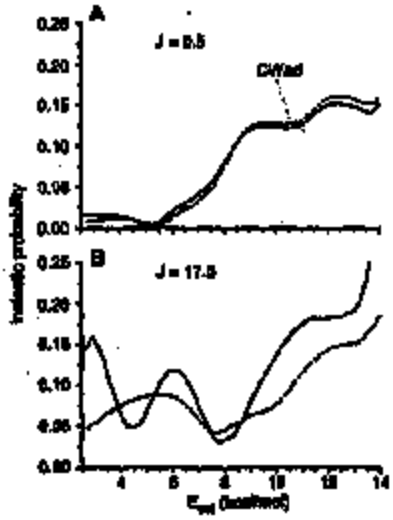

Fig. 3. (A) Solid curve indicates the inelastic transition probabilities for Cl(j = 3/2) + H_2(v = j = 0) for J = 0.5, summed over all energetically accessible final states. The abscissa is the collision energy. Dashed curve indicates a similar sum, but divided by 2, of inelastic transition probabilities from single-state calculations on the CWad PES for J = 0. The abscissa is the collision energy. (B) Similar plot of the inelastic transition probabilities but for J = 17.5 (J = 17 for the CWad calculations).

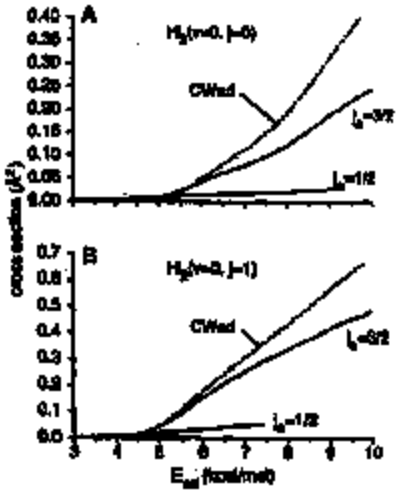

Fig. 4. Integral cross sections for reaction of Cl with H_2(v = 0, j = 0) (A) and with H_2(v = 0, j = 1) (B). Also shown are the predictions of single-state calculations based on the fully adiabatic (CWad) PES, divided by a factor of 2.

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ANN

Freeland, Mark (M.)

From: Akolkar, Shrikant (S.V.)
Sent: Thursday, May 30, 2002 1:59 PM
To: Spindler, Paul (P.G.); Page, James (J.A.); Gates, Jeff (J.A.); Uchwat, James (J.W.); Kouba, Eric (E.E.)
Cc: Maurer, James (J.B.); Freeland, Mark (M.); Gates, Freeman (F.C.)
Subject: Kevlico DPFE sensor form DCDC Tests

I would like to inspect EGR sensors that have partially, fully completed DCDC test under the microscope to determine the if they are still functional or failed & determine the failure appearance is same as seen on customer warranty vehicles. If you have any engines that are in or coming in near future for EMDO teardown, I would like to have those parts for inspection. The DCDC is the only test when EGR is functional. Pl. save the parts & let me know for pick up. Some background info is as follows-

All car/truck lines used same Kevlico DPFE seasor for EGR control. It's a huge warranty/recall possibility issue right now. The team consists of dozen or two members & 4 black belts with Jim Maurer as a leader. I am one of the black belts working with him. I appreciate any help our team can get from you to investigate the concern. Pl. let me know asap. Thanks.

With Regards,

SHRIkant Akolkar
sakolkar@ford.com Ph:(313) 594-1908 Fax::(313) 390-1229
Ford Motor Co. POEE AQ077 P.O.Box 2053 MD#36
Dearborn MI 48124 U.S.A.

ER82-627-C 3196

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTRW07W01KB09290	Veh Line:	T/F5 - F150/250(PN96)/F225-FORD (97-03)	Eng Serial No:	*
Model Year:	2001	Market Derived:	* - [N/A]	Body Style:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/VN - 8-M 4.6L SOHC EFI NA C
Inv. Dealer:	04437	Body Cab Style:	T/BC - DOUBLE CAB (CREW CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO A
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region: NA - [redacted] Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - [redacted] Prod Date: 26-MAR-2001

SALE INFORMATION:

Region: NA - [redacted] Selling Dealer: 152039 - *
Country: USA - [redacted] Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date:	04-APR-2001	Red Carpet Lease:	*
Sale Date:	15-JUN-2001	Fleet/Rental/Co. Lease:	R
Warranty Start Date:	15-JUN-2001	Modified Vehicle:	*
Orig Warranty Date:	15-JUN-2001	Remarketed Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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1FTRW07W01KB09290 5 2 D8C6003     5C XW  U13F95 BN N  25 10 M6  B  52C103 B1  YZ  W  X23 4   5  W1
F250 0 C    A 507A 9HUTXL
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T7B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BA	GVW Class Code:	R
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGIAB - NON-LIMITED SLIP REAR AXLE	Mirror(Pasgr Side):	* - [N/A]
Battery Amp Rating:	ME	Paint:	PNYW3 - OXFORD WHITE SOLID CC
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELITE PREM AM/FM STEREO/CSC
Calibration Code:	1F314M0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	600ZV -	Tire Manufacturer:	AD - GENERAL
Delivery Type:	0	Tire Brand:	A3CU44E - GRABBER AW 109S
Driveshaft Code:	P	Tire Size:	D3JWC - P255/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	A3CU44E4900	RF:	A3CU44E4900
LR:	A3CU44E4900	RR:	A3CU44E4900
LI:	*	RI:	*

SPARE: A3CU44E4900 DOT Plant Manufacturer: A3 - GENERAL TIRE & RUBBER CO ; MOUNT VERNON ; ILLINOIS ; UNITED STATES

ESP INFORMATION:

ESP Code:	
ESP Coverage(Miles):	
ESP Coverage(Time):	
ESP Plan Year:	
ESP Signature Date:	

EMISSIONS INFORMATION:

Emission Code:	T/S - T/S
Emission Cert Type:	5
Emission Decal fmlbk:	HAT
Engine Family:	1FMXT054PP5

Any comments? You can contact

webmaster

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, December 20, 2002 2:43 PM
To: Dyson, Simon (S.C.); Harrigan Sr., Mike (M.J.); Gullen, Gayle (G.D.); Carter, Roscoe (R.O.); Holubka, Joe (J.W.); Stephan, Craig (C.H.); Doadall, James (J.M.)
Subject: Focus Stalls Warranty Data

I have broken the 2.0L Zetec Focus Stalls warranty data down by causal part.
You may like to review this data before our next meeting.

The graphs are formatted to print out on three pages.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

5082-827-C 3284

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Thursday, December 12, 2002 9:19 AM
To:	Lovelace, Maria (M.E.)
Subject:	RE: Kavlico TM dPFE sensors

Maria,

Thanks again. I hope that our paths will cross again in the future.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

----Original Message----

From:	Lovelace, Maria (M.E.)
Sent:	Wednesday, December 11, 2002 1:38 PM
To:	Freeland, Mark (M.)
Subject:	RE: Kavlico TM dPFE sensors

Mark
thank you for the very kind note which I will pass on.

I would like to wish you a very Merry Christmas and a Happy New Year also. It was a pleasure working with you.

----Original Message----

From:	Freeland, Mark (M.)
Sent:	Wednesday, December 11, 2002 1:09 PM
To:	Lovelace, Maria (M.E.)
Cc:	Maurer, James (J.B.); Williamson, Richard (E.)
Subject:	Kavlico TM dPFE sensors

Maria,

I am in the process of phasing out of work on the Kavlico TM dPFE sensor, so I will not be needing any additional post 1/7/2002 build date field returns. However, Jim Maurer from Powertrain may still be interested in additional samples. If he is I am sure he will let you know.

I also want to thank you and you're team of Field Quality Engineers for the valuable support you provided me over the past 9 months. It was very valuable to get the failed parts "fresh" off the vehicles, rather than waiting for parts to filter in through WPRC. In the case of this sensor it seems to make a difference as to whether the parts are inspected soon after failure, or after warehouse storage for some time.

Learning's from the parts you sent helped us to design a electrically more robust TM part. I am expecting first

samples of the new design for testing in the next day or so.

Please pass on my thanks to the FQEs who did the work.

Hope you all have a very merry Christmas and a prosperous new year.

Regards

Mark Freeland

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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

EX02-627-C 3286

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Wednesday, December 11, 2002 1:03 PM
To:	Lovelace, Maria (M.E.)
Cc:	Maurer, James (J.B.); Williamson, Richard (E.)
Subject:	Kavlico TM dPFE sensors

Maria,

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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

To: Klostermeyer, Ken (K.P.)
Cc: Johnson, Joseph (J.H.)
Subject: FW: BB looking for projects

Ken, since there are two of them, how about sending the second one to Kavlico? Or were you going to send Jim Maurer?

—Original Message—
From: Johnson, Joseph (J.H.)
Sent: Friday, March 23, 2001 2:39 PM
To: Klostermeyer, Ken (K.P.)
Subject: RE: BB looking for projects

Ken, I discussed this with Mark Flower, the Director of Plant Operations at Standard Mems (SMI), and he would welcome a black belt to work with them. He has been able to leverage some help from the state of New York for basic training of his personnel, but needs some higher level intervention at this point.

—Original Message—
From: Klostermeyer, Ken (K.P.)
Sent: Friday, March 23, 2001 7:36 AM
To: Finn, Sharl (S.L.); Foster Jr., Elmer (E.S.); Jasinski, Walt (W.J.); Johnson, Joseph (J.H.); McRoy, Gitanjli (G.); Smaldone, Ronald (R.P.); Czaplala, Michael (M.D.); Gates, Freeman (F.C.); Kaput, Michael (M.R.)
Subject: FW: BB looking for projects

Any takers. Joe, can one of these guys work with the Kavlico Sub Supplier

—Original Message—
From: El-Haik, Basem (B.S.)
Sent: Friday, March 23, 2001 7:25 AM
To: Beamer, Jerry (J.D.); Fyfe, Vincent (V.L.); Kaput, Barb (B.J.); Klostermeyer, Ken (K.P.); Kwasnicka, Chuck (C.R.); McCarthy, Thomas (T.A.); Pandolfi, Pete (P.G.); Ramufck, Rick (R.J.); Sears, Renee (R.T.); Sventickas, Ed (E.); Vrsek, Gary (G.A.)
Cc: Paschi, Frank (F.)
Subject: BB looking for projects

Champions,

Two Ford Research Laboratory Black Belts, Chris Gearhart and Ted Jensen, are looking for projects in V-engine. Please, contact them ASAP with project ideas. Have a nice day.

Sincerely;
Dr. Basem El-Haik; MSB, CQE, CQA, ES
V- Engine Engineering Dept
POEE Bldg., MD: 10
21500 Oakwood Blvd.
Dearborn, MI 48121
Tel.: (313) 323-2226

To: Klostermeyer, Ken (K.P.)
Cc: Johnson, Joseph (J.H.)
Subject: FW: BB looking for projects

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Subject: FW: BB looking for projects

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Sent: Friday, March 23, 2001 7:25 AM
To: Beamer, Jerry (J.D.); Pyle, Vincent (V.L.); Kaput, Barb (B.J.); Klostermeyer, Ken (K.P.); Kvasnicka, Chuck (C.R.); McCarthy, Thomas (T.A.); Pandolfi, Pete (P.G.); Renwick, Rick (R.J.); Sears, Renee (R.T.); Sventickas, Ed (E.); Vrsek, Gary (G.A.)
Cc: Fesdrt, Frank (F.)
Subject: BB looking for projects

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Dearborn, MI 48121
Tel.: (313) 323-0920

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Thin Solid Films 371 (2000) 278–282

Thin Solid Films

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Microstructure of thermal hillocks on blanket Al thin films

Deok-kee Kim[a,*], Birgit Heiland[c], William D. Nix[b], Eduard Arzt[c], Michael D. Deal[a], James D. Plummer[a]

[a] *Center for Integrated Systems, Stanford University, Stanford, CA 94305, USA*
[b] *Department of Materials Science and Engineering, Stanford University, Stanford, CA, USA*
[c] *Max-Planck-Institut für Metallforschung, Stuttgart, Germany*

Received 9 October 1999; received in revised form 11 February 2000; accepted 11 April 2000

Abstract

The microstructure of thermal hillocks on blanket Al thin films has been studied for the first time by several techniques, including sectioning and imaging in a focused ion beam system. It is found that the new material in the hillock area lifts the original film up and in some cases penetrates it. The micrographs also reveal the grain structures and give valuable insight into the mechanisms of hillock growth. © 2000 Elsevier Science S.A. All rights reserved.

Keywords: Aluminum; Hillock formation; Microstructure; Focused ion beam; Creep deformation; Stress relaxation

1. Introduction

Thin metallic films are widely used as components in microdevices. Because of their potential limitations on device reliability, mechanical stresses in such thin-film systems have been studied extensively [1]. It is generally found that thin films support much higher stresses than bulk materials of similar composition; this observation has been attributed to constraints on lattice defects due to the fine microstructures and the influence of the substrate. Consequently, stress relaxation, which requires the movement of dislocations is more difficult than in large-scale materials and is, despite recent modeling attempts, not fully understood.

An important source of mechanical stress in thin films is the thermal mismatch between the film and the substrate material. Depending on the sign of the mismatch and of the temperature change, tensile or compressive stresses can develop in the film. One mechanism of compressive stress relaxation which is specific to thin films is the formation of hillocks, i.e. extrusions of material out of the plane of the film. Such hillocking, which results in considerable roughening of the film surface, has frequently been reported in the literature [2–6]. However, the structure of the hillocks has not been investigated in detail. Also the exact mechanism of hillock growth, apart from some suggestions involving condensation of atoms along dislocation lines, remains unclear.

The purpose of this paper is to report the microstructure of thermal hillocks on Al films. The micrographs were obtained by several methods, i.e. side-view scanning electron microscopy (SEM) and cross-sectional transmission electron microscopy (TEM). The most detailed insight resulted from sectioning and viewing selected hillocks with a focused ion beam (FIB). Based on the microstructural information, a possible

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E-mail address: deokkee@leland.stanford.edu (D. Kim).

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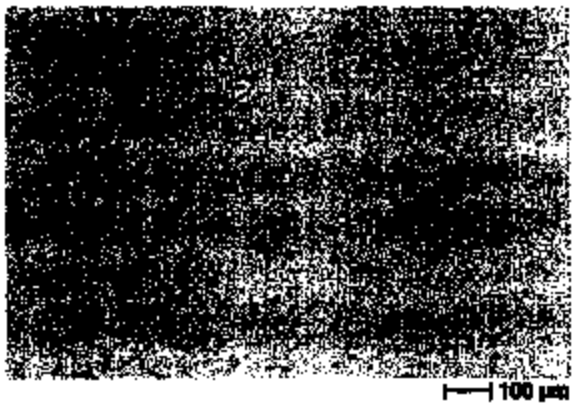

Fig. 1. Optical micrograph of a film after annealing in plan view.

mechanism for the growth of these hillocks is suggested. A more thorough quantitative analysis which includes a mathematical modeling will be published elsewhere [7].

2. Experimental

Pure Al films of 1 μm thickness were magnetron sputter-deposited at room temperature onto Si (100) wafers coated with 0.2 μm LPCVD SiO_2. The Al films were first passivated with a 0.3-μm thick TiW layer, which was subsequently removed by plasma etching. The purpose of the TiW films was to suppress hillock formation in the experiment that we originally planned (not described here). The films were annealed for 2 h at 450°C in forming gas which is composed of 5% H_2 and 95% N_2. Because of the higher coefficient of thermal expansion of the film relative to the substrate, this anneal produced a compressive stress in the film which amounted to several hundred MPa (Fig. 6). Following the anneal, the films were cooled in air. Stress measurement was made by measuring wafer curvature during thermal cycling; thermal cycle includes a 2 h hold at 450°C.

The microstructure of the films was examined by plan view optical and side view scanning electron microscopy using a Hitachi S-800. For closer inspection of individual hillocks, TEM cross-section specimens were prepared in the following way [8]: the Si wafers, containing Al films, were cut and glued together. The glued specimen was cut into thin slices using a diamond saw and 3-mm-diameter disks were cut from the slice. The disks were thinned on a grinding wheel, dimpled, and ion milled to electron transparency. TEM micrographs were taken with a Philips CM20 at an accelerating voltage of 200 kV and typical magnifications of 13000–17500.

The additional use of a focused ion beam (FIB) system offers the advantage of sectioning selected hillocks with high precision. The cross-section can then be imaged by collecting the secondary electrons; because the ions are subjected to a strong channeling effect, the resulting micrographs exhibit clear grain orientation contrast and hence allow thorough analysis of the grain structures. In this study, an FEI FIB 200 workstation with 30 kV accelerating voltage was used; sectioning was performed with an ion current of 1 nA, followed by cleaning at 150 pA and imaging at 70 pA.

3. Results and discussion

Whereas the as-deposited films were planar, the annealing resulted in extensive hillocking as can be seen by optical and scanning electron microscopy (Figs. 1 and 2). The hillocks are homogeneously distributed and have a typical spacing of approximately 70 μm. Typical dimensions of a hillock are 4 μm in width and in height. Cross-sectional TEM reveals the microstructure of the film between the hillocks and of an individual hillock (Fig. 3). Note that the film consists of columnar grains (Fig. 3b), which have grown during the anneal from an initial size of approximately 69 nm to a final size of 90 nm. These values are unusually small in comparison to other studies where grain sizes of the order of the film thickness are commonly found [3,6,9]. This can be attributed to the room-temperature sputtering process and subsequent grain boundary pinning during the annealing by sizeable contents of O, Ti and W impurities which were found to be present by EDS measurements. Small amounts of Ti and W seem to have been incorporated into the Al film, due to the TiW layer which has been removed before the anneal. At the site of the hillock, new material has been deposited between the film and the substrate, displacing the original film upward (Fig. 3a).

