PE13-018

FORD

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APPENDIX G

Engineering Review

9

AND

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APPENDIX G

Engineering Review

9

From: Huang, Larry (L,.)
Sent: Monday, April 01, 2013 11:48 PM
To: 'Satish NADELLA'
Subject: FW: P415 CAC Data
Attachments: CAC P415 WITH EXTERNAL COVERS.pptx; Performance P415 w-Mask and 6 tube blockerx.pdf

Satish,
A couple of questions on the data you just sent to us:

1) Is "Spec CAC" on side 4 the current production PCA CAC, with the internal cover with 27mm open? The performance should be same as one that you sent to us last year, as attached, right? But they are about 5 points difference.
2) PCA CAC with 7-tube external blocker on slide 5 has the effectiveness about 2/3 of PCA on slide 4. However, for CAC without internal cover, "7-tube blocker" impact is about ½, comparing slide to slide 1.

Would you please check your modeling to make the data to be consistent?

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Satish NADELLA [mailto:satish.nadella@valeo.com]
Sent: Wednesday, March 27, 2013 5:16 PM
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.); Alcaraz andrade, Alejandro (M.); Huang, Larry (L,.); Guillermo GUADARRAMA; Eduardo BARRIOS; Blas-Fernando GUTIERREZ
Subject: P415 CAC Data

Hi Erik,

Please find enclosed the data for all of the configurations specified by Mike. Data is from performance testing of these configurations.

Regards,
Satish Nadella

SPEC CAC P415 2013 WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHRGE AIR FLOW (kg/hr)	432	76.2	89.3	92.5
	684	63.4	82.8	88.9
	1037	50.6	74.0	81.4

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	63.5	266.9	607.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	12.32	26.97	58.14

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	43.5	50.5	53.6
	0.19 (684)	36.4	45.1	48.4
	0.28 (1037)	29.2	39.2	43.2

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.1	276.1	626.6

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.55	18.54	40.51

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	44.0	51.5	55.0
	0.19 (684)	36.5	45.6	49.0
	0.28 (1037)	29.4	39.6	43.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.4	276.9	630.9

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.38	18.67	40.54

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

SPEC CAC P415 2013 WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CHARGE AIR FLOW (Kg/hr)	432	65.2	77.5	82.6
	684	54.6	69.8	75.9
	1037	43.8	61.9	67.8

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	61.8	264.0	607.1

ΔP Internal AIR (mbar)	CHARGE AIR FLOW (Kg/hr)		
	432	684	1037
EXT. FLOW 1.08 Kg/s	14.24	32.33	71.39

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.8	55.6	59.7
	0.19 (684)	38.4	48.7	53.6
	0.28 (1037)	30.6	42.0	46.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	69.6	274.3	629.0

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.34	32.38	69.55

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.4	55.8	59.6
	0.19 (684)	38.1	49.4	53.4
	0.28 (1037)	30.2	41.9	46.5

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	70.3	274.5	623.3

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.17	32.34	68.95

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

Heat Transfer Results for CAC P415 With Mask

Version 3 June 18th, 2012

valeo added

Internal Cover

Current Condition

Internal Cover + 6 Tube Blocker

PERFORMANCE RESULTS

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81		
CHARGE AIR FLOW (kg/hr)	432	73.9	70.3	67.7
	684	61.0	56.6	55.7
	1037	48.6	45.3	43.9

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		3.27		
CHARGE AIR FLOW (kg/hr)	432	88.0	84.4	80.2
	684	82.4	74.6	74.2
	1037	74.0	64.5	65.2

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		5.7		
CHARGE AIR FLOW (kg/hr)	432	91.0	87.6	87.0
	684	87.6	79.2	79.9
	1037	81.3	70.9	73.5

EXTERNAL PRESSURE DROP

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)			
	432	684	1037	
EXT. FLOW 1.08 kg/s	70.0	314.0	704.0	Current
	62.9	264.4	602.3	W/ Internal Mask ONLY
	82.9	355.8	795.6	W/ Internal Mask + 6 tube blocker

INTERNAL PRESSURE DROP

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)			
	432	684	1037	
EXT. FLOW 1.08 kg/s	1.4	3.0	6.1	Current
	1.7	3.9	8.4	W/ Internal Mask ONLY
	1.8	4.1	9.0	W/ Internal Mask + 6 tube blocker

From: Corey SMALL <corey.small@valeo.com>
Sent: Friday, June 21, 2013 12:59 PM
To: Huang, Larry (L,.)
Cc: Satish NADELLA <satish.nadella@valeo.com> (satish.nadella@valeo.com); Andersen, Erik (E.); ying.tang@valeo.com; Larry ENGEL
Subject: Re: P415 PCA Data
Attachments: CAC P415 with external blocker_internal cover.pptx

Larry,
Per your request;

Best Regards/Sincèrement,
Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Tue, Jun 18, 2013 at 8:30 PM, Huang, Larry (L,.) <lhuang3@ford.com> wrote:

Satish,

Attached is the datasheet for "PCA-minus internal mask". Would you please provide the datasheet similar to Slid 2, for "Externally block bottom 7 tubes / 8 fins", but "**WITH** INTERNAL MASK (COVER)"? We will appreciate it if you can provide it to us by Thursday. Thank you very much.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Tuesday, May 07, 2013 8:51 AM
To: 'Corey SMALL'
Subject: RE: Summary of P415 Requested CAC Robustness Actions

Thanks, Corey.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: Tuesday, May 07, 2013 8:38 AM
To: Huang, Larry (L,.)
Cc: Satish NADELLA; Andersen, Erik (E.); Kramer, Michael (M.T.); ying.tang@valeo.com; Guillermo GUADARRAMA; Blas-Fernando GUTIERREZ; Tyler, Jim (J.S.)
Subject: Re: Summary of P415 Requested CAC Robustness Actions

Larry,

I will positively confirm, and get back with you, but I am confident this does have the 14 cells with louvers. Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Mon, May 6, 2013 at 5:52 PM, Huang, Larry (L,.) <lhuang3@ford.com> wrote:

Corey,

That is good news. Thanks for the effort for locating the part.

You meant J1 DV CAC (int. 14 cells with louvers), right? A little manufacturing difference won't affect the performance. The following configs in external blocking are correct. When can we have the data? Thank you very much.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: Monday, May 06, 2013 5:32 PM
To: Huang, Larry (L,.)
Cc: Satish NADELLA; Andersen, Erik (E.); Kramer, Michael (M.T.); ying.tang@valeo.com; Guillermo GUADARRAMA; Blas-Fernando GUTIERREZ

Subject: Re: Summary of P415 Requested CAC Robustness Actions

Larry,

Valeo was able to locate one original DV P415 CAC to test. The only difference on the DV part is that the cam lock is spin welded? Currently the outlet tank is just one piece and not welded. Would this part be acceptable to perform the three tests?

1) Externally block bottom 7 tubes / 8 fins

2) Externally block bottom 4 tubes / 5 fins

3) Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length ("L" laying on its side).

Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Fri, May 3, 2013 at 2:00 PM, Andersen, Erik (E.) <eanderse@ford.com> wrote:

Satish,

Can you please confirm data sheets will be provided today?

Thanks,

Erik Andersen

Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Satish NADELLA [mailto:satish.nadella@valeo.com]

Sent: Monday, April 29, 2013 4:55 PM
To: Andersen, Erik (E.)

Cc: Kramer, Michael (M.T.); Corey SMALL <corey.small@valeo.com> (corey.small@valeo.com); ying.tang@valeo.com; Tyler, Jim (J.S.); Widmann, Carl (C.A.); Weber, Erik (E.M.); Rodgers, Thomas (T.A.); Huang, Larry (L,.)
Subject: Re: Summary of P415 Requested CAC Robustness Actions

Hi Erik,

We will have the data from the testing of the 3 samples on Friday this week. FYI, I have attached a schematic of the 3rd test option.

Regards,
Satish

On Fri, Apr 26, 2013 at 6:39 PM, Andersen, Erik (E.) <eanderse@ford.com> wrote:

Is there timing on the data sheets?

Erik Andersen

Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Kramer, Michael (M.T.)
Sent: Tuesday, April 23, 2013 5:16 PM
To: Satish NADELLA; Corey SMALL <corey.small@valeo.com> (corey.small@valeo.com); ying.tang@valeo.com
Cc: Tyler, Jim (J.S.); Widmann, Carl (C.A.); Andersen, Erik (E.); Weber, Erik (E.M.); Rodgers, Thomas (T.A.); Huang, Larry (L,.); Kramer, Michael (M.T.)

Subject: Summary of P415 Requested CAC Robustness Actions

Please provide ASAP timing for the following three data sheets all using the **original J1 P415 CAC**.

1) Externally block bottom 7 tubes / 8 fins

2) Externally block bottom 4 tubes / 5 fins

3) Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length ("L" laying on its side).

Intent is to determine the maximum number of lower tubes that can be externally blocked and meet the heat rejection performance of today's PCA CAC.

Mike Kramer

RWD PT Cooling Supv.

Six Sigma Black Belt

Cell Phone: (313) 805-0190

Text Page: mkramer1

Page from outside Ford, External email: mkramer1@ford.com

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and its disclosure or reproduction is strictly prohibited.
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at the above address and destroy it.

ONE (7 TUBE & 8 FIN) EXTERNAL BLOCKER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.8	55.6	59.7
	0.19 (684)	38.4	48.7	53.6
	0.28 (1037)	30.6	42.0	46.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	69.6	274.3	629.0

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.34	32.38	69.55

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

From: Kramer, Michael (M.T.)
Sent: Friday, March 29, 2013 12:55 PM
To: Widmann, Carl (C.A.); Weber, Erik (E.M.)
Cc: Andersen, Erik (E.); Huang, Larry (L,.); Kramer, Michael (M.T.)
Subject: FW: P415 CAC Data
Attachments: CAC P415 WITH EXTERNAL COVERS.pptx

Here are the data sheets for the P415 CAC condensation robustness actions. Please let us know if any questions.

Mike Kramer
Truck Applications PT Cooling Supv.
(313) 805-0190
Sent with Good (www.good.com)

-----Original Message-----
From: Satish NADELLA [satish.nadella@valeo.com]
Sent: Wednesday, March 27, 2013 05:16 PM Eastern Standard Time
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.); Alcaraz andrade, Alejandro (M.); Huang, Larry (L,.); Guillermo GUADARRAMA; Eduardo BARRIOS; Blas-Fernando GUTIERREZ
Subject: P415 CAC Data

Hi Erik,

Please find enclosed the data for all of the configurations specified by Mike. Data is from performance testing of these configurations.

Regards,
Satish Nadella

SPEC CAC P415 2013 WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHRGE AIR FLOW (kg/hr)	432	76.2	89.3	92.5
	684	63.4	82.8	88.9
	1037	50.6	74.0	81.4

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	63.5	266.9	607.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	12.32	26.97	58.14

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

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ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
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	0.19 (684)	36.4	45.1	48.4
	0.28 (1037)	29.2	39.2	43.2

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.1	276.1	626.6

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.55	18.54	40.51

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

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9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

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- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

SPEC CAC P415 2013 WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CHARGE AIR FLOW (Kg/hr)	432	65.2	77.5	82.6
	684	54.6	69.8	75.9
	1037	43.8	61.9	67.8

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	61.8	264.0	607.1

ΔP Internal AIR (mbar)	CHARGE AIR FLOW (Kg/hr)		
	432	684	1037
EXT. FLOW 1.08 Kg/s	14.24	32.33	71.39

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.8	55.6	59.7
	0.19 (684)	38.4	48.7	53.6
	0.28 (1037)	30.6	42.0	46.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	69.6	274.3	629.0

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.34	32.38	69.55

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.4	55.8	59.6
	0.19 (684)	38.1	49.4	53.4
	0.28 (1037)	30.2	41.9	46.5

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	70.3	274.5	623.3

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.17	32.34	68.95

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

From: Huang, Larry (L,.)
Sent: Tuesday, September 11, 2012 6:55 PM
To: 'Satish NADELLA'
Cc: Sridhar MADDIPATLA; Ying TANG
Subject: RE: Effectiveness tables - P415 CAC
Attachments: Performance P415 w-Mask and 6 tube blockerx.pdf

I was referring the attached data.

Anyway, I understand the situation, and understand this CAC is heavily revised (off a regular CAC very much). That is the reason that I am not asking you to try matching the datasheet with testing data this time. I was just saying that for the "future CAC". Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Satish NADELLA [mailto:satish.nadella@valeo.com]
Sent: Tuesday, September 11, 2012 6:49 PM
To: Huang, Larry (L,.)
Cc: Sridhar MADDIPATLA; Ying TANG
Subject: Re: Effectiveness tables - P415 CAC

Hi Larry,

I didn't realize we had test data 2 months back with tubes covered as they are now and with the blocking plate in front. Are you sure it was test data? And not something we have 'forced' Ying to predict, for something that is not a normal design practice?

If it were test data, we wouldn't have gone through the trouble of testing a sample now for some of the points needed for this request.

-Satish

On Tue, Sep 11, 2012 at 6:40 PM, Huang, Larry (L,.) <lhuang3@ford.com> wrote:

Thanks for the data.

The performance on the datasheet seems to be significantly different from the testing data that you provided a couple months ago, when we decided to partially block the internal tubes.

In the future, when providing the datasheet for any existing CAC, please make sure the performance on the datasheet is reasonably close to the testing data. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Sridhar MADDIPATLA [mailto:sridhar.maddipatla@valeo.com]
Sent: Tuesday, September 11, 2012 2:26 PM
To: Huang, Larry (L,.)
Cc: Satish NADELLA; Ying TANG

Subject: Fwd: Effectiveness tables - P415 CAC

Hello Larry,

Enclosed please find the updated CAC datasheet with all Green cells filled.

Please let us know, if you have any questions.

Best Regards,
Sridhar Maddipatla

---------- Forwarded message ----------
From: **Huang, Larry (L,.)** <lhuang3@ford.com>

Date: Tue, Sep 4, 2012 at 1:56 PM
Subject: RE: Effectiveness tables - P415 CAC
To: "Satish NADELLA <satish.nadella@valeo.com> (satish.nadella@valeo.com)" <satish.nadella@valeo.com>
Cc: "Tyler, Jim (J.S.)" <jtyler1@ford.com>

Satish,

The datasheet you sent to us last week only has 3x3 effectiveness table. Would you please fill all cell on that table.

And also, we need external pressure drop data filled for our TASE UH3D model (it should be similar as the production numbers).

Would you please fill those data and send us back? Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Tyler, Jim (J.S.)
Sent: Friday, August 31, 2012 11:36 AM

To: Huang, Larry (L,.)
Subject: RE: Effectiveness tables - P415 CAC

Larry, please prepare the data file to be provided to TSE.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Satish NADELLA [mailto:satish.nadella@valeo.com]

Sent: Thursday, August 30, 2012 1:55 PM
To: Huang, Larry (L,.)
Cc: Tyler, Jim (J.S.); Sridhar MADDIPATLA; Guillermo GUADARRAMA

Subject: Fwd: Effectiveness tables - P415 CAC

Hi Larry,

Please find enclosed the data and see the email below from Sridhar with regards to the data filled. Let us know if you have any questions.

Regards,
Satish Nadella

---------- Forwarded message ----------
From: **Sridhar MADDIPATLA** <sridhar.maddipatla@valeo.com>
Date: Wed, Aug 29, 2012 at 2:52 PM

Subject: Re: Effectiveness tables - P415 CAC
To: Satish NADELLA <satish.nadella@valeo.com>

Satish,

Enclosed please find the datasheet filled with actual test data. We don't have data for all test conditions requested in datasheet. Only dark green cells are filled (except isothermal external pressure drop, core internal dp).

Test part reflects following design.
1. top 6 tubes/6fins are blocked on external air side.
2. Tubes entry and exit are blocked such that there is only 27mm opening.

Ambient temp used for testing the part and the data provided in the datasheet is for **25C ambient.** (datasheet asks for 38C, we need Ford to make necessary change on datasheet)

Regards,
Sridhar.

On Tue, Aug 28, 2012 at 4:23 PM, Satish NADELLA <satish.nadella@valeo.com> wrote:

---------- Forwarded message ----------
From: **Huang, Larry (L,.)** <lhuang3@ford.com>
Date: Mon, Aug 6, 2012 at 11:12 AM
Subject: RE: Effectiveness tables - P415 CAC
To: "Satish NADELLA <satish.nadella@valeo.com> (satish.nadella@valeo.com)" <satish.nadella@valeo.com>
Cc: "Tyler, Jim (J.S.)" <jtyler1@ford.com>, "Ying TANG/AuburnHills/VEC/VALEO@VALEO" <ying.tang@valeo.com>

Satish,
Would you please fill out the attached Datasheet template, with the PCA design changes to be released next month.

The template has been simplified, focusing on the UH3D parameters and performance (green cells only, on the construction sheet). For UH3D parameters, assume 15 tubes (= 21 - 6). For the thermal performance and pressure drop, assume 27mm tubes. Please let me know if you have any question. No peak-power point is needed. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617

E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215
-----Original Message-----
From: Tyler, Jim (J.S.)
Sent: Monday, August 06, 2012 9:56 AM
To: Huang, Larry (L,.)
Subject: RE: Effectiveness tables - P415 CAC

Larry, I need your help to provide this update for TSE.

Jim Tyler
T1/P552 Cooling
313-805-2565   Bld-2 23P25
-----Original Message-----
From: Rodgers, Thomas (T.A.)
Sent: Friday, August 03, 2012 1:04 PM
To: Tyler, Jim (J.S.)
Cc: Huang, Larry (L,.); Weber, Erik (E.M.); Kramer, Michael (M.T.)
Subject: Effectiveness tables - P415 CAC

Do you have effectiveness files for the condensation fix CAC (alternatives)
- we need to do more assessments of body grilles in front of the CAC to
prevent "damage"/TGW
2014 P415/LJ1 retrofit.

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Heat Transfer Results for CAC P415 With Mask

Version 3 June 18th, 2012

valeo added

Internal Cover

Current Condition

Internal Cover + 6 Tube Blocker

PERFORMANCE RESULTS

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81		
CHARGE AIR FLOW (kg/hr)	432	73.9	70.3	67.7
	684	61.0	56.6	55.7
	1037	48.6	45.3	43.9

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		3.27		
CHARGE AIR FLOW (kg/hr)	432	88.0	84.4	80.2
	684	82.4	74.6	74.2
	1037	74.0	64.5	65.2

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		5.7		
CHARGE AIR FLOW (kg/hr)	432	91.0	87.6	87.0
	684	87.6	79.2	79.9
	1037	81.3	70.9	73.5

EXTERNAL PRESSURE DROP

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)			
	432	684	1037	
EXT. FLOW 1.08 kg/s	70.0	314.0	704.0	Current
	62.9	264.4	602.3	W/ Internal Mask ONLY
	82.9	355.8	795.6	W/ Internal Mask + 6 tube blocker

INTERNAL PRESSURE DROP

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)			
	432	684	1037	
EXT. FLOW 1.08 kg/s	1.4	3.0	6.1	Current
	1.7	3.9	8.4	W/ Internal Mask ONLY
	1.8	4.1	9.0	W/ Internal Mask + 6 tube blocker

From: Andersen, Erik (E.)
Sent: Wednesday, March 27, 2013 7:14 PM
To: Huang, Larry (L,.)
Cc: Kramer, Michael (M.T.); Alcaraz andrade, Alejandro (M.)
Subject: FW: P415 CAC Data
Attachments: CAC P415 WITH EXTERNAL COVERS.pptx

Larry,

Can you please do a quick review to ensure no issues? We need to get these to TSE ASAP.

Erik Andersen
Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Satish NADELLA [mailto:satish.nadella@valeo.com]
Sent: Wednesday, March 27, 2013 5:16 PM
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.); Alcaraz andrade, Alejandro (M.); Huang, Larry (L,.); Guillermo GUADARRAMA; Eduardo BARRIOS; Blas-Fernando GUTIERREZ
Subject: P415 CAC Data

Hi Erik,

Please find enclosed the data for all of the configurations specified by Mike. Data is from performance testing of these configurations.

Regards,
Satish Nadella

SPEC CAC P415 2013 WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHRGE AIR FLOW (kg/hr)	432	76.2	89.3	92.5
	684	63.4	82.8	88.9
	1037	50.6	74.0	81.4

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	63.5	266.9	607.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	12.32	26.97	58.14

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	43.5	50.5	53.6
	0.19 (684)	36.4	45.1	48.4
	0.28 (1037)	29.2	39.2	43.2

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.1	276.1	626.6

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.55	18.54	40.51

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	44.0	51.5	55.0
	0.19 (684)	36.5	45.6	49.0
	0.28 (1037)	29.4	39.6	43.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.4	276.9	630.9

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.38	18.67	40.54

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

SPEC CAC P415 2013 WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CHARGE AIR FLOW (Kg/hr)	432	65.2	77.5	82.6
	684	54.6	69.8	75.9
	1037	43.8	61.9	67.8

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	61.8	264.0	607.1

ΔP Internal AIR (mbar)	CHARGE AIR FLOW (Kg/hr)		
	432	684	1037
EXT. FLOW 1.08 Kg/s	14.24	32.33	71.39

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.8	55.6	59.7
	0.19 (684)	38.4	48.7	53.6
	0.28 (1037)	30.6	42.0	46.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	69.6	274.3	629.0

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.34	32.38	69.55

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.4	55.8	59.6
	0.19 (684)	38.1	49.4	53.4
	0.28 (1037)	30.2	41.9	46.5

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	70.3	274.5	623.3

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.17	32.34	68.95

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

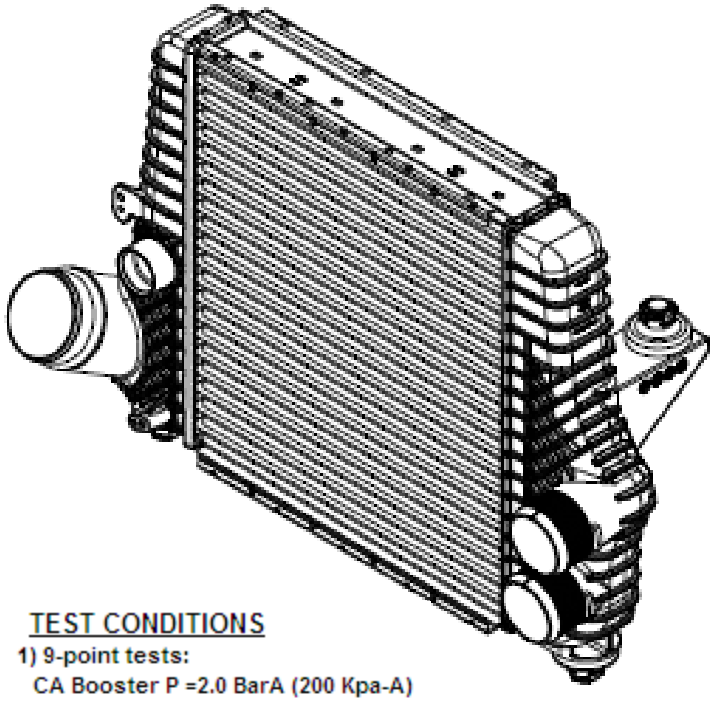
From: Satish NADELLA <satish.nadella@valeo.com>
Sent: Wednesday, May 15, 2013 12:07 PM
To: Andersen, Erik (E.); Tyler, Jim (J.S.); Huang, Larry (L,.); Kramer, Michael (M.T.)
Cc: Corey SMALL; Ying TANG; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA
Subject: Fwd: Summary of P415 Requested CAC Robustness Actions
Attachments: External Covers 3.pptx

Please find enclosed the data for the 3 options with Job 1 core. Data is from the testing done this week.

Regards,
Satish Nadella

CAC P415 2013 (Turbulator: 14cells & with louvers)

Part tested on DV



TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

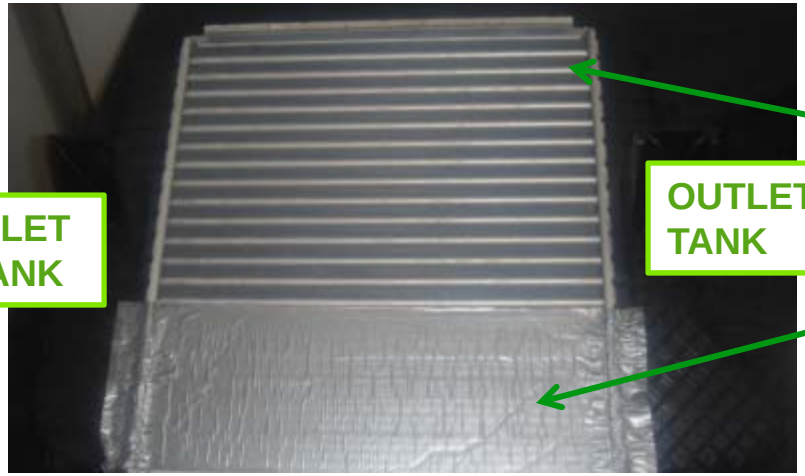
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	79.5	89.9	95.9
	0.19 (684)	66.1	84.7	89.0
	0.28 (1037)	53.4	75.5	83.4

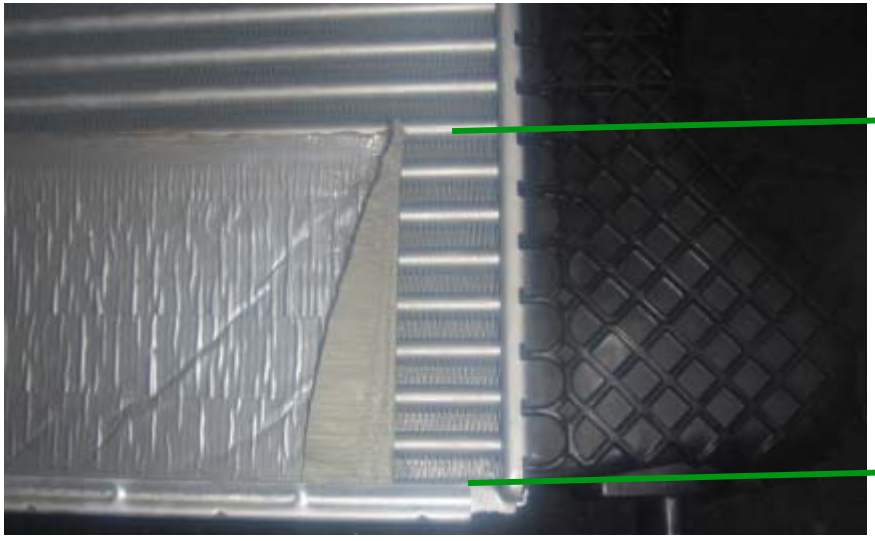
ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	84.6	337.0	749.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	12.07	26.47	56.41

CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins





CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	59.6	70.4	72.5
	0.19 (684)	49.8	63.4	66.4
	0.28 (1037)	40.9	56.8	60.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	122.1	591.5	1400.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.94	26.16	54.40

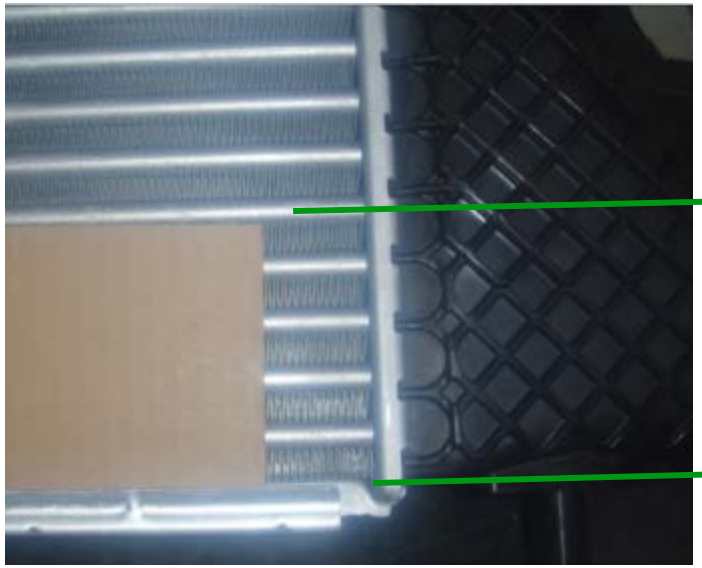
TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins



CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	71.4	83.0	85.8
	0.19 (684)	60.0	77.0	81.9
	0.28 (1037)	48.0	69.4	75.1

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	112.5	500.4	1140.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	11.60	24.08	53.18

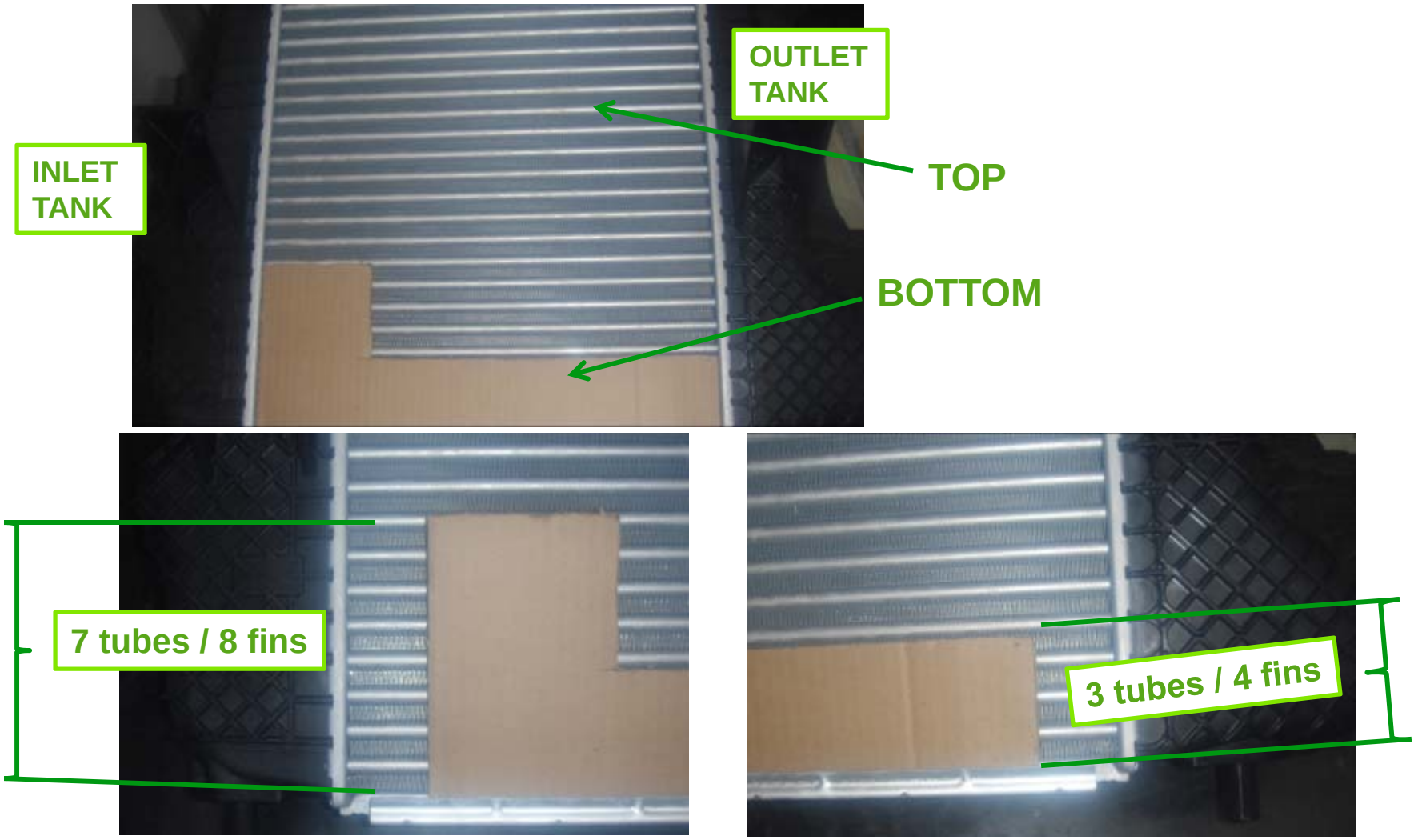
TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



Valeo

PE13-018 030971

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	69.1	81.4	85.5
	0.19 (684)	57.2	75.1	79.7
	0.28 (1037)	46.4	67.2	72.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	101.3	462.7	1071.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.82	25.81	54.36

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

From: Blas-Fernando GUTIERREZ [blas-fernando.gutierrez@valeo.com]
Sent: Monday, February 20, 2012 3:28 PM
To: Huang, Larry (L,.); Joseph LUMETTA; Tyler, Jim (J.S.); Satish NADELLA; Guillermo GUADARRAMA; Eduardo BARRIOS
Subject: CONCEPT REVIEW - P415 Molded Pipe at
Attachments: modif_200212.pptx

Current Mold Views...Initial analysis..to keep on our records.

This is a pair of slides with some views of the mold (Current production tank).

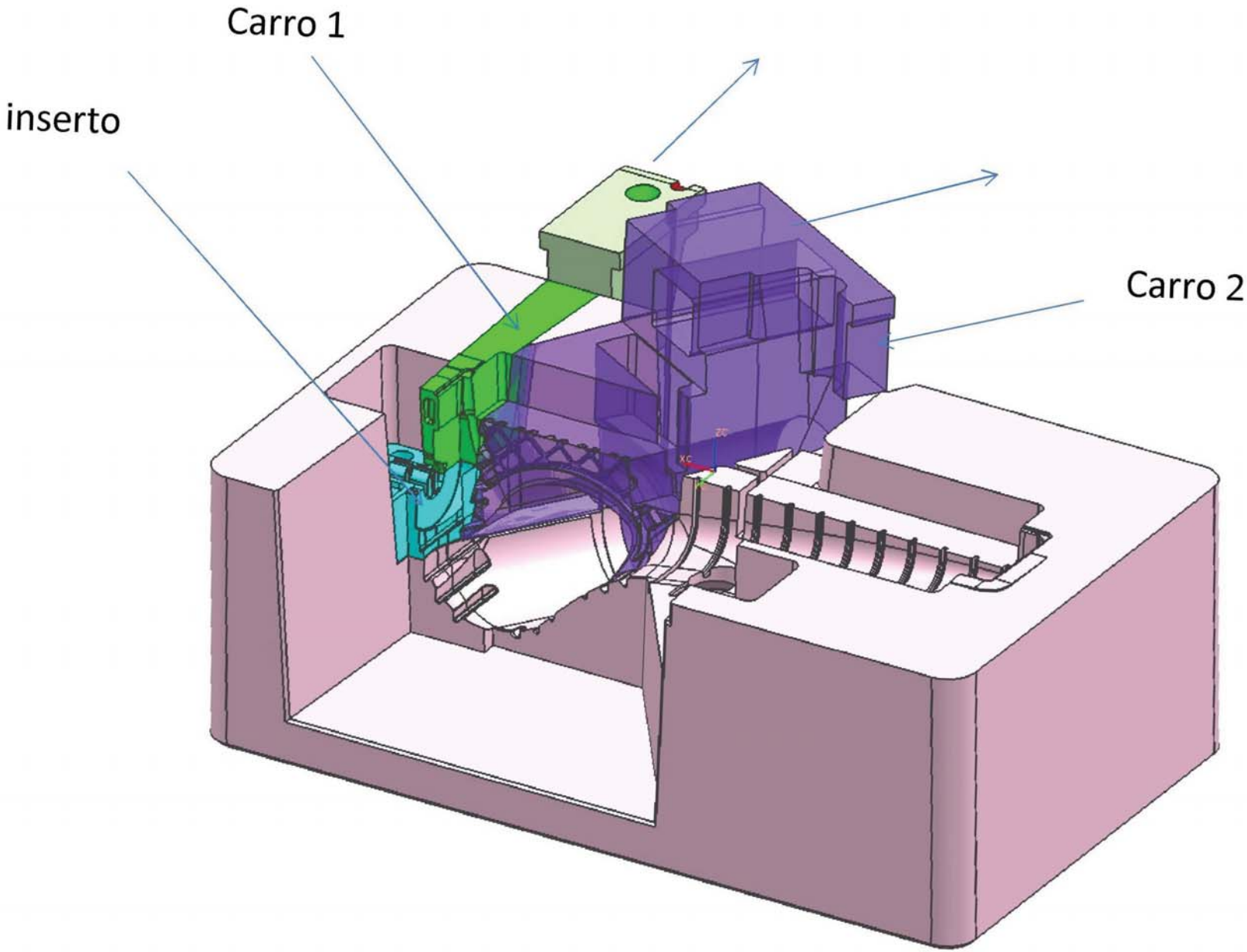
In principle, what was understood and reviewed with ours supplier is that we may could add some pipe formed by the mold components "blue, Green and the purple color ones showed on the slide #1....but, this would make a drain would be more on the engine side than the grill which is the lower portion as a CAC. This was a very rough review since in order to do it with more detail we have to provide a tank 3d Model..

It was confirmed that this is a big change. Ours Tanks molder does not have the capacity to do it at their shop..