While the exact location of the cross-section with respect to the hillock cannot be inferred in the TEM micrograph, some hillocks were sectioned along their central axis by FIB (Fig. 4). Fig. 4a is an example of a hillock in which the original film has been lifted in a similar way to Fig. 3a; it is remarkable that the hillock has an almost perfectly conical shape and that the original film appears to be largely intact. A more extreme case is illustrated in Fig. 4b where the newly deposited material has penetrated the original film and formed a nearly spherical cap. Of particular interest is the grain structure of the new material: Fig. 4 reveal that the grains in this region are not all columnar and their size greatly exceeds that in the original film. Note also that the grain size increases from the film/substrate interface to the top of the hillock; in Fig. 4b new grains even seem to have nucleated in the 'cap' region.

The unexpected microstructures of the hillocks visible in Figs. 3 and 4 have not been reported in the literature before. They provide insight into possible

Fig. 2. Scanning electron micrographs of (a) a single hillock, (b) an anomally big hillock.

mechanisms of hillock growth. We propose the following sequence of events (Fig. 5):

1. Preferred nucleation sites for thermal hillocks are locations at the weakly bonded film/substrate interface, where delamination occurs due to very high compressive stresses in these films. This allows the interface to act initially as a sink for atoms. The regularity of the arrangement of hillocks may be associated with the stress relaxation zones surrounding each hillock.
2. Hillock growth occurs by diffusion of atoms, under the action of the compressive stress, from the vicinity of a nucleation site to the site of the hillock.

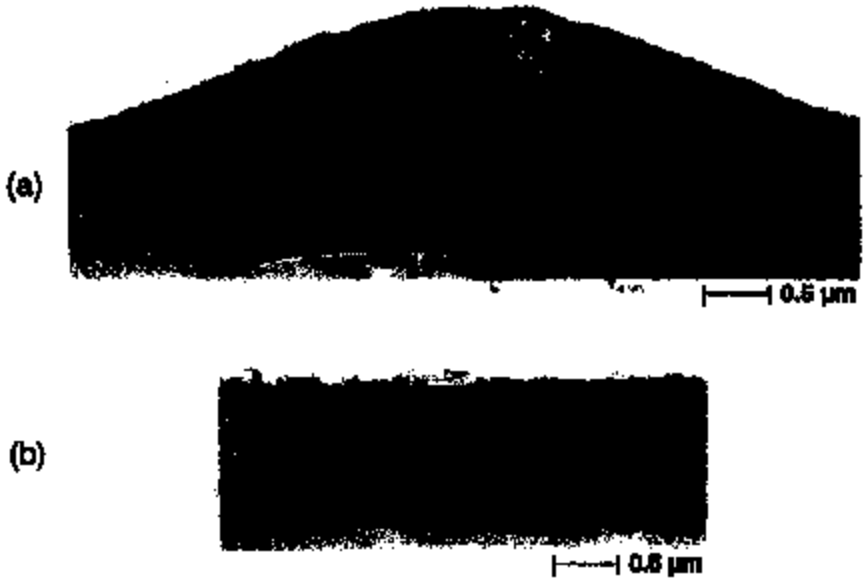

Fig. 3. Cross-sectional TEM images of (a) a hillock, (b) the film remote from a hillock.

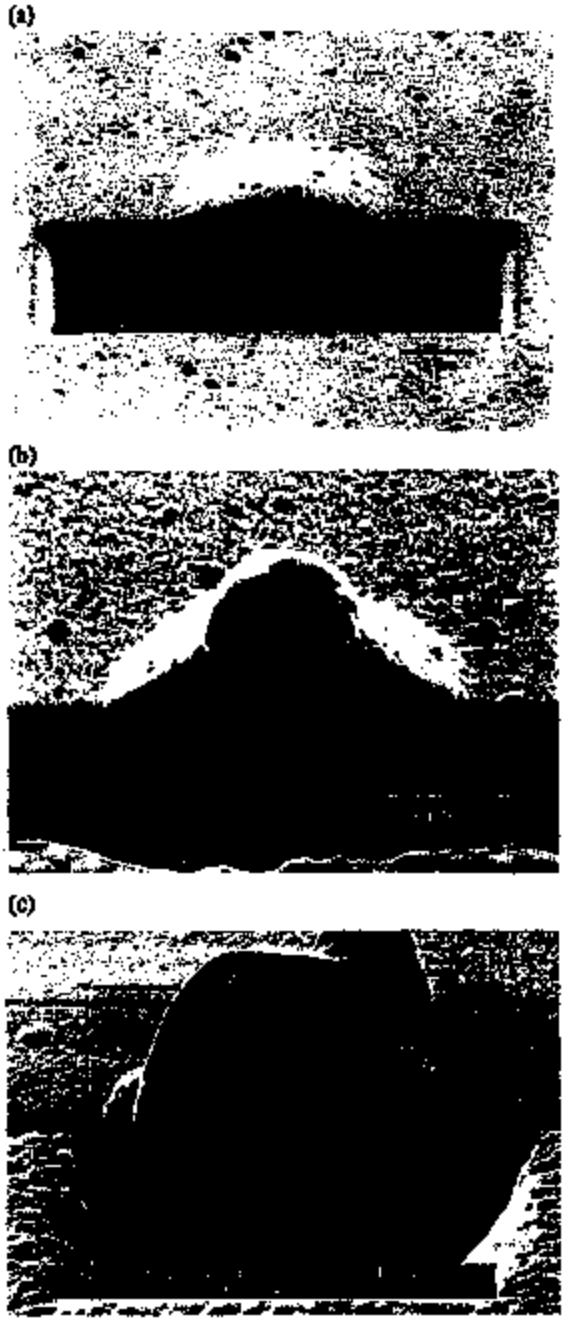

Fig. 4. Focused ion beam (FIB) images of hillock cross-sections: (a) cone-shaped hillock, (b) hillock with spherical 'cap', (c) hillock which has completely penetrated through the original Al film.

The most likely atom sources are the columnar grain boundaries of the original film, where the chemical potential for atoms is raised due to the compressive stress. The diffusion path is, depending on the temperature, the grain boundary, the film/substrate interface or the lattice. The first-arriving atoms are deposited at the film/substrate interface where new grains are nucleated. Subsequently-arriving atoms are deposited at the interfaces between the original film and the hillock material. In this way the grain size can increase in the direction normal to the film surface. Alternatively, the arriving atoms may have been plated at the film/substrate interface and grain growth may have occurred in-situ to adjust the grain size to the new film thickness.

3. During deposition of the atoms, the original film is displaced upward and stays intact at first. It is likely that the bending of the film is controlled by creep deformation and exerts a back stress on the material beneath. Once the film deformation exceeds a critical value, it fractures and new material penetrates to the top. To minimize the surface area, it forms a spherical cap.

One of the most striking observations is the grain structure in the hillock region which differs substantially from that of the original film. The large grains are believed to result from the combination of two factors: first, growth of these regions occurs at an elevated temperature of 450°C at which atom mobility is high; and, second, the material there is much purer than the original film because the diffusion process has left behind the impurities present in the film. It is not clear how the new grains in the cap region of Fig. 4b have nucleated.

Finally, we attempt to estimate the amount of stress relief caused by the formation of the hillocks in these films. The stress relief can be approximated by

$$\Delta\sigma = M\frac{\Delta V/A}{2t_f} = M\frac{(A_{base}\times h)/A}{2t_f} \quad (1)$$

where M is the biaxial modulus and t_f the thickness of the film, ΔV the excess volume of a hillock assumed to be cylinder-shaped with base area A_{base} and height h. A is the film area per hillock, which is assumed to be $70^2 = 4900\ \mu m^2$ using the average hillock spacing 70 μm (Fig. 1). Using a value of 100 GPa for the biaxial modulus, we obtain a theoretical stress relief of approximately 510 MPa. This value is reasonable in view of the total stress relief (approx. 700 MPa), inferred from the stress measurements during thermal cycling, as shown in Fig. 6. The dominant stress relief mechanism in the Al film under study appears to be hillock formation.

Fig. 5. Schematic of the likely mechanism of hillock growth.

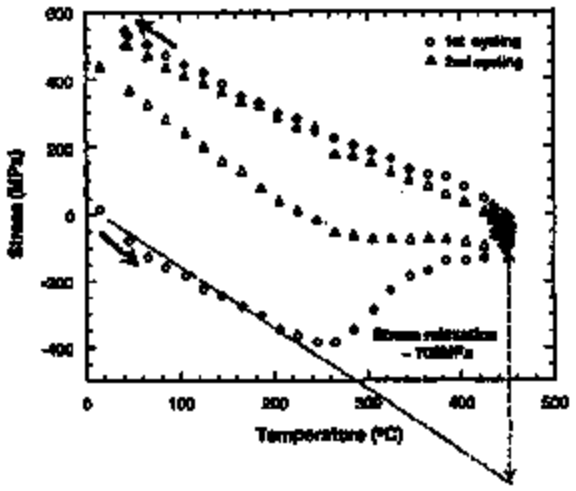

Fig. 6. Stresses vs. temperature during the first and the second thermal cycling of the Al film.

4. Conclusion

We have characterized the microstructure of thermal hillocks in Al films which had been annealed at 450°C. At the sites of the hillocks, the original films are found to be displaced by material inserted under them to give hillocks with a conical shape. The micrographs also reveal the grain structures and give valuable new insight into mechanisms of hillock growth. Based on the microstructural observations, we propose that the hillocks grow by diffusion of atoms from the vicinity to the interface between the original film and the newly-deposited material. The stress relief due to hillock growth is estimated from the size and spacing of the hillocks and found to amount to reasonable values. Hillock formation appears to be the dominant stress relief mechanism in the Al film under study. The proposed hillock model may not be applicable to all kinds of hillocks, but seems to describe the experimentally observed hillock formation in these small-grained films.

Acknowledgements

This work was funded by Semitech, SIA, and DARPA under the MARCO Interconnect Focus Center Program.

References

[1] W.D. Nix, Metall. Trans. A 20 (1989) 2217.
[2] P. Chaudhari, J. Appl. Phys. 45 (1974) 4339.
[3] C.Y. Chang, R.W. Vook, Thin Solid films 228 (1993) 205.
[4] D. Gerth, D. Kaiser, R. Schwarzer, Mater. Sci. Forum 94–96 (1992) 557.
[5] E. Iwamura, T. Ohnishi, K. Yoshikawa, Thin Solid Films 270 (1995) 450.
[6] B. Baccomier, G. Lormand, M. Papoplestro, M. Achard, A.-M. Papon, J. Appl. Phys. 64 (1988) 6485.
[7] D.-K. Kim, W.D. Nix, M.D. Deal, J.D. Plummer, Creep-controlled diffusional hillock formation in blanket aluminum thin films as a mechanism of stress relaxation (to be published in J. Mater. Res.).
[8] J. Brawman, R. Sinclair, J. Electron Microsc. Tech. 1 (1984) 53.
[9] R. Venkatraman, S. Chen, J.C. Bravman, J. Vac. Sci. Technol. A 9 (1991) 2536.

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Microelectronic Engineering 50 (2000) 301–309

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Kinetics of hillock growth in Al and Al-alloys

Michał Zaborowski*, Piotr Dumania

Institute of Electron Technology, Al. Lotników 32/46, 02 668 Warsaw, Poland

Abstract

Hillock growth kinetics and size distribution were investigated in Al, Al:Si 1% and Al:Si1%:Cu 0.5% layers. Metallization surface was examined by optical, SEM and TEM microscopy, stylus profiling and an automatic method of hillock recognition from a microscope image. The method allowed for counting hillocks in a desired range of their diameter d. Surface density of hillocks was measured as a function of time of furnace annealing at 400°C and as a function of temperature of RTP annealing. A maximum hillock size was found to increase linearly with metallization layer thickness and with logarithm of annealing time. A total area occupied by hillocks was evaluated. Hillock density decreased versus $1/T$ with an activation energy of 0.28 eV for Al and 0.31 eV for Al:Si. It was found, that a normalized hillock density N may be expressed by a formula $N = N_0 \exp(-cd)$. Values for N_0 and c are given together with a short discussion. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Metallization; Aluminum thin film; Polycrystalline layer morphology; Hillock growth

1. Introduction

Aluminum-based metallization still remains the most commonly used material for interconnecting lines in silicon ICs and electro-mechanical microsystems. Polycrystalline Al layers alter their surface morphology as a consequence of heat treatment and other processes performed at elevated temperature (250–500°C). Large crystallites, so-called hillocks, can outgrow above the initial metal surface [1,2]. The driving force of hillock growth is a compressive stress caused by large mismatch of thermal expansion coefficients between Al and Si or SiO_2 substrate [3,4]. Hillocks are particularly undesirable in multilevel metal systems.

The aim of this work was to investigate both the growth kinetics and the size distribution of the hillocks.

2. Experimental

Samples were prepared by thermal oxidation of ⟨100⟩ oriented Si wafers to an oxide thickness of

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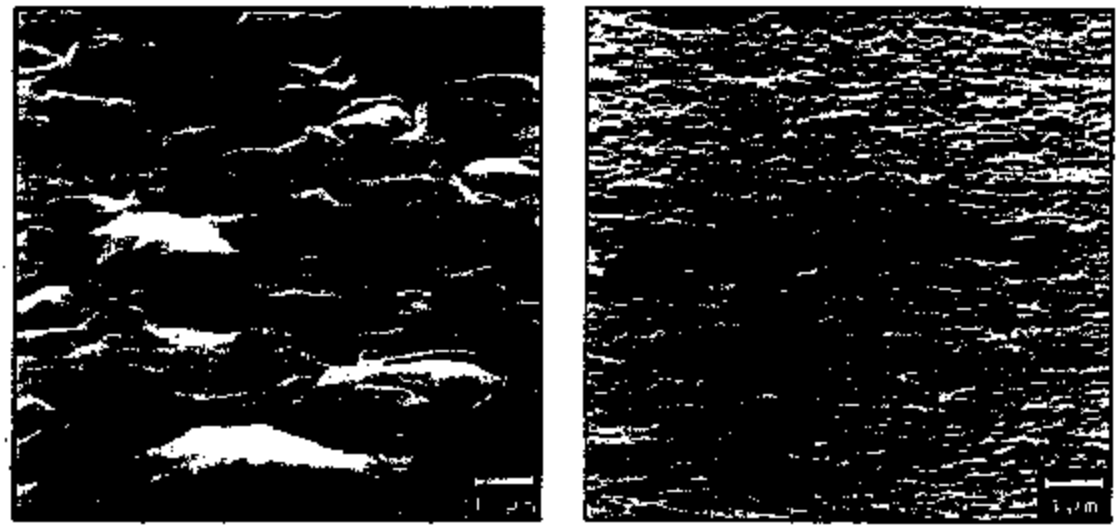
0.4 μm followed by magnetron sputter deposition of the metallization. The vacuum was better than 1×10^{-4} Pa and Ar pressure was equal to 0.5 Pa. We used pure Al 5 N, Al:Si 1% alloy or Al: Si 1%:Cu 0.5% alloy as a target material. Metal layer thickness ranged from 0.5 to 2.5 μm. Substrates were heated up to approximately 180°C before sputtering. The Al reference layers were produced by means of e-gun evaporation under the same temperature conditions. All samples were annealed in a furnace or RTP reactor. Nitrogen, hydrogen or argon were used as an annealing ambient. Metallization surface was examined by a number of methods: optical, SEM and TEM microscopy, stylus profiling and an automatic method of hillock recognition from a microscope image. The last method consists of the processing of surface images acquired by a monochromatic TV camera and allows hillock-like objects to be visualized separately and measured [5].

3. Results and discussion

All manufactured metallization layers were polycrystalline, with grain dimensions dependent on the layer thickness and annealing conditions. A ⟨111⟩ preferred orientation was found from XRD measurements. SEM micrographs revealed numerous hillocks protruded into the metal layer surface (Fig. 1). Shapes and sizes of hillocks involved in Al:Si:Cu alloy by a 30 min annealing at a temperature of 450°C differ significantly from those in Al and Al:Si metallization. No influence of annealing atmosphere (nitrogen, hydrogen or argon) on the surface morphology was noted. The stylus



a b

Fig. 1. Metallization surface examined by SEM after annealing (450°C, 30 min): (a) magnetron sputtered Al layer 1 μm thick; (b) similar layer of Al:Si:Cu alloy.

profiling method was useless in the case of Al:Si:Cu because of the relatively large radius of the tip (2.5 μm). This technique applied for Al and Al:Si metallization gave results comparable to the results of hillock recognition method. Nevertheless, this last method was extensively used in present investigations for reason of better hillock surface area estimation.

Hillocks start to grow up almost immediately at the beginning of annealing. Two-minute annealing of a 0.7 μm thick Al layer at the relatively low temperature of 400°C is sufficient for creation of small hillocks. Fig. 2 presents surface density of these objects as a function of the time of furnace annealing in flowing nitrogen. Hillocks are collected in 0.4 μm groups with regard to their average diameters, lower measurement limit is equal to 0.33 μm. Longer annealing does not change the population of hillocks inside each group noticeably, but induces greater hillocks. Smaller hillocks seem to be a source of larger ones, therefore it is evident that the hillock number is here in a kind of dynamic equilibrium. A maximum hillock size, defined as a diameter of 1% of the whole hillock population exhibiting largest dimensions in the examined surface, is presented in Fig. 3. The maximum hillock size depends nearly linearly on the logarithm of annealing time. Each curve represents a different wafer and a different metal deposition process. Generally, the values for an Al:Si alloy are close to those for pure aluminum. Maximum hillocks in Al:Si:Cu are several times smaller than in Al, after the same time of annealing.