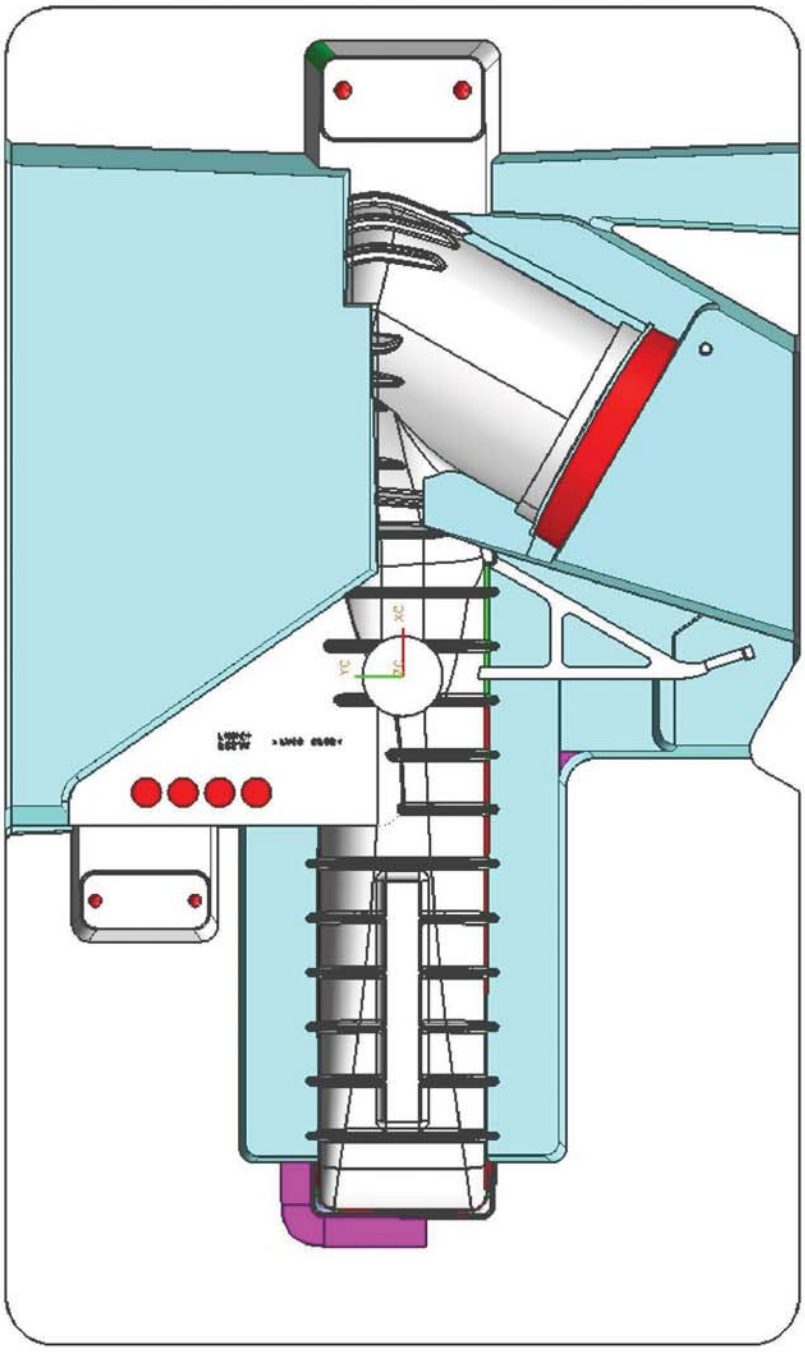
This change would be important since returnable change seems to be not possible because of changes may need also for Core and cavity... high risk for current production tooling if any thing complicates to validate it ..

Some Ideas,
May it is better to start looking for some metal tubing (Fitting) assembled on the tank, something similar as a the fittings used on ITOCs. We will review about adding a hole on the tank to bolt a tubing...

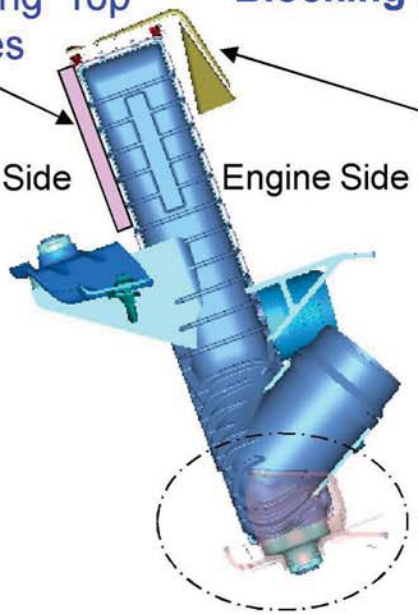
BG



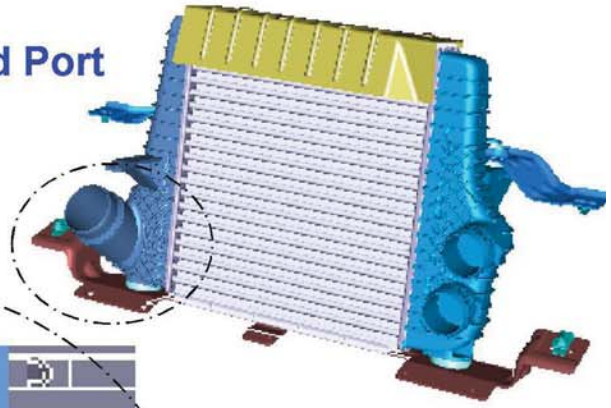
PE13-018 030974

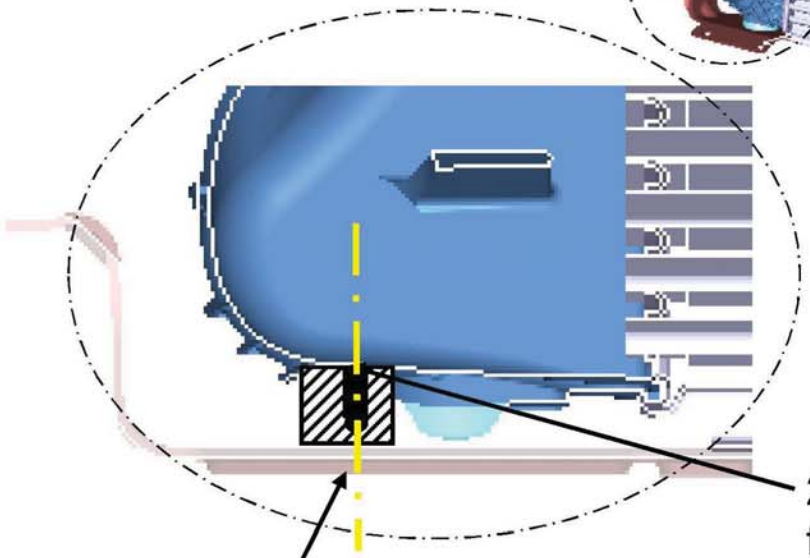


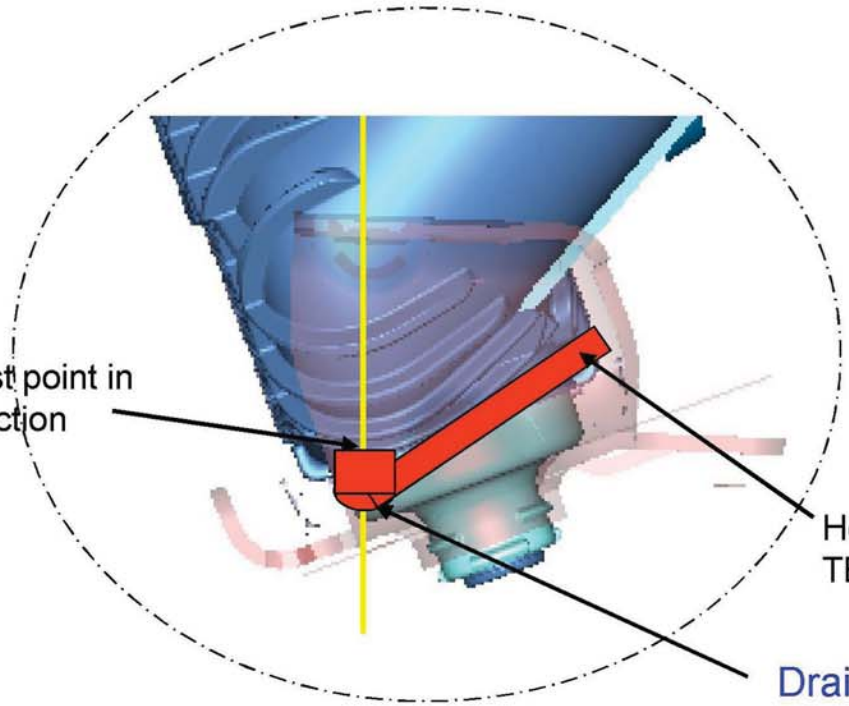
P415 CAC Design Revision, Option I
Blocking upper 6 tubes and Adding Vacuum-Drained Port



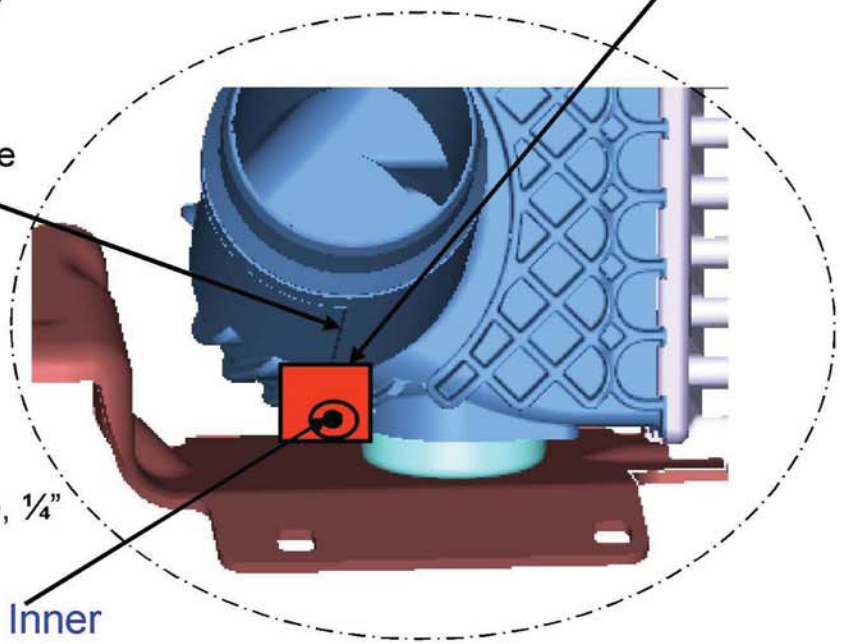
Side View -- On-Vehicle Orientation







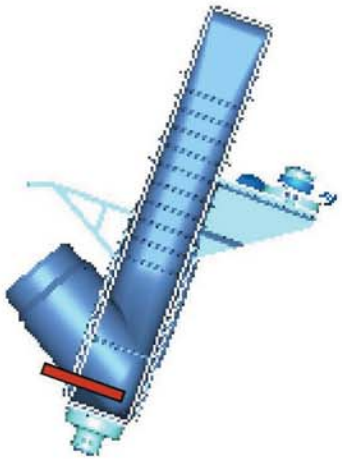
Tank mold
Parting Line

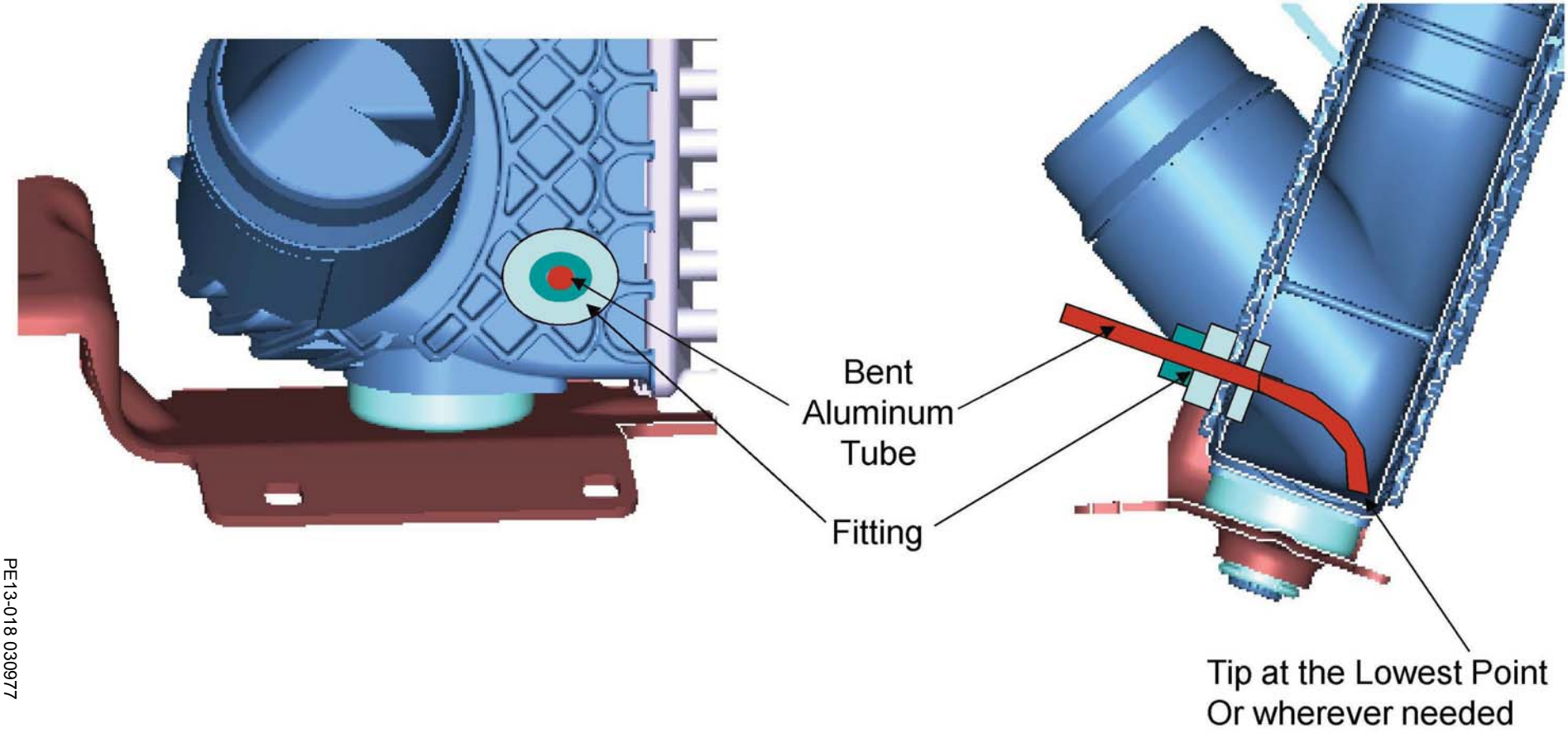


Drain Port with Inner
Hole ID 2mm

PE13-018 030976

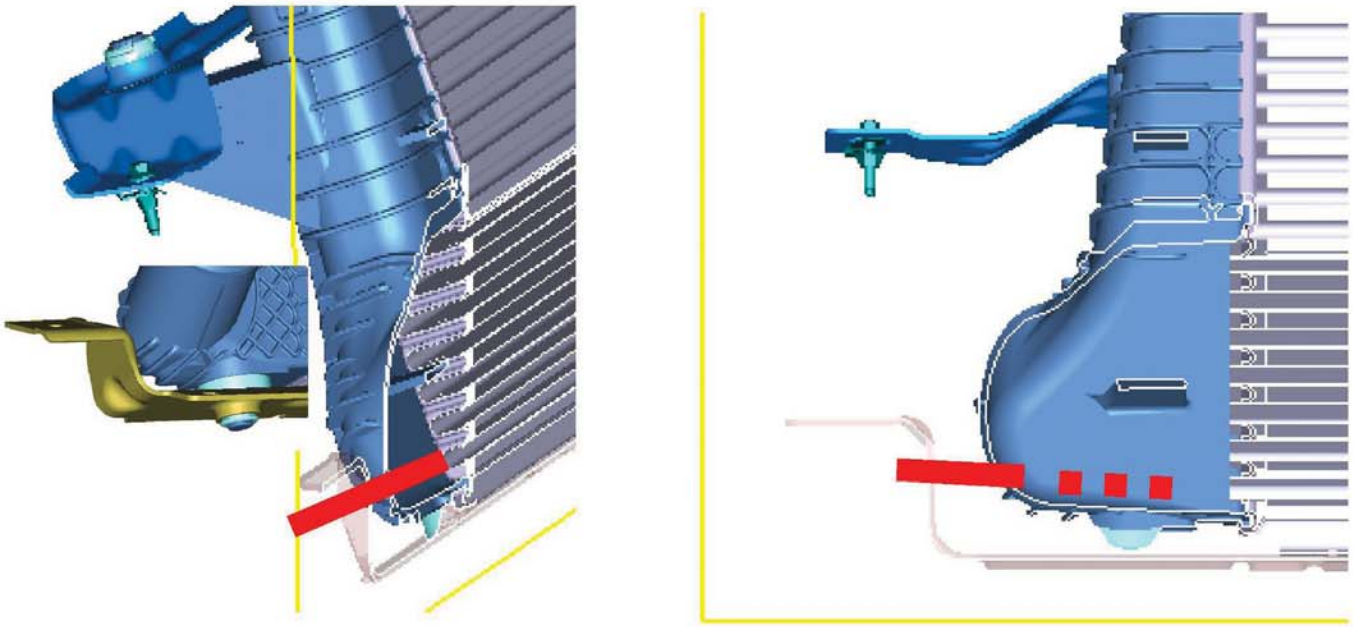
Vacuum-Drained Port
Alternative II – Tube with Fitting





PE13-018 030977

Vacuum-Drained Port
Alternative III – Transverse Drain Port

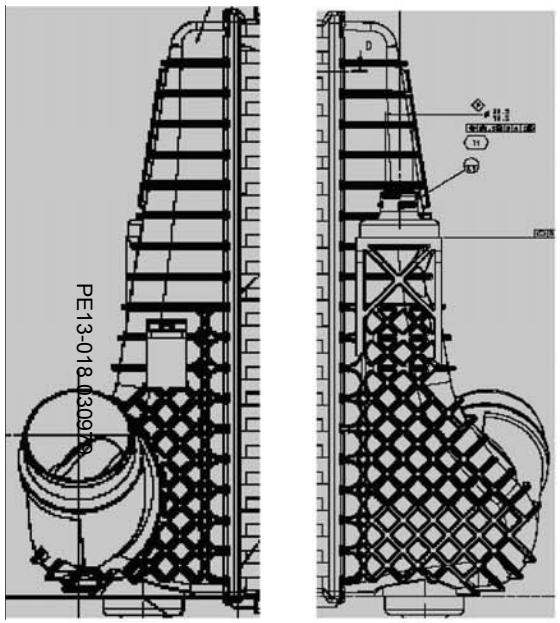


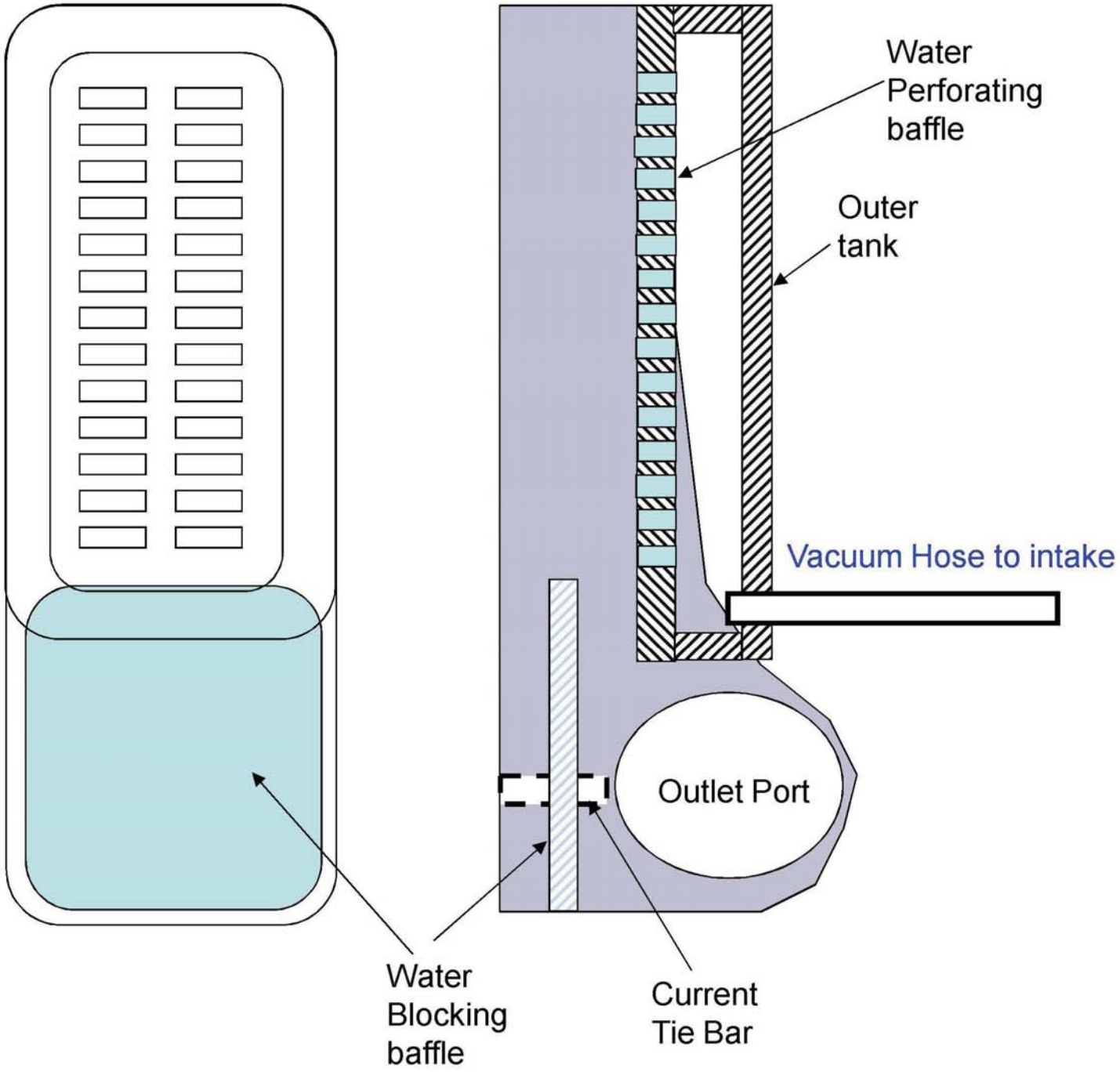
Transverse Drain Port Proposal

P415 CAC Tank Revision, Water Perforating, Option II

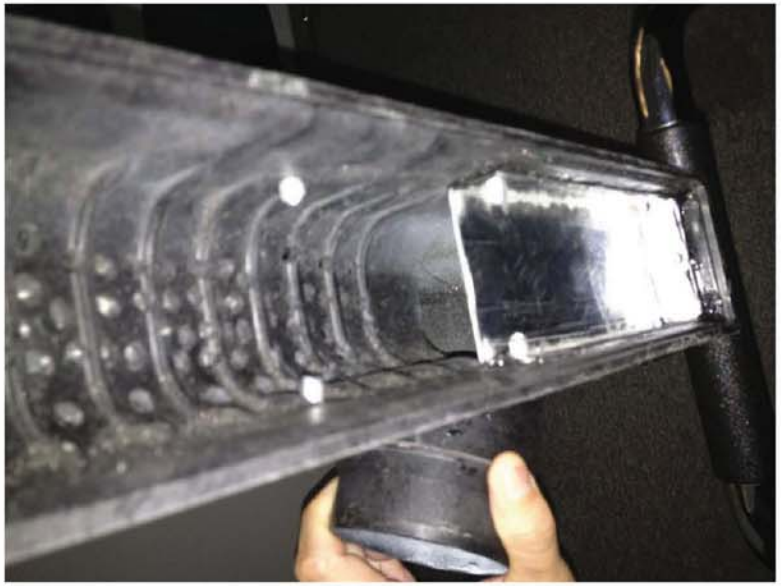
Fasteners

Current P415 CAC Outlet Tank



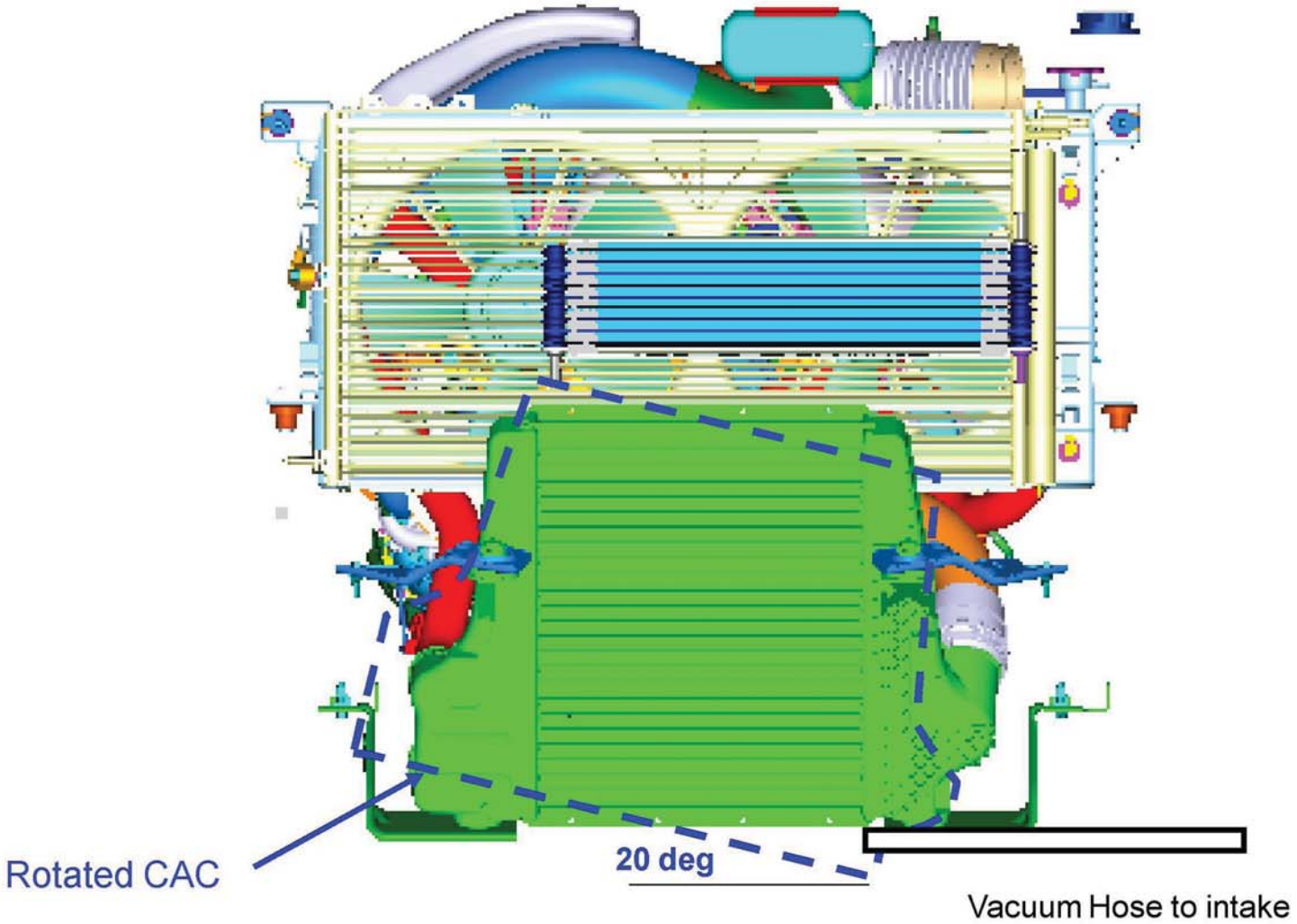


Modified and Tested CAC, with perforating baffle



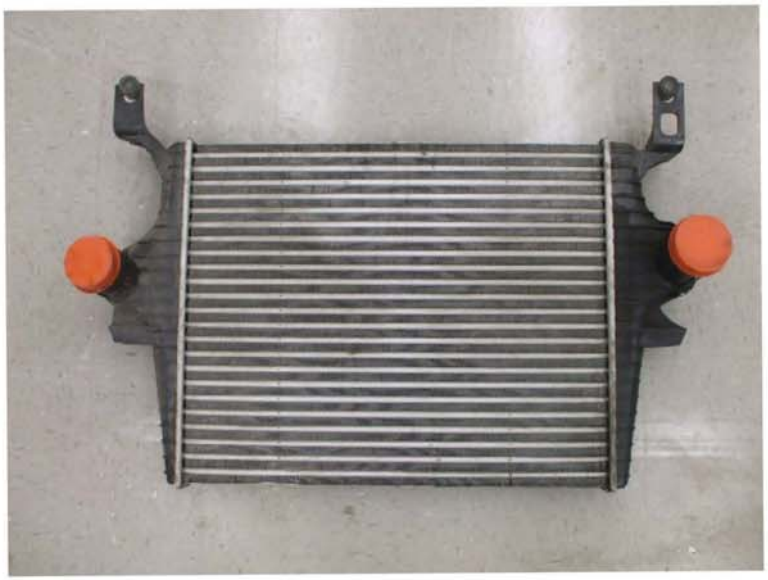
PE13-018 030980

P415, Proposal for Rotating CAC + Vacuum Tube

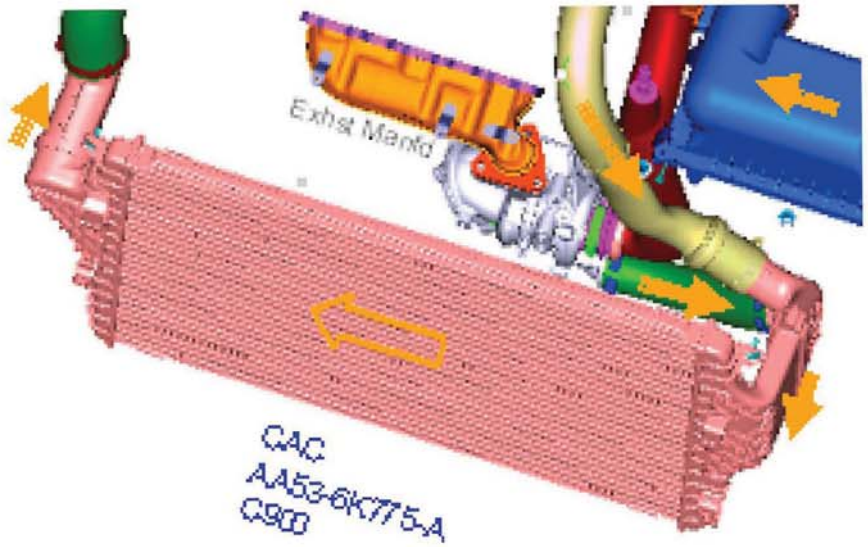


PE13-018 030981

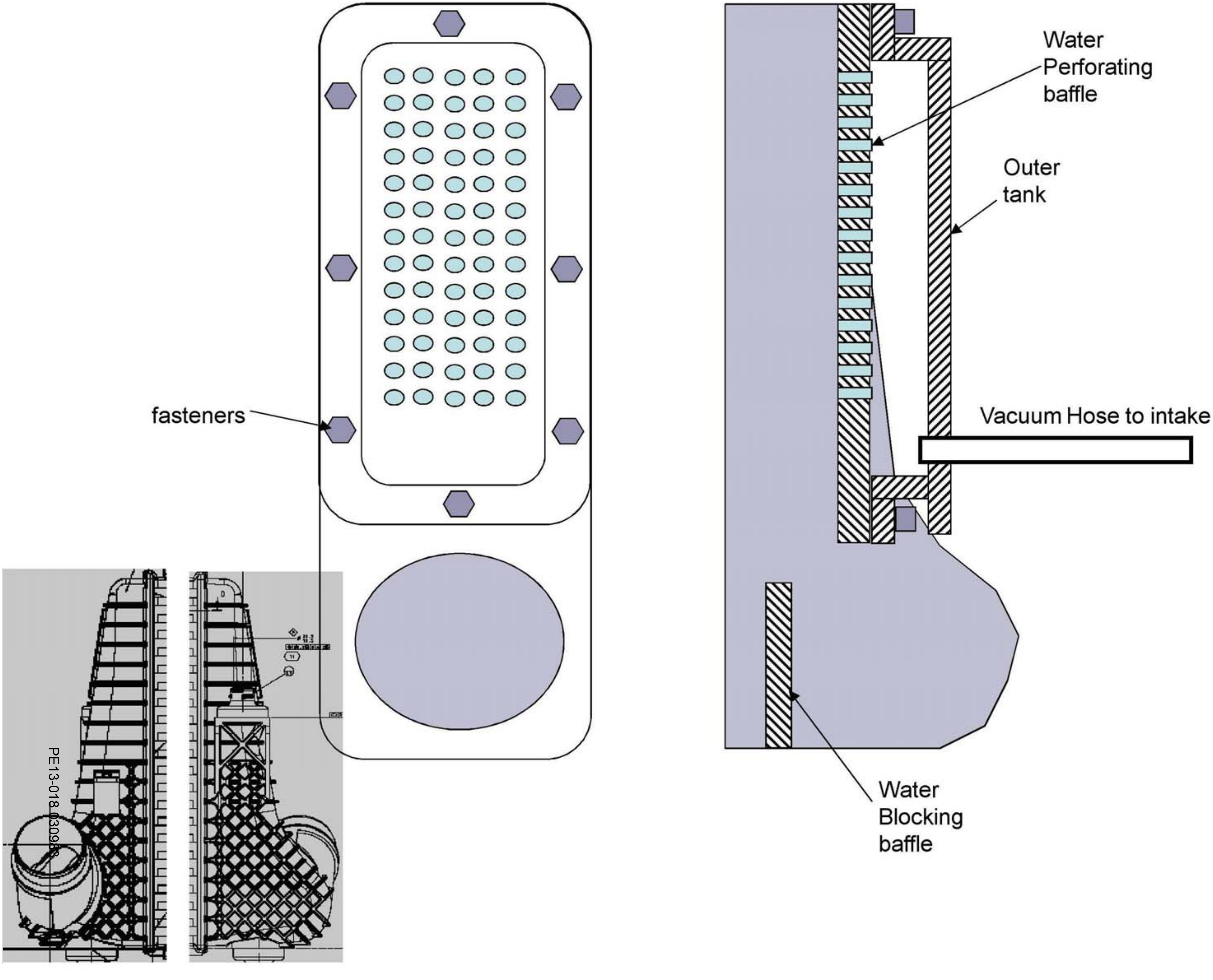
P131 6.0 Diesel CAC



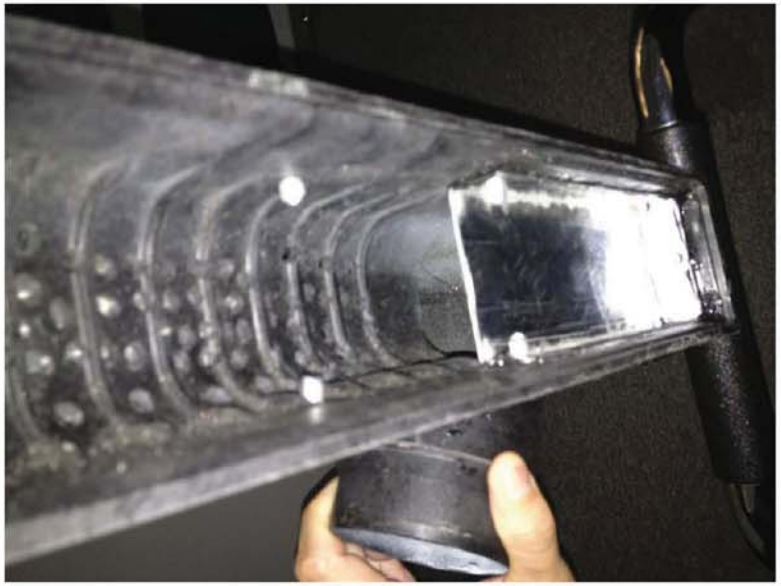
D3 3.5L GTDI CAC



P415 CAC Tank Revision, Water Perforating, Collecting, and Sucking to Intake



Modified and Tested CAC, with perforating baffle



PE13-018 030984

From: Tyler, Jim (J.S.)
Sent: Friday, February 03, 2012 2:22 PM
To: Huang, Larry (L.); Allan, Valerie (V.J.); Palm, Jim (J.R.); Ladd, John (J.R.); Kramer, Michael (M.T.)
Subject: FW: Concept P415 CAC
Attachments: P415 CAC Proposals condensation issue.ppt

Initial Valeo input on outlet tank options.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

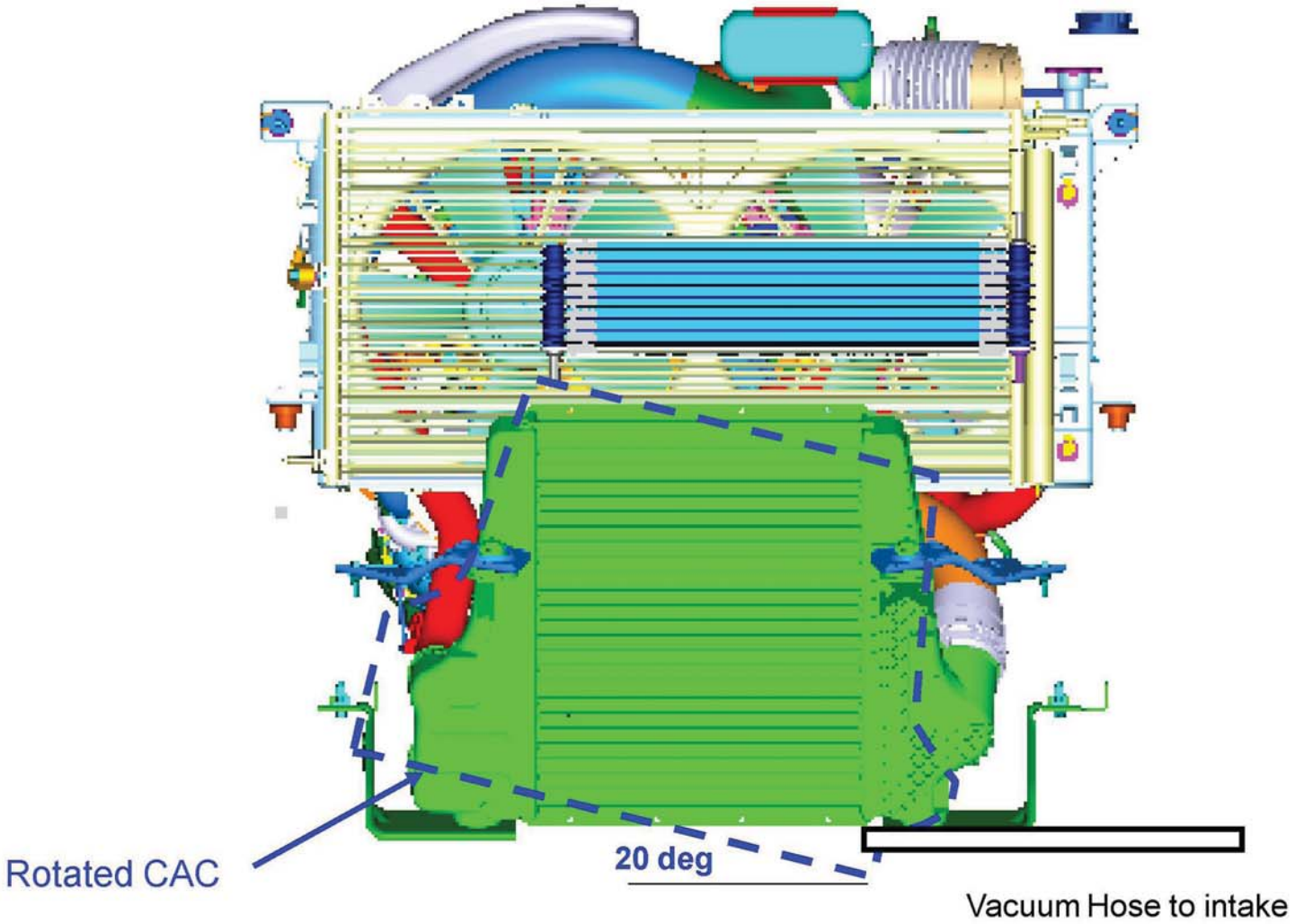
From: Eduardo BARRIOS [mailto:eduardo.barrios@valeo.com]
Sent: Friday, February 03, 2012 1:46 PM
To: Tyler, Jim (J.S.)
Subject: Concept

fyi

--
Eduardo Barrios

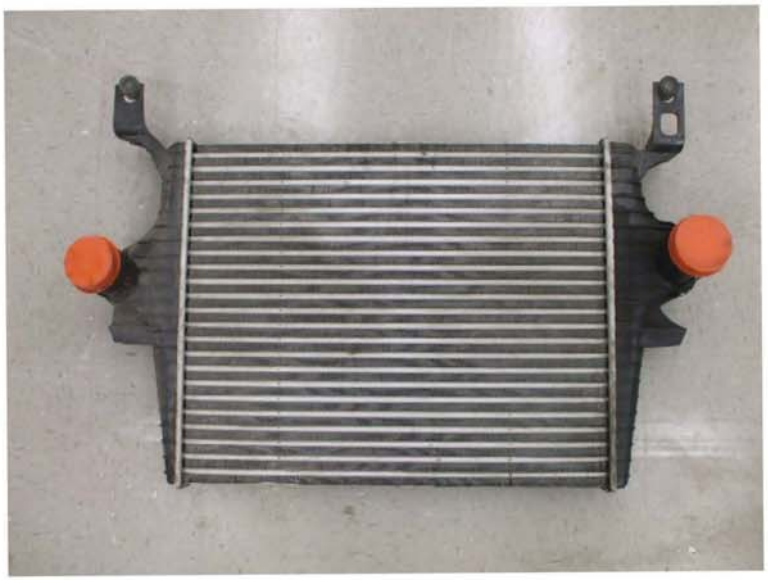
TPT Product Engineering Supervisor (SLP)
Valeo Powertrain Thermal Systems
Eje 130 esq CFE s/n.
C.P 78395 Zona Ind. del Potosí.
San Luis Potosi, Mex.
Tel: 0052 444 826 6655

P415, Proposal for Rotating CAC + Vacuum Tube

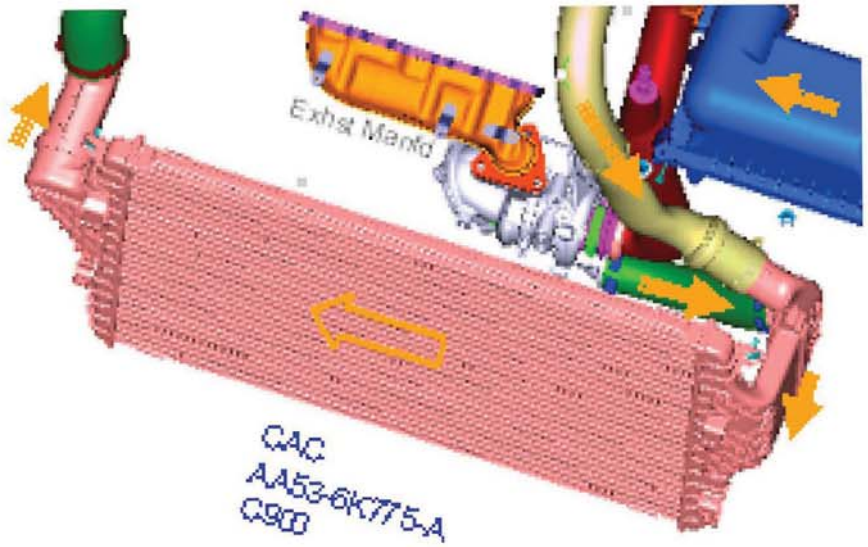


PE13-018 030986

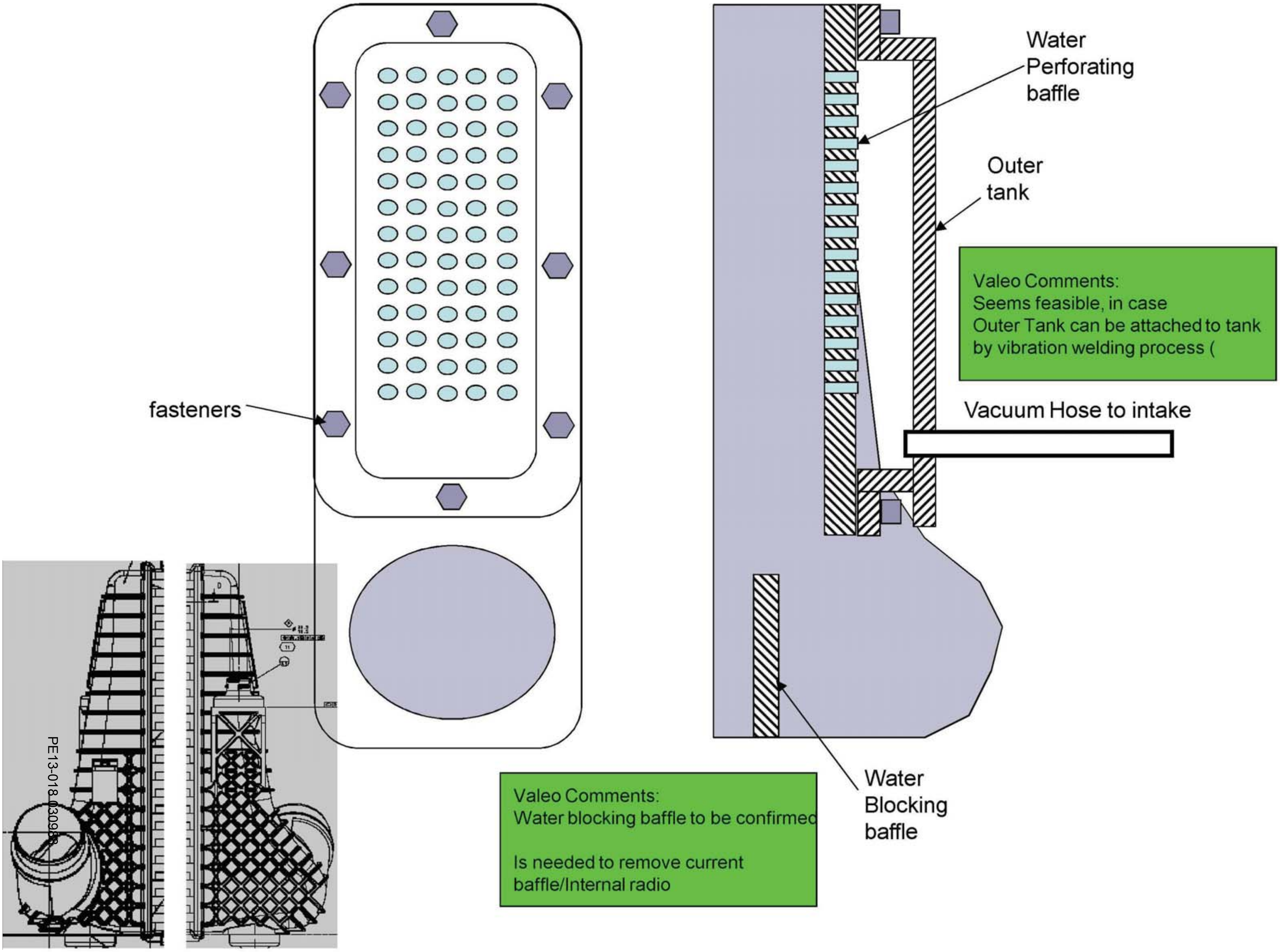
P131 6.0 Diesel CAC



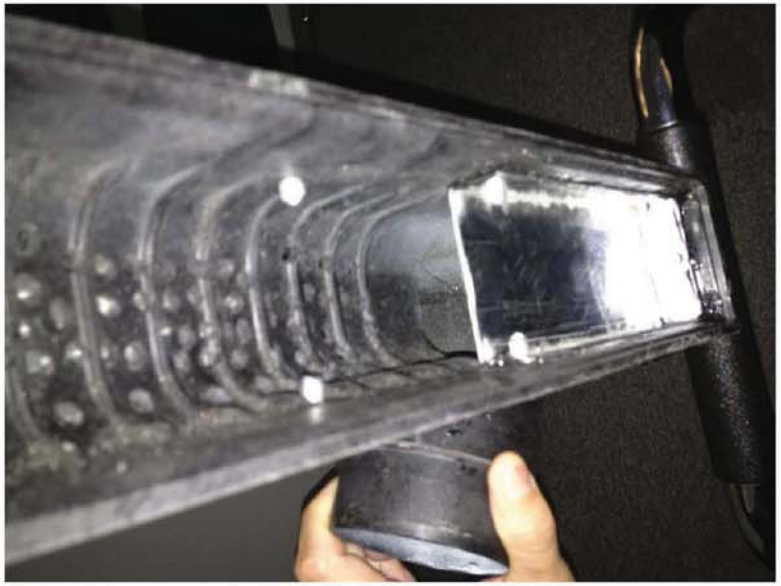
D3 3.5L GTDI CAC



P415 CAC Tank Revision, Water Perforating, Collecting, and Sucking to Intake



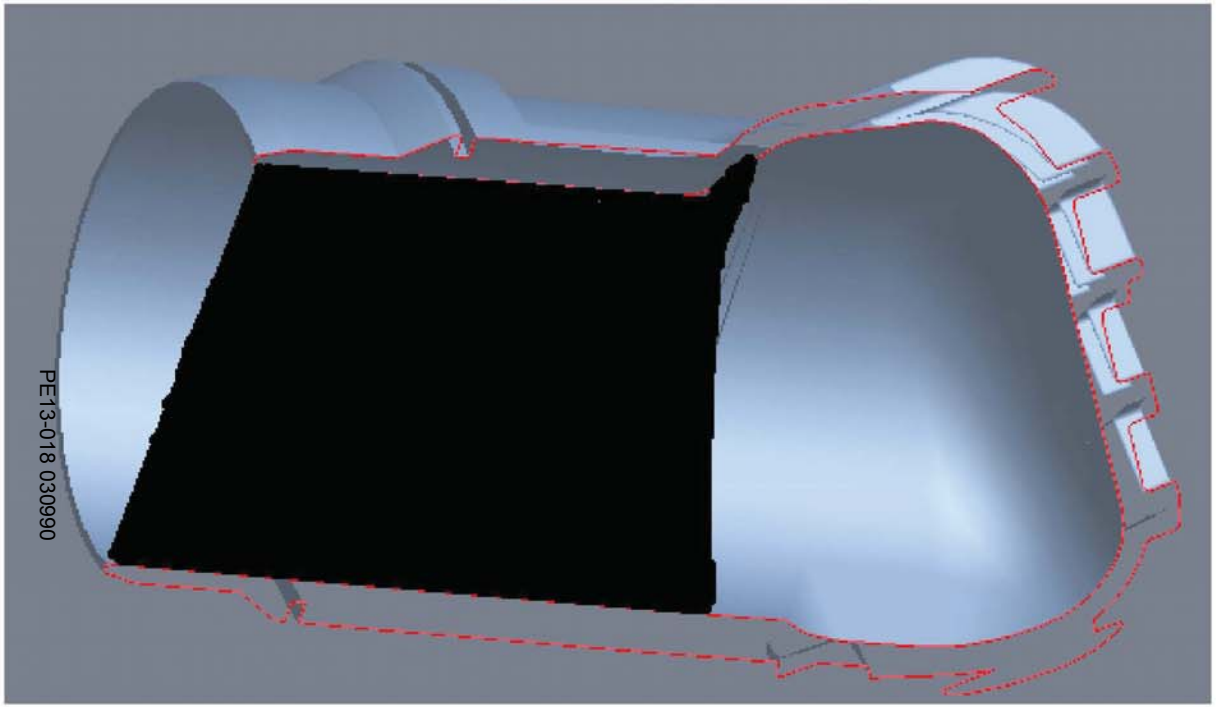
Modified and Tested CAC, with perforating baffle



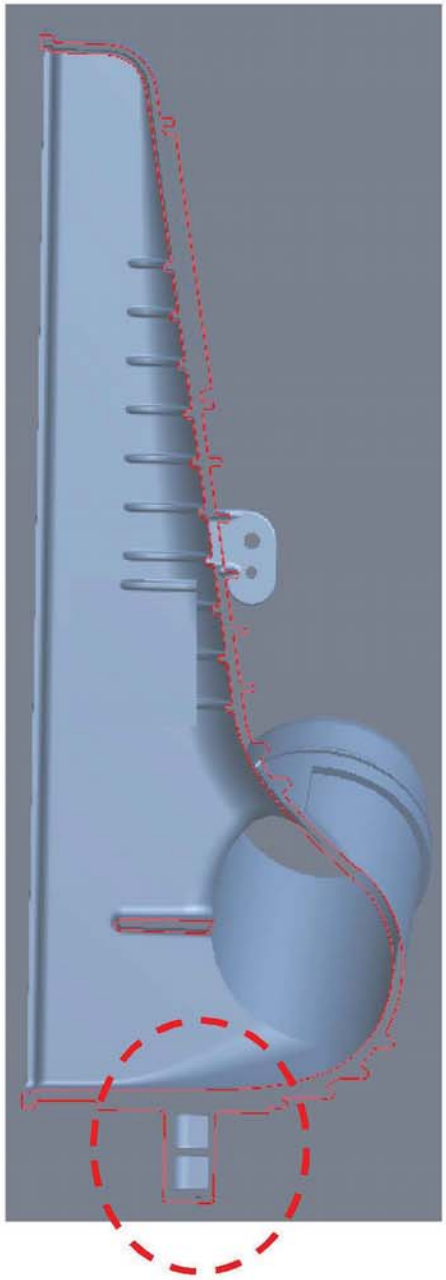
PE13-018 030989

Outlet Tank port modification, adding wall deflector (Concept not tested)

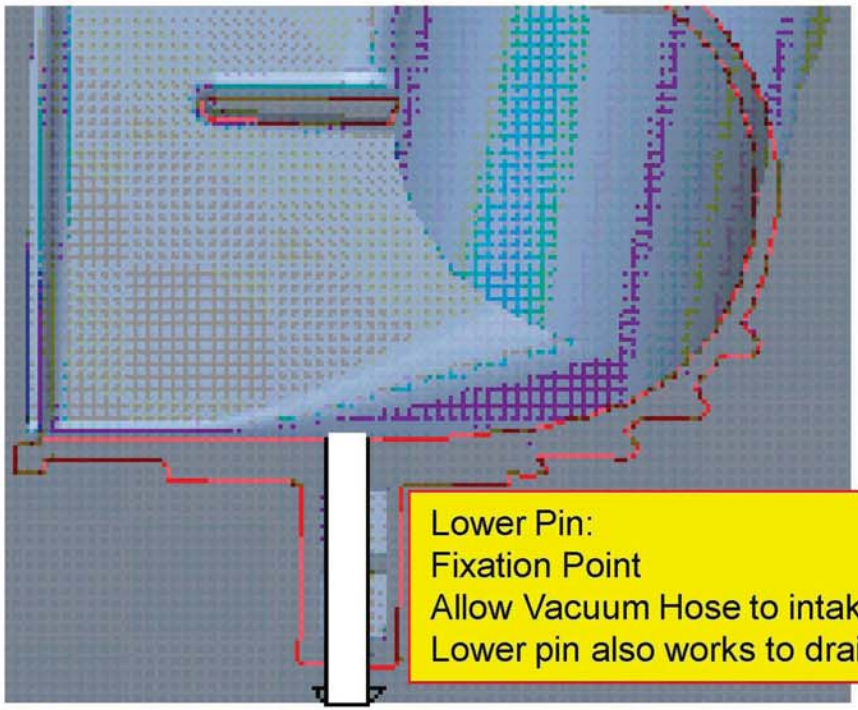
Outlet Tank port modification, adding wall deflector (star shape), to avoid water flow to intake system



Lower Pin/Drain Function



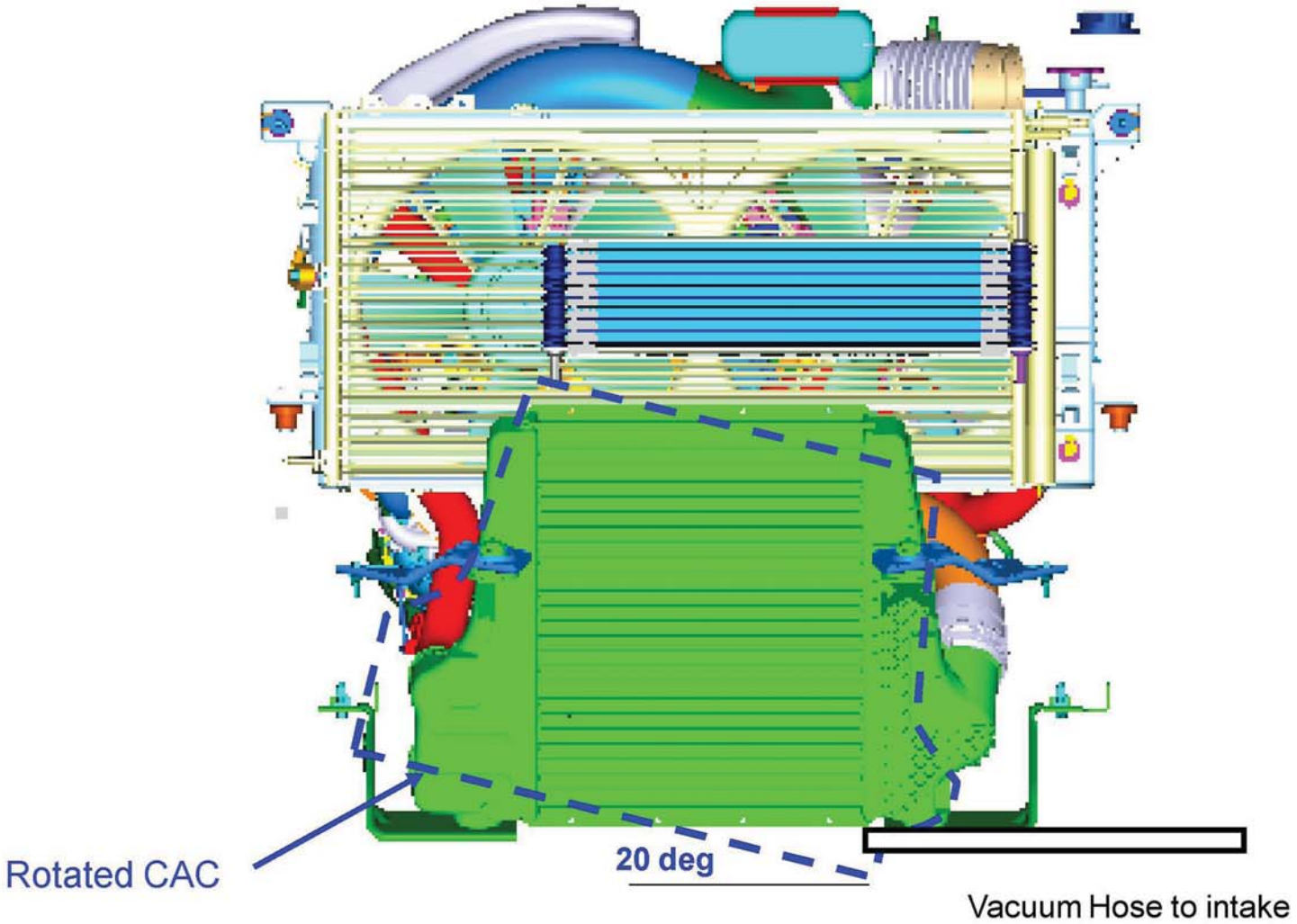
Drain Water pin



Lower Pin:
Fixation Point
Allow Vacuum Hose to intake
Lower pin also works to drain water condensated

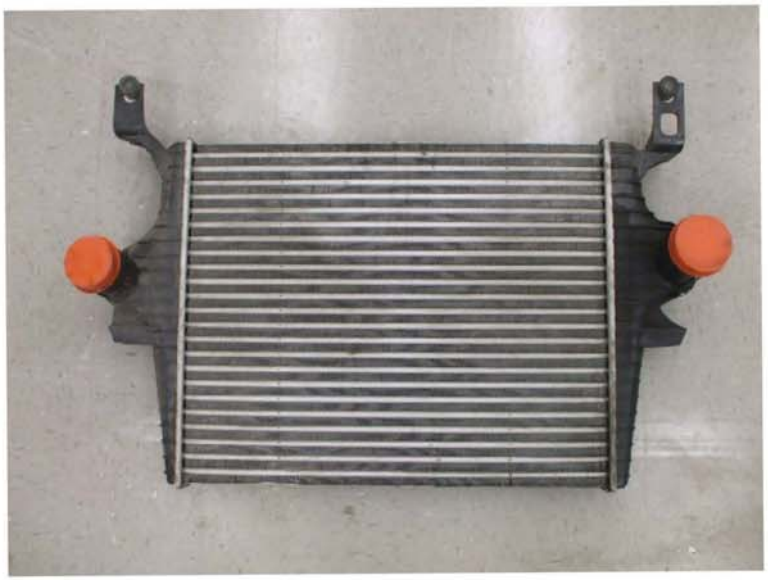
PE13-018 030991

P415, Proposal for Rotating CAC + Vacuum Tube

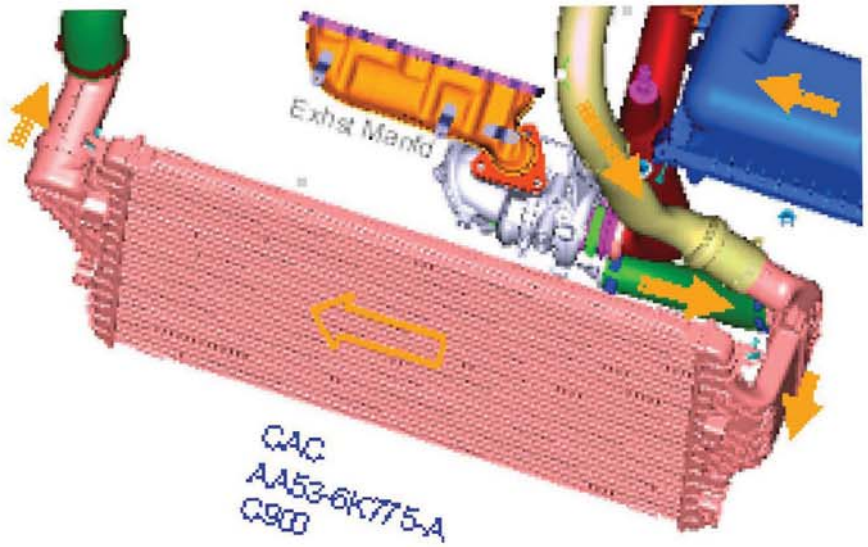


PE13-018 030992

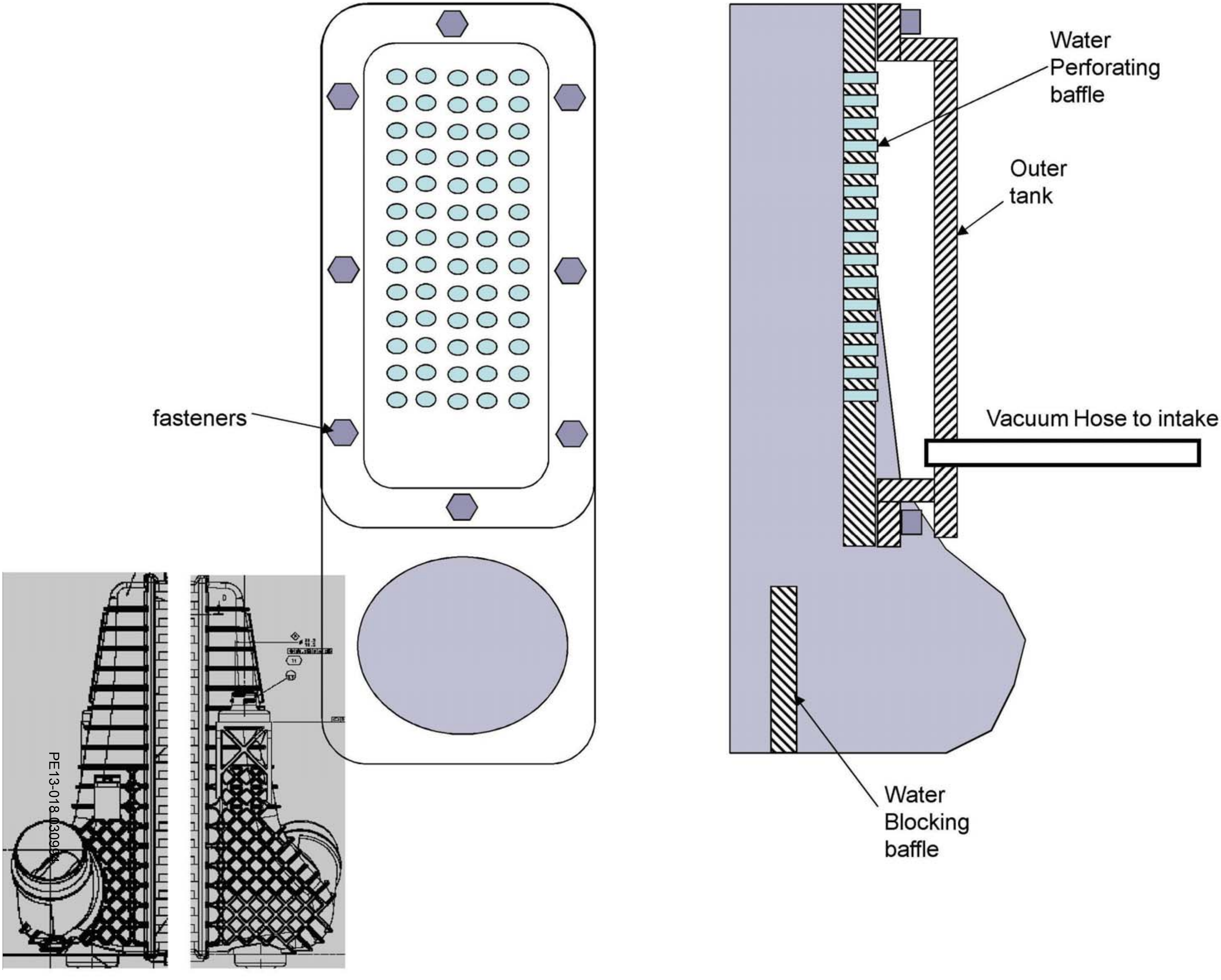
P131 6.0 Diesel CAC



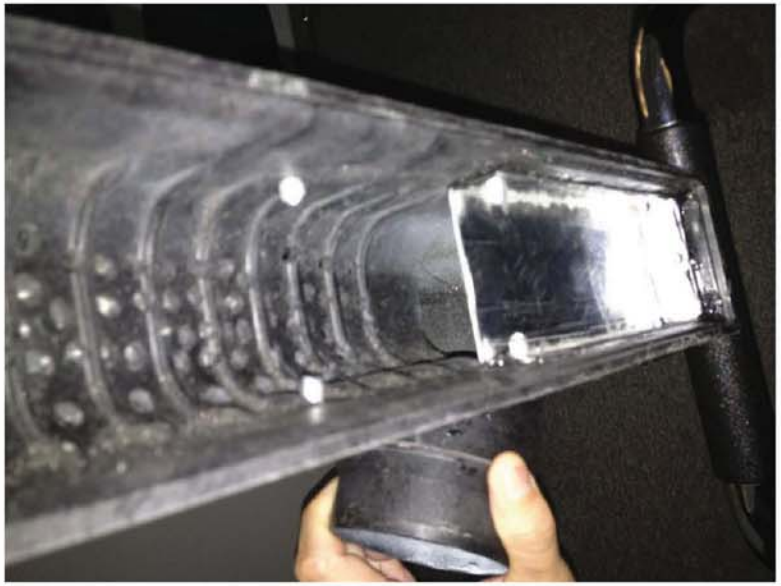
D3 3.5L GTDI CAC



P415 CAC Tank Revision, Water Perforating, Collecting, and Sucking to Intake



Modified and Tested CAC, with perforating baffle



PE13-018 030995

From: Alcaraz andrade, Alejandro (M.)
Sent: Thursday, June 13, 2013 5:38 PM
To: Andersen, Erik (E.); Kramer, Michael (M.T.); Allan, Valerie (V.J.)
Subject: FW: Corrosion Test Status
Attachments: P415 CAC SWAAT Analysis 2013jun13.pptx

See tests results. There is a leak but not where the blocker is located. Further analysis is being held at SLP I think we should request to take the blocker off and look for corrosion?
Thanks

From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: jueves, 13 de junio de 2013 05:24 p.m.
To: Alcaraz andrade, Alejandro (M.)
Cc: Carl HILDINGER; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA; Les TICKNOR; Satish NADELLA
Subject: Re: Corrosion Test Status

Alejandro,
Status of the P415 CAC SWAAT testing. Thanks.

Best Regards/Sincèrement,
Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Thu, Jun 13, 2013 at 12:56 PM, Alcaraz andrade, Alejandro (M.) <malcara2@ford.com> wrote:

Thank you team!

From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: jueves, 13 de junio de 2013 09:09 a.m.
To: Alcaraz andrade, Alejandro (M.)
Cc: Carl HILDINGER; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA; Les TICKNOR; Satish NADELLA

Subject: Re: Corrosion Test Status

Alejandro,

We will provide to you the summary of the results today. Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Thu, Jun 13, 2013 at 8:33 AM, Alcaraz andrade, Alejandro (M.) <malcara2@ford.com> wrote:

Corey,

Can you give the status of the tests please.

Thank you!

From: Alcaraz andrade, Alejandro (M.)
Sent: martes, 11 de junio de 2013 02:02 p.m.
To: 'Corey SMALL'

Subject: RE: Corrosion Test Status

Corey,

The valves you requested are going to arrive to Greensburg on 6/14/2013 and the fasteners I have a bag of fasteners here that you can pick up when you can.

Can you send a new status of the tests?

Last we need a print of the CAC with the Blocker and the CAD. This is to be ready because once we have the concern approved for the release we would need to update buck and have a print. The new part number with PIA CAC is FL14 9L440 AA. (DL34 9L440 AD + sticky blocker)

Thanks

From: Corey SMALL [mailto:corey.small@valeo.com]

Sent: viernes, 31 de mayo de 2013 09:42 a.m.

To: Andersen, Erik (E.)

Cc: Alcaraz andrade, Alejandro (M.); Kramer, Michael (M.T.); Les TICKNOR; Wayne LIU; Allan, Valerie (V.J.); Doug SCHROEDER; Carl HILDINGER; Kerry MACHESNEY (Google Sites); Satish NADELLA; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA; Blanca TORRES

Subject: Re: Corrosion Test Status

Erik,

Status of the P415 CAC with Blocker, Cyclic Corrosion/SWAAT testing:

Cyclic Corrosion 5/31/13

- Sample 1: 213 hours
- Sample 2: 213 hours
- Sample 3: 165 hours
- Sample 4: 165 hours

SWAAT:

- Sample 1: 225 hours
- Sample 2: 225 hours
- Sample 3: 56 hours
- Sample 4: 56 hours

Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Thu, May 30, 2013 at 10:31 AM, Corey SMALL <corey.small@valeo.com> wrote:

Erik,

Status of the Cyclic Corrosion testing, SWAAT to follow:

Cyclic Corrosion 5/30/13

- Sample 1: 189 hours
- Sample 2: 189 hours
- Sample 3: 141 hours
- Sample 4: 141 hours

Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Thu, May 30, 2013 at 9:54 AM, Andersen, Erik (E.) <eanderse@ford.com> wrote:

Corey,

Can you please provide an update on hours? I'd like to confirm no issues so far.

Erik Andersen

Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: Tuesday, May 28, 2013 11:49 AM
To: Andersen, Erik (E.)
Cc: Alcaraz andrade, Alejandro (M.); Kramer, Michael (M.T.); Les TICKNOR; Wayne LIU

Subject: Re: Corrosion Test Status

Erik,

SWAAT testing status:

- Sample 1: 156 hours
- Sample 2: 156 hours
- Sample 3: goal to have in chamber by COB today if all fittings hold pressure
- Sample 4: goal to have in chamber by COB today if all fittings hold pressure

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Tue, May 28, 2013 at 11:31 AM, Corey SMALL <corey.small@valeo.com> wrote:

Erik

Status of the Cyclic Corrosion is:

- Sample 1: 143 hours
- Sample 2: 143 hours
- Sample 3: 94 hours
- Sample 4: 94 hours

I will send you the to-date SWAAT testing hours today also, thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Tue, May 28, 2013 at 9:56 AM, Andersen, Erik (E.) <eanderse@ford.com> wrote:

Corey, Alejandro,

Can you please confirm hours complete on the corrosion test?

Thank you,

Erik Andersen

Core P/T Cooling
eanderse@ford.com
313-805-2966

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P415/U22 CAC SWAAT Analysis

PE13-018 031003

valeo added

CAC SWAAT results

4 CAC samples were tested. Two were to be tested to 500 hours, the other two to failure or 1000 hours.

Samples	# of hours
1	408-477 (weekend)
2	500 (no leaks)
3	358
4 (w/out blocker)	358 (part was dropped needs to be replaced)

Samples 1 and 2 are being sent to SLP for further corrosion analysis.

Note: The SWAAT test that is currently being run was not to the original specification/commercial agreement for the P415/U222 CAC.

PE13-018 031004

CAC SWAAT results

Leak Location: Sample 1

PE13-018 031005

From: Huang, Larry (L,.)
Sent: Thursday, February 02, 2012 12:19 PM
To: Andersen, Erik (E.)
Subject: FW: P415 2013 Timing update
Attachments: Microsoft Office Project - P415 2013 REV 10.pdf

FYI, the timing we just reviewed in the meeting 20 min ago. Valeo will update it by next Monday.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Tyler, Jim (J.S.)
Sent: Thursday, February 02, 2012 11:18 AM
To: Huang, Larry (L,.); Allan, Valerie (V.J.)
Subject: FW: P415 2013 Timing update

Valeo is continuing to work on the timing opportunities. Here is their update as of today.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

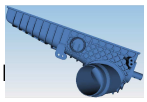
From: Blas-Fernando GUTIERREZ [mailto:blas-fernando.gutierrez@valeo.com]
Sent: Thursday, February 02, 2012 10:57 AM
To: Tejada, Angelito (A.S.); Tyler, Jim (J.S.); Khan, Mohsin (M.K.); Kramer, Michael (M.T.)
Cc: Mickael DA-SILVA; Peter GAUDINO; Alberto CORCHERO; Larry ENGEL
Subject: P415 2013 Timing update

Find attached an updated timing for the P415 2013...out of 8 weeks required to compress to meet May 29th this timing could get an improvement of 3 weeks (vs rev 09). It still needs to be validated for the testing plan proposed.

The timing for the mold with the detail that is required for review is not available yet. We are still working with supplier to get it. We need more time to provide it to you. W can review the progress we are making on this timing today at our conference call.