Samples were divided into four parts and covered with an Al of different thickness in order to estimate the dependence of the maximum hillock size on the layer thickness. Fig. 4 shows the results of furnace annealing at a temperature of 400°C for 8 min in N_2. Maximum hillock size increases linearly with metallization layer thickness ranging from 0.5 to 2 μm, with some scatter from one sample to another. Changing the annealing conditions to 450°C and 5 min (wafer no. 4) does not influence the maximum hillock sizes.

The method of hillock recognition allows for summing the areas of all detected hillocks. A fraction of the sample surface occupied by hillocks increases during annealing (Fig. 5). The total hillock area

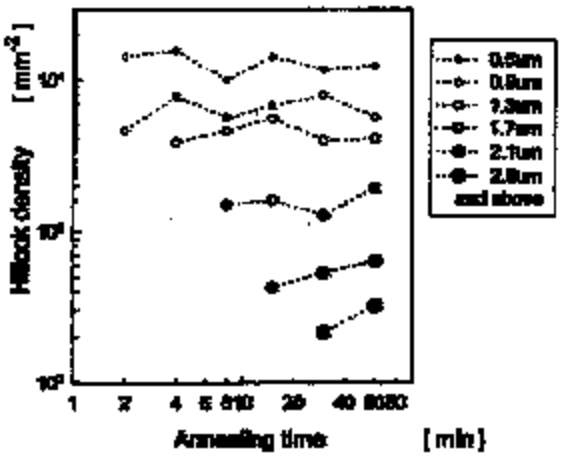


Fig. 2. Surface density of hillocks as a function of annealing time at a temperature of 400°C in N_2 for sputter-deposited Al layer of 0.7 μm thickness.

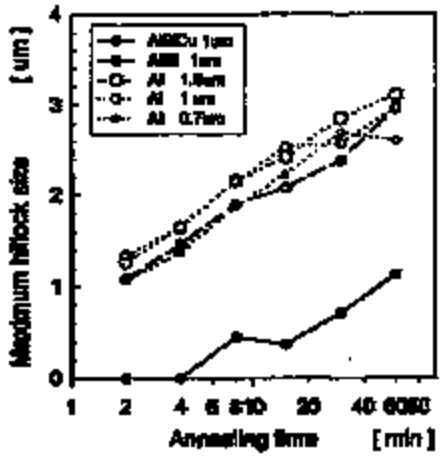


Fig. 3. Maximum hillock size as a function of annealing time at the temperature of 400°C in N_2, for Al:Si:Cu layer, Al:Si layer and three Al layers of different thickness.

does not exceed 3.5% in the aluminum layer. There is roughly two times less hillocks in the Al:Si layer than in pure Al after these rather low-temperature (400°C) annealings. Analogous ratio for the Al:Si:Cu metallization reaches 100.

The total hillock area varies with a metal layer thickness and annealing conditions. Fig. 6 presents results of hillock measurements after a 'moderate' annealing, performed at 400°C for 8 min, and a 'standard' annealing, at 450°C for 30 min. An influence of time and temperature product is predominant; however, both curves demonstrate similar features. The total hillock area decreases to zero for thin Al layers and saturates for the layers thicker than approximately 1.5 μm. Linear dependence of the area on the layer thickness can be easily explained because an average hillock size

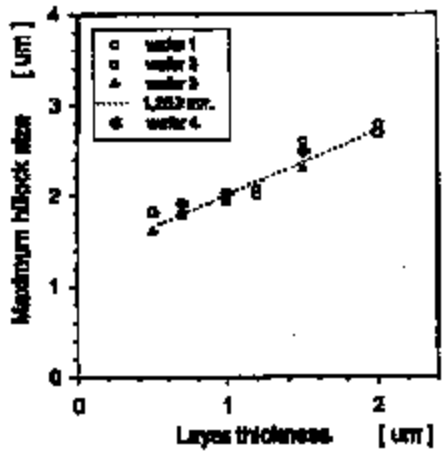


Fig. 4. Maximum hillock size versus Al layer thickness after furnace annealing at a temperature of 400°C for 8 min in N_2 (samples 1, 2 and 3). Sample no. 4 was annealed at 450°C for 5 min.

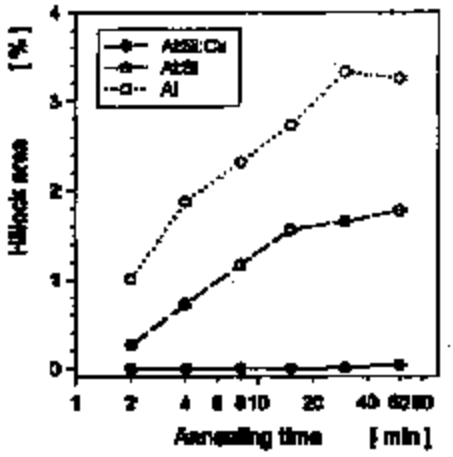


Fig. 5. Total area of hillocks normalized to the sample area as a function of annealing time at a temperature of 400°C in N_2 atmosphere for 1 μm thick Al and Al-based metallization layers.

is also proportional to the thickness of the Al layer in that range. Saturation of the plot, on the contrary, is less obvious. We may suppose that the reason for this phenomenon is a change of mechanism of hillock growth. Grains of the investigated 1 μm thick Al films were found to be columnar from TEM measurements, and the mean grain area was equal to 1.2 μm^2. The authors suppose that the shape of grains may be different in thicker films, but the problem was not studied in detail.

Surface density of hillocks rises with increase of the temperature of annealing. A series of isochronal annealings was performed using an RTP method and an argon atmosphere. A typical Arrhenius dependence was found versus $1/T$. Activation energies of total hillock density were

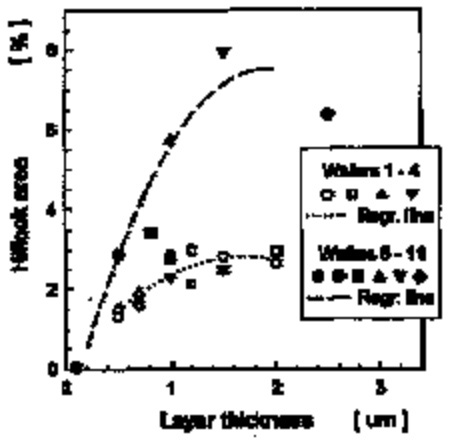


Fig. 6. Total area of hillocks normalized to the sample area versus Al layer thickness. Samples 1–4 were annealed at a temperature of 400°C for 8 min; samples 5–11 at 'standard' conditions (450°C, 30 min).

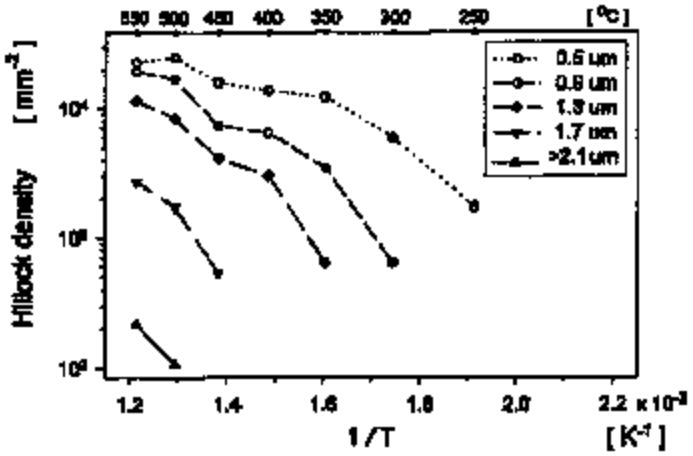


Fig. 7. Distribution of density of aluminum hillocks grouped with regard to their average diameters, as a function of reciprocal of temperature of 5 min isochronal annealings in an RTP reactor in an argon atmosphere.

calculated for the temperature range of 350–550°C, annealing time of 5 min, as 0.28 and 0.31 eV, for 1-μm thick Al and Al:Si layers, respectively.

Hillock size statistics depends also on the temperature of annealing. Fig. 7 displays the density of hillocks in an Al layer with a thickness of 1 μm as a function of $1/T$, with the average hillock diameter as a parameter. One can see that the slope of the density curves becomes higher for larger hillocks. An Arrhenius plot of the maximum hillock size represents a near straight line with an activation energy equal to 0.15 eV for Al and 0.17 eV for Al:Si.

A conclusion can be drawn from the above-presented plots that the surface hillock density, in general, decreases with the hillock diameter. A comparison of the hillock population was done for Al layers of different thickness, subjected to furnace heat treatment at a temperature of 400°C for 8 min in flowing N_2. Fig. 8 shows results for the layers of 0.7 and 1 μm. The hillock density versus hillock size curves do not fall monotonously after such moderate annealing, but its derivative with respect to hillock diameter shows a maximum for 1–1.5 μm hillock size values. This is close to a mean grain size which was established as 1.23 μm for a 1-μm thick Al layer. This suggests that the most probable mechanism of hillock growth during first few minutes of annealing is pushing out a whole grain of the film.

The above-mentioned phenomena have been investigated employing a short time and relatively low temperature of annealing. Such an approach allows for precise analysis of hillock growth kinetics. Nevertheless, the longer annealings have a more practical meaning. In order to effectively compare the morphology of the layers we have introduced a normalized hillock density N, defined as hillock number divided by the examined area of the sample and by the width of the range of diameters of hillocks taken into account. A unit of the normalized hillock density is $mm^{-2}\ mm^{-1}$ ($= mm^{-3}$). Normalized hillock density versus hillock size data for Al and Al-based metallization annealed at a temperature of 450°C for 30 min are gathered in Fig. 9. Data represent mean values from several samples, each layer thickness is equal to 1 μm. The previously mentioned increase of the density of hillocks with dimensions above 1 μm (in the case of a short annealing) is hardly visible here. The

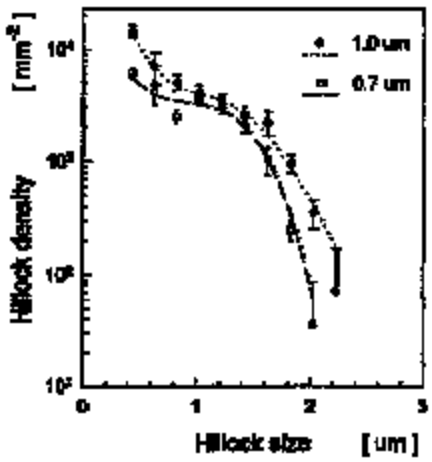


Fig. 8. Distribution of the hillock density versus hillock diameter for aluminum layers of different thickness. Vertical bars represent standard deviations of the measured values.

points for each kind of metallization are scattered near by a straight line in a logarithmic scale given by the formula:

$$N = N_0 \exp(-cd)$$

where d is hillock diameter, N_0 is the density of hillocks of diameter close to zero, and c is the curve slope. Layers made of e-gun-evaporated Al, sputter-deposited Al and Al:Si produce hillocks of similar density (dashed line in Fig. 9). An Al:Si:Cu alloy gives smaller density of hillocks, particularly those of larger size. Values of N_0 and c together with a standard deviation σ_n are gathered in Table 1. Some remarks related to presented parameters can be made. The grain density can be calculated from mean

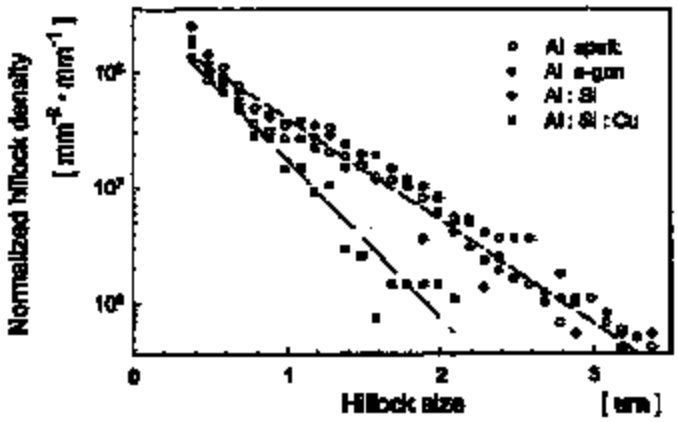


Fig. 9. Normalized density of hillocks versus hillock average diameter for often used metallization materials. Each point represent a mean value, calculated from a number of samples, annealed at a temperature of 450°C for 30 min. Dashed lines, approximate values for both Al together with Al:Si, and for Al:Si:Cu, respectively.

Table 1
Values of N_0, c and σ_n

Layer	c (μm^{-1})	N_0 (mm^{-2})	σ_n
Al, sputtering	1.85	2.07×10^{8}	0.25
Al, e-gun	2.03	3.33×10^{8}	0.33
Al:Si alloy	2.14	3.29×10^{8}	0.60
Al:Si:Cu alloy	3.18	4.05×10^{8}	0.45

grain size (1.23 μm) for aluminum layer. The value of N_0 does not exceed the mean grain density in the sputter-deposited Al layer, which is physically reasonable. It means that there are less potential hillocks than grains in Al metallization. A similar consideration for the Al:Si alloy (mean grain size of 1.95 μm) provides a conclusion, that each grain of the layer is accompanied by roughly two nuclei of hillocks. This gives evidence of the importance of Si-precipitations for hillock growth in this alloy.

4. Conclusion

In this paper new details of hillock behavior are described. The size distribution of the hillocks confirms that phenomena responsible for their growth have a statistical character. The increased population of the hillocks of diameter close to the mean grain size of the metal layer was reported for the first time, to our knowledge. A decrease of the density of the smallest hillocks reported by other authors [3,4] may be explained by a sensitivity limitation of the measuring technique (e.g., stylus profiling). We believe that the automatic optical hillock recognition method is more accurate, enabling a minimum hillock size limit of 0.33 μm (laterally). The high sensitivity of the used method calls for definition of the small hillocks. In our measurements we defined hillocks as protruded objects, surrounded by sharp edges. Therefore, an absence of these edges is particularly important in any approach for hillock suppression in metallization technology.

Acknowledgements

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References

[1] K.N. Tu, J.W. Mayer, L.C. Feldman, in: Electronic Thin Film Science, Macmillan, New York, 1992.
[2] F.M. d'Heurle, Metallurgical topics in silicon device interconnections: thin film stresses, Int. Mater. Rev. 34 (2) (1989) 53.
[3] B. Baccomolar et al., A study of heating rate and texture influences on annealing hillocks by a statistical characterization of Al thin-film topography, J. Appl. Phys. 64 (11) (1988) 6453.

EP02-827-C 3228

[4] S. Aceto, C.Y. Chang, R.W. Vook, Hillock growth on aluminum and aluminum alloy films, Thin Solids Films 219 (1992) 80.
[5] M. Zaborowski, M. Adamiec, A. Baccz, Hillock recognition by digital image processing, Appl. Surf. Sci. 91 (1995) 246.

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UV Raman studies of adsorbed oxygen and NO_x species on Pt/γ-alumina catalysts

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Abstract

Raman spectra at 244 nm are obtained in situ from several Pt/γ-Al_2O_3 catalysts under gas flows containing O_2, CO, NO_2, and H_2 at temperatures from 20 to 600°C. With O_2 or NO_2, a broad peak at 571 cm^{-1} is observed which we attribute to the Pt–O stretch mode of atomic oxygen. This marks the first direct spectroscopic observation of this fundamental species on a real catalyst. The peak can be easily removed with CO or H_2, even at room temperature, and the process is completely reversible. With NO_2 exposure, several peaks associated with surface NO_x species also appear, the most prominent of which is a nitrate line at 1048 cm^{-1}. Under reaction conditions, at 350°C with a stoichiometric $CO/O_2/N_2$ gas stream, the steady-state O coverage on the Pt particles is about half of the maximum coverage achieved with only an O_2 flow. This observation paves the way for future in situ studies of catalytic mechanisms addressing the role of atomic O as an intermediate. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Raman (UV) spectroscopy; Platinum; Oxygen; Atomic oxygen adsorption; Nitrogen oxides; Alumina

1. Introduction

Platinum is widely used in automotive exhaust-gas catalysts because of its ability to catalyze the oxidation of CO and hydrocarbons [1,2]. Under extreme conditions of temperature and O_2 pressure, Pt can form a variety of bulk oxides [3]. However, at the temperatures and oxidizing conditions typical for automotive catalysts (300–600°C and a few % O_2), none of these bulk oxides will readily form. Rather, Pt will adsorb O_2 dissociatively, producing a surface with chemisorbed atomic oxygen. This is the primary feature of the Pt–O chemistry that makes Pt such a good oxidation catalyst. In addition, the dissociative adsorption of oxygen is central to the use of Pt as an electrode material in oxygen sensors [4] and in certain types of fuel cells [5].

There have been numerous experimental [6–9] and theoretical [10–12] studies of atomic O on Pt. Most of the experimental work, however, has been done on single-crystals in ultrahigh vacuum (UHV) or on other types of bulk Pt surfaces. Studies of production catalysts, i.e. highly dispersed Pt particles with typical diameters in the 1–10 nm range supported on a high surface area oxide such as γ-Al_2O_3, have been much more limited. In this paper, we present Raman results on real-world catalysts using UV excitation at 244 nm that show a clear signature for the vibrational mode of O on Pt. A single broad line near 571 cm^{-1} is observed. Previous observations of the Pt–O vibration have given peaks at 477 and 452 cm^{-1} for ^{16}O and ^{18}O on Pt(1 1 1) using FTIR [9]; 540 cm^{-1} on

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defect sites of Pt(1 0 0) using high-resolution electron energy-loss spectroscopy (HREELS) [13]; and 470 and 560 cm^{-1} on the (1 1 1) terraces and steps, respectively, of Pt(3 3 5) [6] and kinked Pt(3 2 1) [8], also using HREELS. These results suggest that we are seeing atomic O associated with stepped and defect sites on Pt, which we expect to be quite abundant in the Pt/γ-Al_2O_3 catalyst.