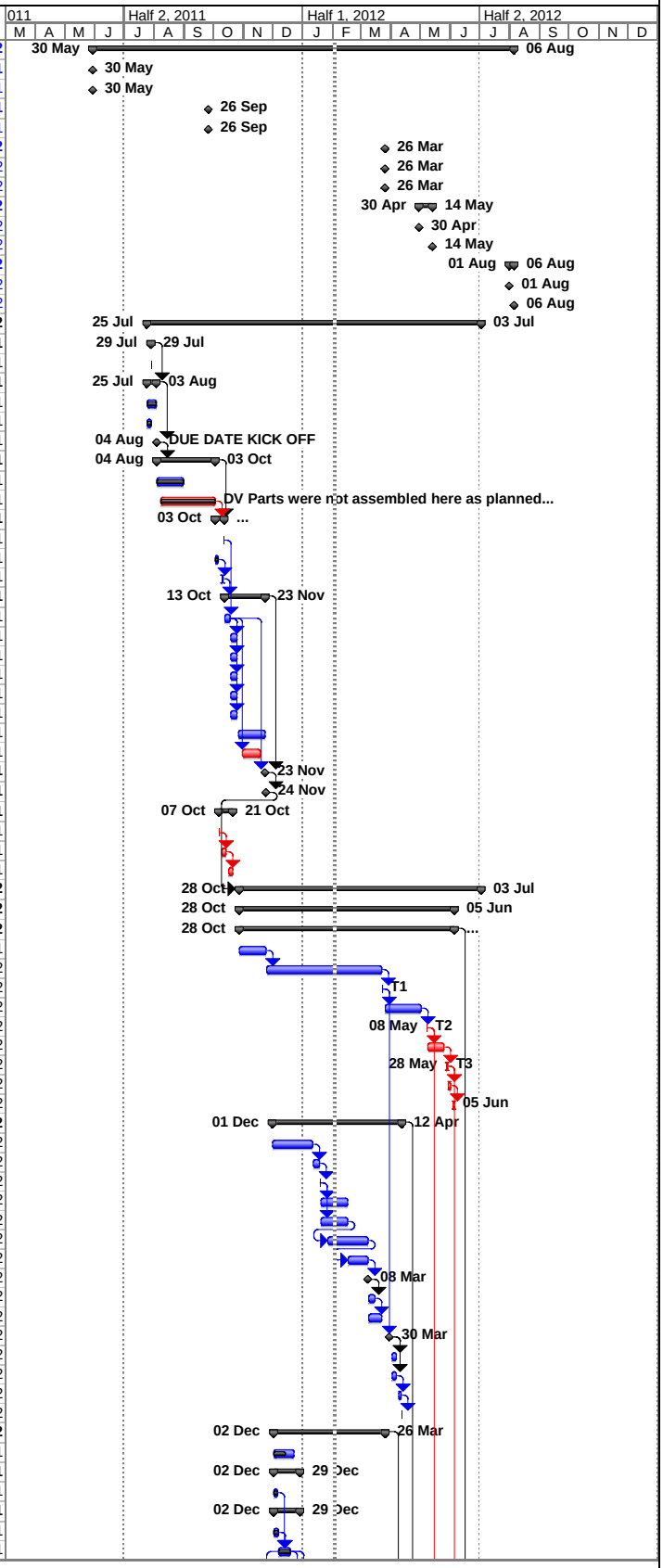
BG

P415 MY 2013

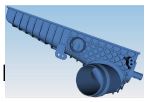


Charge Air Cooler with Cam Lock Port for Muffler assembly & Soft tool Tank from Valeo and Assembly of Cam lock to be made by I
Only for VP Parts.
Plastic tank is planned to be a single piece with cam lock for Production.

ID	Name	Duration	Start	Finish
1	**Customer Milestones P415 2013 CAC**	**310 d**	**Mon 30/05/11**	**Mon 06/08/12**
2	**Prototype Mock Up**	**0 d**	**Mon 30/05/11**	**Mon 30/05/11**
3	M1Parts (FORD Mockups)	0 d	Mon 30/05/11	Mon 30/05/11
4	**Pre-series Soft Tool**	**0 d**	**Mon 26/09/11**	**Mon 26/09/11**
5	VP PARTS MRD	0 d	Mon 26/09/11	Mon 26/09/11
6	**Official samples-Hard tool-**	**0 d**	**Mon 26/03/12**	**Mon 26/03/12**
7	PPAP LEVEL 1 approval	0 d	Mon 26/03/12	Mon 26/03/12
8	FORD TT Parts MRD	0 d	Mon 26/03/12	Mon 26/03/12
9	**Pre-Production**	**10 d**	**Mon 30/04/12**	**Mon 14/05/12**
10	PPAP LEVEL 2 approval	0 d	Mon 30/04/12	Mon 30/04/12
11	FORD PP Parts MRD	0 d	Mon 14/05/12	Mon 14/05/12
12	**Start of Production**	**3 d**	**Wed 01/08/12**	**Mon 06/08/12**
13	PPAP LEVEL 3 Approval	0 d	Wed 01/08/12	Wed 01/08/12
14	FORD MP1 - JOB 1	0 d	Mon 06/08/12	Mon 06/08/12
16	**IMPLEMENTATION TIMING P415 2013 - CAC -**	**246.5 d**	**Mon 25/07/11**	**Tue 03/07/12**
17	**Design Release for VP**	**1 d**	**Fri 29/07/11**	**Fri 29/07/11**
18	Design Freeze	1 d	Fri 29/07/11	Fri 29/07/11
19	**VP tool Orders**	**8 d**	**Mon 25/07/11**	**Wed 03/08/11**
20	Obtain ST Prototype order	1.6 w	Mon 25/07/11	Wed 03/08/11
21	IAR Process	1 w	Mon 25/07/11	Fri 29/07/11
22	SOFT TOOL KICK OFF	0 d	Thu 04/08/11	Thu 04/08/11
23	**ST MFG and Modification - VP and DV PARTS-**	**42.5 d**	**Thu 04/08/11**	**Mon 03/10/11**
24	ST Tank -MODIFICATION ON CURRENT-	4 w	Thu 04/08/11	Wed 31/08/11
25	ST Connector- Made by FORD-MAGNUM FOR VP	8.1 w	Mon 08/08/11	Mon 03/10/11
26	**VP PARTS MFG**	**7.5 d**	**Mon 03/10/11**	**Wed 12/10/11**
27	Ship Assembled tanks to VALEO SLP for DV	1 d	Wed 12/10/11	Wed 12/10/11
28	Valeo SLP to Assemble and Verify Parts. (7 VP)	3 d	Mon 03/10/11	Thu 06/10/11
29	VP Parts Delivery	1 d	Mon 10/10/11	Tue 11/10/11
30	**DESIGN VALIDATION DV**	**30 d**	**Thu 13/10/11**	**Wed 23/11/11**
31	DV Parts Build	4 d	Thu 13/10/11	Tue 18/10/11
32	Leak Test	5 d	Wed 19/10/11	Tue 25/10/11
33	Internal cleanliness	5 d	Wed 19/10/11	Tue 25/10/11
34	Internal Volume	5 d	Wed 19/10/11	Tue 25/10/11
35	Weight	5 d	Wed 19/10/11	Tue 25/10/11
36	Heat Transfer	5 d	Wed 19/10/11	Tue 25/10/11
37	Hot Pressue Cycle	4 w	Thu 27/10/11	Wed 23/11/11
38	Vibration Test	3 w	Mon 31/10/11	Fri 18/11/11
39	**Review for Validation**	**0 d**	**Wed 23/11/11**	**Wed 23/11/11**
40	**DESIGN FREEZE FOR PRODUCTION**	**0 d**	**Thu 24/11/11**	**Thu 24/11/11**
41	**Production Tool Orders**	**11 d**	**Fri 07/10/11**	**Fri 21/10/11**
42	customer PO for Tooling	1 d	Fri 07/10/11	Fri 07/10/11
43	Valeo Budget Release	1 w	Mon 10/10/11	Fri 14/10/11
44	Purchase orders for Suppliers	1 w	Mon 17/10/11	Fri 21/10/11
45	**Implement process equipment**	**177.5 d**	**Fri 28/10/11**	**Tue 03/07/12**
46	**New tools**	**158 d**	**Fri 28/10/11**	**Tue 05/06/12**
47	**New Tank Mold**	**158 d**	**Fri 28/10/11**	**Tue 05/06/12**
48	Mold Design	4 w	Fri 28/10/11	Thu 24/11/11
49	Mold Manufacture	17 w	Fri 25/11/11	Thu 22/03/12
50	Trial 1	1 d	Fri 23/03/12	Fri 23/03/12
51	Adjustment	5.5 w	Mon 26/03/12	Wed 02/05/12
52	Trial 2	1 d	Tue 08/05/12	Tue 08/05/12
53	Adjustment	13 d	Wed 09/05/12	Fri 25/05/12
54	Trial 3	2 d	Mon 28/05/12	Tue 29/05/12
55	Adjustment	3 d	Wed 30/05/12	Fri 01/06/12
56	Final Validation	2 d	Mon 04/06/12	Tue 05/06/12
57	**Crimping Die Mfg**	**96 d**	**Thu 01/12/11**	**Thu 12/04/12**
58	Design	30 d	Thu 01/12/11	Wed 11/01/12
59	Design Review	5 d	Thu 12/01/12	Wed 18/01/12
60	Design validatiom	1 d	Thu 19/01/12	Thu 19/01/12
61	Purchase of materials	4 w	Fri 20/01/12	Thu 16/02/12
62	Purchase of components	4 w	Fri 20/01/12	Thu 16/02/12
63	Mechanical elements manufacture	6 w	Fri 27/01/12	Thu 08/03/12
64	Heat treatment	3 w	Fri 17/02/12	Thu 08/03/12
65	Initial Samples for Adjustments	0 d	Thu 08/03/12	Thu 08/03/12
66	Grinding	1 w	Fri 09/03/12	Thu 15/03/12
67	Assembly	2 w	Fri 09/03/12	Thu 22/03/12
68	Representative samples for final adjustments	0 d	Fri 30/03/12	Fri 30/03/12
69	Adjustments	1 w	Mon 02/04/12	Fri 06/04/12
70	Trial	1 w	Mon 02/04/12	Fri 06/04/12
71	Release at MPC	3 d	Mon 09/04/12	Wed 11/04/12
72	Intallation at Valeo	1 d	Thu 12/04/12	Thu 12/04/12
73	**New EOL Fixtures**	**81 d**	**Fri 02/12/11**	**Mon 26/03/12**
74	Programación	15 d	Fri 02/12/11	Fri 23/12/11
75	**Elaboración de Diseño Mecánico**	**19.25 d**	**Fri 02/12/11**	**Thu 29/12/11**
76	Revisión de Planos para metrología	2 d	Fri 02/12/11	Tue 06/12/11
77	**Elaboración de Diseño de Platina**	**19.25 d**	**Fri 02/12/11**	**Thu 29/12/11**
78	Distribución de elementos en Platina	3 d	Fri 02/12/11	Wed 07/12/11
79	Diseño de Metrología de Platina	8 d	Wed 07/12/11	Mon 19/12/11

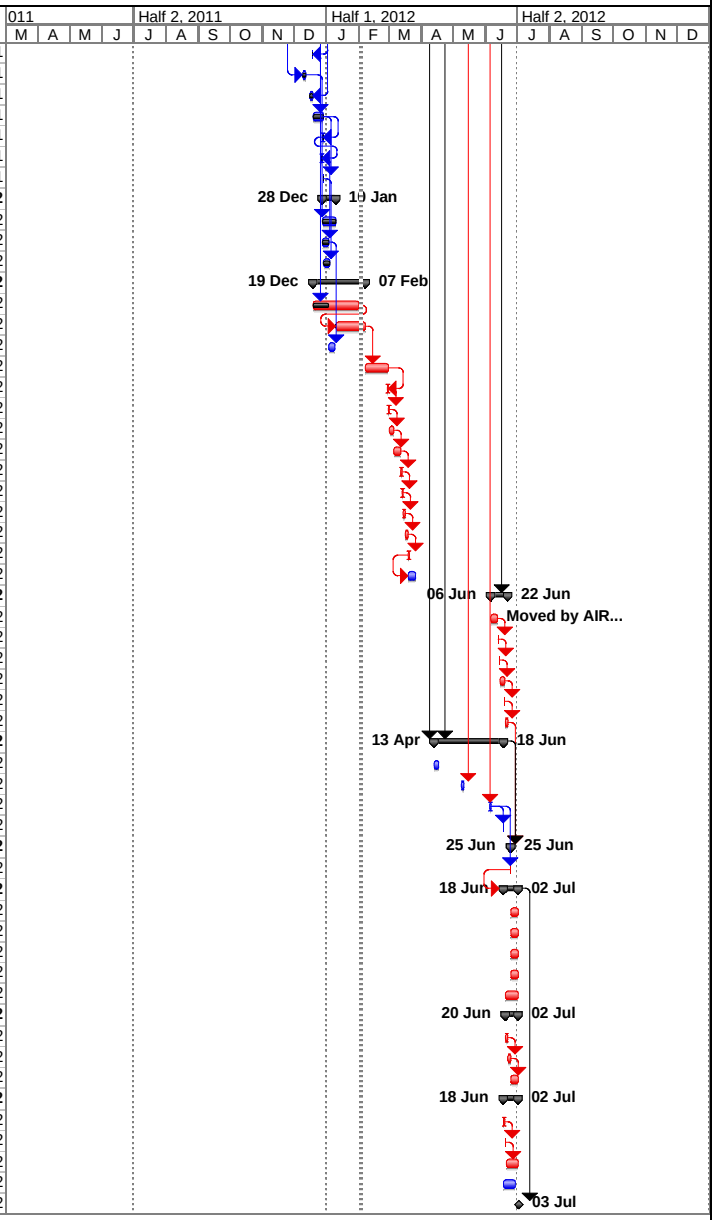


P415 MY 2013



Charge Air Cooler with Cam Lock Port for Muffler assembly & Soft tool Tank from Valeo and Assembly of Cam lock to be made by I
Only for VP Parts.
Plastic tank is planned to be a single piece with cam lock for Production.

ID	Name	Duration	Start	Finish
80	Entrega de dibujos de Metrología	3 h	Mon 19/12/11	Mon 19/12/11
81	Requisicion de materiales de Platina	1 d	Fri 09/12/11	Mon 12/12/11
82	Requisicion de materiales de Platina	1 d	Fri 16/12/11	Mon 19/12/11
83	Elaboración de MASTER	8 d	Mon 19/12/11	Thu 29/12/11
84	Revisión de Diseño MASTER	1 d	Wed 28/12/11	Thu 29/12/11
85	Requisición de materiales MASTER	1 d	Tue 27/12/11	Wed 28/12/11
86	Requisición de Consumibles	2 h	Thu 29/12/11	Thu 29/12/11
87	**Compras**	**9 d**	**Wed 28/12/11**	**Tue 10/01/12**
88	Placa y aluminios para Platina	9 d	Wed 28/12/11	Tue 10/01/12
89	Compra de materiales MASTER	4 d	Wed 28/12/11	Tue 03/01/12
90	Cilindros	4 d	Thu 29/12/11	Wed 04/01/12
91	**Fabricación**	**36 d**	**Mon 19/12/11**	**Tue 07/02/12**
92	Maquinado de Platina Metrología	32 d	Mon 19/12/11	Wed 01/02/12
93	Maquinado de soporteria de platina	20 d	Tue 10/01/12	Tue 07/02/12
94	Fabricación MASTER	4 d	Tue 03/01/12	Mon 09/01/12
95	Maquinados ER	16 d	Tue 07/02/12	Wed 29/02/12
96	Pavonado de piezas	1 d	Tue 28/02/12	Wed 29/02/12
97	Ensamble de Platinas Metrología	1 d	Wed 29/02/12	Thu 01/03/12
98	Metrología ASCON	2 d	Thu 01/03/12	Mon 05/03/12
99	Ajustes ASCON	1 w	Mon 05/03/12	Mon 12/03/12
100	Liberación VALEO	1 d	Mon 12/03/12	Tue 13/03/12
101	Ensamble Soportería	1 d	Tue 13/03/12	Wed 14/03/12
102	Cableado de Platinas	2 d	Wed 14/03/12	Fri 16/03/12
103	Pruebas en ASCON	1 d	Fri 16/03/12	Mon 19/03/12
104	Envío a Planta	1 d	Mon 19/03/12	Tue 20/03/12
105	Pruebas en Planta	1 w	Mon 19/03/12	Mon 26/03/12
106	**Component PPAP**	**13 d**	**Wed 06/06/12**	**Fri 22/06/12**
107	Mold Transport - Tank molder	1 w	Wed 06/06/12	Tue 12/06/12
108	Mold Preparation	1 d	Wed 13/06/12	Wed 13/06/12
109	Mold Trial #1	1 d	Thu 14/06/12	Thu 14/06/12
110	Dimensional Verifications	3 d	Fri 15/06/12	Tue 19/06/12
111	Mold Trial #2	1 d	Tue 19/06/12	Tue 19/06/12
112	Dimensional for Component PPAP	3 d	Wed 20/06/12	Fri 22/06/12
113	**Process Debugg**	**47 d**	**Fri 13/04/12**	**Mon 18/06/12**
114	Process Trial #1 (Mold Maker Tanks)	3 d	Fri 13/04/12	Tue 17/04/12
115	Process Trial run 2 (Mold Maker Tanks)	3 d	Wed 09/05/12	Fri 11/05/12
116	Process Trial run 3	2 d	Tue 05/06/12	Wed 06/06/12
117	Valeo FDPR	1 d	Mon 18/06/12	Mon 18/06/12
118	**Process VALIDATION**	**1 d**	**Mon 25/06/12**	**Mon 25/06/12**
119	FORD R&R	1 d	Mon 25/06/12	Mon 25/06/12
120	**PV (Valeo FDPR parts)**	**10.5 d**	**Mon 18/06/12**	**Mon 02/07/12**
121	Leak Test	5 d	Mon 25/06/12	Mon 02/07/12
122	Internal cleanliness	5 d	Mon 25/06/12	Mon 02/07/12
123	Internal Volume	5 d	Mon 25/06/12	Mon 02/07/12
124	Weight	5 d	Mon 25/06/12	Mon 02/07/12
125	Heat Transfer - 6 Samples	8 d	Wed 20/06/12	Mon 02/07/12
126	**Hot Pressue Cycle - To 375k Cycles)**	**8 d**	**Wed 20/06/12**	**Mon 02/07/12**
127	Ship to USA Lab	2 d	Wed 20/06/12	Fri 22/06/12
128	Test set up	1 d	Fri 22/06/12	Mon 25/06/12
129	Test - 2 Samples	1 w	Mon 25/06/12	Mon 02/07/12
130	**Vibration Test**	**10.5 d**	**Mon 18/06/12**	**Mon 02/07/12**
131	Ship to USA Lab	2 d	Mon 18/06/12	Tue 19/06/12
132	Test set up	1 d	Wed 20/06/12	Wed 20/06/12
133	Test - 2 Samples	1.5 w	Thu 21/06/12	Mon 02/07/12
134	Hot Age - 2 Samples	2 w	Mon 18/06/12	Fri 29/06/12
135	Obtain PPAP PH1, 2, 3 Approval	0 d	Tue 03/07/12	Tue 03/07/12



From: Kramer, Michael (M.T.)
Sent: Friday, March 29, 2013 12:55 PM
To: Widmann, Carl (C.A.); Weber, Erik (E.M.)
Cc: Andersen, Erik (E.); Huang, Larry (L,.); Kramer, Michael (M.T.)
Subject: FW: P415 CAC Data
Attachments: CAC P415 WITH EXTERNAL COVERS.pptx

Here are the data sheets for the P415 CAC condensation robustness actions. Please let us know if any questions.

Mike Kramer
Truck Applications PT Cooling Supv.
(313) 805-0190
Sent with Good (www.good.com)

-----Original Message-----
From: Satish NADELLA [satish.nadella@valeo.com]
Sent: Wednesday, March 27, 2013 05:16 PM Eastern Standard Time
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.); Alcaraz andrade, Alejandro (M.); Huang, Larry (L,.); Guillermo GUADARRAMA; Eduardo BARRIOS; Blas-Fernando GUTIERREZ
Subject: P415 CAC Data

Hi Erik,

Please find enclosed the data for all of the configurations specified by Mike. Data is from performance testing of these configurations.

Regards,
Satish Nadella

SPEC CAC P415 2013 WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHRGE AIR FLOW (kg/hr)	432	76.2	89.3	92.5
	684	63.4	82.8	88.9
	1037	50.6	74.0	81.4

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	63.5	266.9	607.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	12.32	26.97	58.14

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	43.5	50.5	53.6
	0.19 (684)	36.4	45.1	48.4
	0.28 (1037)	29.2	39.2	43.2

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.1	276.1	626.6

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.55	18.54	40.51

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITHOUT INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	44.0	51.5	55.0
	0.19 (684)	36.5	45.6	49.0
	0.28 (1037)	29.4	39.6	43.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	71.4	276.9	630.9

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.38	18.67	40.54

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

SPEC CAC P415 2013 WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CHARGE AIR FLOW (Kg/hr)	432	65.2	77.5	82.6
	684	54.6	69.8	75.9
	1037	43.8	61.9	67.8

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	61.8	264.0	607.1

ΔP Internal AIR (mbar)	CHARGE AIR FLOW (Kg/hr)		
	432	684	1037
EXT. FLOW 1.08 Kg/s	14.24	32.33	71.39

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

ONE (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.8	55.6	59.7
	0.19 (684)	38.4	48.7	53.6
	0.28 (1037)	30.6	42.0	46.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	69.6	274.3	629.0

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.34	32.38	69.55

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

TWO (7 TUBE & 8 FIN) EXTERNAL BLOQUER WITH INTERNAL COVERS

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	46.4	55.8	59.6
	0.19 (684)	38.1	49.4	53.4
	0.28 (1037)	30.2	41.9	46.5

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.288 kg/s	70.3	274.5	623.3

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	14.17	32.34	68.95

TEST CONDITIONS

9 point tests

CA Booster P = 2.0 BarA = 200 kPa-A

CA Inlet Temp = 125±1.1°C

Ambient temp.= 25°C

Face vel:

- 0.154 kg/s
- 0.62 kg/s
- 1.08 kg/s

CA flow:

- 0.12 kg/s
- 0.19 kg/s
- 0.288 kg/s

From: Andersen, Erik (E.)
Sent: Monday, May 06, 2013 10:10 AM
To: Huang, Larry (L,.) (lhuang3@ford.com); Kramer, Michael (M.T.)
Subject: FW: P415 CAC last week test results-Updated
Attachments: External Covers 2.pptx

Larry,

Can you please review for accuracy? Once complete, please let Mike know for routing to TSE to complete their analysis.

Please prioritize this morning.

Thanks,

Erik Andersen
Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Satish NADELLA [mailto:satish.nadella@valeo.com]
Sent: Monday, May 06, 2013 10:06 AM
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.); Corey SMALL <corey.small@valeo.com> (corey.small@valeo.com); ying.tang@valeo.com; Tyler, Jim (J.S.); Widmann, Carl (C.A.); Weber, Erik (E.M.); Rodgers, Thomas (T.A.); Huang, Larry (L,.)
Subject: Fwd: P415 CAC last week test results-Updated

Erik,

Please find enclosed the data from testing for the P415 CAC for the 3 options.

Regards,
Satish Nadella

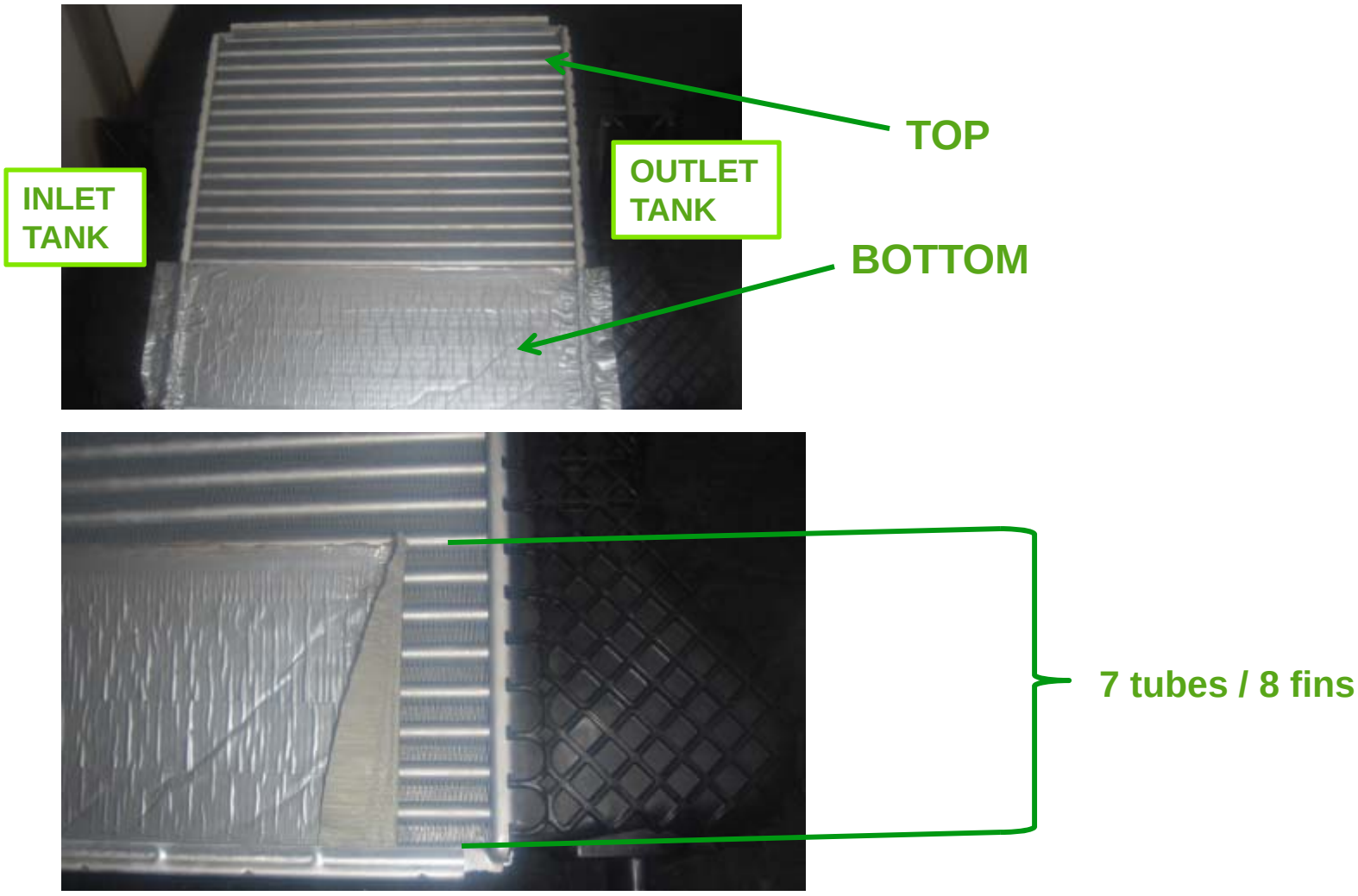
---------- Forwarded message ----------
From: **Ying TANG** <ying.tang@valeo.com>
Date: Mon, May 6, 2013 at 9:49 AM
Subject: RE: P415 CAC last week test results-Updated
To: Satish NADELLA <satish.nadella@valeo.com>

FYI

This e-mail message is intended only for the use of the intended recipient(s).
The information contained therein may be confidential or privileged,
and its disclosure or reproduction is strictly prohibited.

If you are not the intended recipient, please return it immediately to its sender at the above address and destroy it.

Externally block bottom 7 tubes / 8 fins



Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	48.6	55.6	60.3
	0.19 (684)	40.6	49.5	53.3
	0.28 (1037)	34.1	45.2	48.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	87.9	434.7	1047.3

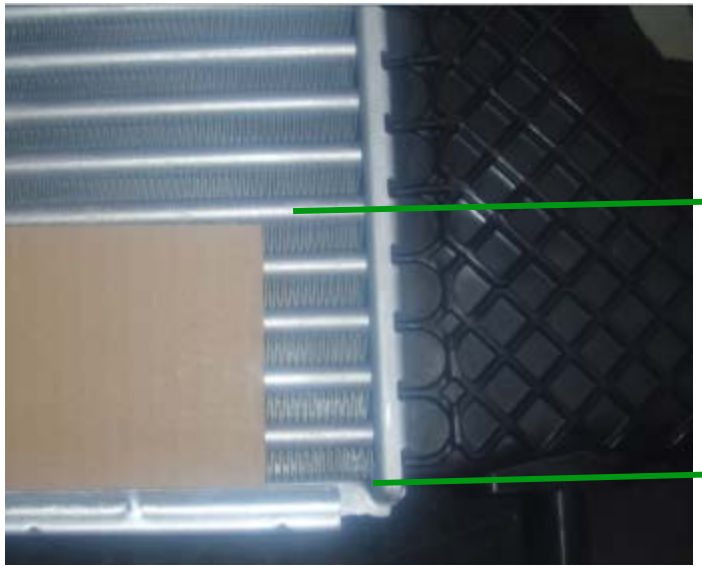
ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.41	18.64	40.08

TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

Externally block bottom 4 tubes / 5 fins



Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	56.1	66.0	70.5
	0.19 (684)	46.9	60.1	64.2
	0.28 (1037)	38.4	52.6	57.4

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	75.4	357.3	835.3

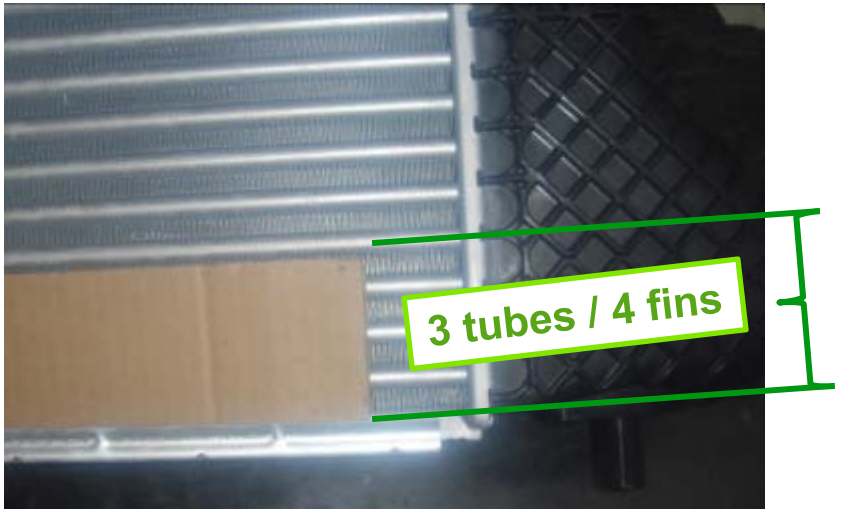
ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	8.19	18.26	39.93

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	55.9	67.3	70.0
	0.19 (684)	46.8	60.0	64.4
	0.28 (1037)	38.4	52.9	57.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	73.2	362.2	865.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.02	18.13	39.23

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

From: Huang, Larry (L,.)
Sent: Thursday, February 23, 2012 2:10 PM
To: Satish NADELLA; Joseph LUMETTA; Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Blas-Fernando GUTIERREZ; Kramer, Michael (M.T.); Ladd, John (J.R.); Eduardo BARRIOS; Vicente ALVAREZ; Allan, Valerie (V.J.)
Subject: FW: P415 Concepts
Attachments: Valeo Outlet Tank proposal Rev1.ppt

FYI

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Eduardo BARRIOS [mailto:eduardo.barrios@valeo.com]
Sent: Thursday, February 23, 2012 1:57 PM
To: Huang, Larry (L,.); Tyler, Jim (J.S.)
Cc: Joseph LUMETTA; Blas-Fernando GUTIERREZ; Ricardo SANCHEZ
Subject: P415 Concepts

Larry attached you will find a presentation for option II, and Option III for today meeting.

Note: Option II after this meeting we need to perform a design review with Mold supplier (under construction 2013) to review it is possible or not.

regards

--
Eduardo Barrios

TPT Product Engineering Supervisor (SLP)
Valeo Powertrain Thermal Systems
Eje 130 esq CFE s/n.
C.P 78395 Zona Ind. del Potosí.
San Luis Potosí, Mex.
Tel: 0052 444 826 6655

P415
Outlet Tank
Design Concept
Condensation Issue

Feb 22th 2012

Rev.1

CAC P415 GTDI

valeo added

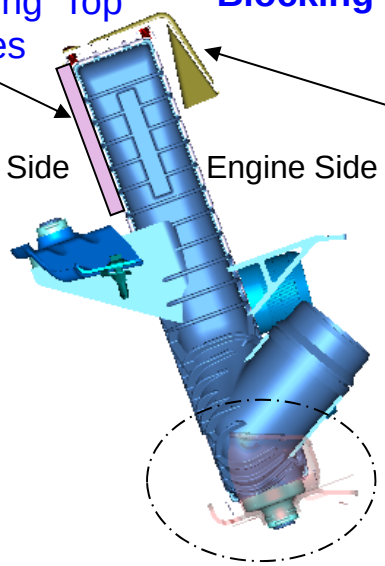
P415 CAC Design Revision, Option I
Blocking upper 6 tubes and Adding Vacuum-Drained Port

Covering Top 6 Tubes

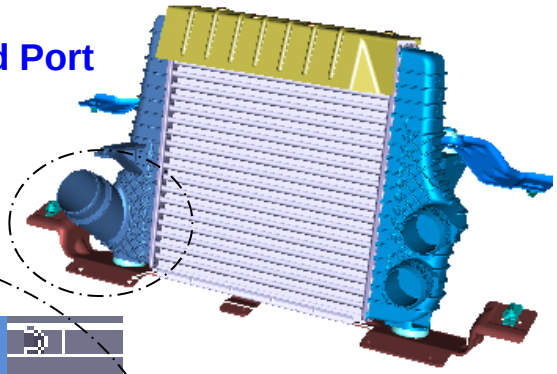
Existing Upper Shield to be modified for Blocking 6 tubes from grill side

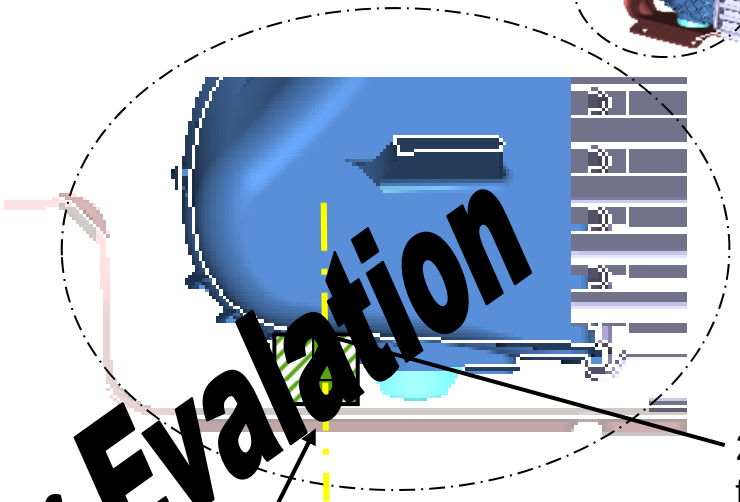
Drill Side

Engine Side



Side View -- On-Vehicle Orientation

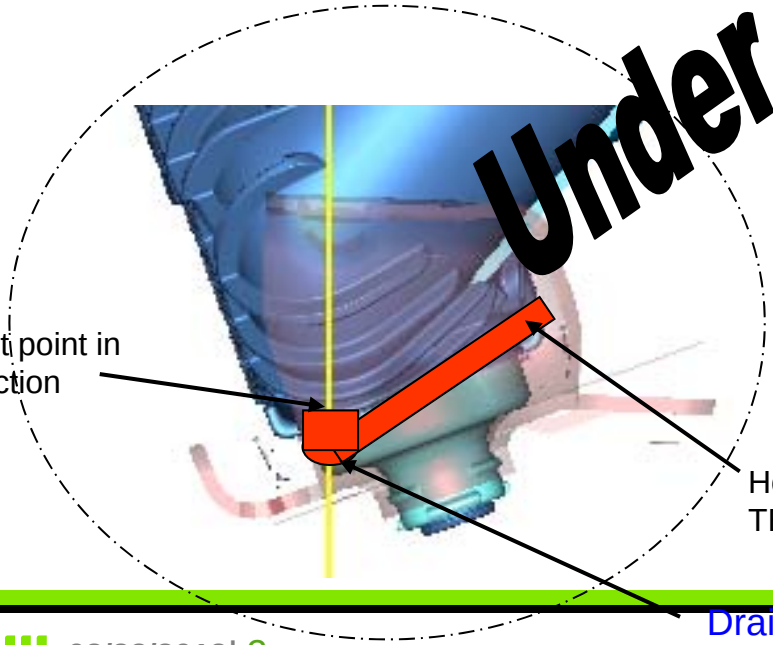




2mm hole, flushed with tank

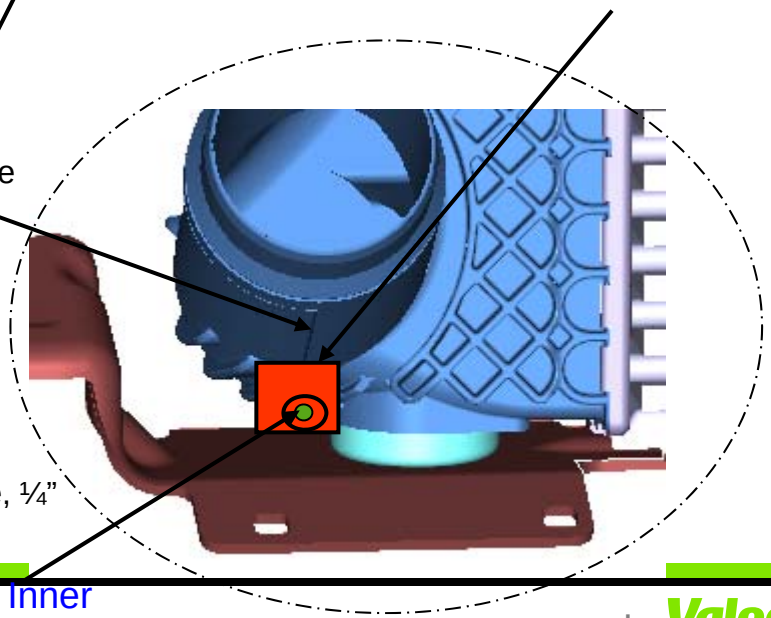
Under Evaluation

Tank mold Parting Line



Lowest point in X-direction

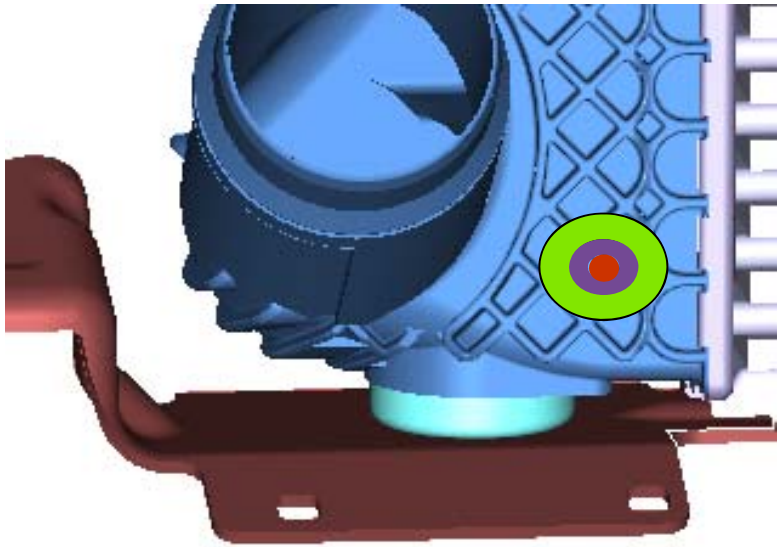
Hose Port, TBD hose size, ¼”

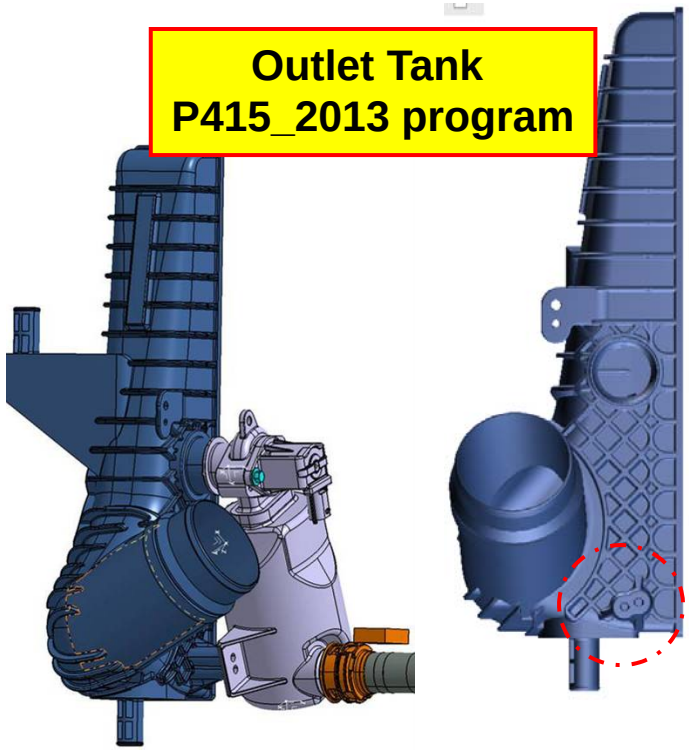


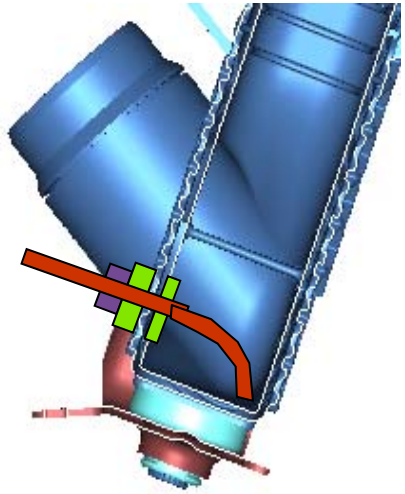
Drain Port with Inner Hole ID 2mm

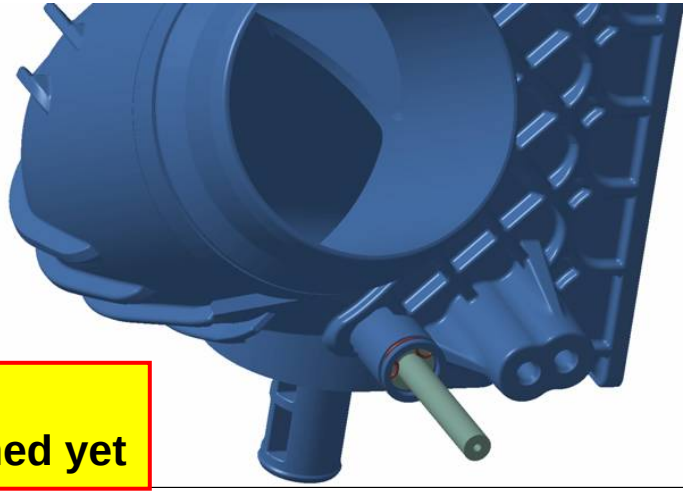
Vacuum-Drained Port
Alternative II – Tube with Fitting

Outlet Tank
P415_2013 program



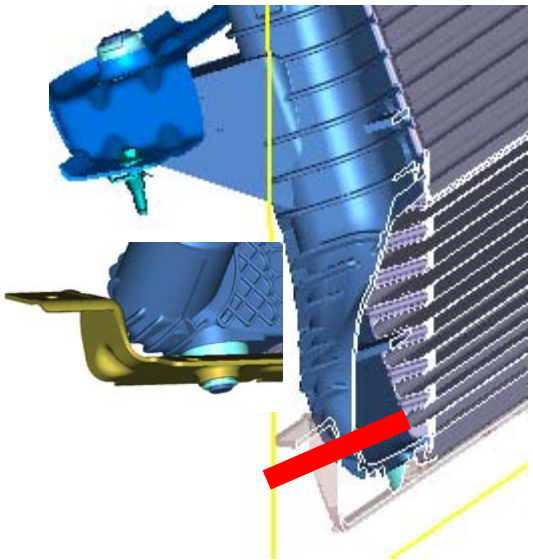


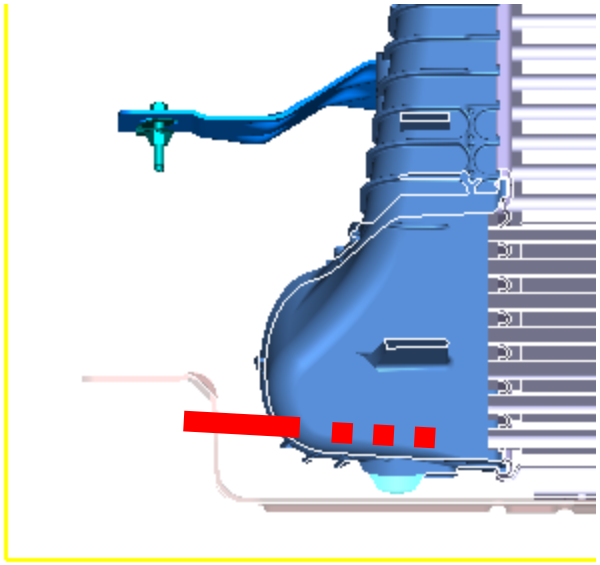




NOTE:
Mold Feasibility not confirmed yet

Vacuum-Drained Port
Alternative III – Transverse Drain Port





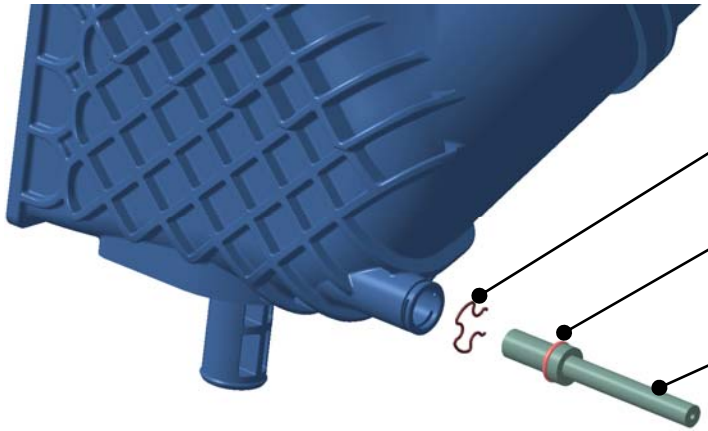
Transverse Drain Port Proposal

Vacuum-Drained Port
Alternative III – Valeo Concept Proposal

Option III-A: Drain Concept Design, for plastic pipe

Plastic Drain_pipe Molded in one part

Silicone O-Ring



Clip retainer

Silicone O-Ring

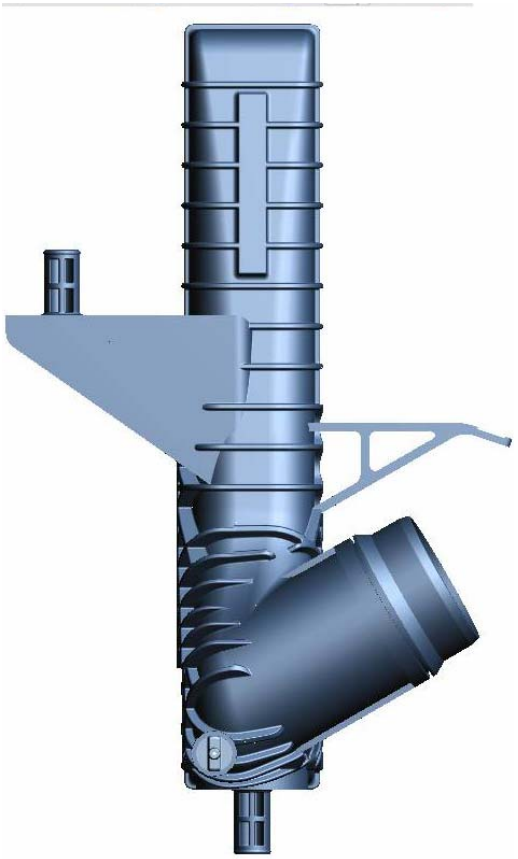
Metal Drain_pipe

Option III-B: Quick Connector Concept for Metal pipe (Steel / Aluminum / Brass)

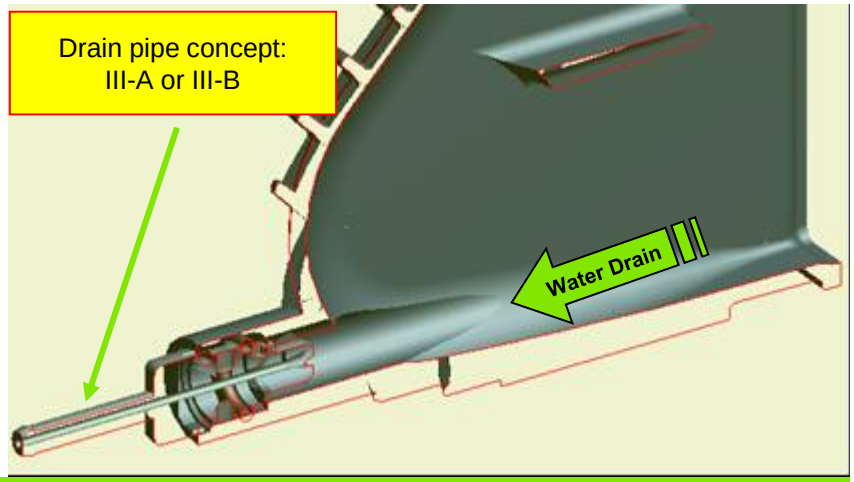
Advantages:
Most robust to support external forces
Packaging / less space

Vacuum-Drained Port
Alternative III – Transverse Drain Port

CAC Vehicle position



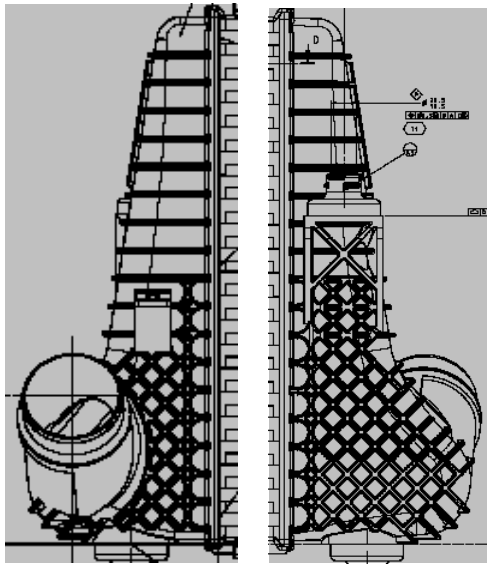
Drain pipe concept:
III-A or III-B

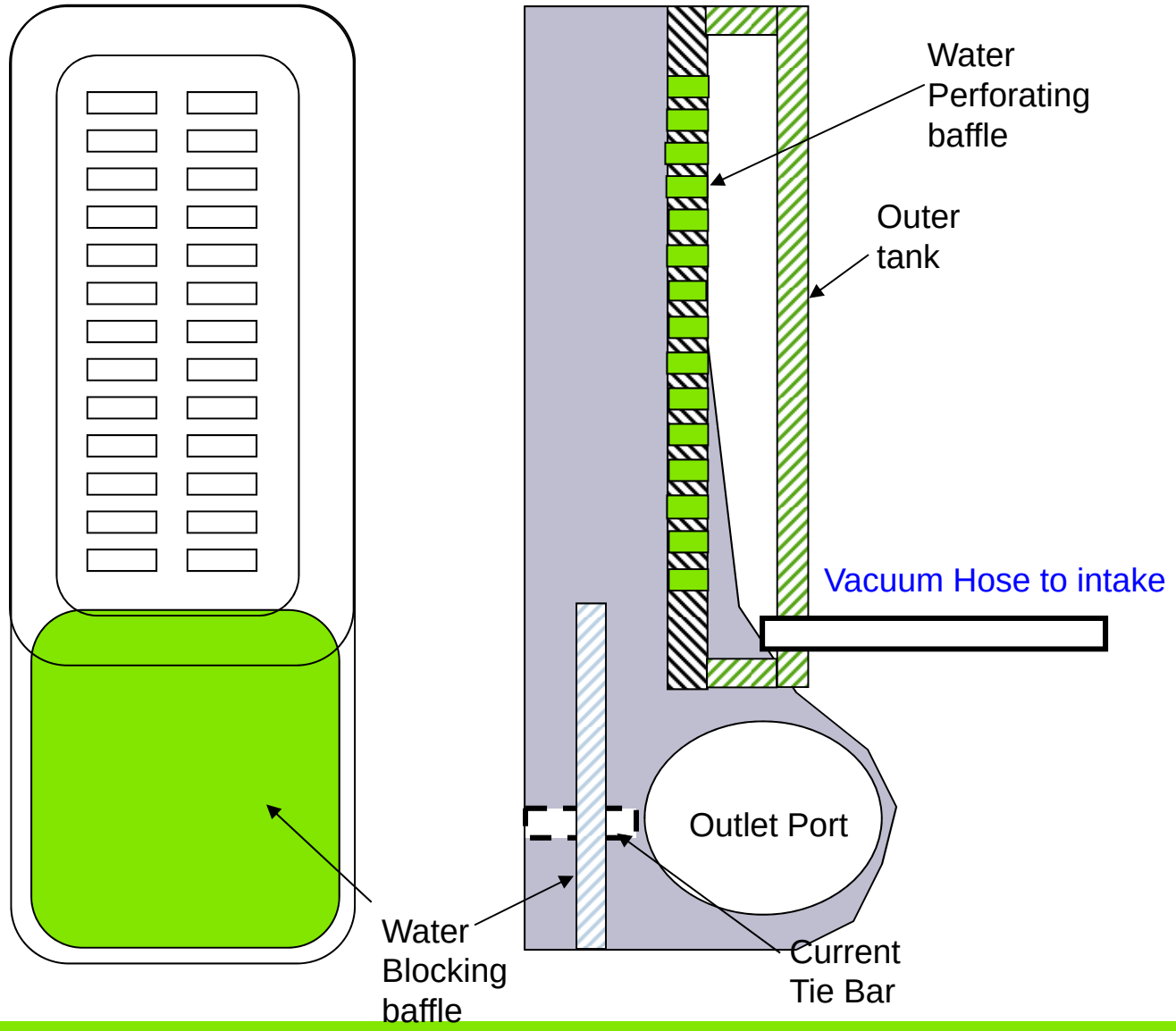


P415 CAC Tank Revision, Water Perforating, Option II

Fasteners

Current P415 CAC Outlet Tank





Enabling a better automotive world

From: Kramer, Michael (M.T.)
Sent: Tuesday, April 24, 2012 3:26 PM
To: Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); Peter GAUDINO (peter.gaudino@valeo.com)
Cc: Tyler, Jim (J.S.); Kramer, Michael (M.T.)
Subject: FW: Pull off fixture
Attachments: Cover Pull off fixture.doc

Yes.

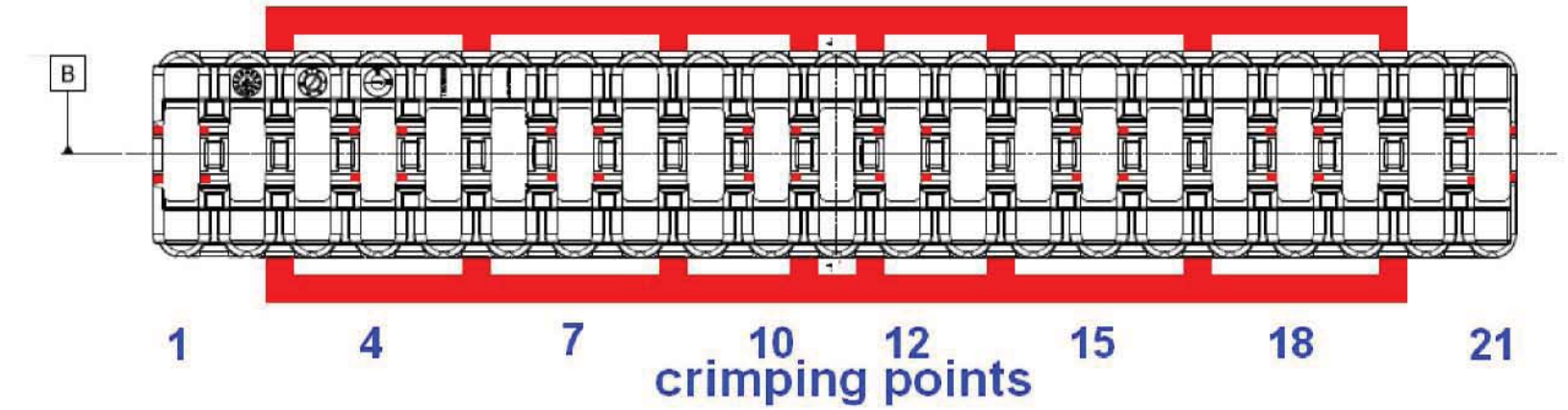
Fixture should not impart loading on the plate that is not perpendicular to the tube ends.

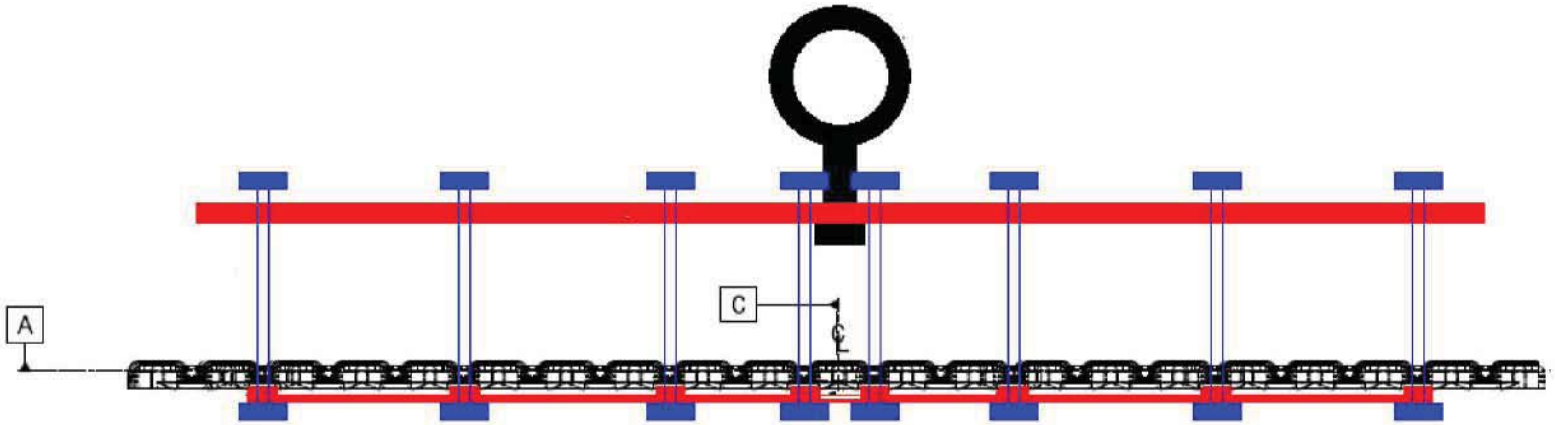
Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com
From: Joseph LUMETTA [mailto:joseph.lumetta@valeo.com]
Sent: Tuesday, April 24, 2012 3:22 PM
To: Kramer, Michael (M.T.); Tyler, Jim (J.S.)
Cc: Larry ENGEL; Peter GAUDINO; Satish NADELLA
Subject: Pull off fixture

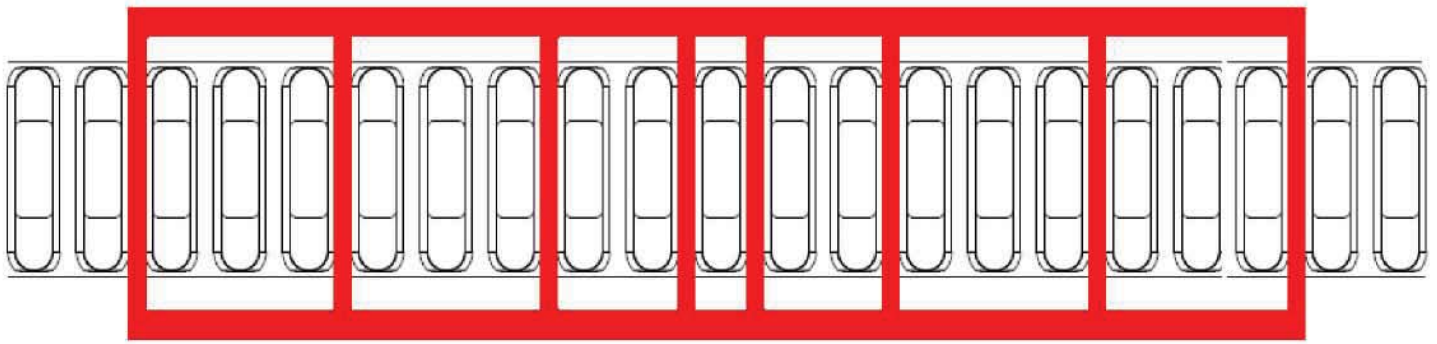
Hello Gentlemen
Per our meeting today I tried to capture the thought behind the pull off fixture.
Is this the concept? If so no need to respond if not please let me know.
I need to send to SLP so they can make up the tool.

--
Joseph Lumetta
joseph.lumetta@valeo.com
office phone 248-209-8237
fax 248-209-8282
cell 248-709-4710

Pull Off Fixture







PE13-018 031036

From: Andersen, Erik (E.)
Sent: Wednesday, May 15, 2013 12:36 PM
To: Huang, Larry (L,.) (lhuang3@ford.com)
Cc: Kramer, Michael (M.T.)
Subject: FW: Summary of P415 Requested CAC Robustness Actions
Attachments: External Covers 3.pptx

Larry,

Please review and make sure it is what we need.

Erik Andersen
Core P/T Cooling
eanderse@ford.com
313-805-2966

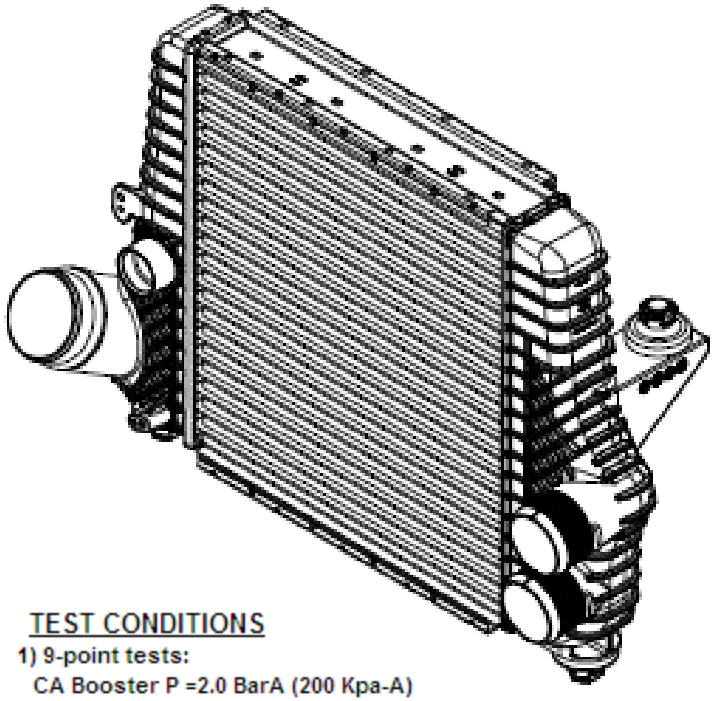
From: Satish NADELLA [mailto:satish.nadella@valeo.com]
Sent: Wednesday, May 15, 2013 12:07 PM
To: Andersen, Erik (E.); Tyler, Jim (J.S.); Huang, Larry (L,.); Kramer, Michael (M.T.)
Cc: Corey SMALL; Ying TANG; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA
Subject: Fwd: Summary of P415 Requested CAC Robustness Actions

Please find enclosed the data for the 3 options with Job 1 core. Data is from the testing done this week.

Regards,
Satish Nadella

CAC P415 2013 (Turbulator: 14cells & with louvers)

Part tested on DV



TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

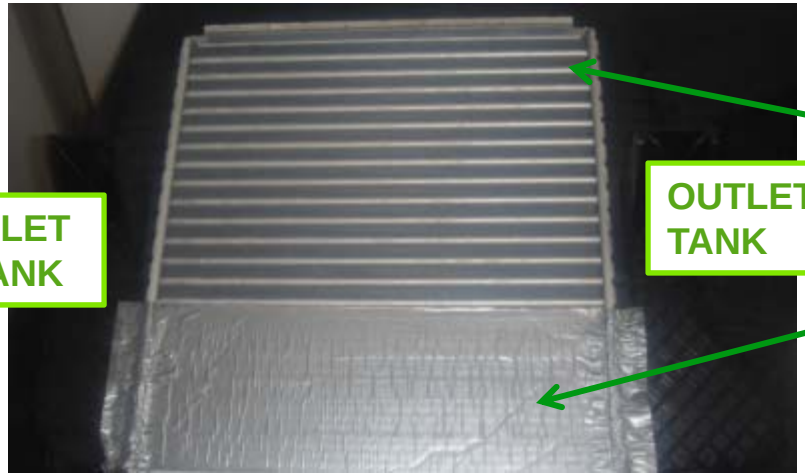
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	79.5	89.9	95.9
	0.19 (684)	66.1	84.7	89.0
	0.28 (1037)	53.4	75.5	83.4

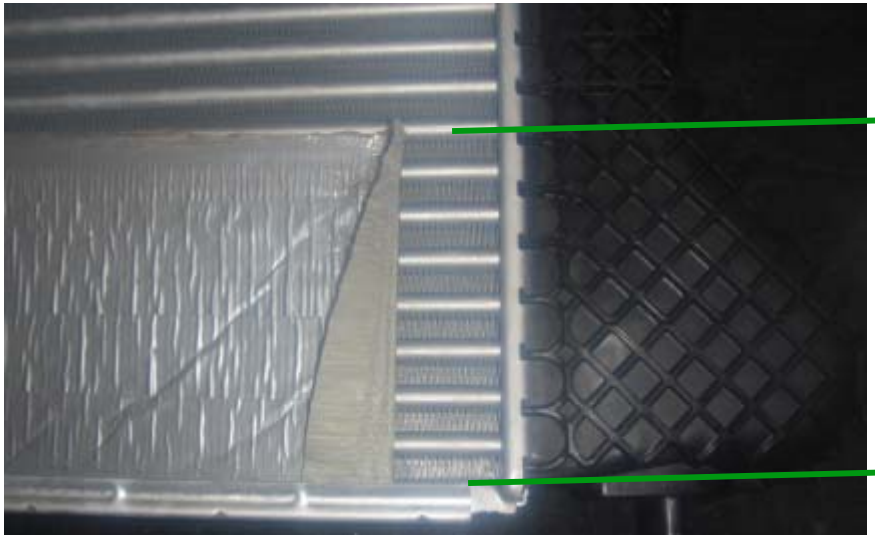
ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	84.6	337.0	749.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	12.07	26.47	56.41

CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins





CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	59.6	70.4	72.5
	0.19 (684)	49.8	63.4	66.4
	0.28 (1037)	40.9	56.8	60.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	122.1	591.5	1400.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.94	26.16	54.40

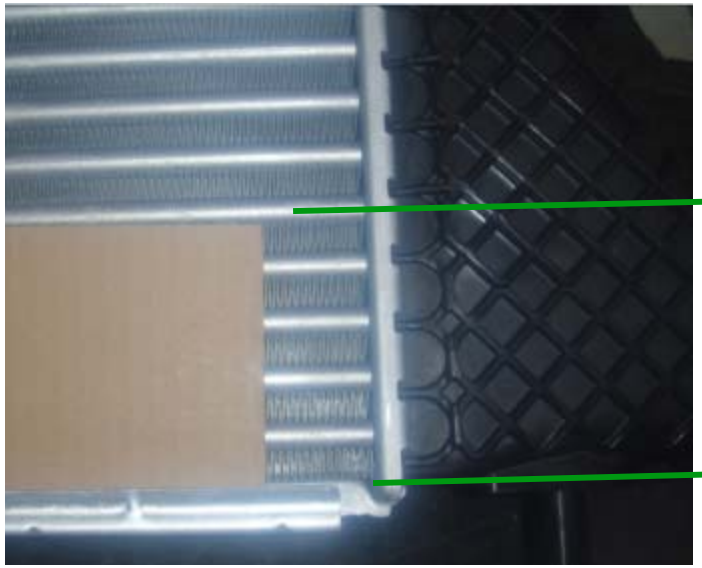
TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins



CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	71.4	83.0	85.8
	0.19 (684)	60.0	77.0	81.9
	0.28 (1037)	48.0	69.4	75.1

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	112.5	500.4	1140.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	11.60	24.08	53.18

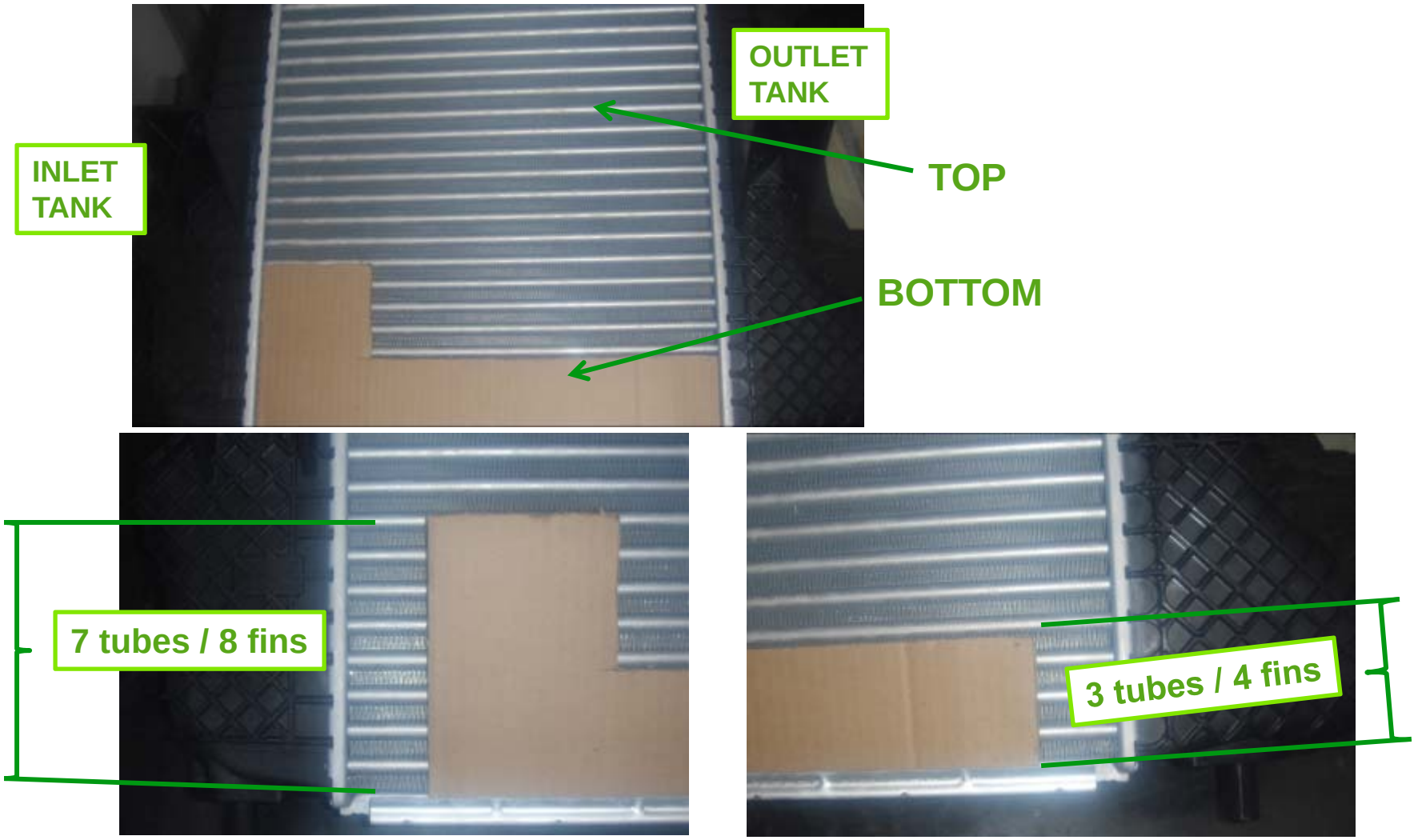
TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	69.1	81.4	85.5
	0.19 (684)	57.2	75.1	79.7
	0.28 (1037)	46.4	67.2	72.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	101.3	462.7	1071.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.82	25.81	54.36

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

From: Kramer, Michael (M.T.)
Sent: Thursday, May 16, 2013 1:29 PM
To: Weber, Erik (E.M.)
Cc: Kramer, Michael (M.T.); Huang, Larry (L,.); Andersen, Erik (E.); Kramer, Michael (M.T.)
Subject: FW: Summary of P415 Requested CAC Robustness Actions
Attachments: External Covers 2.pptx; External Covers 3.pptx

Here are the long awaited data sheets.

Filename = External Covers 3. Original J1 heat exchanger core with external lower blockers as described/shown.

Filename = External Covers 2. PCA CAC heat exchanger core without the internal 27 mm tube end throttle plates with external lower blockers as described/shown. This data was a result of a Valeo error (was supposed to be the one above. I am forwarding in case interested.

Note. The external lower blockers are the same between the two files.

Let me know if questions.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Andersen, Erik (E.)
Sent: Wednesday, May 15, 2013 3:19 PM
To: Kramer, Michael (M.T.)
Subject: FW: Summary of P415 Requested CAC Robustness Actions

Looks like we're okay to go with these. If you want to get them over to your TSE team, we need them to complete their full assessment.

Erik Andersen
Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Huang, Larry (L,.)
Sent: Wednesday, May 15, 2013 3:18 PM
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.)
Subject: RE: Summary of P415 Requested CAC Robustness Actions

Yes, the configs are what we want, and the data looks reasonable. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Andersen, Erik (E.)
Sent: Wednesday, May 15, 2013 12:36 PM
To: Huang, Larry (L,.)
Cc: Kramer, Michael (M.T.)
Subject: FW: Summary of P415 Requested CAC Robustness Actions

Larry,

Please review and make sure it is what we need.

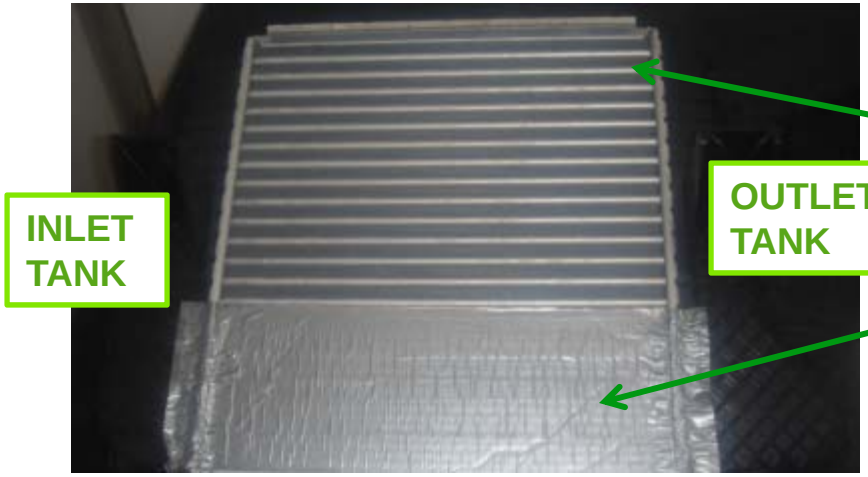
Erik Andersen
Core P/T Cooling
eanderse@ford.com
313-805-2966

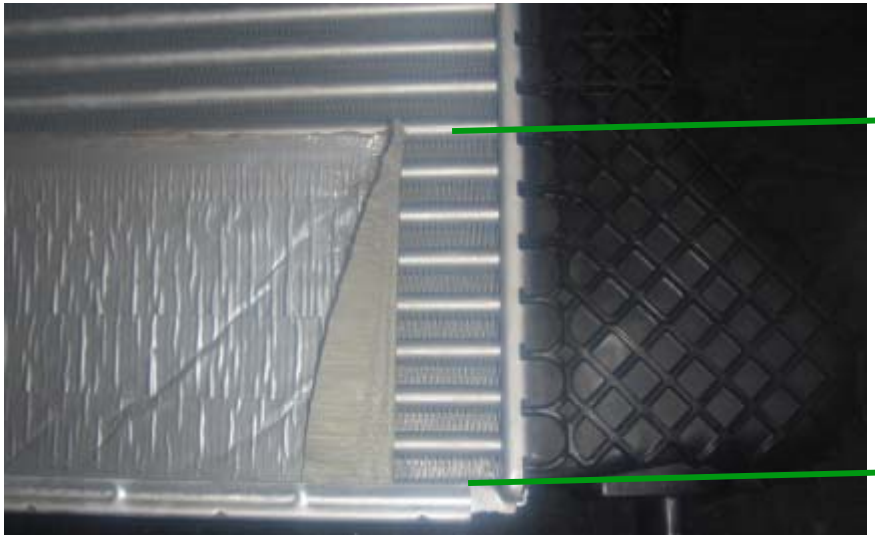
From: Satish NADELLA [mailto:satish.nadella@valeo.com]
Sent: Wednesday, May 15, 2013 12:07 PM
To: Andersen, Erik (E.); Tyler, Jim (J.S.); Huang, Larry (L,.); Kramer, Michael (M.T.)
Cc: Corey SMALL; Ying TANG; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA
Subject: Fwd: Summary of P415 Requested CAC Robustness Actions

Please find enclosed the data for the 3 options with Job 1 core. Data is from the testing done this week.