The simple picture of O atoms sitting on surface sites of Pt particles alluded to above may be oversimplified when the Pt particles are extremely small. Extended X-ray absorption fine structure (EXAFS) studies by Alexeev and Gates [14] and earlier by Fukushima et al. [15] indicated that in Pt/γ-Al_2O_3 with Pt particles of diameter 1 nm or less, exposure to O_2 at room temperature leads to the loss of observable Pt–Pt bonds, i.e. the particles seem to be completely oxidized. Similar behavior was observed by Borgna et al. [16] and Gnutzmann and Vogel [17] for Pt particles on Al_2O_3 and SiO_2 with O_2 exposure at 300°C. However, for particles in this size range, most of the Pt atoms are surface atoms, so there is no clear distinction between a particle that is completely oxidized and one in which only the surface is covered with atomic O. A similar ambiguity between a thin surface oxide and a chemisorbed O layer also exists, especially for larger particles as discussed by McCabe et al. [18].

In an earlier Raman study with 514.5 nm excitation, Otto et al. observed a broad band near 590 cm^{-1} in Pt/γ-Al_2O_3 catalysts oxidized under extreme conditions, e.g. 10 h in O_2 at 450°C [19]. That band was associated with a bulk, amorphous Pt oxide phase, designated a-PtO_2, formed by prolonged oxidation at elevated temperatures, and this phase was not reducible in H_2 at 150°C. The line we see is not from this amorphous phase, since it appears under mildly oxidizing conditions and it rapidly disappears even at room temperature in the presence of a reductant such as CO or H_2.

We present in situ results on the changes in the Raman spectrum as functions of the temperature and reaction conditions. The Pt–O signature can be generated with flowing O_2 or NO_2 and can be removed with a reductant such as CO or H_2. With flowing NO_2, we also see strong spectra from surface nitrate and nitrite species, which are adsorbed primarily on the γ-Al_2O_3. The temperature range extends from room temperature to 600°C and the reactants studied include H_2, CO, NO_2, and O_2. Since we have found that the reducing characteristics of dilute H_2/N_2 mixtures are similar to those of CO/N_2 mixtures, we include only the results for CO reduction.

2. Experimental

The UV Raman spectra were obtained with a Renishaw 1000 Raman microscope that has been described in a previous paper [20]. Briefly, a frequency-doubled argon ion laser supplied the excitation radiation at 244 nm, while the microscope employed the usual 180° backscattering geometry. The Rayleigh scattering was attenuated with a pair of stacked dielectric filters, whose bandpass limited the Raman spectra on the low-frequency end to about 400 cm^{-1} from the laser line. All spectra were corrected for the oscillatory transmission characteristics of these filters. A single-stage spectrometer with a 3600 groove/mm grating dispersed the light, which was detected with a CCD array optimized for UV collection efficiency with a lumogen coating. Grams/32 software from Galactic Industries Corporation controlled the instrument. The spectra were recorded in an extended-scan mode, in which the grating was stepped synchronously with the shifting of charge in the CCD array. The UV beam was focused onto the sample with a 15× objective. The optical power reaching the sample was 2–3 mW, which was purposely kept low to avoid doing chemistry on the samples, and the spot size was ~10 mm. The spectrometer was calibrated daily using the single-crystal graphite peak at 1582 cm^{-1}. The exposure time was 30 s, and eight accumulations were co-added, resulting in an acquisition time of ~10 min per spectrum. The spectral resolution was ~8 cm^{-1}.

Most of the experiments were done on Pt/γ-alumina samples prepared by hydrolysis of aluminum alkoxide followed by a 1 wt.% Pt impregnation using an aqueous solution of H_2PtCl_6. The samples were then calcined for 4 h at 600°C and reduced in 5% H_2/N_2 at 400°C for 3 h, which should remove all residual chlorine from the sample. Its surface area was 144 m^2/g before Pt loading, and transmission electron-microscopy (TEM) showed final Pt particle sizes of <2 nm. More limited results were obtained on two other Pt/γ-Al_2O_3 samples. The second was

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a commercial sample obtained from AESAR®. This consisted of a Pt/γ-Al_2O_3 powder with a Pt loading of 5 wt.% and a BET surface area of 300 m^2/g. TEM showed an average particle size of ~5 nm, with sizes ranging from ~2 to 13 nm. The last sample, also a commercial catalyst, was a cordierite monolith from Degussa with a Pt/γ-Al_2O_3 washcoat. The Pt loading was 1 wt.% and the Pt particle size distribution was bimodal, with peaks at 2 and 5 nm.

For in situ Raman analyses, the samples were placed in a temperature-controlled chamber from Linkam Scientific that had a thin, fused silica window allowing optical access. Reaction gases were premixed and usually diluted with N_2 in a manifold before passing through the chamber at typical total flow rates of a few hundred sccm and always at atmospheric pressure. For the experiments involving the oxidation of CO, the exhaust-gas was analyzed for CO and CO_2 by passing it through a California Analytical Instruments, Inc. infrared gas analyzer.

3. Results and discussion

3.1. O_2 exposure

Fig. 1 shows a series of spectra from a 1 wt.% Pt/γ-Al_2O_3 sample taken at 12 min intervals beginning at the top, at room temperature, as the gas stream was alternated between O_2 and a mixture of 5% CO in N_2. Under the oxygen flow, a broad feature appears at a peak frequency of $571 \pm 4\,cm^{-1}$, as obtained by fitting and then averaging the peaks in the three spectra in the figure. We assign this peak to the vibrational mode of atomic O on Pt. This feature nearly disappears after a few minutes' exposure to the CO. At low temperatures, molecular O_2 is known to adsorb on Pt, but at room temperature and above, we expect atomic oxygen to be the only oxygen surface species [1,6,8]. We also show as vertical lines at the bottom of the figure, the positions of the vibrational frequencies for atomic O on Pt observed on single-crystals in UHV by HREELS. The solid line ($560\,cm^{-1}$) is for O located at steps on (3 3 5) and (3 2 1) surfaces; the dashed line ($470\,cm^{-1}$) for O on (1 1 1) terraces. The good agreement between the peak in Fig. 1 and the result for stepped sites on bulk crystals supports our assignment. With an average particle size <2 nm,

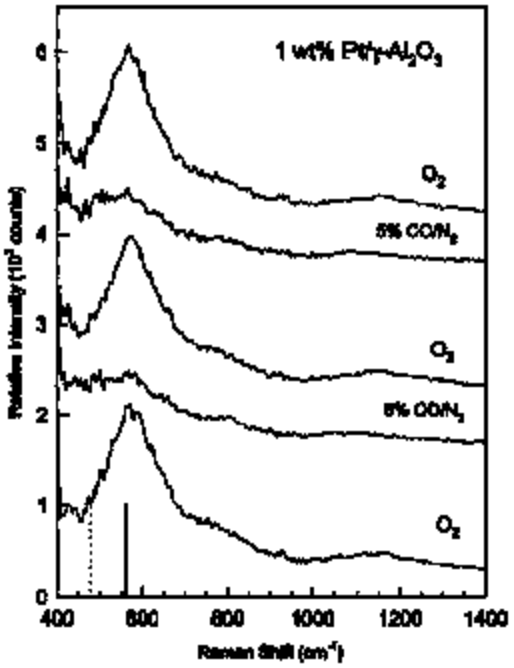

Fig. 1. UV Raman spectra at room temperature taken at 12 min intervals, beginning at the top, under different flow conditions: 25 sccm of pure O_2 or 100 sccm of 5% CO/N_2. Each spectrum is recorded 2 min after the flow is switched. All spectra except the bottom one are displaced vertically for clarity. The vertical lines at the bottom show the O–Pt frequencies observed by HREELS for O on (1 1 1) terraces (dotted line) and at step sites on a (3 3 5) surface (solid line).

each particle contains only a few hundred Pt atoms, and most surface sites will be step sites of some type. Such particles are too small to support large terraces. The $100\,cm^{-1}$ breadth of the observed line suggests inhomogeneous broadening, resulting from the distribution of sites, including both steps and terraces.

Fig. 2 shows the Pt–O mode at various temperatures in flowing O_2. It is stable up to ~500°C, but disappears above this temperature. This upper temperature limit is comparable to that found by Wang et al. [6] for O at step sites on a Pt(3 3 5) surface. Correcting for the known temperature dependence of the Raman signals did not substantially change the relative intensities of the Pt–O mode at different temperatures.

The Pt–O feature in the 1 wt.% Pt/γ-Al_2O_3 catalyst could not be seen using a HeNe laser (633 nm) for

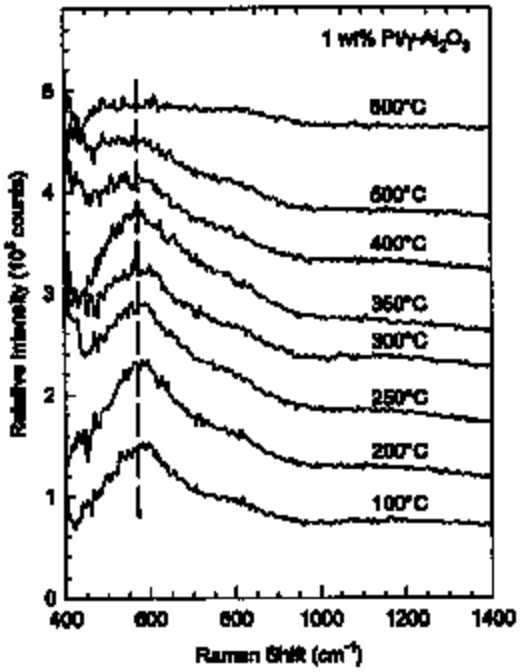

Fig. 2. Spectra of 1 wt.% Pt/γ-Al_2O_3 taken from 100 to 600°C in 25 sccm of O_2. The Pt–O feature is stable up to ~500°C. All spectra except the bottom one are displaced vertically for clarity.

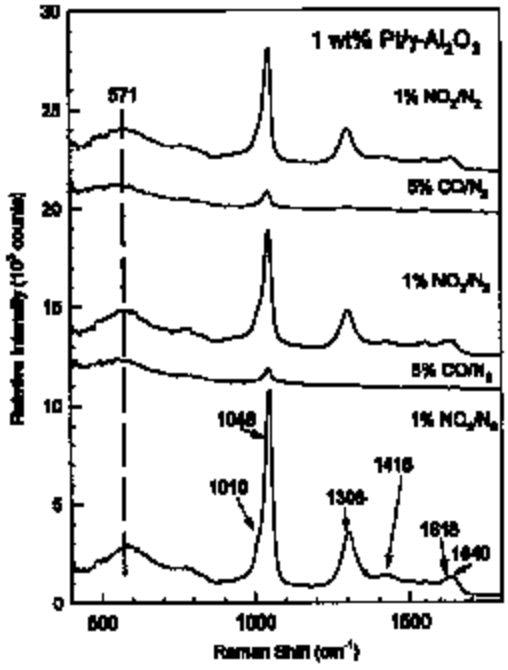

Fig. 3. Spectra similar to those in Fig. 1 taken with alternating flows of 25 sccm 1% NO_2/N_2 and 100 sccm of 5% CO/N_2. The position, width, and strength of the broad low-frequency mode, indicated by the dashed vertical line, match those for the low-frequency mode in Fig. 1. All spectra except the bottom one are displaced vertically for clarity.

excitation because of a huge fluorescent background. However, a 5 wt.% Pt/γ-Al_2O_3 catalyst did show a peak at 570 cm^{-1} which disappeared when the sample was reduced. Observations using the 5 wt.% catalyst are discussed further in the next section.

Molecular CO will also adsorb on Pt, but we see no Raman features attributable to CO, either at low frequencies where the Pt–C vibration is expected or near 2000 cm^{-1} where the CO vibration occurs. The Raman cross-section for atomic O on Pt must be much greater than that for molecular CO on Pt, since we would expect the coverages of the two species to be comparable in the successive spectra of Fig. 1.

3.2. NO_2 exposure

Fig. 3 shows a similar series of spectra taken at room temperature on the same sample for alternating flows of 1% NO_2 in N_2 and the same CO mixture as in Fig. 1. Exposure to NO_2 is known to be an efficient way to produce high coverage of atomic O on Pt. In fact, for Pt(1 1 1) in UHV, exposure to NO_2 can produce higher atomic O coverage than direct exposure to O_2 [21].

With the NO_2 flow, the spectra are dominated by adsorbed NO_x species. Peaks appear at 1010 (shoulder), 1048, 1306, 1418 (broad), 1618, and 1640 cm^{-1}. All the peaks except for 1306 cm^{-1} can be attributed to vibrations of the free nitrate ion [22]. The 1010 and 1048 cm^{-1} lines correspond to the symmetric stretch (ν_1, D_{3h}) of nitrate. The peak at 1418 cm^{-1} is the ν_3 anti-symmetric stretch, while the peaks at 1618 and 1638 cm^{-1} correspond to $2\nu_2$, an overtone of the Raman-inactive out-of-plane bending ν_2 at 828 cm^{-1} [22,23]. The doubling of the peaks is due to association of the nitrates with different types of hydroxyl groups on the alumina [24]. The peak at 1306 cm^{-1} may be either the symmetric stretch of a nitrite ion (NO_2^-) or a nitro species (–NO_2) [22,25].

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There is also a broad, weaker line at lower frequency that we assign to atomic O. This line has the same frequency (as indicated by the dashed line), breadth, and approximate strength (~10^3 counts) as the corresponding line in Fig. 1. Exposure to CO removes this line as well as most of those lines we attribute to adsorbed NO_x species, and the process is completely reversible, as shown in the figure. We conclude that NO_2 exposure is an effective way to produce an atomic O layer on highly dispersed Pt nanoparticles, just as it is for bulk Pt crystals.

The NO_x species are not strongly bound to the surface, since the peaks associated with them will mostly disappear when the chamber is purged with 500 sccm of N_2. The addition of CO or elevated temperature only accelerates the removal process. In contrast, the Pt–O feature is much more stable. This feature, once established, remains without the NO_2 or O_2 flows; it can only be removed by reduction with CO or H_2 or by decomposition at elevated temperature. The UV laser beam has a weak effect on the surface NO_x features, causing them to noticeably diminish after an hour's exposure, but there is little change during the time taken to record a spectrum. No such photo-induced effect is seen with the Pt–O line.

When the γ-Al_2O_3 powder, without Pt, is exposed to the 1% NO_2/N_2 flow, we see spectra of adsorbed NO_x species similar to those obtained from Pt/γ-Al_2O_3, as shown in the lower trace of Fig. 4. The NO_x peaks are slightly shifted to higher frequency, and there is no splitting or broadening of the nitrate lines, unlike that observed with the Pt/γ-Al_2O_3 sample. This result also indicates that the surface NO_x species reside primarily on the γ-Al_2O_3 and that they are only slightly affected by the presence of Pt. However, no evidence of the broad mode at 571 cm^{-1} is seen, consistent with our assignment of this line to atomic O on Pt.

Results on the catalysts with 5 wt.% Pt, shown in Fig. 5, are similar to those obtained with 1 wt.% Pt, except that all of the Raman lines are weaker. For example, the surface nitrate line at 1048 cm^{-1} is weaker by roughly a factor of ten and the Pt–O line by a factor of two. We attribute these intensity differences to the reduced penetration depth of the laser beam caused by the higher loading of the opaque Pt. The 5 wt.% Pt/γ-Al_2O_3 had a nearly black appearance compared with the 1 wt.% samples, which were light gray in color. The gas flows for these data are the same used

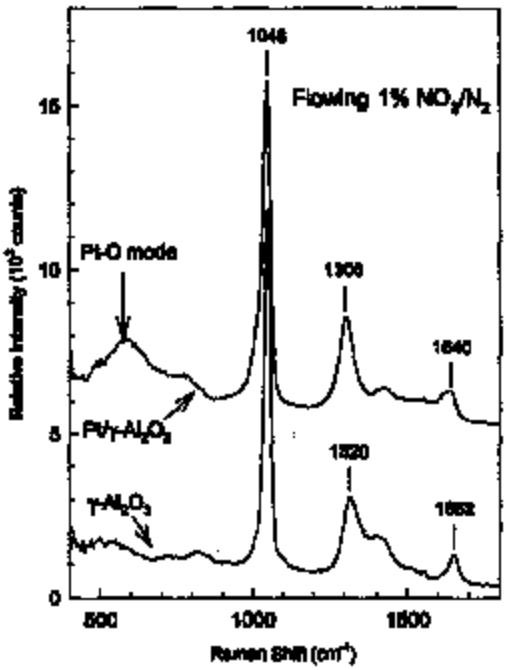


Fig. 4. UV Raman spectra of γ-Al_2O_3 catalysts at room temperature with and without Pt under 35 sccm of 1% NO_2/N_2. Note that the low-frequency mode attributed to the Pt–O stretch vibration is absent when the catalyst contains no Pt and that the surface NO_x modes are only slightly affected by the Pt. The Pt/γ-Al_2O_3 spectrum is shifted up by 5000 counts for clarity.

for the results in Fig. 3. Note that both figures show similar Raman lines and trends, but in Fig. 5 all the lines are weaker and the ratio of the surface NO_x lines to the Pt–O line is reduced compared to the corresponding spectra in Fig. 3. Both effects are caused by the higher Pt loading.