Regards,
Satish Nadella

Externally block bottom 7 tubes / 8 fins





Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	48.6	55.6	60.3
	0.19 (684)	40.6	49.5	53.3
	0.28 (1037)	34.1	45.2	48.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	87.9	434.7	1047.3

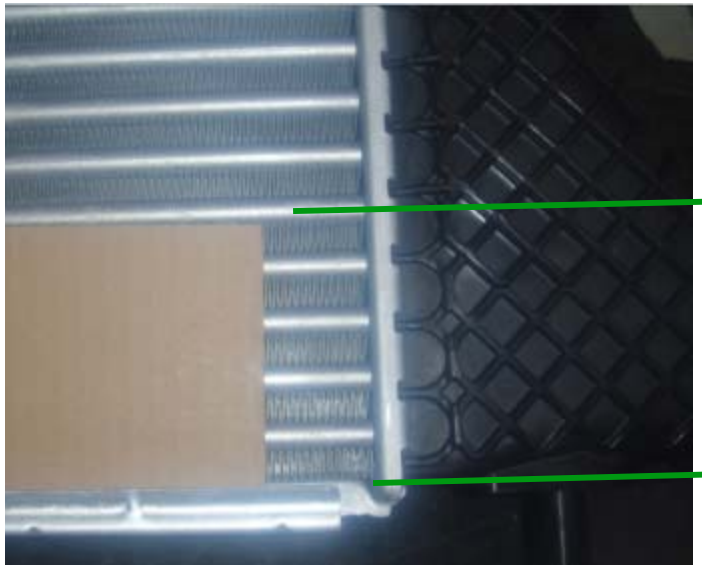
ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.41	18.64	40.08

TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

Externally block bottom 4 tubes / 5 fins



Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	56.1	66.0	70.5
	0.19 (684)	46.9	60.1	64.2
	0.28 (1037)	38.4	52.6	57.4

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	75.4	357.3	835.3

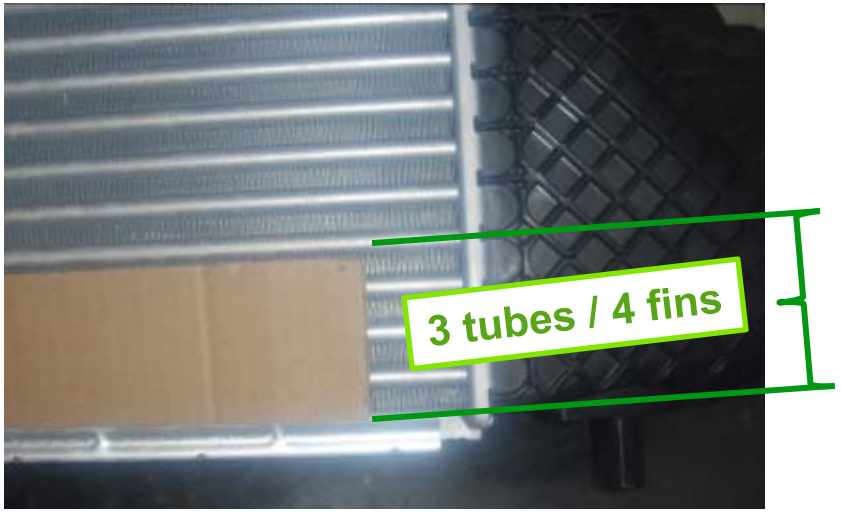
ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	8.19	18.26	39.93

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	55.9	67.3	70.0
	0.19 (684)	46.8	60.0	64.4
	0.28 (1037)	38.4	52.9	57.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	73.2	362.2	865.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.02	18.13	39.23

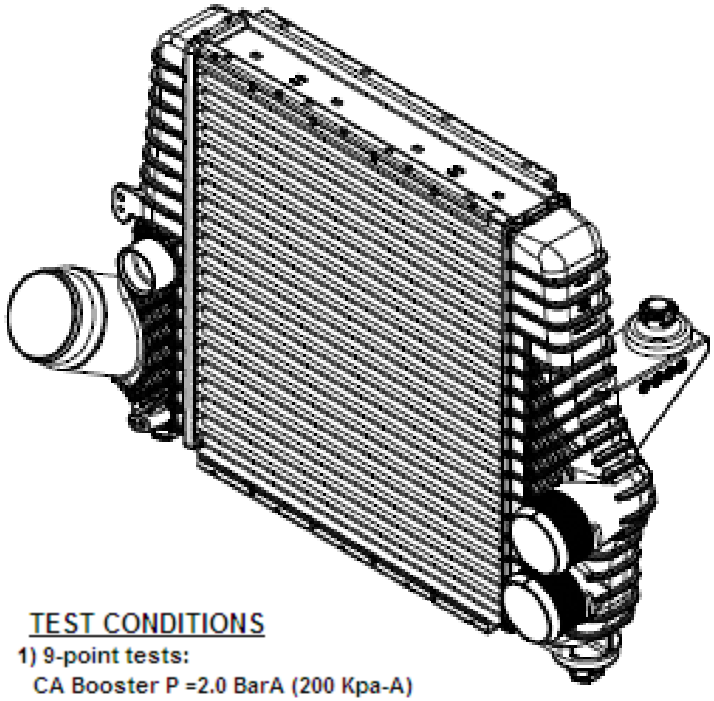
TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Part tested on DV



TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

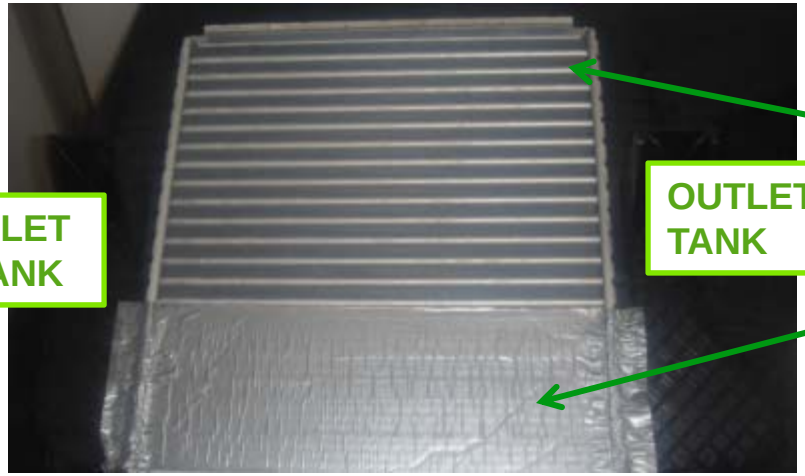
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	79.5	89.9	95.9
	0.19 (684)	66.1	84.7	89.0
	0.28 (1037)	53.4	75.5	83.4

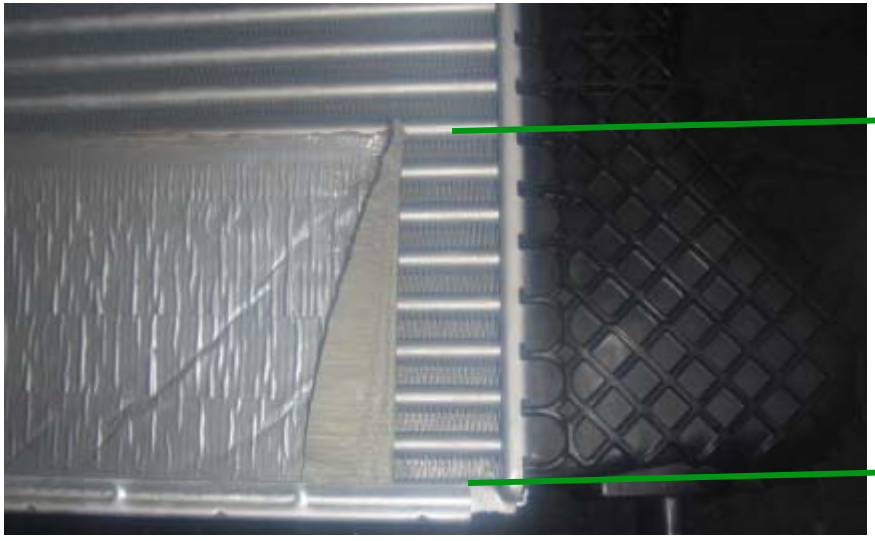
ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	84.6	337.0	749.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	12.07	26.47	56.41

CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins





CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	59.6	70.4	72.5
	0.19 (684)	49.8	63.4	66.4
	0.28 (1037)	40.9	56.8	60.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	122.1	591.5	1400.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.94	26.16	54.40

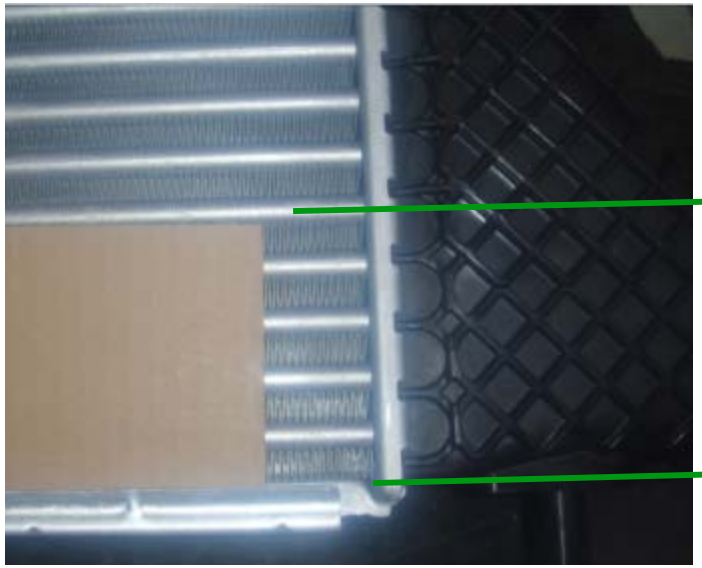
TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins



CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	71.4	83.0	85.8
	0.19 (684)	60.0	77.0	81.9
	0.28 (1037)	48.0	69.4	75.1

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	112.5	500.4	1140.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	11.60	24.08	53.18

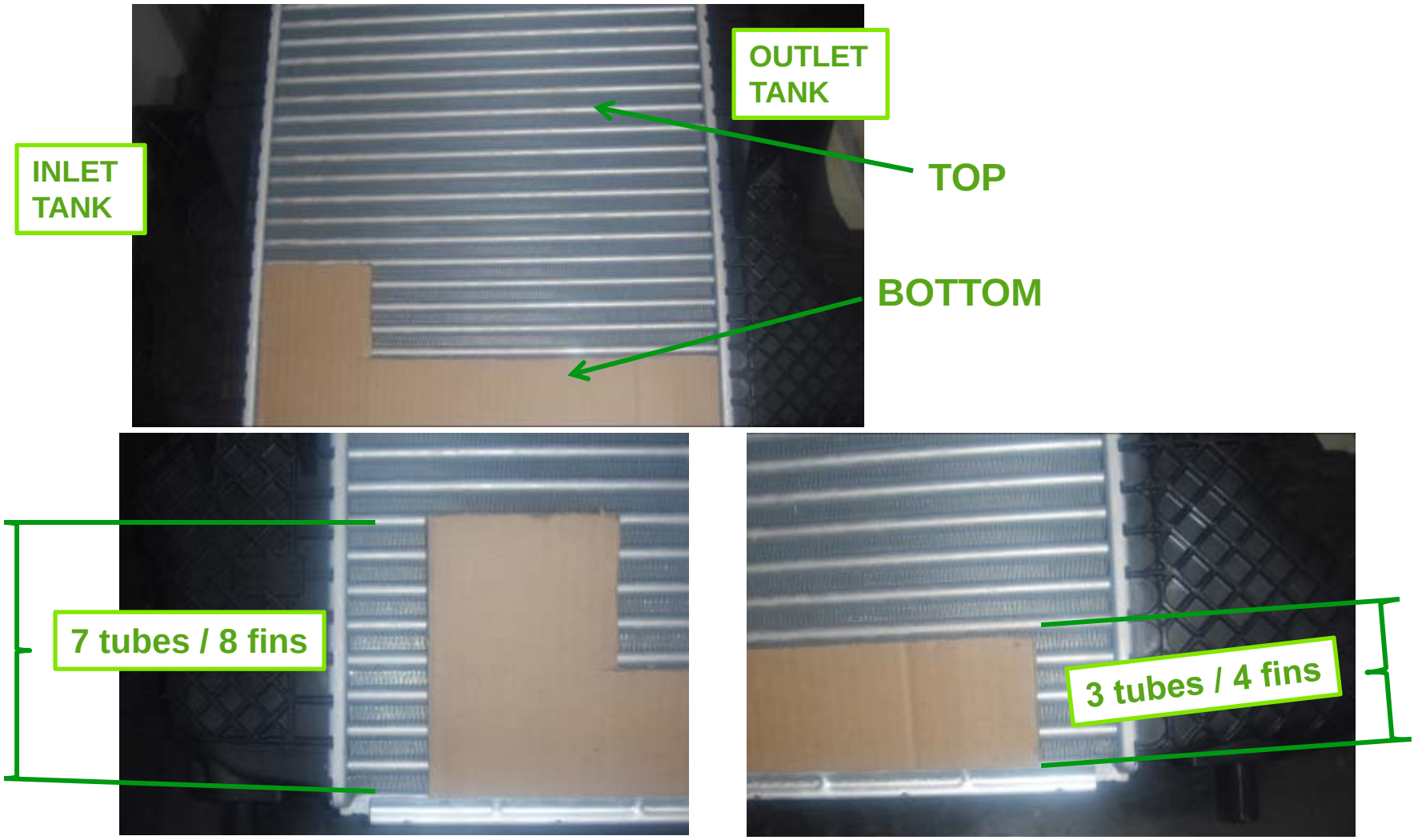
TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	69.1	81.4	85.5
	0.19 (684)	57.2	75.1	79.7
	0.28 (1037)	46.4	67.2	72.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	101.3	462.7	1071.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.82	25.81	54.36

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

From: Ying TANG [ying.tang@valeo.com]
Sent: Friday, June 15, 2012 8:36 AM
To: Kramer, Michael (M.T.)
Subject: Fwd: CAC
Attachments: P415 WO louvers vs w louvers.ppt

Kramer:

Please see the no-blockage 11cells non-louvered performance. It is strange for me.

Ying Tang

---------- Forwarded message ----------
From: **Ying TANG** <ying.tang@valeo.com>
Date: Tue, Jun 5, 2012 at 10:34 AM
Subject: RE: CAC
To: Joseph LUMETTA <joseph.lumetta@valeo.com>

FYI

CAC P415

W/O Louver vs. W/ Louvers

Performance comparison

PE13-018 031061

Date: JANUARY 31st, 2012

COMPARISON

BL34-9L440-AC

CHANGE AIR
PREASSURE: 1.7bar (abs)
T CAHRGE SIDE: 150C +/-5C
AMBIENT: 25 +/-5C
HEAT TRANSFER Eff(%)

CAHRGE AIR FLOW kg/s (kg/hr) \ COOLING AIR FLOW kg/s (m/s)	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)	Pasc Internal Air (mbar) *
0.12 (432)	73.9	88.0	91.0	1.37
0.19 (684)	61.0	82.4	87.6	2.99
0.28 (1037)	48.6	74.0	81.3	6.11
P External AIR (Pa) **	70.0	314.0	704.0	

* 1.08 kg/s EXT. FLOW
** 0.288 kg/s INT. FLOW

WITH LOUVERS

BL34-9L440-AC - 0T Sin Louvers

CHANGE AIR
PREASSURE: 1.7bar (abs)
T CAHRGE SIDE: 150C +/-5C
AMBIENT: 25 +/-5C
HEAT TRANSFER Eff(%)

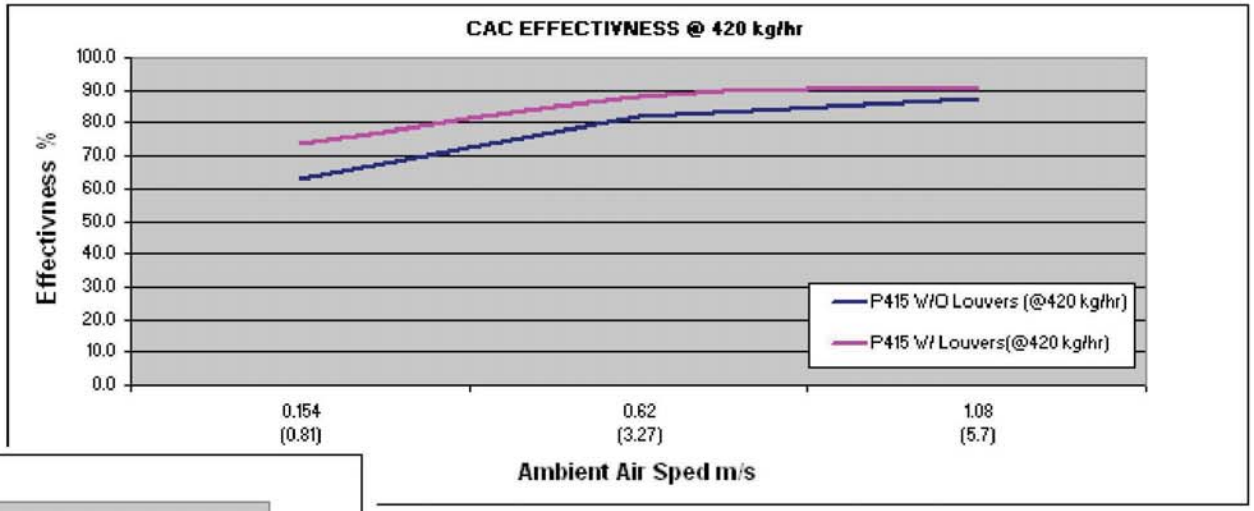
CAHRGE AIR FLOW kg/s (kg/hr) \ COOLING AIR FLOW kg/s (m/s)	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)	ΔPasc Internal Air (kPa) *
0.12 (432)	62.9	82.2	87.3	0.09
0.19 (684)	50.8	75.6	80.8	2.10
0.28 (1037)	39.7	67.3	75.2	4.49
ΔP External AIR (Pa) **	57.0	330.0	727.0	

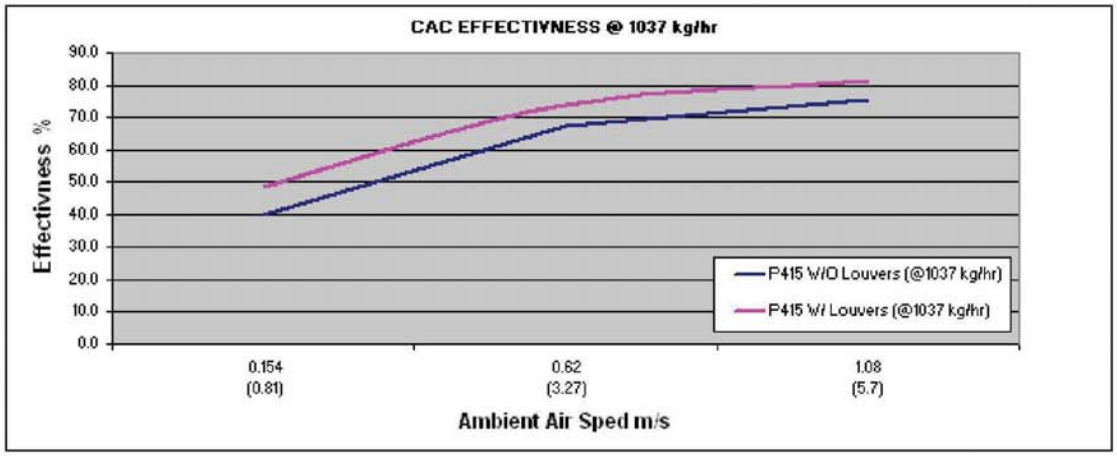
* 1.08 kg/s EXT. FLOW
** 0.288 kg/s INT. FLOW

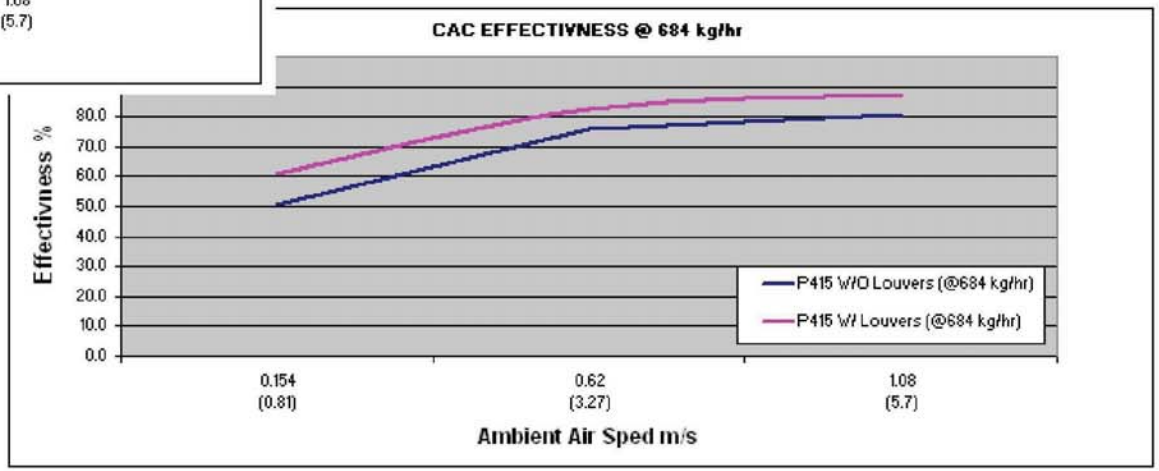
WITH NO LOUVERS

PE13-018 031062

COMPARISON







PE13-018 031063

From: Satish NADELLA [satish.nadella@valeo.com]
Sent: Monday, May 06, 2013 7:06 AM
To: Andersen, Erik (E.)
Cc: Kramer, Michael (M.T.); Corey SMALL <corey.small@valeo.com> (corey.small@valeo.com); ying.tang@valeo.com; Tyler, Jim (J.S.); Widmann, Carl (C.A.); Weber, Erik (E.M.); Rodgers, Thomas (T.A.); Huang, Larry (L,.)
Subject: Fwd: P415 CAC last week test results-Updated
Attachments: External Covers 2.pptx

Erik,

Please find enclosed the data from testing for the P415 CAC for the 3 options.

Regards,
Satish Nadella

---------- Forwarded message ----------
From: **Ying TANG** <ying.tang@valeo.com>
Date: Mon, May 6, 2013 at 9:49 AM
Subject: RE: P415 CAC last week test results-Updated
To: Satish NADELLA <satish.nadella@valeo.com>

FYI

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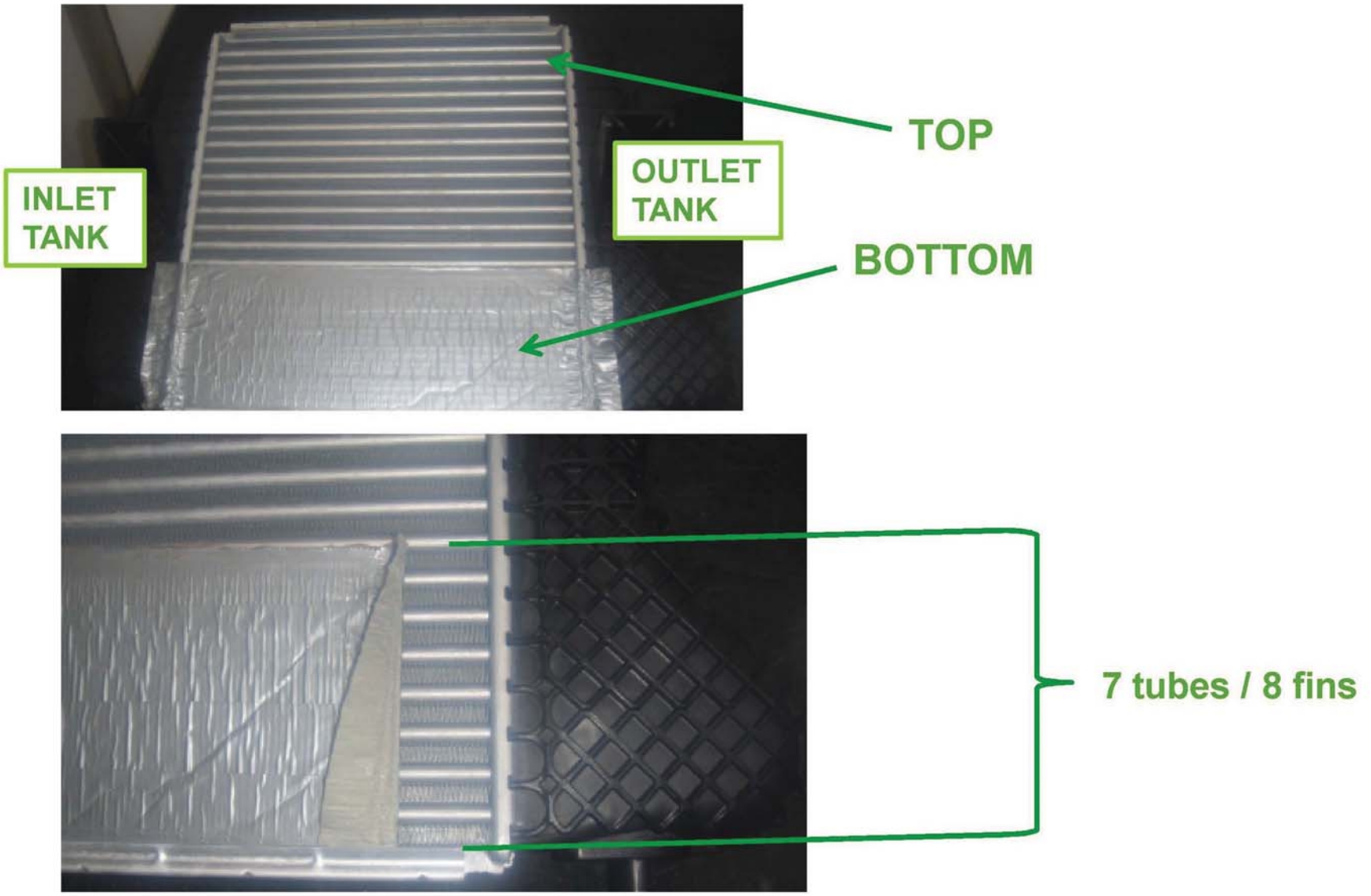
If you are not the intended recipient, please return it immediately to its sender
at the above address and destroy it.

Externally block bottom 7 tubes / 8 fins



PE13-018 031065

Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	48.6	55.6	60.3
	0.19 (684)	40.6	49.5	53.3
	0.28 (1037)	34.1	45.2	48.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	87.9	434.7	1047.3

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.41	18.64	40.08

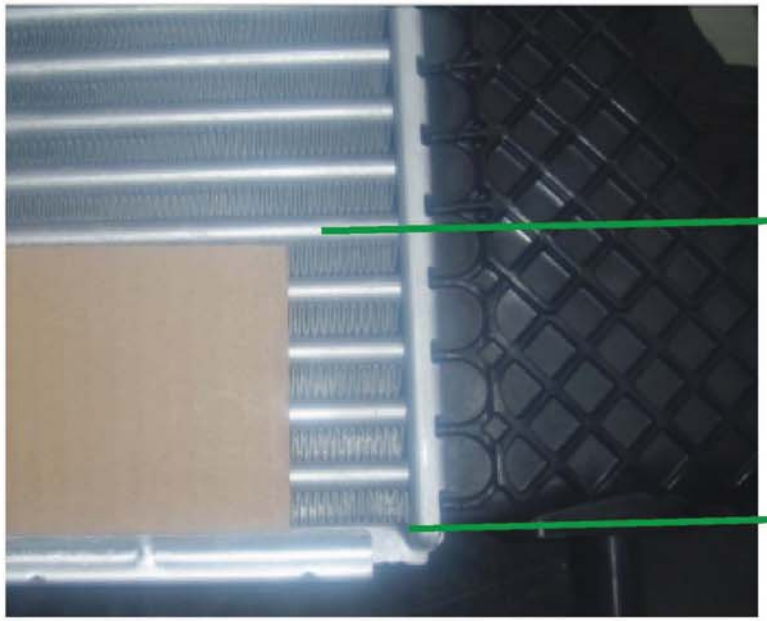
TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

PE13-018 031066

NO INTERNAL MASK (COVER)

Externally block bottom 4 tubes / 5 fins



PE13-018 031067

Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	56.1	66.0	70.5
	0.19 (684)	46.9	60.1	64.2
	0.28 (1037)	38.4	52.6	57.4

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	75.4	357.3	835.3

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	8.19	18.26	39.93

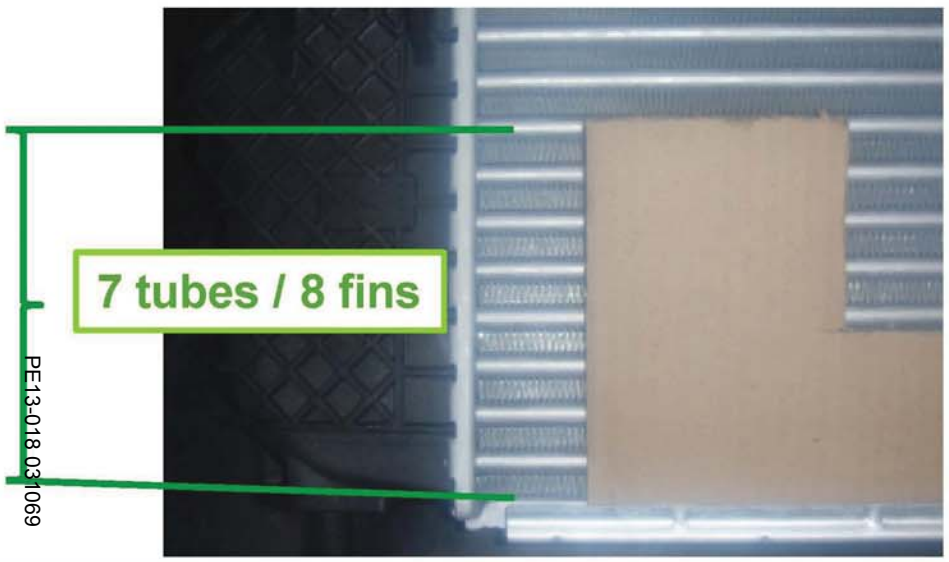
TEST CONDITIONS

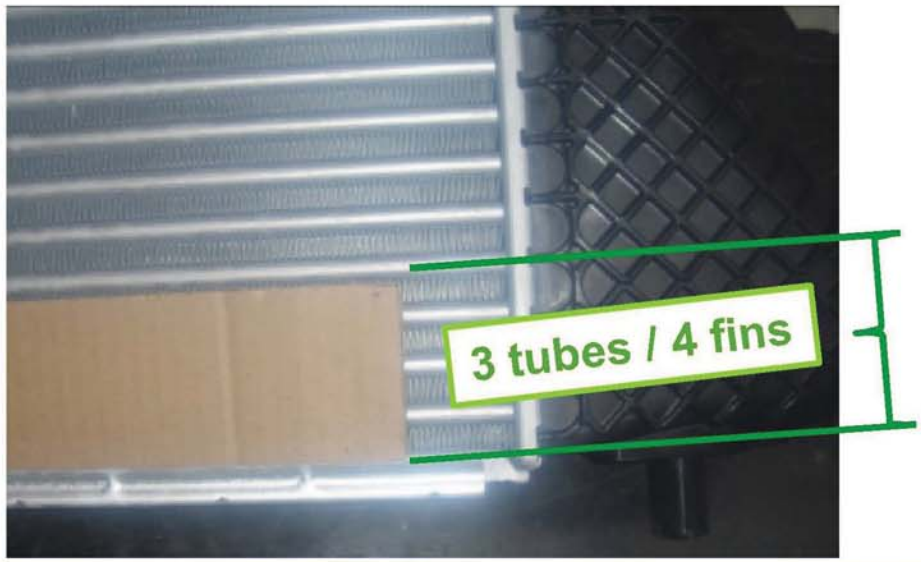
1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

PE13-018 031068

NO INTERNAL MASK (COVER)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length





PE13-018.031069

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	55.9	67.3	70.0
	0.19 (684)	46.8	60.0	64.4
	0.28 (1037)	38.4	52.9	57.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	73.2	362.2	865.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.02	18.13	39.23

TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

PE13-018 031070

NO INTERNAL MASK (COVER)

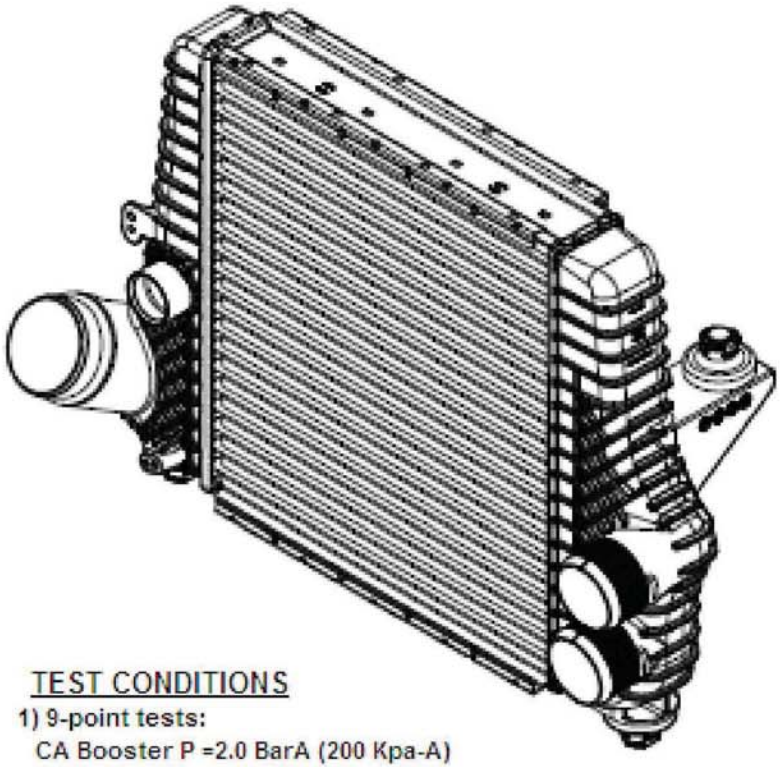
From: Satish NADELLA [satish.nadella@valeo.com]
Sent: Wednesday, May 15, 2013 12:07 PM
To: Andersen, Erik (E.); Tyler, Jim (J.S.); Huang, Larry (L,.); Kramer, Michael (M.T.)
Cc: Corey SMALL; Ying TANG; Blas-Fernando GUTIERREZ; Guillermo GUADARRAMA
Subject: Fwd: Summary of P415 Requested CAC Robustness Actions
Attachments: External Covers 3.pptx

Please find enclosed the data for the 3 options with Job 1 core. Data is from the testing done this week.