We should anticipate a different Pt–O lineshape for the 5 wt.% Pt sample, since some of the particles are bigger and they would have a different distribution of sites including some with larger terraces. However, the line is so weak (see Fig. 5) that we cannot make any definite conclusions regarding changes in the lineshape, particularly on the low-frequency side.

For the Degussa catalyst, which has 1 wt.% Pt loading, somewhat different size distribution, and a cordierite substrate, the peaks associated with the NO_x surface species were identical to those shown in Fig. 3. However, the Pt–O line tended to be weaker,

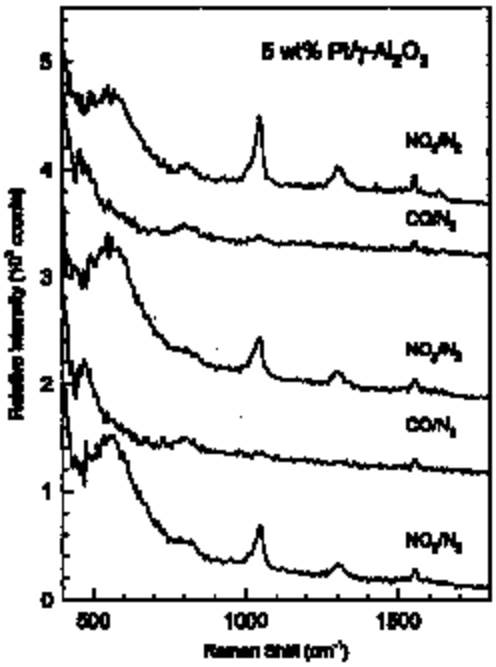


Fig. 5. UV Raman spectra of 5 wt.% Pt/γ-Al_2O_3 catalyst at room temperature under alternating flows of 25 sccm of 1% NO/N_2 and 100 sccm of 5% CO/N_2 as in Fig. 3. All except the bottom spectrum are shifted vertically.

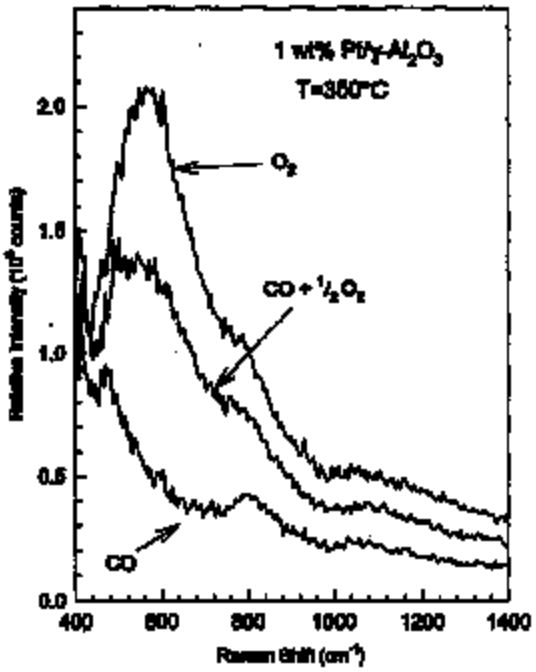


Fig. 6. UV Raman spectra of 1 wt.% Pt/γ-Al_2O_3 catalyst at 350°C. The top spectrum is taken in flowing 25 sccm O_2; the middle spectrum after 10 min of 500 sccm of 5% CO, 2.5% O_2, and 92.5% N_2; and the bottom spectrum after 10 min of 500 sccm 5% CO in N_2.

and it was often more difficult to see because of interference from lines of other oxide additives and of the cordierite substrate that occur in the same, low-frequency, spectral region.

3.3. CO and O_2 exposure

Fig. 6 shows the behavior of the Pt–O mode under reaction conditions, when the catalyst is functioning as an oxidation catalyst. The sample is 1 wt.% Pt/γ-Al_2O_3, which is initially heated to 350°C in flowing O_2, leading to the usual Pt–O mode, as shown in the top trace. In the middle trace, the gas flow is switched to a stoichiometric mixture of carbon monoxide and oxygen (5% CO, 2.5% O_2, 92.5% N_2 flowing at 500 sccm). Under these conditions, the catalyst is converting about 7% of the CO to CO_2, as indicated by the gas sensor downstream. This conversion efficiency is limited by the small catalyst volume and the relatively high flow rate; it is not limited by the catalyst efficiency. The Pt–O feature at this stage is reduced, but it is still much larger than it is when the O_2 is removed from the gas stream, leading to the bottom trace in the figure. These spectra indicate that the steady-state coverage of O during oxidation of a stoichiometric mixture of CO and O_2 is about half that obtained when only O_2 is present in the gas stream.

4. Summary and conclusions

We have observed the Pt–O stretch mode of atomic oxygen on Pt/γ-Al_2O_3 catalysts using UV Raman spectroscopy. To our knowledge, this marks the first direct observation of adsorbed O on a catalyst under real-world conditions. The peak appears at 571 cm^{-1},

which is close to observations of the Pt–O vibration on single-crystal Pt at step [6,8] and defect sites [13]. It is stable up to ~500°C, and is easily formed with exposure to O_2 or NO_2 and removed with CO or H_2 at room temperature. Except for intensity variations, the peak looked and behaved identically for the three catalysts investigated. Thus, the Raman signature does not seem to distinguish between the very small Pt particles with diameters ≤2 nm, which are nearly completely oxidized, and the larger particles with diameters ~5 nm, which may be more appropriately viewed as bulk Pt covered with a chemisorbed layer of O.

We have also observed adsorbed NO_x species on alumina at room temperature, and seen the behavior of the Pt–O mode during CO oxidation at 350°C. The difference in behavior of the Pt–O peak under different reaction conditions shows promise for elucidating catalytic mechanisms involving atomic oxygen in future studies.

Acknowledgements

We are indebted to J. Haugas for the electron-microscopy analyses; to A. Bogicevic for suggesting the NO_2 experiments; to R.W. McCabe, J.V. Cavataio, G.W. Graham, and K.C. Hass for helpful discussions; and to A. Dubkov, C.N. Montreuil and C.H. Wu for providing the samples.

References

[1] T. Engel, G. Ertl, Elementary steps in the catalytic oxidation of CO on Pt metals, in: D.D. Eley, H. Pines, P.B. Weisz (Eds.), Advances in Catalysis, Vol. 28, Academic Press, New York, 1979.
[2] K.C. Taylor, Automotive catalytic converters, in: J.R. Anderson, M. Boudart (Eds.), Catalysis Science and Technology, Vol. 5, Springer, Berlin, 1984.
[3] W.H. Weber, Raman applications in catalysis for exhaust-gas treatment, in: W.H. Weber, R. Merlin (Eds.), Raman Scattering in Materials Science, Springer, Berlin, 2000.
[4] E.M. Logothetis, Automotive oxygen sensors, in: M. Yamazoe (Ed.), Chemical Sensor Technology, Vol. 3, Elsevier, Tokyo, 1991.
[5] K. Kinoshita, Electrochemical Oxygen Technology, Wiley, New York, 1992.
[6] H. Wang, R.G. Tobin, D.K. Lambert, C.L. DiMaggio, G.B. Fisher, Surf. Sci. 372 (1997) 267.
[7] J.L. Gland, B.A. Sexton, G.B. Fisher, Surf. Sci. 95 (1980) 587.
[8] M.R. McClellan, F.R. McFeely, J.L. Gland, Surf. Sci. 123 (1982) 188.
[9] U. Bagstrom, B. Ryberg, Phys. Rev. Lett. 82 (1999) 2741.
[10] P.J. Feibelman, J. Hafner, G. Kresse, Phys. Rev. B 58 (1998) 2179.
[11] A. Bogicevic, J. Strömquist, B.I. Lundqvist, Phys. Rev. B 57 (1998) 4289.
[12] B. Jain, H. von Schenck, M. Gothelid, U.O. Karlsson, M. Svensson, Phys. Rev. B 61 (2000) 13144.
[13] V.V. Gorodetskii, A.V. Matveev, P.D. Cobden, B.E. Nieuwenhuys, J. Mol. Catal. A 158 (2000) 155.
[14] O. Alexeev, B.C. Gates, Stud. Surf. Sci. Catal. 130 (2000) 371.
[15] T. Pakuskina, J.R. Kanzer, D.E. Sayers, J. Cook, Stud. Surf. Sci. Catal. 7 (1981) 79.
[16] A. Borgna, F. Le Normand, T. Garetto, C.R. Apesteguia, B. Moraweck, Catal. Lett. 13 (1992) 175.
[17] V. Gamsjäger, W. Vogel, J. Phys. Chem. 94 (1990) 4991.
[18] R.W. McCabe, C. Wong, H.S. Woo, J. Catal. 114 (1988) 354.
[19] K. Otto, W.H. Weber, G.W. Graham, J.Z. Shyu, Appl. Surf. Sci. 37 (1989) 250.
[20] D. Uy, A. Dubkov, G.W. Graham, W.H. Weber, Catal. Lett. 68 (2000) 25.
[21] D.H. Parker, M.E. Bartram, B.E. Koel, Surf. Sci. 217 (1989) 489.
[22] K. Nakamoto, Infrared and Raman Spectra of Inorganic and Coordination Compounds. Part A. Theory and Applications in Inorganic Chemistry, 5th Edition, Wiley, New York, 1997.
[23] M.R. Waterland, A. Myers Kelley, J. Chem. Phys. 113 (2000) 6760.
[24] R.P. Cooney, P. Tsai, J. Raman Spectrosc. 9 (1980) 33.
[25] K. Nakamoto, Infrared and Raman Spectra of Inorganic and Coordination Compounds. Part B. Applications in Coordination, Organometallic, and Bio-Inorganic Chemistry, 5th Edition, Wiley, New York, 1997.

ER02-827-C 3236

Wirebonding

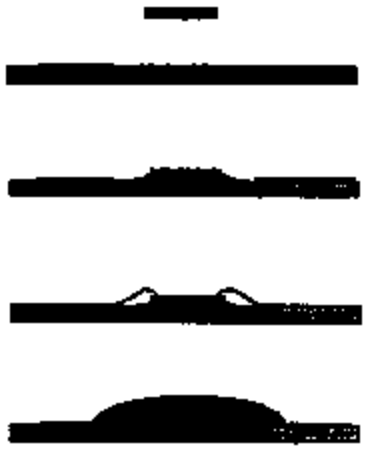
Alexander Bogicevic

Department of Applied Physics
Chalmers University of Technology
Göteborg University
1997

9982-827-0 3239

Wire Bonding

- Wire bonding (Chip-On-Board): Naked chips mounted directly on a printed circuit board
- Originally developed in France and Switzerland



Advantages

- Higher quality
- Smaller dimensions
- Lower weight
- Shorter lead-times
- Lower system cost
- Higher noise immunity
- Increased flexibility
- Fewer solder joints

Wire Bonding Au/Al

- Embedding (pressure + ultrasound) in a reduction-gas prevents oxidation
- Al wires are mostly used for large currents
- Relevant Au-Al alloys (room-temperature) are Au_4Al, Au_5Al_2, Au_2Al, AuAl and $AuAl_2$
- The solubility of Al in Au (3-3.5%) makes Au_4Al metastable; Au_5Al_2 grows around Au_4Al by consuming Al, creating Kirkendall voids
- Just like cratering and molar volume pores, Kirkendall voids decrease the conductivity and often initiate cracks
- Degradation is often induced by insufficient gold-plating of the ceramic
- Less residual stress is accomplished by heating the Au rather than the Al upon embedding
- A thin layer of TiW sandwiched between Au and Al increases the activation energy for intermetallic diffusion, preventing the brittle Au_5Al_2 phase to grow
- Cl-rich resin in the manufacturing process enhances degradation

Wire Bonding Cu/Al

Advantages over Au/Al

- High bond pull strengths
- Long wire spans (no sagging)
- Enhanced electrical conductivity
- Better resistance to intermetallic growth through higher activation energy for segregation
- 4-5 times longer degradation times
- Heat sinking capabilities
- Less affected by resin
- Cheaper; no sudden price fluctuations in the precious metals market
- Cu/Al is regarded as a more reliable system than Au/Al

Potential disadvantages due to harder modulus of Cu

- Dielectric cracking
- Silicon cratering; can lead to open circuit failures
- Weak bond due to surface oxidation
- Ball non-uniformity
- Metal extrusion – overbonding extrudes the Al metallization around the ball periphery

Solution: Control thermosonic bonding

VOQ Reporicape Stalls:

Item No	ODI No	Model Yr	Model	Vin	Failure Date	Letter Date	Acc Ide	Injured	Fault	Fire	Part Name	City
10	891790	2001	ESCAPE	N/A	1-Jun-01	2-Jul-01	N	0	ERRATIC OPERATION,POOR PERFORMANCE	N	ENGINE	UTICA
13	747622	2001	ESCAPE	1FMCU04101KB91988	28-Jun-01	30-Jun-01		0	INOPERATIVE	N	ENGINE	KING OF PRUSSIA
87	743710	2001	ESCAPE	1FMCU03141KF42807	2-Apr-01	8-Apr-01		0	INOPERATIVE	N	ENGINE	TALLAHASSEE
89	743953	2001	ESCAPE	1FMCU04111KB02817	12-Apr-01	12-Apr-01		0	INOPERATIVE	N	ENGINE	CHESTERFIELD
109	890438	2001	ESCAPE	1FMYU04131KD92807		15-Jun-01	N	0	ERRATIC OPERATION,POOR PERFORMANCE	N	ENGINE	LITTLE FERRY
111	746727	2001	ESCAPE	1FMYU04191KA98626	6-Jun-01	12-Jun-01		0	INOPERATIVE	N	ENGINE	KNOXVILLE

EXHIBIT C-127-2002

VOQ Reporicape Stalls:

Item No	ODI No	Model Yr	Model	Vin	Failure Date	Letter Date	Accide	Injured	Fault	Fire	Part Name	City
115	748329	2001	ESCAPE	1FMYU04141KB61916		12-Jul-01		0	ERRATIC OPERATION,POOR PERFORMANCE		ENGINE	STUARTS DRAFT
116	748474	2001	ESCAPE	1FMYU04121KB61574	9-Jul-01	15-Jul-01		0	ERRATIC OPERATION,POOR PERFORMANCE	N	ENGINE	WAVERLY
132	868311	2001	ESCAPE	1FMYU04191KA73139	30-Apr-01	15-May-01	N	0	DESIGN	N	ENGINE	COAL TOWNSHIP
138	748530	2001	ESCAPE	1FMYU04131KE81258	3-Nov-00	8-Jun-01		0	ERRATIC OPERATION,POOR PERFORMANCE	N	ENGINE	COCHRANVILLE

EN02-0277-0 12/4

VOQ Report

Item No	ODI No	Summary
10	891790	WHILE DRIVING DOWN HILL VEHICLE STALLED OUT WITHOUT PRIOR WARNING, CAUSING LOSS OF ALL POWER STEERING AND BRAKING ABILITY. CONSUMER HAS CONTACTED DEALER, DEALER NOT WILLING TO PROVIDE ANY ASSISTANCE. PLEASE PROVIDE ANY FURTHER DETAILS.*AK
13	747622	WHILE DRIVING 35-40 MPH ON LEVEL ROAD, ENGINE SHUTDOWN; POWER STEERING LOST, POWER ASSIST BRAKING LOST; 3 OCCURRENCES SAME SITUATION, SAME ROAD & APPROXIATE LOCATION AND TIME OF DAY; THIS IS THE SECOND VEHICLE TO WHICH THIS HAS HAPPENED; DEALER HAS VEHICLE. *AK
87	743710	ENGINE SHUT OFF WHILE DRIVING DOWN A HILL HAS HAPPENED TO ME FOUR TIMES THIS WEEK. CAUSES LOSS OF POWER-ASSISTED BRAKES AND STEERING. VEHICLE PUT IN DEALER SHOP ON 4/6/2001. NO REPAIRS MADE BECAUSE DEALER COULD NOT DUPLICATE THE PROBLEM IN THE SHOP.
89	743953	DRIVING DOWN A BUSY STREET, DOWN A SLIGHT GRADE ABOUT 45 MPH, THE CAR SUDDENTLY DIED. I HAD TO PULL OVER TO THE SIDE OF THE ROAD. I WAITED A COUPLE OF MINUTES AND IT RESTARTED. THERE WAS NO INDICATION OF ANY PROBLEM PRIOR TO THIS.*AK
109	890436	WHILE DRIVING AT ANY SPEED VEHICLE COMPLETELY SHUTDOWN WITHOUT WARNING , CAUSING LOSS OF POWER BRAKES AND STEERING CONTROL, NEARLY CAUSING A COLLISION. DEALER REPLACED ENGINE WHICH HAS NOT CORRECTED THE PROBLEM. PLEASE GIVE ANY FURTHER DETAILS. *AK
111	746727	WHILE DRIVING AT ABOUT 35-40 MPH, THE ENGINE JUST QUITS. ONCE I COME TO A ROLLING STOP, I HAVE TO TURN THE CAR OFF AND RESTART IT. THIS IS THE SECOND TIME THIS HAS HAPPENED.*AK

VOQ Report

Item No	ODI No	Summary
115	748329	DRIVING 45-50 MPH WHEN ENGINE JUST SHUT DOWN. HAD ALL LOSS OF POWER INCLUDING STEERING AND BRAKES. COASTED TO EDGE OF ROAD, PLACED GEAR IN PARK AND SAT FOR A FEW MINUTES AND TRIED TO RESTART. WAS SUCCESSFUL AT RESTARTING WITH NO PROBLEM. THIS IS THE FIRST OF TWO INCIDENTS WITHIN A PERIOD OF 5 DAYS. THE SECOND HAPPENED AT 60 MPH. TO AFRAID TO ATTEMPT DRIVING ON INTERSTATE AND AM ON PINS AND NEEDLES EVEN ON RURAL ROADS. MADE APPT WITH DEALER THE FIRST BUSINESS DAY AFTER IT HAPPENED AND THEY ARE TRYING TO FIGURE IT OUT ALSO. JIM SNEAD FORD IS REPLACING THE IGNITION STARTER SWITCH HOPING THIS SOLVES THE PROBLEM.*AK
116	748474	ENGINE SHUT OFF WHILE DRIVING DOWN A HILL WITHOUT PRIOR WARNING.LOSS OF POWER STEERING AND POWER BRAKES.PULLED OVER AND SHUT CAR OFF.WHEN I RESTARTED IT IT SEEMED TO WORK OK.TOOK IT TO THE GARAGE AND THEY SAID IT WAS RUNNING VERY HOT.CALLED FORD AND THEY MADE SUGGESTIONS ON A FIX.THEY ENDED UP REPLACING THE ERG VALVE.I HAVE DRIVEN IT FOR TWO DAYS AND IT HASN'T HAPPENED AGAIN.....YET.VERY DANGEROUS TO DRIVE WITH NO STEERING OR BRAKES.SOMEONE IS GOING TO END UP HURT BADLY OR KILLED.*AK
132	888311	WHILE DRIVING AT 45MPH SUDDENLY VEHICLE STALLED OUT FOR NO REASON IN MIDDLE OF TRAFFIC. THIS WAS SECOND TIME IT HAS HAPPENED. WAS AT A STOP SIGN WHEN STALLING FIRST TIME.*AK *JB
138	748530	TOTAL AND COMPLETE LOSS OF POWER AND ALL ELECTRICAL SYSTEM WHILE CAR IS BEING OPERATED ON BUSY ROADS

EN02-007-C 3246

Freeland, Mark (M.)

From: Williamson, Richard (E.)
Sent: Wednesday, December 19, 2001 2:21 PM
To: Freeland, Mark (M.)
Subject: RE: Escapes

Mark,
Please find the file with those VIN's attached.

Original Message----
From: Freeland, Mark (M.)
Sent: Wednesday, December 19, 2001 2:14 PM
To: Williamson, Richard (E.)
Subject: RE: Escapes

Thanks Rick,

Can you get me the VIN numbers for the vehicles in the 12 VOQ reports

891790; 747622; 885769;743710; 743953; 890438; 746727; 748329; 748474; 748637;888311; 746530

I would like to review their repair history, both before and since the report was issued?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
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Silicon as a Mechanical Material - A Summary

About this document

The following text is derived of the well-known paper of K.Petersen, "Silicon as a Mechanical Material", where he describes the most important mechanical properties of silicon, and shows several ways on using silicon as a working material, including etching, micromachining, and other techniques, as well as the problems that arise from the fact that silicon, primarily developed for the semiconductor industry, has to fulfill very different tasks when used due to its mechanical rather than its electronical properties.
The original paper also describes many examples of the MEMS field in order to show its possibilities as well as its limitations, and to discuss some of the information that is given in the first three chapters in detail. These examples are *not* described here, lecture of the original paper is therefore required and highly recommended, since the today more than 15-year-old paper can still be viewed at as one of the most important introductional and comparative papers written to this subject so far.

Silicon as a Mechanical Material (A Summary), by Kurt E. Petersen

Source: K.E. Petersen "Silicon as a Mechanical Material", *Proceedings of the IEEE*, Vol. 70, No.5, May 1982.

Index:

EP82-827-C 3285

Abstract

Single-crystal silicon is being increasingly employed in a variety of new commercial products not because of its well-established electronic properties, but rather because of its excellent mechanical properties. In addition, recent trends in the engineering literature indicate a growing interest in the use of silicon as a mechanical material, with the ultimate goal of developing a broad range of inexpensive, batch-fabricated high-performance sensors and transducers which are easily interfaced with the rapidly proliferating microprocessor. This review describes the advantages of employing silicon as a mechanical material, the relevant mechanical characteristics of silicon, and the processing techniques which are specific to micromechanical structures.

Introduction

The basis of micromechanics is that silicon, in conjunction with its conventional role as an electronic material, and taking advantage of an already advanced microfabrication technology, can also be exploited as a high-precision high-strength high-reliability mechanical material, especially applicable wherever miniaturized devices and components must be integrated or interfaced with electronics.

The four main factors for the success of silicon as a mechanical material are:

- The active material, silicon, is **abundant, inexpensive**, and can be produced in extremely **high purity** and perfection;
- Silicon processing itself is based on very thin deposited films which are highly amenable to **miniaturization**;
- Definition and **reproduction** of the devices shapes and patterns are performed using photographic techniques that have **already proved** of being capable of **high precision**;
- Silicon microelectronical (and therefore also mechanical) devices are **batch-fabricated**.

EMC2-027-C 3288

Since these four factors are responsible for the rise of the microelectronics industry, they also can be exploited in design and manufacture of a wide spectrum of miniature mechanical devices and components. One key advantage here is that almost the *same manufaction processes* that are known from microelectronics can be used for micromechanics. On the other hand, since these processes were developed with the needs of the semiconductor industry in mind, problems arise when the same processes are now used in the area of mechanical engineering and design.

Mechanical Characteristics of Silicon

Overview

The following table gives an overview over some of the mechanical properties of single crystal silicon (SCS), compared to some selected other materials.

	Yield Strength (10^9n/cm^2)	Knoop Hardness (kg/mm^2)	Young's Modulus	Density (g/cm^3)	Thermal Conductivity (W/cm°C)	Thermal Expansion (10^{-6}/°C)
Diamond	53	7000	10.35	3.5	20	1.0
Al_2O_3	15.4	2100	5.3	4.0	0.5	5.4
Iron	12.6	400	1.96	7.8	0.803	12
SiO_2	8.4	820	0.73	2.5	0.014	0.55
Si	7.0	850	1.9	2.3	1.57	2.33
Al	0.17	130	0.70	2.7	2.36	25

Although silicon is a *brittle material*, it is not as fragile as often believed. One reason is that it comes in a flat disc (wafer), with an height-to-width ratio of over 1:50, and even stainless steel is easy to deform inelastically if fabricated in such formats. The value of the Young's modulus is near to that of steel, its hardness twice as high as iron, and most common glasses, and the tensile yield strength is at least three times higher than that of stainless steel wires. The main difference is, compared to metals, that silicon (at room temperature) tends to yield by *fracturing*, while metals usually yield by *deforming inelastically*.

Wafer breakage

Reasons

Since SCS is a single crystal, it tends to *cleave along crystallographic planes*, especially if edge, bulk, or surface imperfections cause stresses to concentrate and orient along cleavage planes. So, efforts are made by the semiconductor industry to reduce the possibility of wafer break due to these imperfections in form of *edge contouring* and improved optical control. Another reason for wafer breakage results from unavoidable increase of internal stresses coming from the often performed high-temperature processing an multiple thin films depositions on the wafer, which lead to stress

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concentration at imperfections as described above.

Avoidance

To *avoid* wafer damage, these guidelines should be followed:

1. The silicon material should have the lowest possible bulk, surface, and edge crystallographic defect density.
2. Components which might be subjected to severe friction, abrasion, or stress should be as small as possible to minimize the total number of crystallographic defects in these areas.
3. Minimization or elimination of mechanical, fault causing treatments such as grinding, sawing, etc.
4. If these conventional treatments are necessary, isotropic post-etching with the purpose of smoothing the affected surfaces should be processed. The same rule may apply after isotropic etching steps that also often forms sharp edges and corners.
5. To prevent direct mechanical contact to the silicon, hard, tough surface coating films like Si_3O_4 should be applied.
6. If possible, low temperature techniques like CVD depositions should be preferred.
7. Since hydrostatic pressure has been shown to increase fatigue strengths, any film which places the silicon surface under compression should have a similar effect.

It can be stated that, since the initiation of fatigue cracks occurs almost exclusively at the surfaces of stressed members, the rate of fatigue depends strongly on the *surface preparation, morphology, and defect density*. Therefore, care should be taken to reduce surface roughness and high vapor content in the atmosphere (silicon is hydrophilic), since any surface imperfection can be the initiation point for damages. In polycrystalline materials, these initiation points could be inclusions, grain boundaries, and other surface irregularities.

Micromechanical Processing Techniques

Etching

Categories

Etchants can be categorized by using the following characteristics:

1. **direction dependency** (isotropic or anisotropic)
2. **etch rate** (0.25 to 40 µm/min), and its variability
3. **anisotropic etch rate ratio** (only for anisotropical etchants, 1:1 to 400:1 for (100)/(111)-planes)
4. **dopant dependence / selectivity**
5. **temperature** of etching (20 to 100°C)

Direction dependency

The most important feature in classifying silicon etchants is their ability to have *different etch rates in different directions* of the crystal lattice that is exposed to them. *Isotropic* etchants etch in all directions with the same rate, resulting in rather round shaped pits, and also rounding off previous

EMZ-427-C 3288

sharp corners and edges. The result of *anisotropic* etchants, on the other hand, is different, looking perpendicular on each of the crystal planes. This makes it possible to fabricate sharply formed structures or narrow gaps, whose borders have to coincide with the according crystal planes. (See also picture below.)
Depending on what kind of structure is desired, the proper etchant type has to be chosen.

Etch rate

Basically, the etch rate can vary with temperature, mix of ingredients, sometimes optical circumstances (light intensity), or it can be stable over a wide range. As described above, this variability can either be wanted or not, so here also, the desired result determines the etchant type.

Anisotropic etch rate ratio

If an anisotropic etchant is chosen, the ratio of etch rates concerning the different crystal planes, can vary in a wide range. Again, the desired result influences the choice of etchant, since ratios from 1:1 to 400:1 are possible, if one compare the (100) and the (111)-planes.

Dopant dependence (selectivity)

Another, very important attribute is the dopant dependency of etchants. Some etchants are very selective on the material that they are exposed to, so that a doped layer or a layer of different material can be used as an *etch stop* or a direction of a much higher etch rate. If this is not desired, it is advantageous to choose a non-selective etchant (at least for this special type of layer / material).

Etching temperature

In general, lower temperatures are better than higher ones, since temperature induced stress concentrations are minimized when the processing temperature is as low as possible. In addition, the occurrence of hazardous gases is lower at low temperatures (IT).

systems

Three systems are of particular interest due to their versatility:

1. EDP (ethylene diamine, pyrocatechol, and water)
2. KOH and water
3. HNA (acetic acid CH_3OOH)

1. EDP

EDP has three properties which make it indispensable for micromachinig:

- It is **anisotropic** (important for special structures that otherwise would be impossible to fabricate)
- It is highly **selective.**
- It is **dopant dependent** (stops on highly boron-doped layers).

2. KOH and water

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The main advantage of KOH is, that it is **orientation dependent** (with a much higher (110):(111)-etch rate ratio than EDP, therefore useful for *groove etching* on (110) wafers). Unfortunately, the etch rate on SiO_2 is so high that it often can not be used as a masking material. (Si_3N_4 can then be used, instead.)

3. HNA

The HNA system is **highly variable** in its etching rates and characteristics, depending on

- silicon dopant concentration
- mix ratios
- degree of etchant agitation

A major disadvantage is, again, that SiO_2 is etched somewhat for all mixtures, so that it only can be used for short etching times, otherwise, Si_3N_4 or Au can be used instead.

overview table

The following table gives an overview over some *often used etchants* and their main characteristics.

Etchant (Diluent)	Typical Composi-tions	Temp °C	Etch Rate (μm/min)	Anisotropic (100)/(111) Etch Rate Ratio	Dopant Dependance
HF HNO_3 (water, CH_3COOH)	10 ml 30 ml 80 ml	22	0.7-3.0	1:1	$\leq 10^{17} cm^{-3}$ n or reduces etch rat by about 150
	25 ml 50 ml 25 ml	22	40	1:1	no dependance
	9 ml 75 ml 30 ml	22	7.0	1:1	----
Ethylene diamine Pyrocatechol (water)	750 ml 120 gr 100 ml	115	0.75	35:1	$\geq 7 \times 10^{19} cm^{-3}$ b reduces etch ra by about 50
	750 ml 120 gr 240 ml	115	1.25	35:1	

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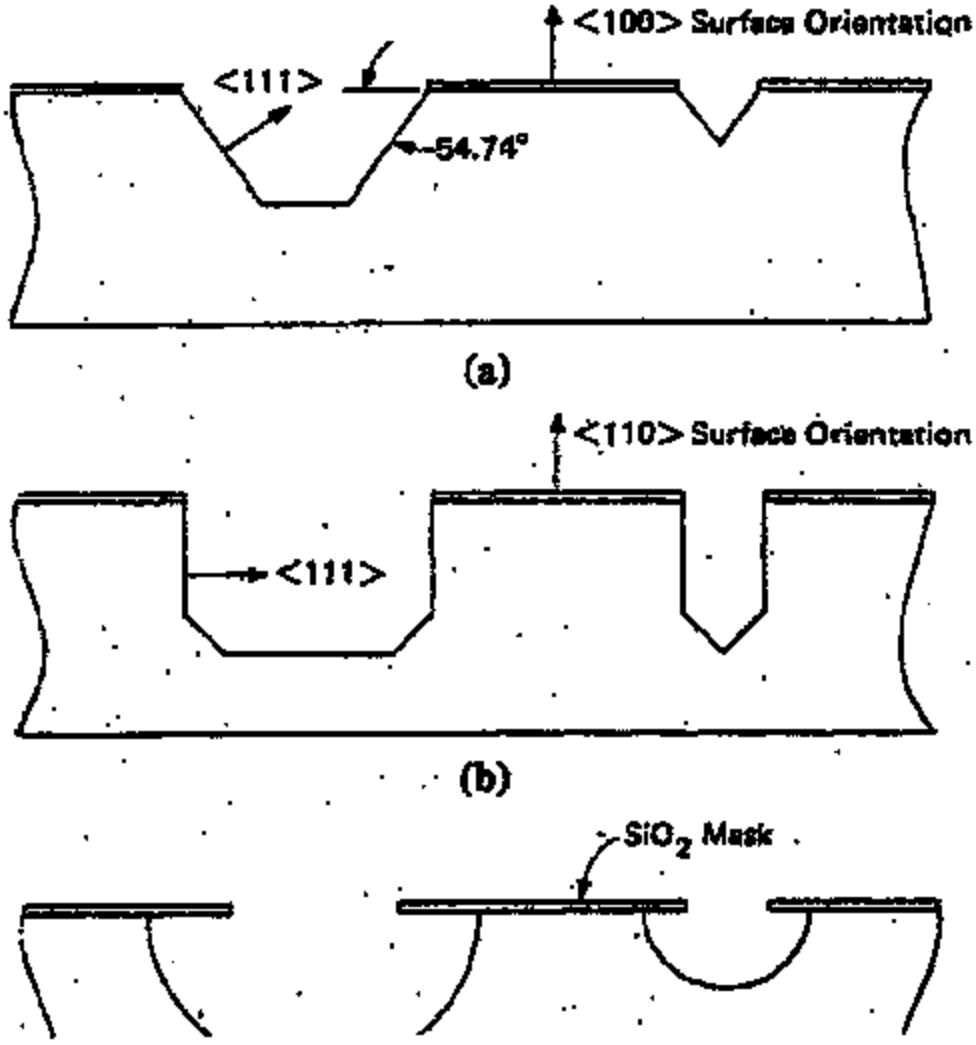
KOH (water, isopropyl)	44 gr 100 ml	85	1.4	400:1	$\geq 10^{20}$ cm^{-3} bor reduces etch rat
	50 gr 100 ml	50	1.0	400:1	by about 20
H_2N_4 (water, isopropyl)	100 ml 100 ml	100	2.0	—	no dependence
NaOH (water)	10 gr 100 ml	65	0.25-1.0	—	$\geq 3 \times 10^{20}$ cm^{-3} reduces etch rat by about 10

The picture shows the *different shapes* than depend mainly on the general *type of etchant* (iso- or



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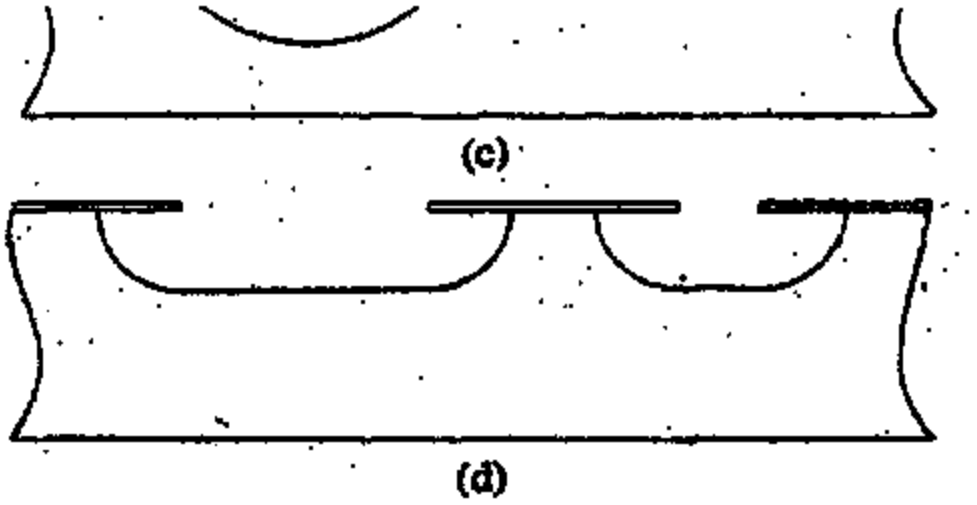

anisotropic).