Regards,
Satish Nadella

CAC P415 2013 (Turbulator: 14cells & with louvers)

Part tested on DV



TEST CONDITIONS

1) 9-point tests:
   CA Booster P =2.0 BarA (200 Kpa-A)
   CA inlet Temp =125±1.1°C
   Amb air Temp =25 degC
   Face vel. -
      0.81 m/s
      3.27 m/s
      5.7 m/s
   CA flow:
      432 kg/hr
      684 kg/hr
      1037 kg/hr

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	79.5	89.9	95.9
	0.19 (684)	66.1	84.7	89.0
	0.28 (1037)	53.4	75.5	83.4

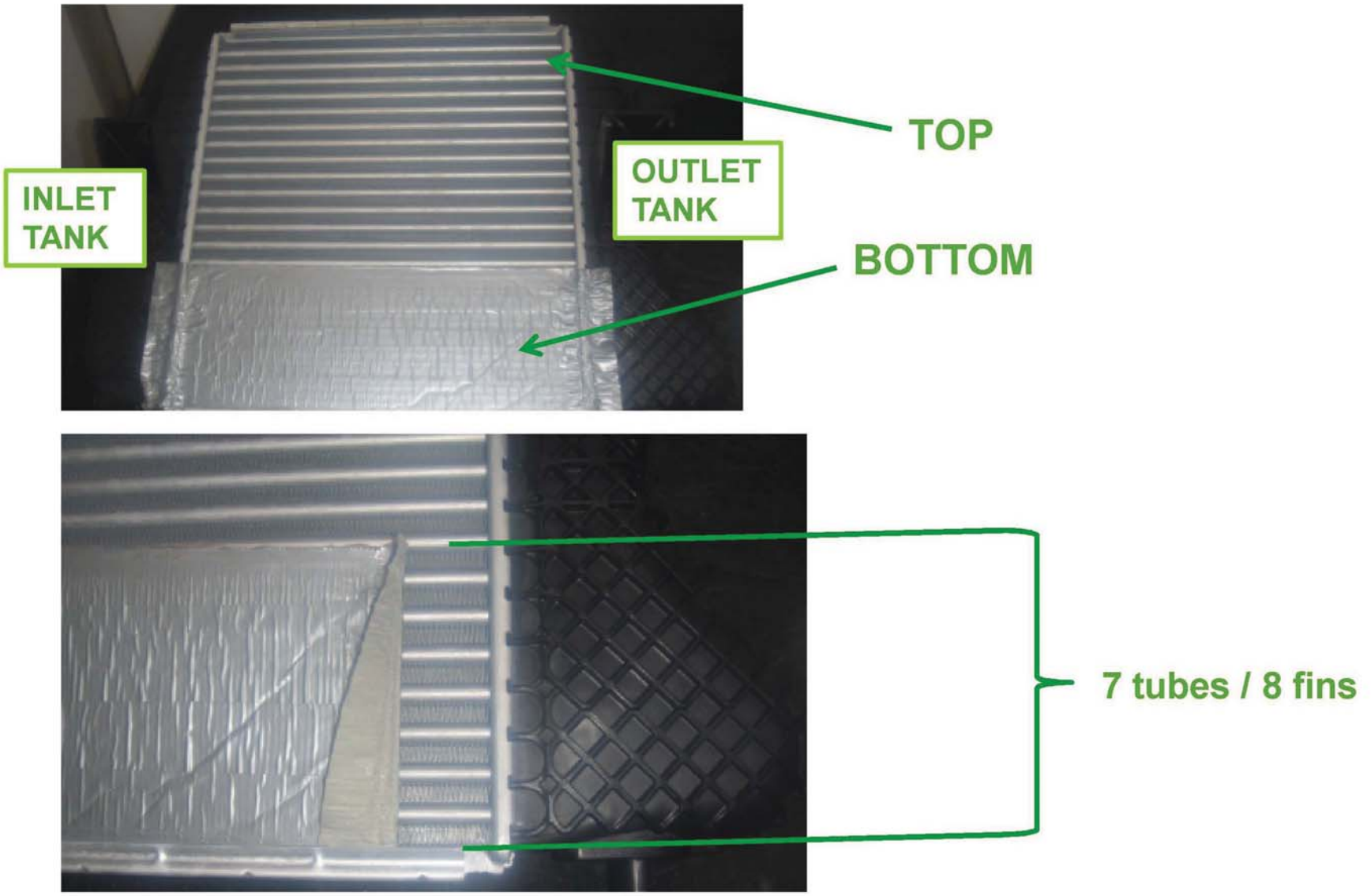
ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	84.6	337.0	749.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	12.07	26.47	56.41

PE13-018 031072

CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins



PE13-018 031073

CAC P415 2013 (Turbulator: 14 cells & with louvers)

Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	59.6	70.4	72.5
	0.19 (684)	49.8	63.4	66.4
	0.28 (1037)	40.9	56.8	60.7

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	122.1	591.5	1400.8

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.94	26.16	54.40

TEST CONDITIONS

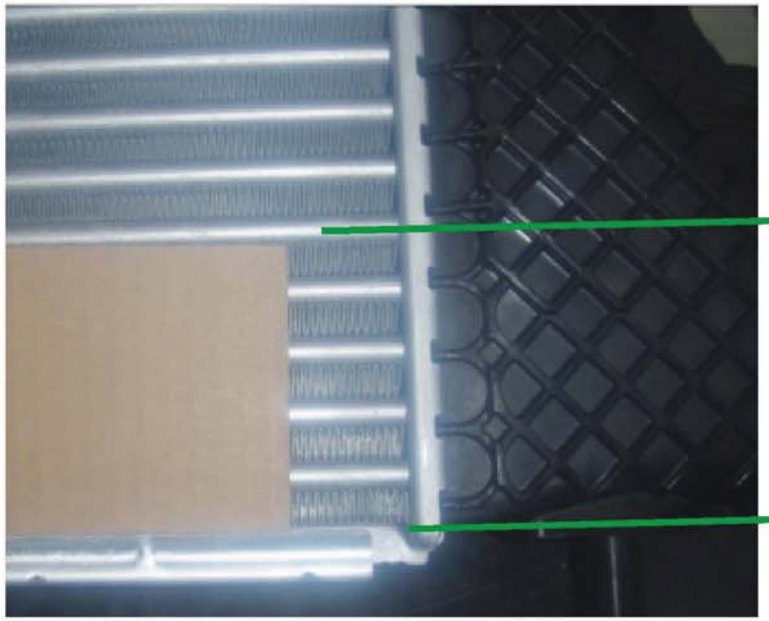
1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

PE13-018 031074

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins



PE13-018 031075

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	71.4	83.0	85.8
	0.19 (684)	60.0	77.0	81.9
	0.28 (1037)	48.0	69.4	75.1

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	112.5	500.4	1140.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	11.60	24.08	53.18

TEST CONDITIONS

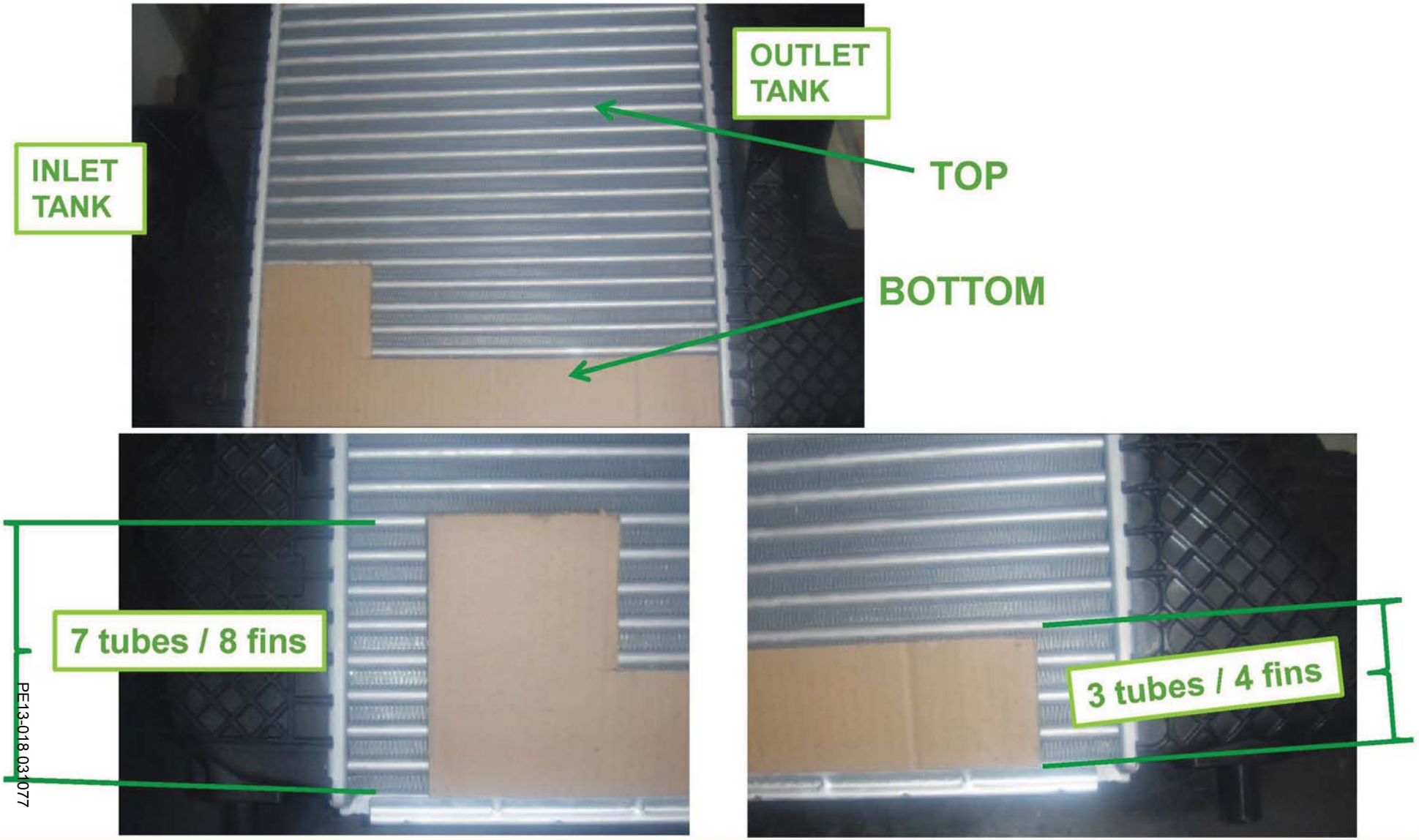
1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

PE13-018 031076

CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



CAC P415 2013 (Turbulator: 14cells & with louvers)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	69.1	81.4	85.5
	0.19 (684)	57.2	75.1	79.7
	0.28 (1037)	46.4	67.2	72.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	101.3	462.7	1071.5

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	11.82	25.81	54.36

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

PE13-018 031078

NO INTERNAL MASK (COVER)

From: Peter GAUDINO [peter.gaudino@valeo.com]
Sent: Tuesday, May 15, 2012 7:26 AM
To: Kronig, Donald (D.M.); Kramer, Michael (M.T.)
Cc: Madej, Jeanette (J.); Lee HERVEY; David CASTILLO; Mickael DA-SILVA; Larry ENGEL; Joseph LUMETTA; Tyler, Jim (J.S.)
Subject: P415 CAC Cover Change - Need Full cost Tool Order - Facing Stoppage

Don,

As you are aware, to initiate the new tooling required to support the new core internal cover for the P415 CAC, Valeo has two Tool Orders for $50,000 each and one letter from Ford Purchasing authorizing another $50,000. From the inception of the new cover discussion early this year, we have always been in full throttle mode relative to timing for this design change initiated by Ford PD.

This $150,000 enabled Valeo's to release our tool suppliers to start the new tools. Our expectation was always the full cost tool order was forthcoming after the Concern was written and approved. This $150,000 was to enable early tool kick-off to support the aggressive timing plan.

My understanding is the Concern was approved nearly two weeks ago.

Valeo's tool suppliers have now accumulated cost in excess of $150,000.

The full cost tool order has not been released.

If the full cost tool order is not released to Valeo tomorrow, Valeo will have no other choice than to stop the tool making tomorrow at the close of business.

Please advise how we should proceed.

Regards,
Peter Gaudino
Valeo Engine Cooling
4100 North Atlantic Boulevard
Auburn Hills, MI 48326
Office: 248-209-8362
Cell: 248-310-5992

From: Joseph LUMETTA <joseph.lumetta@valeo.com>
Sent: Thursday, April 26, 2012 9:51 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.); David CASTILLO; Guillermo GUADARRAMA; Peter GAUDINO; Larry ENGEL
Subject: P415 DVP&R
Attachments: DVP&R CAC P415 Ford Hystorical changes rev 17 25-April 12.xls

Hello Jim
Attached you will find the DVP&R for the P415 CAC testing. I will be in your building today so please sign off this Document so we can make sure you approve.
Thank YOU

--
Joseph Lumetta
joseph.lumetta@valeo.com
office phone 248-209-8237
fax 248-209-8282
cell 248-709-4710

DESIGN VALIDATION PLAN & REPORT

CONFIDENTIAL

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

ECR No. 26256
PC No
AC No.

PVP&R No. PV08-093
DATE ORIG: Feb-15th-2011

REVISION No: 17
DATE REV: April 25th , 2012

APPROVALS:

R&D MANAGER / R. Sanchez	QUALITY DIRECTOR / Karina Nuñez
P1/P0's SUPERVISOR / E. Barrios	PROJECT MANAGER / Jose Martinez
LAB MANAGER / J. A. Rodriguez or H. Urbina	Other:

MODEL YEARS:	COMPONENT / ASSY:	VALEO P/N	DRAWING & REV.	SUPPLIER NAME:	CUSTOMER APPROVAL:
2012	CAC	M150754	MCAD 100033922 Rev B	Valeo Termico	NAME SIGN DATE
PROJECT APPLICATION (S):	**CUSTOMER:**	**CUSTOMER P/N**	**ASSEMBLY PLANT:**	ORIGINATOR:	
FORD F-Series GTDI	FORD	BL34-9L440-AC	VEC SLP	Guillermo Guadarrama	

TEST PLAN							TEST REPORT								
ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP.	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT RESULT	ACTUAL RESULT REPORT No / CODE	NOTES / SUMMARY RESULTS / ACTIONS

PROCEDURE:	TEST DESCRIPTION:	ACCEPTANCE CRITERIA:	TARGET REQ'D:	TEST STAGE:	SAMPLES TESTED:	SAMPLE TYPE:	ACTUAL RESULTS:
SPECIFY THE GOVERNING TEST PROCEDURE OR STANDARD.	PROVIDE A BRIEF DESCRIPTION OF EACH TEST.	SPECIFY CYCLES, MILES, VOLTS, MINIMUM VALUES, NO FAILURES, ETC.	STAGE REQ'D RELIABILITY OR NO FAILURE.	ED=ENGINEERING DESIGN. DV= DESIGN VALIDATION. PV= PRODUCTION VALIDATION. CC= CONTINUOUS CONFORMANCE.	LIST QUANTITY TESTED, SAMPLES TYPE, ETC.	A= PROTOTYPE (HAND-MADE). B= PROTOTYPE (TOOLED). C= PROGRAM LEVEL.. D= INITIAL PRODUCTION.	LIST RESULT IN TERMS OF EG.: R90,C90, PASS OR NO FAILURE.

PV CHANGES CONTROL:

PVP & R Rev.	Date.	Change description
1	8-Aug-08	1) PV released for customer review, taking the Satish Assumption for Max. Temp.= 205°C & Max pressure in the system=237 KPa-A 2) CPS-0032 is defined like test specifications
2	28-Sep-08	1) Changed for Heat transfer test, Charge air inlet pressure to 1.5 bar-g, instead of 1.7Bar-A, 1.5 bar-g MUST BE Confirmed by customer 2) Pressure cycle test: 1) Changed peak temperature to 185°C, instead of 205°, 2) Changed peak pressure to 150 KPa-g, instead of 236 Kpa-A 3) Thermal cycle test: Changed peak temperature to 185°C, instead of 205° 4) Hot age test was added, considering 185°, instead of 205°C
3	20-Nov-08	Erosion Test Added, item 11, Performance test change is considered using Y connector,, Thermal cycle test minimum cycles changed to class B as per FORD Requested (Larry Hung)
4	12-Dec-08	Added SWAAT test s reference for CAC P415 GTDI, taking P415 Diesel as product validated
5	25-Jan-09	1) Changed leak test time to 20 sec. (Only for X1 Stage, not for production intent, 2) Added core weight only as record, 3) FORD requested to incresed the cycles for Pressure cycle test until 375,000 Vs 250,000 for minimumm, 4) FORD requested to incresed the cycles for Thermal cycle test until 5,000 Vs 3, 750
6	8-Jul-09	1) Vibration Test Tri axis completed
7	13-Aug-09	1) Removed PV stage, PV stage will be driven in separate file, 2) Added part number to BL34-9L440-AA for PV stage
8	7-Oct-11	Addition of PV11-092. Fin Pitch change from 1.2 mm to 1.4 mm
9	12-Oct-11	Additon of PV11-0130. Change side plate thickness reduction from 1.5 mm to 1.2 mm
10	13-Jan-12	Data completion of PV11-0138. Change side plate thickness reduction from 1.5 mm to 1.2 mm
11	30-Jan-12	Addition of PV11-0173. Change fin and turbulator thickness to 0.070mm
12	31-Jan-12	Release for Technical concep validation
13	5-Mar-12	PV12-015. Outlet tank design change due to condensation issue, drain . (fitting added one with locking nut one without).
14	10-Mar-12	PV12-015. Outlet tank design change due to condensation issue, drain .
15	25-Apr-12	Cover plate addition due to condesation issue in vehicle
16	25-Apr-12	Update the cover plate blow off test to 1.5 times max air flow requirement (1560 kg/hr flow).
17	25-Apr-12	Air Blocking shield tri-axis test added as record keeping only.

PE13-018

FORD

8-23-2013

APPENDIX G

Engineering Review

10

From: Huang, Larry (L,.)
Sent: Tuesday, June 18, 2013 8:31 PM
To: 'corey.small@valeo.com'; Satish NADELLA <satish.nadella@valeo.com> (satish.nadella@valeo.com)
Cc: Andersen, Erik (E.); ying.tang@valeo.com
Subject: P415 PCA Data
Attachments: External Covers 2_PCA minus int blocker.pptx

Satish,
Attached is the datasheet for "PCA-minus internal mask". Would you please provide the datasheet similar to Slid 2, for "Externally block bottom 7 tubes / 8 fins", but "**WITH** INTERNAL MASK (COVER)"? We will appreciate it if you can provide it to us by Thursday. Thank you very much.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Tuesday, May 07, 2013 8:51 AM
To: 'Corey SMALL'
Subject: RE: Summary of P415 Requested CAC Robustness Actions

Thanks, Corey.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215
From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: Tuesday, May 07, 2013 8:38 AM
To: Huang, Larry (L,.)
Cc: Satish NADELLA; Andersen, Erik (E.); Kramer, Michael (M.T.); ying.tang@valeo.com; Guillermo GUADARRAMA; Blas-Fernando GUTIERREZ; Tyler, Jim (J.S.)
Subject: Re: Summary of P415 Requested CAC Robustness Actions

Larry,
I will positively confirm, and get back with you, but I am confident this does have the 14 cells with louvers. Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Mon, May 6, 2013 at 5:52 PM, Huang, Larry (L,.) <lhuang3@ford.com> wrote:

Corey,

That is good news. Thanks for the effort for locating the part.

You meant J1 DV CAC (int. 14 cells with louvers), right? A little manufacturing difference won't affect the performance. The following configs in external blocking are correct. When can we have the data? Thank you very much.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Corey SMALL [mailto:corey.small@valeo.com]
Sent: Monday, May 06, 2013 5:32 PM
To: Huang, Larry (L,.)
Cc: Satish NADELLA; Andersen, Erik (E.); Kramer, Michael (M.T.); ying.tang@valeo.com; Guillermo GUADARRAMA; Blas-Fernando GUTIERREZ

Subject: Re: Summary of P415 Requested CAC Robustness Actions

Larry,

Valeo was able to locate one original DV P415 CAC to test. The only difference on the DV part is that the cam lock is spin welded? Currently the outlet tank is just one piece and not welded. Would this part be acceptable to perform the three tests?

1) Externally block bottom 7 tubes / 8 fins

2) Externally block bottom 4 tubes / 5 fins

3) Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length ("L" laying on its side).

Thanks.

Best Regards/Sincèrement,

Corey Small
Customer Technical Leader
(P) 1-248-209-8677
(C) 1-248-310-2334
Email: corey.small@valeo.com

On Fri, May 3, 2013 at 2:00 PM, Andersen, Erik (E.) <eanderse@ford.com> wrote:

Satish,

Can you please confirm data sheets will be provided today?

Thanks,

Erik Andersen

Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Satish NADELLA [mailto:satish.nadella@valeo.com]

Sent: Monday, April 29, 2013 4:55 PM
To: Andersen, Erik (E.)

Cc: Kramer, Michael (M.T.); Corey SMALL <corey.small@valeo.com> (corey.small@valeo.com); ying.tang@valeo.com; Tyler, Jim (J.S.); Widmann, Carl (C.A.); Weber, Erik (E.M.); Rodgers, Thomas (T.A.);

Huang, Larry (L,.)
Subject: Re: Summary of P415 Requested CAC Robustness Actions

Hi Erik,

We will have the data from the testing of the 3 samples on Friday this week. FYI, I have attached a schematic of the 3rd test option.

Regards,
Satish

On Fri, Apr 26, 2013 at 6:39 PM, Andersen, Erik (E.) <eanderse@ford.com> wrote:

Is there timing on the data sheets?

Erik Andersen

Core P/T Cooling
eanderse@ford.com
313-805-2966

From: Kramer, Michael (M.T.)
Sent: Tuesday, April 23, 2013 5:16 PM
To: Satish NADELLA; Corey SMALL <corey.small@valeo.com> (corey.small@valeo.com); ying.tang@valeo.com
Cc: Tyler, Jim (J.S.); Widmann, Carl (C.A.); Andersen, Erik (E.); Weber, Erik (E.M.); Rodgers, Thomas (T.A.); Huang, Larry (L,.); Kramer, Michael (M.T.)

Subject: Summary of P415 Requested CAC Robustness Actions

Please provide ASAP timing for the following three data sheets all using the **original J1 P415 CAC**.

1) Externally block bottom 7 tubes / 8 fins

2) Externally block bottom 4 tubes / 5 fins

3) Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length (“L” laying on its side).

Intent is to determine the maximum number of lower tubes that can be externally blocked and meet the heat rejection performance of today’s PCA CAC.

Mike Kramer

RWD PT Cooling Supv.

Six Sigma Black Belt

Cell Phone: (313) 805-0190

Text Page: mkramer1

Page from outside Ford, External email: mkramer1@ford.com

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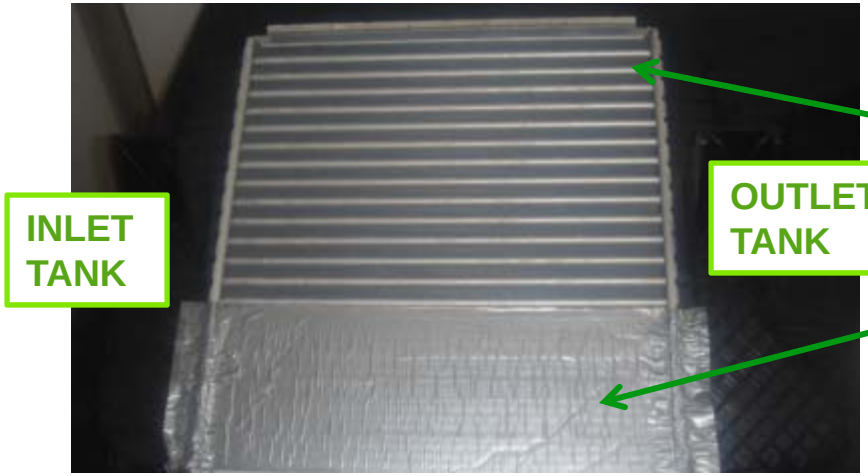
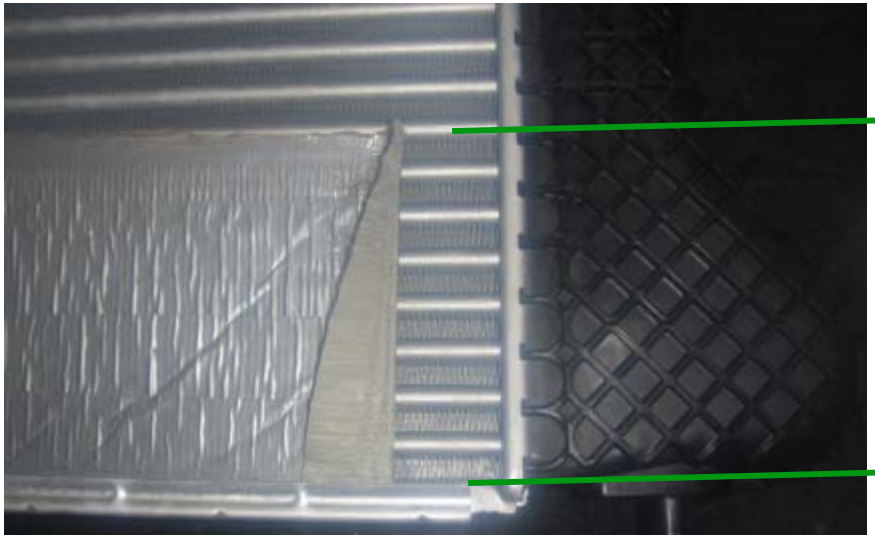
Externally block bottom 7 tubes / 8 fins





Externally block bottom 7 tubes / 8 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	48.6	55.6	60.3
	0.19 (684)	40.6	49.5	53.3
	0.28 (1037)	34.1	45.2	48.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	87.9	434.7	1047.3

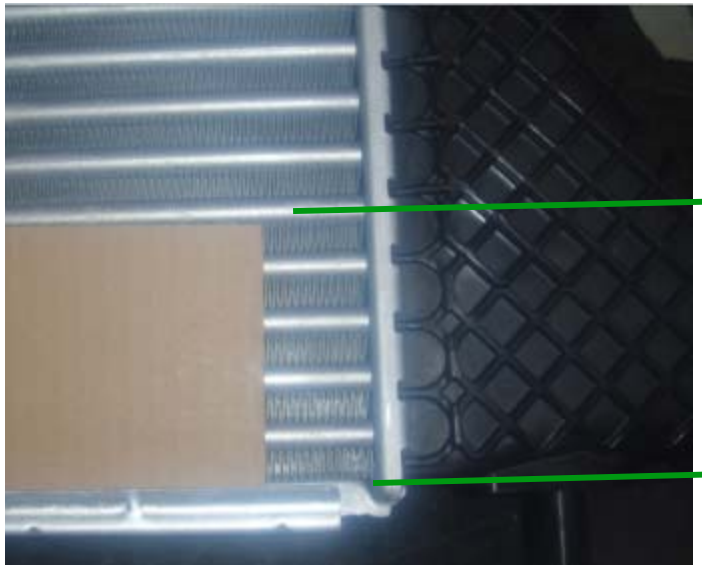
ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.41	18.64	40.08

TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

Externally block bottom 4 tubes / 5 fins



Externally block bottom 4 tubes / 5 fins

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	56.1	66.0	70.5
	0.19 (684)	46.9	60.1	64.2
	0.28 (1037)	38.4	52.6	57.4

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.3 kg/s	75.4	357.3	835.3

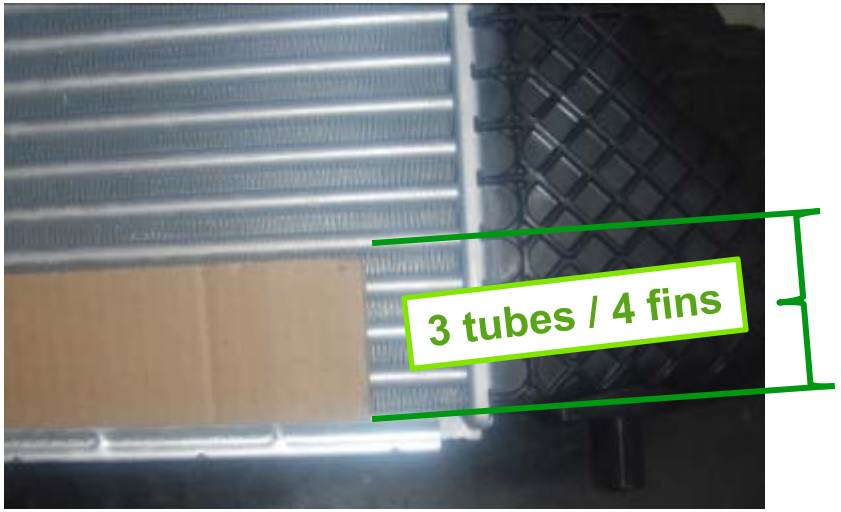
ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.33 kg/s	8.19	18.26	39.93

TEST CONDITIONS

1) 9-point tests:
- CA Booster P =2.0 BarA (200 Kpa-A)
- CA inlet Temp =125±1.1°C
- Amb air Temp =25 degC
- Face vel. -
  - 0.81 m/s
  - 3.27 m/s
  - 5.7 m/s
- CA flow:
  - 432 kg/hr
  - 684 kg/hr
  - 1037 kg/hr

NO INTERNAL MASK (COVER)

Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length



Externally block bottom 7 tubes / 8 fins 25% of the length across the CAC from the inlet side and the bottom 3 tubes / 4 fins the remainder of the length

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY Kg/s (m/s)		
		0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
CAHRGE AIR FLOW Kg/s (kg/hr)	0.12 (432)	55.9	67.3	70.0
	0.19 (684)	46.8	60.0	64.4
	0.28 (1037)	38.4	52.9	57.8

ΔP External AIR (Pa)	AIR VELOCITY Kg/s (m/s)		
	0.154 (0.81)	0.62 (3.27)	1.08 (5.7)
INT. FLOW 0.19 kg/s	73.2	362.2	865.1

ΔP Internal Air (mbar)	CAHRGE AIR FLOW Kg/s (kg/hr)		
	0.12 (432)	0.19 (684)	0.28 (1037)
EXT. FLOW 1.08 kg/s	8.02	18.13	39.23

TEST CONDITIONS

1) 9-point tests:
CA Booster P =2.0 BarA (200 Kpa-A)
CA inlet Temp =125±1.1°C
Amb air Temp =25 degC
Face vel. -
0.81 m/s
3.27 m/s
5.7 m/s
CA flow:
432 kg/hr
684 kg/hr
1037 kg/hr

NO INTERNAL MASK (COVER)

From:	Joseph LUMETTA [joseph.lumetta@valeo.com]
Sent:	Tuesday, April 03, 2012 3:25 PM
To:	lenharts@tmdinc.com; Tyler, Jim (J.S.); Kramer, Michael (M.T.)
Cc:	Blas-Fernando GUTIERREZ; Eduardo BARRIOS; Norbert BIKOS; Satish NADELLA; Larry ENGEL; Ahmad, Syed (S.)
Subject:	Plastic cover P415 - 31 Mar 2012 Update from TMD
Attachments:	Plastic Cover to Tank Wall Clearance.doc

Hello Steve / Jim / Mike
Taking a quick initial look at the clearances between the inlet tank and the plastic cover I found no additional room to add material thickness to the plastic cover. In fact it maybe important for Steve L to keep this in mind when filling the part. Will there be gate marks in this area?
Please look at attachment.

---------- Forwarded message ----------
From: **Tyler, Jim (J.S.)** <jtyler1@ford.com>
Date: Tue, Apr 3, 2012 at 12:32 PM
Subject: RE: Plastic cover P415 - 31 Mar 2012 Update from TMD
To: Joseph LUMETTA <joseph.lumetta@valeo.com>, Eduardo BARRIOS <eduardo.barrios@valeo.com>, Blas-Fernando GUTIERREZ <blas-fernando.gutierrez@valeo.com>
Cc: Larry ENGEL <larry.engel@valeo.com>, "lenharts@tmdinc.com" <lenharts@tmdinc.com>, "Ahmad, Syed (S.)" <sahmad2@ford.com>

Per review today with Stephen Lenhart/TMD, Valeo please assess if the cover wall thickness is feasible at 1.6 - 1.7mm (increase from current 1.4mm). Consider the environment clearances inside the tank. The mold flow analysis is being done at Ford with this latest version. We expect to have the mesh ready for the mold flow runs on Wednesday. The mold flow analysis will also be used check effects of this proposed material thickness increase.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

No Room To Increase the Cover Plate Thickness.


All of the tube covers are very close to the tank wall
the one marked in red is the worst.

PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

OBJECTIVE: PRODUCT VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PLM control:		PVP&R No.	PV12-122 & PV12-134	REVISION No:	5
ECO#		ORIGIN DATE:	27-May-11	DATE REV:	13-Aug-12
PPCR #:	N/A	APPROVAL:			
PPDR #:	N/A	R&D Manager / R. Sánchez		Quality Site Manager / K. Nuñez	
		P1/P0's Coordinator/ E. Barrios		Project Manager or Change Leader	
		Testing Lab / J.A Rdz or Homar U.		Other: /	

MODEL YEARS:	COMPONENT / ASSY:	VALEO P/N	DRAWING & REV.	SUPPLIER NAME:	CUSTOMER APPROVAL: NAME SIGN DATE
2013	Charger Cooler (CAC)	M165170	100046940 REV A	Valeo Termico	
PROJECT APPLICATION (S)	**CUSTOMER:**	**CUSTOMER P/N**	**ASSEMBLY PLANT:**	**ORIGINATOR:**	
FORD F-Series GTDI	FORD	DL34-9L440-AB	VEC SLP	GUILLERMO GUADARRAMA	

Change Description:

SREA #006 250512: Brazing process on alternative oven for CAC P415 and New Crimping press validation due to volume increase (PV12-122)

DL34-9L440-AB

NON FUNCTIONAL TESTING

1	CPS-0032, III.A Class A	**LEAK TEST** Test conditions: Test pressure: 207±14 kPa (g) Test time: 20 sec (for prototype stage) Test medium: ambient compressed air	Valeo SLP	Pressure loss less than 17.2 kPa	PASS 100%	PV	ALL	D							

FUNCTIONAL TEST AND RESTRICTIONS

2	CPS-0032, III.B Class A	**Internal Cleanliness.** Test descrition: Measure the internal cleanless per SAE-J1726, air to air CAC Filter size: 11µm	Valeo SLP	CAC must meet Internal surface SAE-J1726 requirements Max weight: 25 mg. Maximum particle size: 3.175 mm Maximum particle area: 2.58 mm2 non-ferrous metal particle size <0.65mm, sand < 0.3mm	PASS 100%	PV	2	D							
3	VEC REC 20012 Rev A	**Metallurgical Analysis / Braze quality**	Valeo SLP	The CAC shall meet the minimum requirement requested on VEC REC-0012 specification	PASS 100%	PV	2	D							
6	CPS-0032. IV.E Class B (See exception)	**HOT PRESSURE CYCLE** Cycle pressure: 0 to 150 kPa-g ± 21 Kpa, instea of 210 KPa Charge Inlet Temperature: 185ºC±5ºC instead of 205ºC ±5.0ºC Test Medium: Compressed Air Cycle Rate: 50 cycles/min (± 10 Cycles/min).	Valeo SLP	~~250,000~~ 375,000 MINIMUM CYCLES to pass the test specification ~~331,750~~ 500,000 TARGET CYCLES After enduring twice the minimum requirement (750,000) the test can be accelerated by increasing the high pressure to 210 kPa in order to produce a failure	PASS 100%	PV	4	D							
4	CPS-0032, IV.G Class A	**PROOF PRESSURE / BURST** Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec. Test Medium: Water	Valeo SLP	RECORD Sample CAC must meet the acceptance requirement for leak test III.A No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst: Increased pressure at a slow rate until leakage occurs	PASS 100%	PV	5	D							

BL34-9L440-AC, Baseline

Change Description: Due to Condensation issue in vehicle (PV12-134)

Production change validation for: C.A.C. --> 27mm window Cover Plate added to Inlet and Outlet Header, Non Louverd Turbulators, gasket change (removal two ladder rungs)

WPTS E 12559964 000

NON FUNCTIONAL TESTING

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	TEST FACILITY	ACCEPTANCE CRITERIA	TARGET REQUIRED	TEST STAGE	SAMPLES		TIMING		SAMPLES TESTED		ACTUAL RESULT		NOTES / SUMMARY RESULTS / ACTIONS
							QTY	TYPE	START (dd/mm/aa)	COMPLETED (dd/mm/aa)	QTY	TYPE	RESULT	REPORT No / CODE	
1	Drawing	**27mm Cover Plate Dimensional**	Valeo SLP	Meet the drawing dimensions	PASS 100%	PV	ALL	D							
2	CPS-0032 III.A Class A	**LEAK TEST** Test conditions: Test pressure: 207±14 kPa (g) Test time: 20 sec (for prototype stage) Test medium: ambient compressed air	Valeo SLP	VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)	PASS 100%	PV	ALL	D							

FUNCTIONAL TEST AND RESTRICTIONS

3	CPS-0032, IV.A Class A	**HEAT TRANSFER** Charge side: Q~=0.288 Kg/s (50% On each port) Charge air inlet temp.= 125±1.1ºC Charge air inlet pressure = 200 Kpa-A Ambient temp.= 25ºC Air Speed (5.7 m/s) = 1.08 Kg/s	Valeo SLP	**Performance opearation point 0.288 Kg/s/1.07 Kg/s** CAC Effectiveness. TBD % ± 5%. Maximum Internal Pressure Drop TBD kPa ± 10% 9-point matrix to be printed on the drawing, CAC Effectiveness and pressure drop Cooling air flow = 0.154, 0.62, 1.08 kg/s Charge Air Flow = 0.12, 0.19 & 0.288 kg/s	PASS 100%	PV	5	D							*** AVERAGE RESULTS FROM 5 SAMPLES TESTED**
4	CPS-0032, IV.G Class B (See exception)	**HOT AGE TEST** Chamber Temperature = 185ºC ± 5.0ºC, instead of 205° C All Parts will be used for Pull off Force testing	Valeo SLP	The CAC shall not develop a crimp or tank leakage that esceed a leak rate of 500 cc/min at 207 kPa after enduring min. time requirement Minimum life Inlet side: 200 hrs Minimum life Outlet side: 75 hrs	PASS 100%	PV	6	D							

PE13-018 031097

PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL*

OBJECTIVE: PRODUCT VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PLM control:		PVP&R No.	PV12-122 & PV12-134	REVISION No:	5
ECO#		ORIGIN DATE:	27-May-11	DATE REV:	13-Aug-12
PPCR #:	N/A	APPROVAL:			
PPDR #:	N/A	R&D Manager / R. Sánchez		Quality Site Manager / K. Nuñez	
		P1/P0's Coordinator/ E. Barrios		Project Manager or Change Leader	
		Testing Lab / J.A Rdz or Homar U.		Other: /	

MODEL YEARS:	COMPONENT / ASSY:	VALEO P/N	DRAWING & REV.	SUPPLIER NAME:	CUSTOMER APPROVAL: NAME / SIGN / DATE
2013	Charger Cooler (CAC)	M165170	100046940 REV A	Valeo Termico	
PROJECT APPLICATION (S)	**CUSTOMER:**	**CUSTOMER P/N**	**ASSEMBLY PLANT:**	**ORIGINATOR:**	
FORD F-Series GTDI	FORD	DL34-9L440-AB	VEC SLP	GUILLERMO GUADARRAMA	

5	Valeo PCD 1703, PCD 1714	**Vibration test Tri-Axial test** Road Load data from DPG or MPG testing	Valeo AH	Minimum hours :Two life cycles (206 hrs.) After completion, the CAC shall have no distortion and no cracks, be fully functional and meet the criteria of the Leak test. This will be applied just to the CAC area. Test to prove the performance of tank and header due to the weight added	PASS 100%	PV	2	D							
6	No Spec associated	**Pull Off Force (Cover will be pulled from header after crimping)** Recorded as Newton force required to pull cover from the crimp (free from tube)	Valeo SLP	New test so no criteria published at this time Test part as crimped (6) Test after heat age testing (6)	PASS 100%	PV	12	D							

PROCEDURE:	TEST DESCRIPTION:	ACCEPTANCE CRITERIA:	TARGET REQ'D:	TEST STAGE:	SAMPLES TESTED:	SAMPLE TYPE:	ACTUAL RESULTS:
SPECIFY THE GOVERNING TEST PROCEDURE OR STANDARD.	PROVIDE A BRIEF DESCRIPTION OF EACH TEST.	SPECIFY CYCLES, MILES, VOLTS, MINIMUM VALUES, NO FAILURES, ETC.	STAGE REQ'D RELIABILITY OR NO FAILURE.	ED=ENGINEERING DESIGN. DV= DESIGN VALIDATION PV = PRODUCTION VALIDATION CC= CONTINUOUS CONFORMANCE.	LIST QUANTITY TESTED, SAMPLES TYPE, ETC.	A= PROTOTYPE (HAND-MADE). B= PROTOTYPE (TOOLED). C= PROGRAM LEVEL.. D= INITIAL PRODUCTION.	LIST RESULT IN TERMS OF EG.: R90,C90, PASS OR NO FAILURE. NBR OF CYCLES WITH OR WITHOUT FILURE.