(a) and (b) show pits resulting from anisotropic etching, depending of the orientation of the wafer, pyramidal or vertical shapes are produced. (c) and (d) depict shapes coming from isotropic etching, where (d) shows the results of unagitated etching solution.

Principle of SCS etching

The etching of SCS takes place in four basic steps:

1. **injection of the holes** onto the semiconductor to raise the silicon to a higher oxidation rate Si^+;
2. **the attachment of the hydroxyl groups** OH^- to the positively charged Si;
3. **the reaction** of the hydrated silicon with the complexing agent in the solution;
4. **the dissolution** of the hydrated products into the etchant solution.

This process implies that any etching solution must provide a *source of holes* as well as *hydroxyl groups*, and must also contain a *complexing agent* whose reacted species is *soluble* in the etchant solution. Since the etching process is fundamentally a charge-transfer mechanism, it is not surprising that etch rates might be dependent on dopant type and concentration. Highly doped material in general might be expected to exhibit higher etch rates because of the higher concentration of mobile charge carriers.

For *anisotropic etchants*, such parameters as *diameter of the doping atom*, *density* of atoms in a particular direction, *energy* needed to remove si-atoms from the surface, and *screening effects* play a role; the precise mechanisms are not yet fully understood.

Shapes resulting from different, anisotropic etch types

Consider a (100) oriented silicon wafer covered with SiO_2. The following table shows some results, depending on etching time (or aggressivity), and tendency to undercut.

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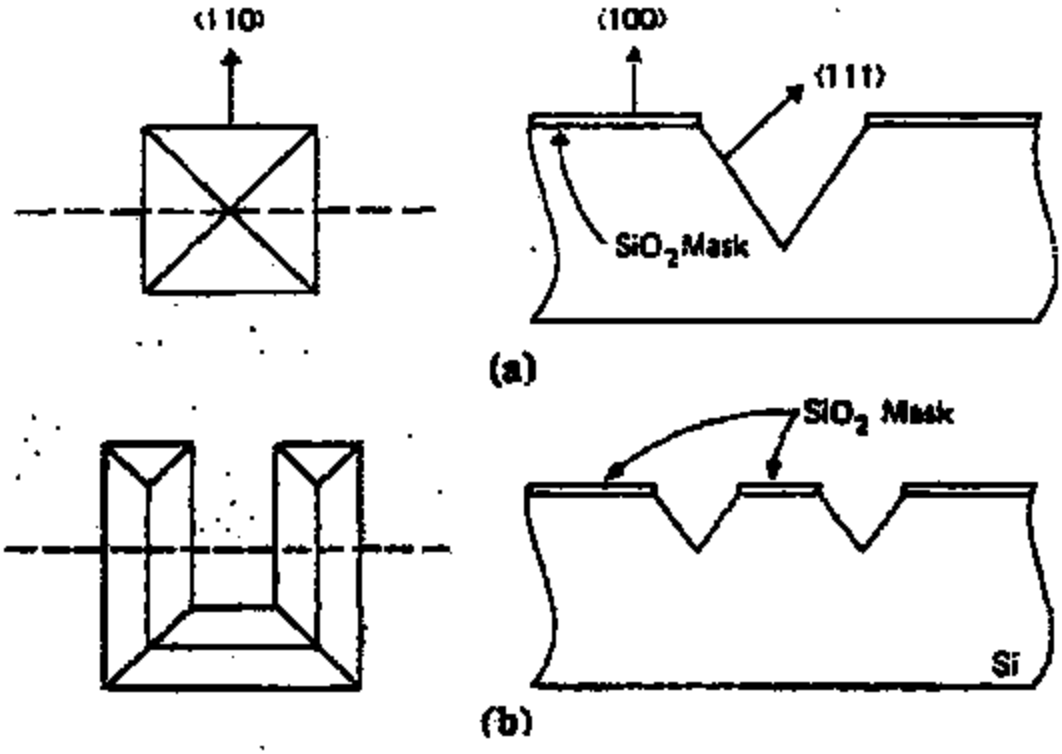
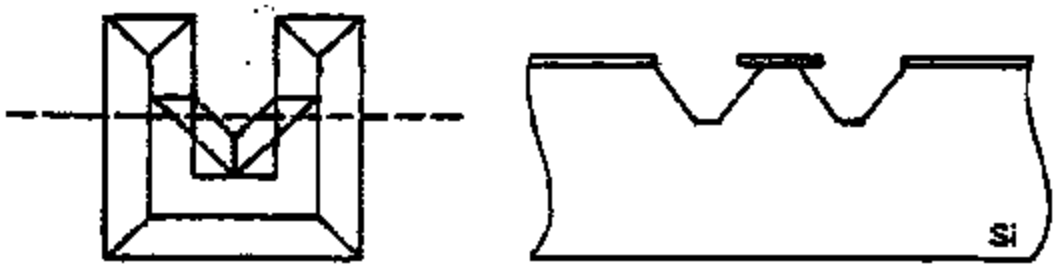
Shape of mask	*Undercut rate*	*Time of exposure*	*Resulting pit*	*see*
Square	Slow		Top-down pyramid	(a)
Square with in-reaching beam	Fast	Medium	As before, but beam partly undercut	(b), (c)
Square with in-reaching beam	Fast	Long	Beam suspended over pit	(d)
Any shape		"sufficiently long"	See "general rule" below	(e)

Some *rules for anisotropic etching* (on (100)-wafers)

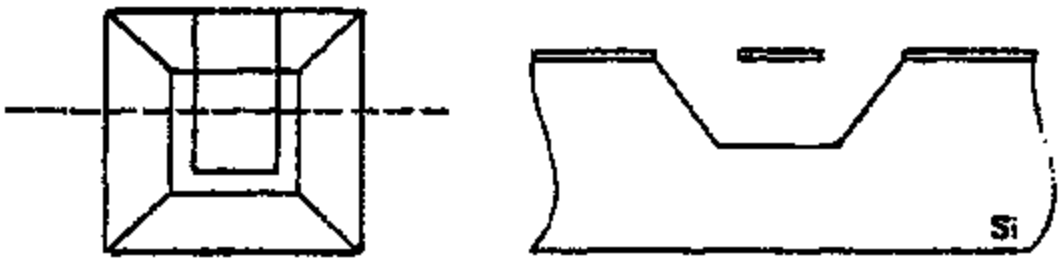
- The "walls" always coincide with (111)-surfaces, since these are always etched slowest.
- **Concave corners** lead to few undercut, if aligned properly.
- **Convex corners** are undercut, depending on the undercut rate of the etchant.
- **General rule**: if silicon is *etched long enough*, ant arbitrarily shaped closed pattern in a closed mask will result in a rectangular pit in the silicon, bounded by the (111)-surfaces, oriented in the (110)-directions, with dimensions such as the pattern is *perfectly inscribed* in the resulting rectangle.

When (110)-wafers are used, deep, *long grooves* can be etched, again bound by (111)-walls. The results of the above table are depicted below.

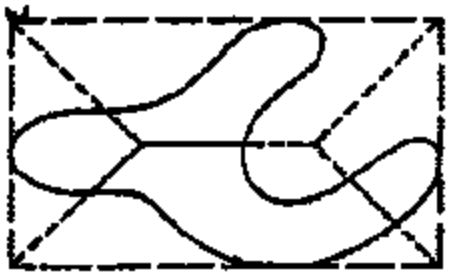




(c)



(d)



(e)

(For description, see table above.)

Electrochemical etching (ECE)

Principle

Electrical contact is made to the front or back of a wafer, with a positively biased silicon electrode and a negative biased platinum electrode. Since etching is still a matter of charge transfer, the fundamental steps are the same as described above. Typical etchants are HF/H_2O-solution , where, due to the weak oxidation capabilities of H_2O, the etch rate is near zero as long as there is no current flow between the electrodes. When a constant current flows between anode and cathode, the etch rate is raised by the following mechanism:

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1. ***accumulation of holes in the silicon***
2. *results in an* ***accumulation of OH^-*** *in the solution at the interface*
3. ***oxidation*** *occurs*
4. ***HF dissolves*** *oxide*
5. *holes are transported to the cathode as* ***H^+-ions, and released there as H_2-bubbles***

Since the oxidation rate is dependent on the current flow, the etching characteristics depend not only on dopant type and resistivity, but also on the arrangement of p and n layers in the wafer interior.

Localized electrochemical jet stream etching

This technique is used to generate *small holes* or *thinned regions* in silicon wafers. In this case, the etchant stream itself is the cathode. Etchrates are high due to high agitation, fast removal of oxides, and the continual arrival of fresh solution at the interface.

Electrical etch-stop

If a voltage bias on an n-type epitaxial layer is established, it can be used to *stop the dissolution* of the p-type silicon substrate at the n-type epitaxial layer. The advantage of this technique is that anisotropical etchants like KOH and EDP can be used without the need for a buried p^+ layer.

Side effect: porous silicon

When ECE is performed at *very low current densities*, or in etchant solutions highly deficient in OH^-, the silicon is not fully oxidized during etching and a *brownish film* is formed. This film is a *single-crystalline silicon layer* that is permeated with a dense network of *very fine holes or channels*, ranging in diameter from much less than 1 to several m m, preferentially oriented in the direction of current flow. The properties can be *controlled* by *current density*, allowing also different grades of porosity in one fabrication step. Note that the necessary temperature to produce porous silicon lies above at least 1000° C.

Laser etching

The mechanism of laser etching is two-fold: on the one hand, the *high temperature* of the laser beam alone, focussed on the substrate, leads to its local destruction. In addition, certain *gases* (HCl and Cl_2) intensify the effect of the laser beam. Advantages can be seen in the possibility of fabricating a wide range of structures or contours with only one tool, and the only locally applied high temperature. Disadvantages are the "*serial*" etching process, since the laser has to *scan* the surface, taking an large amount of time when larger areas have to be etched, so that laser etching is only applicable on special micromachining tasks (contouring, grooving).

Epitaxial processes

In opposite to the previous discussed ways of material *removal*, structures also can be built by *addition* of thin films, epitaxial layers, or metal plating.

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The main attribute of epitaxial layers is that they *maintain* the highly perfect *SCS structure* they are deposited on. In general, thin film layers can be used for passivation, wear resistance, corrosion protection, fatigue strength enhancement, and as very thin, high precision spacers, as well as their use etch stop layer configurations. If an epitaxial layer is grown on a etch stopping material such as B-doped p^+-silicon, and then masked and etched, the depth of the resulting hole depends only on the (very exact controllable) thickness of the epi-layer.

Another advantage is, that doped epi-layer growth provides a much faster way of fabricating rather thick films than diffusion.

Thermomigration

Thermomigration can be used to produce very *narrow "channels"* of doped material in or even through a wafer. The basic principle can be described in the following way:

- **droplets** of a mixture of silicon and the doping material (e.g., Al), are deposited on one side of the wafer
- a **temperature gradient** (ca. 50° C/cm) has be established between the wafer surfaces, so that the droplet is on the hotter side (for Al+Silicon, ≈ 1100° C)
- silicon atoms **dissolve** at the hotter side, are **transported** across the wafer to the colder zone, also **depositing** some Al-atoms along their path through the wafer

The side spread of the Al in this example is only about 1% of the path length, so that a narrow channel of Al-doped silicon is produced.

However, certain *guidelines* have to be followed. So, an *optimal line width* lies between 30 to 160 μm, and the lines are (110)-oriented on a (100)-wafer. A disadvantage of thermomigrated channels is that they represent a source of internal stress for the wafer. A practical application for this technique is the fabrication of *electrical contacts* between electrical circuitry on one side of a wafer to mechanical structures on its other side, or the dopant dependent of long narrow holes.

Field assisted Thermal Bonding

This technique provides a tight and *sealed connection* between glass and silicon wafer, or between two wafers. It is based on the fact, that, when these two materials are in direct contact, and a voltage of approximately 1200V is applied to the outer surfaces, the temperature in the contact area gets as high as 300° C and more, and *electrostatic forces*, resulting from the high electrical field that crosses the narrow air gap between the "electrodes", reach more than 350 psi. As a result, the two materials are strong, uniformly, and hermetically sealed together. If two wafers shall be connected, a thin glass film has to be deposited on one of them first (e.g., by sputtering).

Advantages of this technique are the reasonably low bonding temperature, and the possibility of sealing electric circuitry under glass (when a pit is etched in the glass before bonding).

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Microelectromechanical Systems

Advanced Materials and Fabrication Methods

Committee on Advanced Materials
and Fabrication Methods for
Microelectromechanical Systems

National Materials Advisory Board

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Cover: Rotating grating on a 200 μm diameter gear that allows 180 degrees of positioning. The grating is 185 μm x 200 μm with 2 μm wide lines and spaces. The device has the potential to be used as a beam splitter or as a diffractive element in a microspectrometer. The system was designed by Major John Comtois and Professor Victor Bright, U.S. Air Force, and fabricated by the DARPA-sponsored MCNC MUMPs program. Courtesy of J.H. Comtois and V.M. Bright, U.S. Air Force.

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Preface

Many people in the field of microelectromechanical systems (MEMS) share the belief that a revolution is under way. As MEMS begin to permeate more and more industrial procedures, not only engineering but society as a whole will be strongly affected. MEMS provide a new design technology that could rival, and perhaps even surpass, the societal impact of integrated circuits (ICs). Is this fact or fiction? If it is fact, then several questions must be asked.

- What precisely is the nature of this "revolution"?
- What should be done to exploit MEMS in the most advantageous way?
- Are lessons learned from the development of other fields applicable to the future of MEMS?
- What are the risks of various strategies?
- What steps can be taken to provide an environment in the U.S. that promotes healthy and vigorous growth for MEMS?

A brief consideration of the nature of the revolution can provide a focus for further discussion. Although the revolution may seem to be nothing more than the "miniaturization of engineering systems" to some observers, the authors of this report believe that much more is involved. Miniaturization per se is more of an evolutionary than a revolutionary process. Building systems as compactly as possible has been a theme of engineering practice for many years, and progress toward this goal is typically measured in terms of countless refinements in design and manufacturing techniques.

MEMS is a new and revolutionary field because it takes a technology that has been optimized to accomplish one set of objectives and adapts it for a new, completely different task. The industry, of course, is the silicon-based IC process, which is now so highly refined that it can produce millions of electrical elements on a single chip and define their critical dimensions to tolerances of 100-billionths of a meter. Countless hours and dollars were invested in this technology over the past 30 years to develop a superb method for fabricating overwhelmingly complex electrical systems. The MEMS revolution arises directly from the ability of engineers to harness IC know-how and use it to build working microsystems from micromechanical and microelectronic elements. Because the committee believes that this adaptation is the

revolutionary aspect of MEMS, this report will strongly emphasize those "lithography-based" processing methods that have been well established through the IC experience.

MEMS is a multidisciplinary field that involves challenges and opportunities for electrical, mechanical, chemical, and biomedical engineering, as well as for physics, biology, and chemistry. Papers describing developments in MEMS are being presented more and more frequently at research meetings that have traditionally focused on other fields, such as the large and respected annual International Electron Devices Meeting of the Institute of Electrical and Electronics Engineers (IEEE). Articles about these conferences in trade publications indicate the importance of MEMS to ICs in the gigabit era. One finds "evening discussion sessions," for example, that explore the impact of MEMS on the design of control systems, displays, optical systems, fluid systems, instrumentation, medical and biological systems, robotics, navigation, and computers, among other fields. Universities worldwide are incorporating MEMS research into their programs. To accommodate the interdisciplinary features of the field, many universities are creating cross-departmental and cross-college programs. New graduate courses are being introduced using new materials for teaching, and several books on the subject are nearing completion.

A significant number of government programs supporting MEMS development are in place around the world (e.g., Japan, Switzerland, Germany, Taiwan, and Singapore), and the list is growing. This suggests that development will accelerate as new applications and product opportunities become evident. One can see a similarity to the parallel, independent development of ICs that coalesced in the early 1970s, after a decade or so of intense development had led to processes and designs suitable for use in marketable products.

Early federal support for MEMS research in the United States came from the National Science Foundation, which recognized the field as an emerging area of opportunity. This very limited support (less than $1 million per year) was only for prototype demonstrations, however. In recent years, a major additional source of federal funds has been the U.S. Department of Defense, which currently supports a program at a level of more than $50 million per year.

Only now are established industries in the United States becoming aware of the potential effects of MEMS on their products, and a "show me" attitude has arisen in many quarters. Interest has been steadily increasing with the success of a number of MEMS pioneer companies (e.g., Analog Devices, Inc., EGG IC Sensors, and NovaSensor) in developing commercially rewarding products. More than 80 U.S. firms currently have activities in the MEMS area, a high proportion of which (65 percent) can be classified as "small businesses" (i.e., annual revenues of less than $10 million—in most cases less than $5 million). About 20 large U.S. companies have also incorporated MEMS into their products (e.g., Honeywell, Motorola, Hewlett-Packard, Texas Instruments, Xerox, GM Delco, Ford Motor Company, and Rockwell).

According to Kurt Petersen (1996), a founder of Nova-Sensor and a recognized pioneer in the field, total sales of MEMS in the United States by 1994 were about $630 million, with pressure sensors for medicine ($170 million), automotive use ($200 million), and industrial/aerospace applications ($200 million) completely dominating the scene. The rest of the market was divided among pressure sensors for non-medical applications ($20 million), accelerometers for air bag deployment ($15 million), auto suspension ($2 million), fuel injectors ($20 million), and microvalves ($2 million). Although developments were anticipated in all of these areas, as well as in wholly new areas, Petersen notes that the pace of commercial development was very

slow before the 1990s. MEMS pressure sensors were first commercialized in the 1960s, and ink-jet nozzles in production printers have been evolving since 1974.

In response to the growing interest in MEMS, various trade groups and technical-assessment organizations have surveyed the field and attempted to predict its course. As is customary with predictions and especially with economic punditry, the outcome values of these assessments vary substantially. Although the committee neither reviewed nor compared the various predictions, it did believe that noting some general statements from these sources would be valuable. Projections began to appear in the early 1990s when, for example, a Battelle survey predicted about $8 billion in MEMS products worldwide by the usually quoted target year of 2000. Other predictions since 1990 have generally been more bullish, between $12 and $14 billion.

In 1994, the U.S. trade group SEMI (Semiconductor Equipment and Materials International) conducted a survey of commercial opportunities (Walsh and Schumann, 1994). These predictions were based on information from MEMS manufacturers, users, suppliers, and researchers. This feature does not, of course, validate the study, and committee members had different views of "best guesses" for the field. We repeat here only a few of the SEMI report conclusions starting with its prediction of a year 2000 MEMS world market of more than $14 billion, of which medical and transportation applications for pressure sensing could provide about 30 percent. SEMI's report also predicts major markets (totaling $2.7 billion) for inertial sensors, including accelerometers for auto-crash safety systems, auto suspensions and braking systems, munitions, pacemakers (which can use accelerometers to sense bodily activity), and machine control and monitoring. Other MEMS areas targeted for strong growth in the SEMI survey were fluid regulation and control, optical switching and routing, mass-data storage, displays, and analytical instruments.

Based on a fairly general consensus that lithography-based technologies are the key to low-cost MEMS developments and on the shared desire for "foundry processing," some MEMS foundries are now in operation, notably at MCNC in Research Triangle Park, North Carolina, but also through runs sponsored by the Defense Advanced Research Projects Agency (DARPA) at Analog Devices, Inc., and by special arrangement at Sandia National Laboratories. For specialized uses, such as for space applications, more expensive customized processing techniques like LIGA may be needed, and MCNC is also exploring possibilities in this area. A growing number of examples show that MEMS fabrication could be possible by adding processing steps to conventional IC production lines.

In a recent paper entitled MEMS: What Lies Ahead?, Kurt Petersen (1995) states that "without exception, every company involved in electronics and miniature mechanical components should have programs to familiarize themselves with the capabilities and limitations of MEMS Instrumentation companies that are not fluent in MEMS in the coming years will experience severely threatening competition." Petersen continues that, as MEMS evolves, it is becoming "less an industry unto itself and more of a critical discipline within many other industries." This means that application-specific MEMS processes will undoubtedly evolve as producers discover the best way to use MEMS for their products. Just like production for ICs, processes for MEMS will probably be limited by economic factors, and designers will attempt to satisfy their needs with the simplest, most economical technology.

The purpose of this report is (1) to review current and projected MEMS needs based on

projected applications, (2) to identify shortcomings in present and developing MEMS technologies, (3) to recommend how MEMS can best use advanced materials and fabrication processes to overcome these shortcomings, and (4) to recommend research and development (R&D) areas that would lead to the necessary advances in materials and fabrication processes for MEMS. The first chapter provides background information on the development of the MEMS field and future prospects. Chapter 2 examines the strengths of the various IC-based technologies for fabricating MEMS and their potential for producing even more innovative devices. Chapter 3 focuses on the rationale for introducing new materials and processes that can extend the capabilities and applications of MEMS and that are compatible with IC-based, batch fabrication processes. Chapter 4 extends the discussion of MEMS to the information and manufacturing infrastructure needed to favor the development of MEMS. The final chapter of the report examines the major challenges facing the assembly, packaging, and testing of MEMS.

This report concentrates on MEMS technologies and designs that either derive from or are applicable to those of the IC industry. In the view of the committee, these areas hold the greatest opportunity for the immediate future. Discussions of technologies, fabrication tools, and properties for microsystems made solely from non-IC-based materials (e.g., glasses, plastics, or semiconductors other than silicon) have been necessarily omitted. The committee believes that there are important opportunities for these microsystems, but they are beyond the scope of this report.

Richard S. Muller, chair
Committee on Advanced Materials and
Fabrication Methods for
Microelectromechanical Systems

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Tables, Figures, and Boxes

FIGURES

Acronyms

A/D analog-to-digital converter
ADI Analog Devices, Inc.
AP&T assembly, packaging, and testing
ASIC application-specific integrated circuit

BiCMOS bipolar complementary metal oxide semiconductor

CAD computer-aided design
CAE computer-aided engineering
CMP chemical-mechanical polishing
CNC computer numerical control
CPU central processing unit
CRT cathode-ray tube
CVD chemical vapor deposition

DARPA Defense Advanced Research Projects Agency
DIP dual in-line package
DLP digital light processing
DMD digital micromirror display
DRAM dynamic random-access memories
DRIE deep reactive ion etching

EDM electron-discharge machining

FAMOS field-avalanched metal oxide semiconductor device
FEA finite-element analysis

HF hydrofluoric acid
HP Hewlett-Packard

IBSD ion-beam sputter deposition
IC integrated circuit
ICP inductively coupled plasma

KOH potassium hydroxide

LCD liquid-crystal display
LED light-emitting diode
LPCVD low-pressure chemical-vapor deposition

MBE molecular-beam epitaxy
MEMS microelectromechanical systems
MOCVD metal-organic chemical-vapor deposition
MOD metal/organic decomposition
MOS metal oxide semiconductor
MOSIS metal oxide semiconductor implementation system (now refers to a wider scope of

technologies)
MST microsystem technology

NITINOL Ni/Ti thin-film material
NMOS N-channel metal oxide semiconductor
NSF National Science Foundation
NVFRAM nonvolatile ferroelectric random access memory

PCA portable clinical analyzer
PLAD pulsed laser-ablation deposition
PECVD plasma-enhanced chemical-vapor deposition
PMMA polymethylmethacrylate
PSD plasma sputter deposition

R&D research and development
RIE reactive-ion etching

SAM self-assembled monolayer
SMA shape memory alloy

TI Texas Instruments
TO transistor outline

VLSI very large-scale integration

Executive Summary

As the twenty-first century approaches, the capacity to shrink electronic devices while multiplying their capabilities has profoundly changed both technology and society. Beginning in 1948, the vacuum tube gave way to the transistor, which was followed by a series of major strides leading to integrated circuits (ICs), which led to on-chip electronic systems, such as large-scale memories and microprocessors. Present silicon very-large-scale-integrated (VLSI) chip technology seems destined to continue developing for at least another 20 years based on smaller and smaller electronic devices that can operate faster and do more.

In the late 1980s, the design and manufacturing tool set developed for VLSI was adapted for use in a field called microelectromechanical systems (MEMS). These systems interface with both electronic and nonelectronic signals and interact with the nonelectrical physical world as well as the electronic world by merging signal processing with sensing and/or actuation. Instead of handling only electrical signals, MEMS also bring into play mechanical elements, some with moving parts, making possible systems such as miniature fluid-pressure and flow sensors, accelerometers, gyroscopes, and micro-optical devices. MEMS are designed using computer-aided design (CAD) techniques based on VLSI and mechanical CAD systems and are typically batch-fabricated using VLSI-based fabrication tools. Like ICs, MEMS are progressing toward smaller sizes, higher speeds, and greater functionality.

MEMS already have a track record of commercial success that provides a compelling case for further development (e.g., pressure sensing, acceleration sensing, and ink-jet printing). Like any developing field, however, commercial successes in the MEMS field coexist with products still under development that have not yet established a large customer base (e.g., MEMS display systems and integrated chemical-analysis systems).

The U.S. Department of Defense and the National Aeronautics and Space Administration requested that the National Research Council conduct a study (1) to review current and projected MEMS needs based on projected applications, (2) to identify shortcomings in present and developing MEMS technologies, (3) to recommend how MEMS can best use advanced materials and fabrication processes to overcome these shortcomings, and (4) to recommend research and development areas that would lead to the necessary advances in materials and fabrication processes for MEMS. The Committee on Advanced Materials and Fabrication Methods for Microelectromechanical Systems, under the auspices of the National Materials Advisory Board, was convened to undertake this study and write this report.

The committee concluded that the MEMS field faces a number of challenges to the establishment of an environment that promotes healthy and vigorous growth. These challenges are presented in this Executive Summary along with recommendations for meeting them. Because of the broad perspective with which the MEMS field is viewed in the report, the findings and recommendations are not prioritized.

LEVERAGING AND EXTENDING THE INTEGRATED CIRCUITS FOUNDATION

A great deal of the excitement and promise of MEMS has arisen from the demonstrated ability to produce three-dimensional fixed or moving mechanical structures using lithography-based processing techniques derived from the established IC field. Conventional IC materials can continue to be used in new ways in MEMS, and much of the needed MEMS-specific hardware can still be leveraged from IC-technology. Such MEMS developments are most likely to be accepted in traditional IC-fabrication facilities and therefore most likely to succeed commercially.

In the microelectronics world, major steps forward have sometimes resulted from inspired looks backward at technologies and materials that were already known and well categorized. For MEMS, this "cleverness research" can take on a special character by posing mechanical problems to technologies that originally responded only to the demands of electrical design. A wide field of opportunity for creative work in MEMS could be based on what is already known about IC processing, particularly in the re-evaluation of the vast knowledge compiled during the history of IC development (e.g., transistor-transistor logic; integrated-injection logic; analog; bipolar; n-channel metal-oxide semiconductors).

Conclusion. The expertise and advanced state of the current microelectronics industry provides an enormous advantage for the development of MEMS. Leveraging and extending existing IC tools, materials, processes, and fabrication techniques is an excellent strategy for producing MEMS with comparable levels of manufacturability, performance, cost, and reliability to those of modern VLSI circuits.

Recommendation. Efforts to stimulate solutions to the challenges of producing MEMS should capitalize on the families of relatively well understood and well documented IC materials and processes. These solutions may be found in current IC practices but may also result from creatively re-establishing older IC technologies. This recommendation calls for continuing strategic investment.

ENLARGING THE SUITE OF MATERIALS SUITABLE FOR INTEGRATED-CIRCUIT-LIKE PROCESSING

Although there may be commercial advantages to leveraging the present suite of IC-process materials, they will not be able to meet all of the demands that a growing number of users and applications will place on MEMS. Easily foreseen requirements (e.g., higher forces, stability in harsh and high-temperature environments, and robust high-aspect-ratio structures) will compel the application of new materials and extend the MEMS field beyond the boundaries of the IC world.

Materials that are not usually used in IC processes include magnetic, piezoelectric, ferroelectric, and shape-memory materials. Actuating-force requirements for valve closures and motor drives, for example, are already drawing attention to the advantages these materials would bring to MEMS. Other developments, such as MEMS for optics, biological purposes, chemical-process controls, high-temperature applications, and other hostile environments, will inevitably draw attention to the need for an even broader range of materials.

In the IC world, new materials are typically incorporated as thin films and are produced by a limited number of techniques (e.g., low-pressure chemical-vapor deposition or sputtering). Many of these materials either do not show optimal mechanical properties in thin-film form or are difficult to deposit by typical IC-fabrication methods or are incompatible with the microelectronic IC process. For some MEMS designs, it is possible to apply these specialized materials either by incorporating them in a step prior to more-conventional processing or by adding them as a final step. Either option raises the possibility that the technology will be substantially different from better known processing techniques. Materials that are incompatible with the IC-processes might have to be handled by a specialized foundry.

Conclusion. Extending the list of materials that have useful MEMS properties and can be processed using lithography-based, IC-compatible techniques will be beneficial to MEMS development.

Recommendation. Research and development should be encouraged to develop new materials that extend the capabilities of MEMS. The new materials should be integrable, at some level, with conventional IC-based processing. This recommendation calls for continuing strategic investment.

Recommendation. Research should be encouraged to develop techniques to produce repeatable, high-quality, batch-processed thin films of specialized materials and to determine the dependence of their properties on film-preparation techniques. For some materials, it may be advisable to establish "foundries" that are available to the entire MEMS community and can serve as repositories for equipment and know-how. This recommendation calls for new

strategic investment.

CHARACTERIZING MEMS MATERIALS

The IC industry has been built on an extensive, constantly expanding body of knowledge about the behavior of silicon and related materials as they are scaled down in size. No comparable resource has been established for MEMS, however. For example, although a great deal is known about the electrical properties of polysilicon thin films, not much is known about their micromechanical properties or about specific details of the long-term reliability of mechanically stressed polysilicon or the surface mechanics related to friction, wear, and stress-related failure. There is a similar lack of fundamental knowledge about other thin-film materials borrowed from the electrical domain that are now exercised mechanically (e.g., silicon nitride, silicon dioxide, and thin-film metals). Many thin-film materials that are used in the IC industry (e.g., aluminum, silicon dioxide, amorphous silicon, porous silicon, various other deposited and plated metals, and polyimide) have still not been extensively studied and evaluated for their applicability to MEMS.

Conclusion. A thorough understanding of the micromechanical properties of the materials to be used in MEMS at appropriate scales is not available.

Recommendation. The characterization and testing of MEMS materials should be an area of major emphasis. Studies that address fundamental mechanical properties (e.g., Young's modulus, fatigue strength, residual stress, internal friction) and the engineering physics of long-term reliability, friction, and wear are vitally needed. It is important that these studies take into account fabrication processes, scaling, temperature, operational environment (i.e., vacuum, gaseous, or liquid), and size dependencies. Studies of the size effects of physical elements, on a scale comparable to the crystallite regions in a polycrystalline material, are required. This recommendation calls for continuing strategic investment.

UNDERSTANDING SURFACE AND INTERFACE EFFECTS

The properties of materials can differ at the small scales at which individual MEMS devices are configured, causing effects that can influence their behavior. At these tiny scales, material behavior is more influenced by surface-driven effects than by volume or bulk effects. For example, frictional effects take on overwhelming importance, in contrast to inertial effects, in small mechanical systems. If the interfaces act as electrical contacts (e.g., in MEMS microrelays), additional wear, corrosion, frictional effects, and contact forces are present. Surface-to-surface sticking (stiction) is also likely to be important in surface-driven processes. During the drying process and after the final cleaning of MEMS devices, the surface tension of the meniscus of liquids can pull suspended mechanical structures toward nearby surfaces, causing the structures to become stuck. Stiction can also occur during the operation of actuated MEMS if shock, electrostatic discharge, or other stimuli cause moving components to touch either each other or to touch another surface.

The MEMS operating environment and the interfaces of this environment on individual MEMS devices can influence performance. Signals admitted to the MEMS package may have electrical, thermal, inertial, fluid, chemical, optical, and possibly other origins. Output can be

electrical, optical, mechanical, chemical, hydraulic, or magnetic signals. MEMS applications to liquid systems, for example, would raise interface questions about the use of wetting and dewetting agents and the nature of fluids in micrometer-sized channels and cavities. The high precision of some MEMS sensing devices also makes them sensitive to gas/solid interactions.

Conclusion. Further development of moving elements in MEMS demands a more complete understanding of (1) the effects of internal friction, Coulomb friction, and wear at solid/solid interfaces and (2) the influence of interfaces on performance and reliability. This understanding should lead to the development of suitable coatings, lubricants, and wetting agents, as well as improved designs that take these effects into account.

Recommendation. Surface and interface studies should be pursued to address questions associated with contact forces, stiction, friction, corrosion, wear, lubrication, electrical effects, and microstructural interactions at solid, liquid, and gaseous interfaces. Engineering design and manufacturing solutions to the problems associated with MEMS surfaces and interfaces should also be pursued. This recommendation calls for continuing strategic investment.

ETCHING TECHNOLOGIES

At the heart of MEMS is the ability to construct extremely small mechanical devices, preferably using batch processing. Wet etching has historically dominated the MEMS field because (1) structures can be micromachined from silicon in a short time and (2) chemical-etch equipment is well established, simple, and inexpensive. The disadvantages of wet-chemical processing are its inability to achieve vertical sidewalls and nonorthogonal linear geometries in d silicon and its reaction with films on the wafer surface. Because of the lateral spread of etching, patterned features must also be spaced relatively far apart so that adjacent features do not merge, and the features on the mask and pattern-transfer layer must be biased or reduced (and sometimes even distorted) to achieve the desired size and shape at the completion of the wet-etch process. Although dry etching is a mainstay of IC processing and gas-phase dry-etching techniques are currently a subject of research for MEMS production, the etch depths for MEMS are often significantly greater than those commonly employed in IC-fabrication. Therefore, etching for MEMS may present different or additional challenges.

Conclusion. Because controlled etching is so important to the fabrication of three-dimensional structures and, therefore, to progress in MEMS, methods of etching in a controlled fashion and ways of tailoring the isotropic or anisotropic etch-rates of various materials are of great value.

Recommendation. Further research and development should be undertaken to improve etches, etching, and etching controls for MEMS. This work should take into account the status, potential development, and limitations of manufacturing-process equipment. This recommendation calls for continuing strategic investment.

ESTABLISHING STANDARD TEST DEVICES AND METHODS

Standard test devices and methods are required to determine the mechanical properties of MEMS devices, to demonstrate the repeatability and reliability of mechanical devices, and to facilitate quality-control practices. Package-level testing is currently the most common way to