PV CHANGES CONTROL:

Rev.	Date.	Change description / NOTES
1	27-May-11	PVP&R released for customer approval
2	04-Oct-11	1) Hot Age added per customer request. 2) Comments added.
3	14-May-12	1) Internim PV added. 2) Comments added.
4	12-Jun-12	1) Complete PV12-099 with data
5	30-Jul-12	1) Complete PV11-081 with data 2) WPTS addition
6	13-Ago-12	1) Addition of PV12-122. Brazing process on alternative oven for CAC P415 and New Crimping press validation due to volume increase 2) Addition of PV12-134. 27mm window Cover Plate added to Inlet and Outlet Header, Non Louverd Turbulalors, gasket change

PE13-018 031098

From: Guillermo GUADARRAMA [guillermo.guadarrama@valeo.com]
Sent: Monday, August 27, 2012 4:00 PM
To: Tyler, Jim (J.S.); Kramer, Michael (M.T.)
Cc: David CASTILLO
Subject: PVP&R for CAC P415 with Plastic Internal Cover.
Attachments: PVP&R CAC P415 NEW CAC eCBV Ford Hystorical changes - Advance.pdf

Jim/Mike,

I am sending you the preliminary PVP&R cover sheet.

This include all results except the Flow blow test that is going to be performed tonight.

Please review it and send me your comments.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

OBJECTIVE: PRODUCT VALIDATION NEW CAC P415 eCBV, 57MA proposal (Plastic tanks)

PLM control:	PVP&R No.	PV12-134	REVISION No:	9
ECO#	ORIGIN DATE:	27-May-11	DATE REV:	27-Aug-12
PPCR #: N/A	APPROVAL:			
PPDR #: N/A	R&D Manager / R. Sánchez		Quality Site Manager / K. Nuñez	
	P1/P0's Coordinator/ E. Barrios		Project Manager or Change Leader	
	Testing Lab / J.A Rdz or Homar U.		Other: /	

MODEL YEARS:	COMPONENT / ASSY:	VALEO P/N	DRAWING & REV.	SUPPLIER NAME:	CUSTOMER APPROVAL: NAME SIGN DATE
2013	Charger Cooler (CAC)	M165170	100046940 REV A	Valeo Termico	
PROJECT APPLICATION (S):	**CUSTOMER:**	**CUSTOMER P/N**	**ASSEMBLY PLANT:**	**ORIGINATOR:**	
FORD F-Series GTDI	FORD	~~DL34-9L440-AB~~ DL34-9L440-AC	VEC SLP	GUILLERMO GUADARRAMA	

Change Description: Due to Condensation issue in vehicle (PV12-134)
Production change validation for: C.A.C. --> 27mm window Cover Plate added to Inlet and Outlet Header, Non Louverd Turbulators, gasket change (removal two ladder rungs)
WPTS E 12559964 000
BL34-9L440-AC

NON FUNCTIONAL TESTING

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	TEST FACILITY	ACCEPTANCE CRITERIA	TARGET REQUIRED	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START (dd/mm/aa)	TIMING COMPLETED (dd/mm/aa)	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No / CODE	NOTES / SUMMARY RESULTS / ACTIONS
1	CPS-0032 III.A Class A	**LEAK TEST** Test conditions: Test pressure: 207±14 kPa (g) Test time: 20 sec (for prototype stage) Test medium: ambient compressed air	Valeo SLP	VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)	PASS 100%	PV	ALL CAC	D	15-Aug-12	15-Aug-12	ALL CAC	D	OK	N/A	**LEAK CHECKED ON EOL.**

FUNCTIONAL TEST AND RESTRICTIONS

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	TEST FACILITY	ACCEPTANCE CRITERIA	TARGET REQUIRED	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START (dd/mm/aa)	TIMING COMPLETED (dd/mm/aa)	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No / CODE	NOTES / SUMMARY RESULTS / ACTIONS
2	CPS-0032, IV.A Class A	**HEAT TRANSFER** Charge side: Q'=0.288 Kg/s (50% On each port) Charge air inlet temp.= 125±1.1°C Charge air inlet pressure = 200 Kpa-A Ambient temp.= 25°C Air Speed (5.7 m/s) = 1.08 Kg/s **RESULTS WILL BE USED TO DEFINE NEW COOLING AND EFFECTIVNESS SPECIFICATION**	Valeo SLP	**Performance opearation point 0.288 Kg/s/1.07 Kg/s** CAC Effectiveness TBD % ± 5%. Maximum Internal Pressure Drop TBD kPa ± 10% 9-point matrix to be printed on the drawing, CAC Effectiveness and pressure drop Cooling air flow = 0.154, 0.62, 1.08 kg/s Charge Air Flow = 0.12, 0.19 & 0.288 kg/s	PASS 100%	PV	5 CAC	D	20-Aug-12	24-Aug-12	5	D	OK	TR 5363	* AVERAGE RESULTS FROM 5 SAMPLES TESTED HEAT REJECTION (EFFICIENCY %) / AIR VELOCITY (m/s): 0.81 / 3.27 / 5.7 CAHRGE AIR FLOW (kg/hr): 432: 69.2, 77.5, 82.6; 684: 54.6, 68.0, 75.9; 1037: 43.8, 61.3, 67.8 ΔP External AIR (Pa) / AIR VELOCITY (m/s): 0.81 / 3.27 / 5.7 INT. FLOW 0.288 kg/s: 61.8, 264.0, 697.1 ΔP Internal Air (mbar) / CAHRGE AIR FLOW (kg/hr): 432 / 684 / 1037 EXT. FLOW 1.08 kg/s: 1.42, 3.23, 7.16
3	CPS-0032, IV.G Class B (See exception)	**HOT AGE TEST** Chamber Temperature = 185°C ± 5.0°C, instead of 205° C **All Parts will be used for Flow to Blow off Outlet Plate**	Valeo SLP	The CAC shall not develop a crimp or tank leakage that exceed a leak rate of 500 cc/min at 207 kPa after enduring min. time requirement Minimum life Inlet side: 200 hrs Minimum life Outlet side: 75 hrs	PASS 100%	PV	2 CAC	D	17-Aug-12	28-Aug-12	2	D	OK	TR	SAMPLE ID / 200 HOURS (INLET SIDE) / 75 HOURS (OUTLET SIDE) / TOTAL OF HOURS TESTED / LEAK RATE AFTER TEST / COMMENTS LB12xxxx: OK / OK / 201 / 0.0 / NO LEAKS DETECTED LB12xxxx: OK / OK / 201 / 0.0 / NO LEAKS DETECTED
4	Valeo PCD 1703, PCD 1714	**Vibration test Tri-Axial test** Road Load data from DPG or MPG testing	Valeo AH	Minimum hours :Two life cycles (206 hrs.) After completion, the CAC shall have no distortion and no cracks, be fully functional and meet the criteria of the Leak test. This will be applied just to the CAC area. Test to prove the performance of tank and header due to the weight added	PASS 100%	PV	2 CAC	D	17-Aug-12	28-Aug-12	2	D	OK	TR	SAMPLE ID / TOTAL OF HOURS / LEAK RATE AFTER TEST / COMMENTS xxxxxx: 206 / 0.0 / TEST PREFORMED WITH FINAL MUFFLER AND INTERNAL PLASTIC COVER xxxxxx: 206 / 0.0 / TEST PREFORMED WITH FINAL MUFFLER AND INTERNAL PLASTIC COVER **NOTE: AFTER REVIEW THE INTERNAL WITH PLASTIC COVER IS STILL ON PLEACE AFTER THE TEST.**
5	No Spec associated	**Pull Off Force (Cover will be pulled from header after crimping)** Recorded as Newton force required to pull cover from the crimp (free from tube) Rate: 5 +/-1 mm/min **Test part as crimped (6)** **Test after Pre-heat (6)** **Pre-heating** Chamber Temperature = 185°C ± 5.0°C **Will be performed just on cores**	Valeo SLP	Pre-Heating. NO LEAK TEST REQUIRED. The core must meet the requirement of minimum of 200 hrs New test so no criteria published at this time RECORD	PASS 100%	PV	12 CORE	D	17-Aug-12	29-Aug-12	12	D	OK	TR CAC P415	**BEFORE HOT EGE TEST:** SAMPLE ID / MAXIMUM FORCE (N) SAM. 1: 1060 SAM. 2: 726 SAM. 3: 1005 SAM. 4: 866 SAM. 5: 734 SAM. 6: 1388 **AFTER HOT EGE TEST:** SAMPLE ID / MAXIMUM FORCE (N) SAM. 1: 1991 SAM. 2: 2311 SAM. 3: 1809 SAM. 4: 2253 SAM. 5: 1338 SAM. 6: 2041
6	No Spec associated	**Flow to Blow off Outlet Plate** **After hot age test completion** With; no inlet cover and only outlet cover (fully assembled CAC) apply during 10 min. The max flow the CAC could ever see in the vehicle (1560 kg/hr). **Test will be made on Heat Transfer bench at the same conditions as Heat Transfer test except for the flow.**	Valeo SLP	Cover must still be attached to the tubes.	PASS 100%	PV	2 CAC	D	28-Aug-12	28-Aug-12					**TO BE COMPLETED END OF THE DAY (27 AUGUST 2012)**

PROCEDURE:	TEST DESCRIPTION:	ACCEPTANCE CRITERIA:	TARGET REQ'D:	TEST STAGE:	SAMPLES TESTED:	SAMPLE TYPE:	ACTUAL RESULTS:
SPECIFY THE GOVERNING TEST PROCEDURE OR STANDARD.	PROVIDE A BRIEF DESCRIPTION OF EACH TEST.	SPECIFY CYCLES, MILES, VOLTS, MINIMUM VALUES, NO FAILURES, ETC.	STAGE REQ'D RELIABILITY OR NO FAILURE.	ED=ENGINEERING DESIGN. DV= DESIGN VALIDATION PV = PRODUCTION VALIDATION CC= CONTINUOUS CONFORMANCE.	LIST QUANTITY TESTED, SAMPLES TYPE, ETC.	A= PROTOYPE (HAND-MADE). B= PROTOTYPE (TOOLED), C= PROGRAM LEVEL, D= INITIAL PRODUCTION.	LIST RESULT IN TERMS OF EG.: R90,C90, PASS OR NO FAILURE. NBR OF CYCLES WITH OR WITHOUT FILURE.

PE13-018 031100

PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

OBJECTIVE: PRODUCT VALIDATION NEW CAC P415 eCBV, 57MA proposal (Plastic tanks)

PLM control:	PVP&R No.	PV12-134	REVISION No:	9
ECO#	ORIGIN DATE:	27-May-11	DATE REV:	27-Aug-12
PPCR #: N/A	APPROVAL:			
PPDR #: N/A	R&D Manager / R. Sánchez		Quality Site Manager / K. Nuñez	
	P1/P0's Coordinator/ E. Barrios		Project Manager or Change Leader	
	Testing Lab / J.A Rdz or Homar U.		Other: /	

MODEL YEARS:	COMPONENT / ASSY:	VALEO P/N	DRAWING & REV.	SUPPLIER NAME:	CUSTOMER APPROVAL: NAME SIGN DATE
2013	Charger Cooler (CAC)	M165170	100046940 REV A	Valeo Termico	
PROJECT APPLICATION (S):	**CUSTOMER:**	**CUSTOMER P/N**	**ASSEMBLY PLANT:**	**ORIGINATOR:**	
FORD F-Series GTDI	FORD	~~DL34-9L440-AB~~ DL34-9L440-AC	VEC SLP	GUILLERMO GUADARRAMA	

PV CHANGES CONTROL:

Rev.	Date.	Change description / NOTES
1	27-May-11	PVP&R released for customer approval
2	04-Oct-11	1) Hot Age added per customer request. 2) Comments added.
3	14-May-12	1) Intemim PV added. 2) Comments added.
4	12-Jun-12	1) Complete PV12-099 with data
5	30-Jul-12	1) Complete PV11-081 with data 2) WPTS addition
6	13-Ago-12	1) Addition of PV12-122. Brazing process on alternative oven for CAC P415 and New Crimping press validation due to volume increase 2) Addition of PV12-134. 27mm window Cover Plate added to Inlet and Outlet Header, Non Louvred Turbulators, gasket change
7	15-Ago-12	1) Addition of Flow to Blow off Outlet plate
8	23-Ago-12	1) Define testing
9	27-Ago-12	1) Complete with data

PE13-018 031101

From: Huang, Larry (L,.)
Sent: Thursday, January 19, 2012 2:41 PM
To: Andersen, Erik (E.)
Subject: RE: 1/19 D35 Misfire Meeting Minutes

Besides CAC with the condensate collector from Chevy Cobalt that I sent out last week, here is another (for oil collection), from Toyota.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Andersen, Erik (E.)
Sent: Thursday, January 19, 2012 2:23 PM
To: Huang, Larry (L,.)
Subject: FW: 1/19 D35 Misfire Meeting Minutes

Please stop by when you have a chance to discuss. We need to discuss what benchmarking info is available and in what format for this discussion. I think you already have a lot of info, it would just need to be put in a presentable format for these guys.

Erik Andersen
eanderse@ford.com
313-805-2966

From: Norman, Kristofor (K.R.)
Sent: Thursday, January 19, 2012 2:08 PM
To: Ladd, John (J.R.)
Cc: Andersen, Erik (E.); Huang, Larry (L,.)
Subject: RE: 1/19 D35 Misfire Meeting Minutes

Johh, Yes, at Monday's meeting, the team wants to review the world of CACs with Larry.

Regards,

Kristofor Norman
Manager, Engine Performance Development
Global Engine Engineering
knorman1@ford.com
313-390-7855

From: Ladd, John (J.R.)
Sent: Thursday, January 19, 2012 2:06 PM
To: Norman, Kristofor (K.R.)
Cc: Andersen, Erik (E.); Huang, Larry (L,.)
Subject: RE: 1/19 D35 Misfire Meeting Minutes

I thought the team wanted a review of current benchmarking info also.

Regards,
John Ladd
Supervisor - Cooling Development Engineering
Ph: (313) 62-16626 Cell: (313) 805-4627
Fax: (313) 317-9241

From: Norman, Kristofor (K.R.)
Sent: Thursday, January 19, 2012 1:43 PM
To: Norman, Kristofor (K.R.); Gardner, Greg (G.D.); McCoy, Jim (D.); Saad, Thomas (T.J.); Nester, Darren (D.); Kramer, Michael (M.T.); Ladd, John (J.R.); Madej, Jeanette (J.); Allan, Valerie (V.J.); Baldwin, Damien (D.K.); Emery, Jim (J.M.); Bollman, Wes (W.); Lyon, Peter (P.M.); Dumler, Jeff (J.D.); Yamada, Shuya Shark (S.Y.); Sparks, Douglas (D.S.); Fabien, Phil (P.A.); Smith, Craig (C.A.); Nault, Ben (B.D.); Pierce, Michael (M.A.); Sims, Ivan (I.D.); Morrow, Bill (N.W.); Donahue, Francis (Fran.); Cockerill, Al (C.A.); Fried, Marcus (M.W.); Devries, Jason (J.E.); Whitehead, Joseph (J.P.); Krygowski, Richard (R.J.); Cowher, Terry (T.); Hargreaves, Gregory (G.J.); Garrett, David (D.P.); Sullivan, Todd (T.E.); Imarisio, Valerio (V.); Zott, Brian (B.R.); Mancini, Michael (M.A.); Pawlak, Greg (G.J.); Ahmed, Masood (M.); Dixon, Mark (M.R.); Wilson, David (D.G.); Dusa, Daniel (D.V.); Wagers, Sue (S.K.); Zimlich, Mary (M.); Mingo, Paul (P.C.); Rollinger, John (J.E.); Huberts, Garlan (G.); Baskins, Robert (R.S.); Michela, Mike (M.); Zhou, Jay (J.); Lehto, Scott (S.A.); Mazuchowski, James (J.A.); Hammoud, Mazen (M.); Boerger, Jim (J.G.); Merrell, Robert (R.J.); Stanley, Daniel (D.J.); Ronzi, Bill (W.C.); Palepu, Padmalaya (P.); Stefanski, John (J.C.); Russ, Stephen (S.G.); Glugla, Chris (C.P.); McDonagh, Scot (S.M.); Ricks, Kevin (K.J.); Dobbs, Dan (K.D.); Nowaczyk, Rick (R.J.); Ducklow, Corey (C.S.); Bailey, Owen (O.R.); Mohan, Robert (R.); Norman, Kristofor (K.R.); Yamada, Shuya Shark (S.Y.)
Subject: 1/19 D35 Misfire Meeting Minutes

Reviewed DTF and PT Dyno Testing - . Confirmed process to make sufficient condensate in conditions of around 30 min. Even worse at higher temps. Separator/reservoir concepts in HP AIS did not prevent misfire. A static test indicated that the CAC can hold 23 oz of water.

PT cooling, Palm, will work to develop a bench test for flow/condensate through the CAC/AIS/Manifold at dyno basement or PFSL.

Concepts to be fabricated for testing:

Manifold Runners in a Box - Cockerill
Manifold End Reservoir/Absorber - Cockerill
Build a CAC end tank perforated separator/lith part - Cockerill
Orient CAC for down flow connection - McCoy desired to run at DTF on Monday
Develop an improved HP AIS can separator, better location(s) - Palm
Procure from supplier reduced turbulator/louver tubes CAC - Palm
Develop an ideal HP AIS trap design - Russ/Norman/Yamada

TIMING is ASAP on all.

Regards,

Kristofor Norman
Manager, Engine Performance Development

Global Engine Engineering
knorman1@ford.com
313-390-7855

From: Norman, Kristofor (K.R.)
Sent: Thursday, January 19, 2012 8:05 AM
To: Gardner, Greg (G.D.); McCoy, Jim (D.); Saad, Thomas (T.J.); Nester, Darren (D.); Bld-1 13F040 (20); Kramer, Michael (M.T.); Ladd, John (J.R.); Madej, Jeanette (J.); Allan, Valerie (V.J.); Baldwin, Damien (D.K.); Emery, Jim (J.M.); Bollman, Wes (W.); Lyon, Peter (P.M.); Dumler, Jeff (J.D.); Yamada, Shuya Shark (S.Y.); Sparks, Douglas (D.S.); Fabien, Phil (P.A.); Smith, Craig (C.A.); Nault, Ben (B.D.); Pierce, Michael (M.A.); Sims, Ivan (I.D.); Morrow, Bill (N.W.); Donahue, Francis (Fran.); Cockerill, Al (C.A.); Fried, Marcus (M.W.); Devries, Jason (J.E.); Whitehead, Joseph (J.P.); Krygowski, Richard (R.J.); Cowher, Terry (T.); Hargreaves, Gregory (G.J.); Garrett, David (D.P.); Sullivan, Todd (T.E.); Imarisio, Valerio (V.); Zott, Brian (B.R.); Mancini, Michael (M.A.); Pawlak, Greg (G.J.); Ahmed, Masood (M.); Dixon, Mark (M.R.); Wilson, David (D.G.); Dusa, Daniel (D.V.); Wagers, Sue (S.K.); Zimlich, Mary (M.); Mingo, Paul (P.C.); Rollinger, John (J.E.); Huberts, Garlan (G.); Baskins, Robert (R.S.); Michela, Mike (M.); Zhou, Jay (J.); Lehto, Scott (S.A.); Mazuchowski, James (J.A.); Hammoud, Mazen (M.); Boerger, Jim (J.G.); Merrell, Robert (R.J.); Stanley, Daniel (D.J.); Ronzi, Bill (W.C.); Palepu, Padmalaya (P.); Stefanski, John (J.C.); Russ, Stephen (S.G.); Glugla, Chris (C.P.); McDonagh, Scot (S.M.); Ricks, Kevin (K.J.); Dobbs, Dan (K.D.); Nowaczyk, Rick (R.J.); Ducklow, Corey (C.S.); Bailey, Owen (O.R.); Mohan, Robert (R.)
Subject: 1/19 D35 Misfire Meeting Agenda

12pm 13F040 Audio and Webex in Mtg Notice

1) Review latest DTF/PT Dyno test results - Glugla/Mandjack

2) Determine next steps for potential fixes, testing required - All
PT Cooling, please bring in CAC cutaways/drawings

3) How to proceed with IP

Regards,

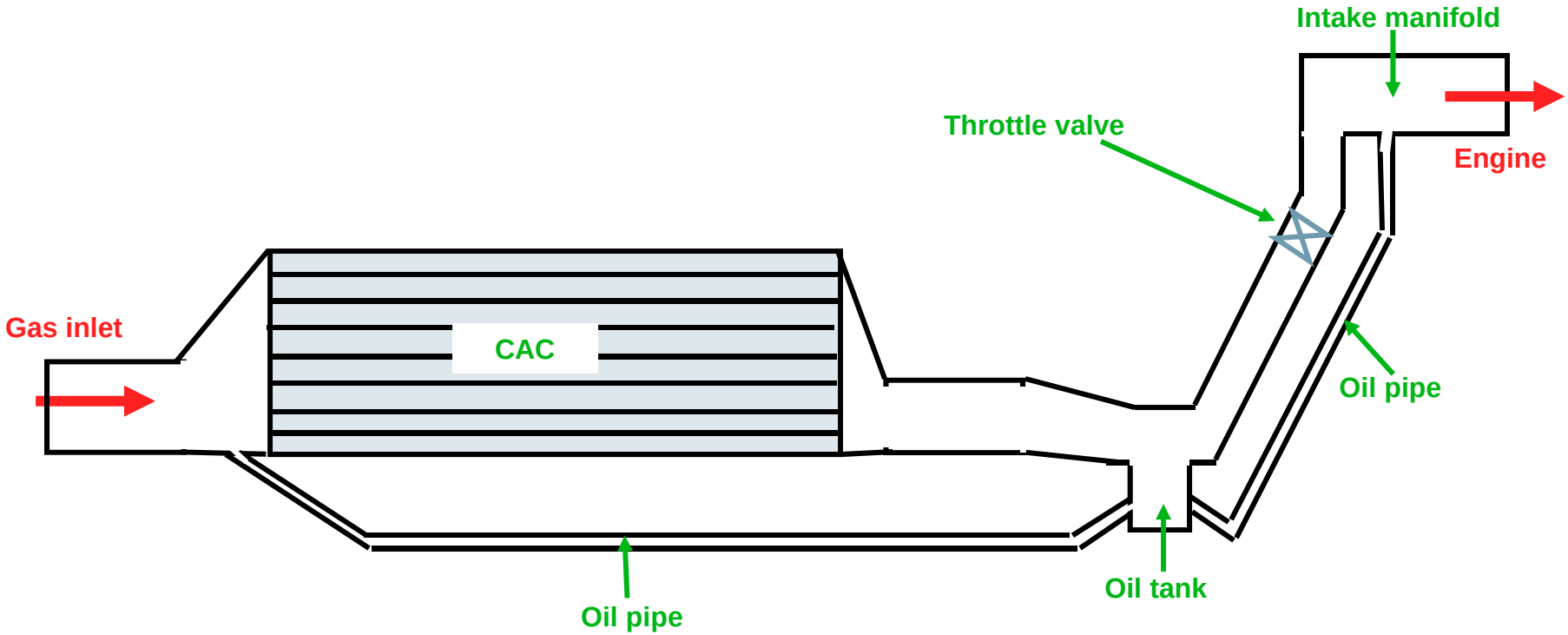
Kristofor Norman
Manager, Engine Performance Development
Global Engine Engineering
knorman1@ford.com
313-390-7855

Benchmarking

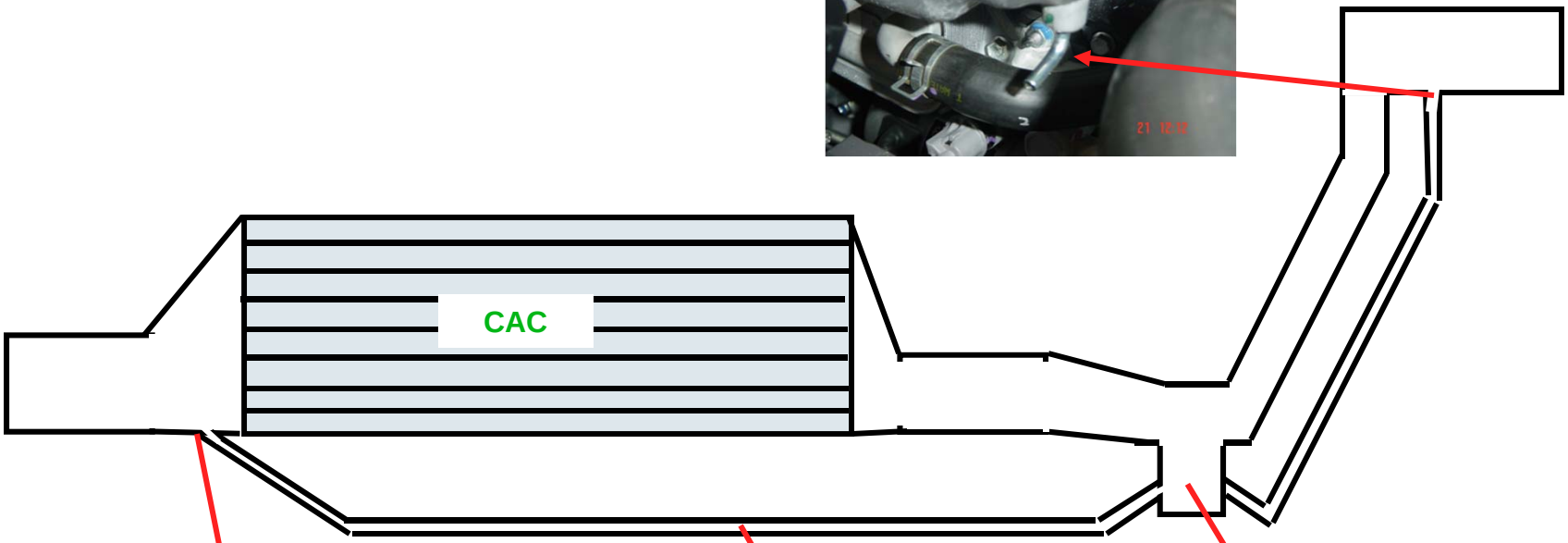
TOYOTA solution

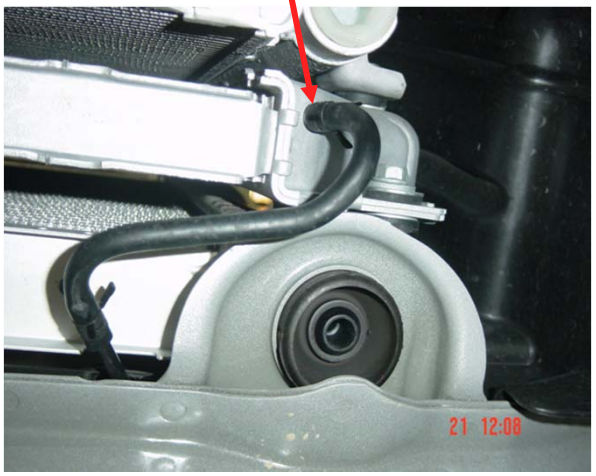
- **Device components:**
  - ➔ Oil tank used in the gas outlet of the CAC to recover oil
  - ➔ Oil pipe connecting CAC inlet and oil tank
  - ➔ Oil pipe connecting oil tank and intake manifold

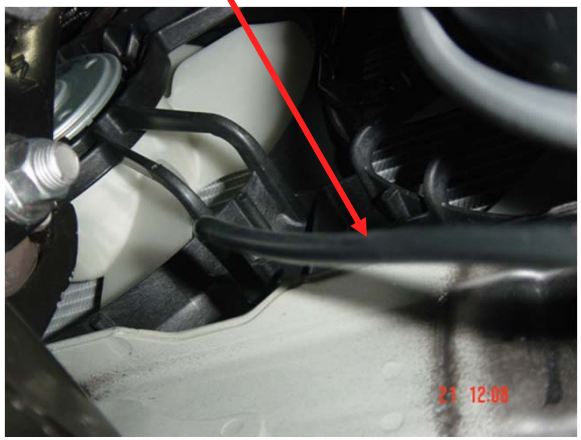
- **The throttle valve (used to increase HP EGR flow) creates a necessary pressure drop allowing the oil draining**

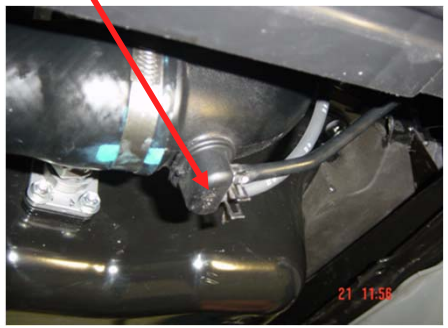


TOYOTA solution



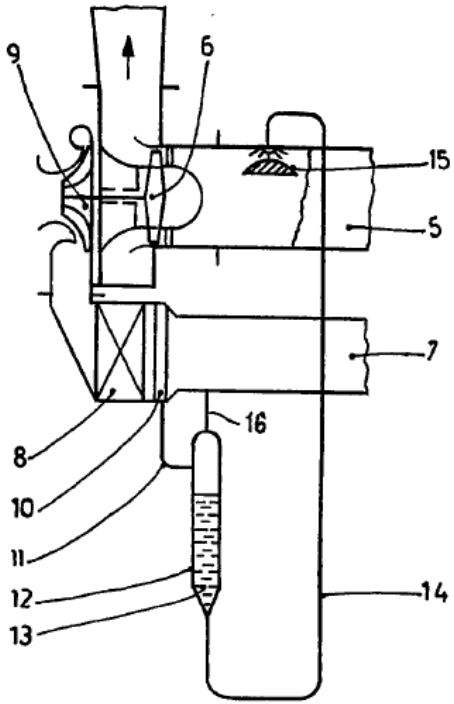






Condensation Management (System)

- **Maschinenfabrik Patent (1978): re-inject into exhaust**



Not specific to LP EGR, only CAC (air or water)

Benefits claimed:
Removal of condensate avoids corrosion in engine
Exhaust gas temperature higher as a result
Re-injection into exhaust lowers T into turbine

Realization:
Collection tank 12
Water piping avoids contact between intake & exhaust
Pressure difference between condensation point and re-injection point can avoid use of a pump

Patent BEHR EP 1724453A1 05 / 2006

- **<u>Patents objectives</u>: To recover condensates after EGRc.**

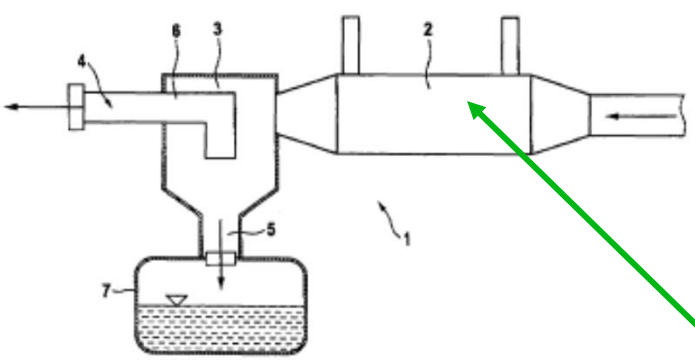
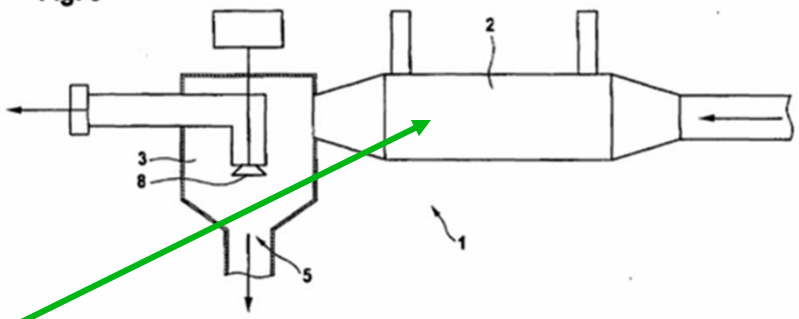
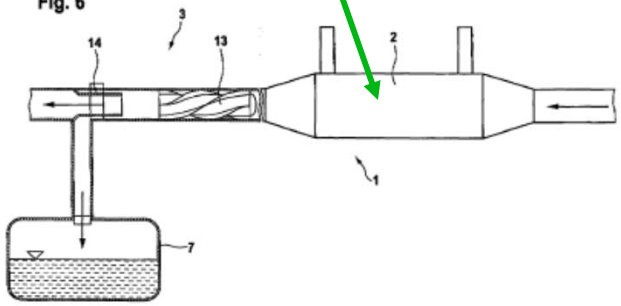


Fig. 3



EGRc

Fig. 6



Patent Detroit diesel US2004079079A1

- **<u>Patents objectives</u>: To recover condensates after EGRc.**

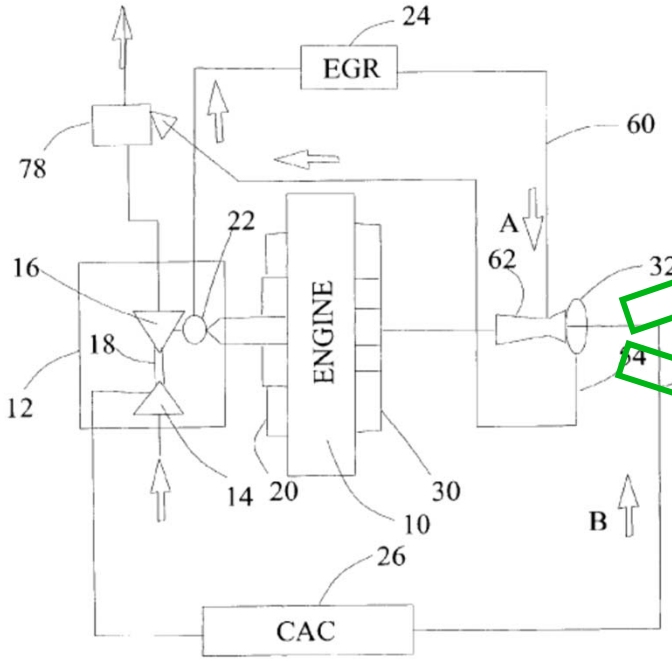


FIG. 4

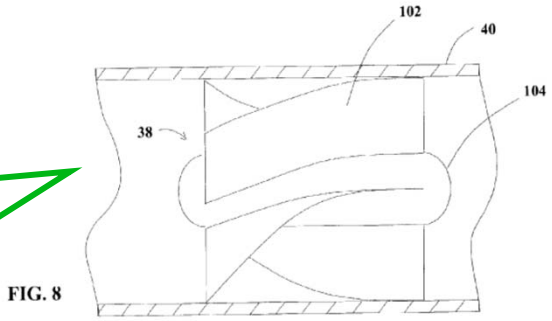


FIG. 8

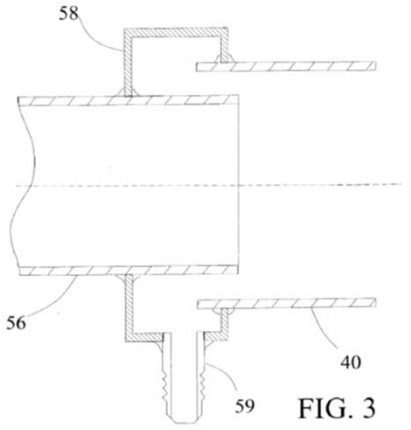


FIG. 3

Patent Detroit diesel GB2391587A1 06 / 2003

- **<u>Patents objectives</u>: To avoid condensates in CAC by means of a condensation sensor.**

FIG - 1

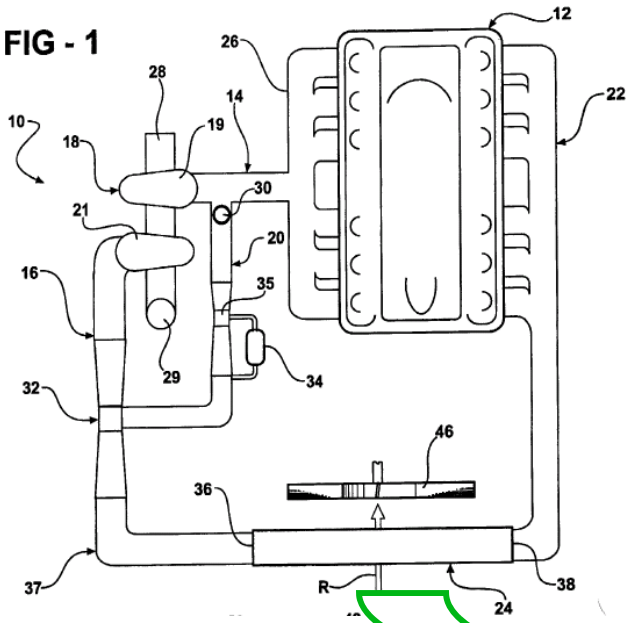
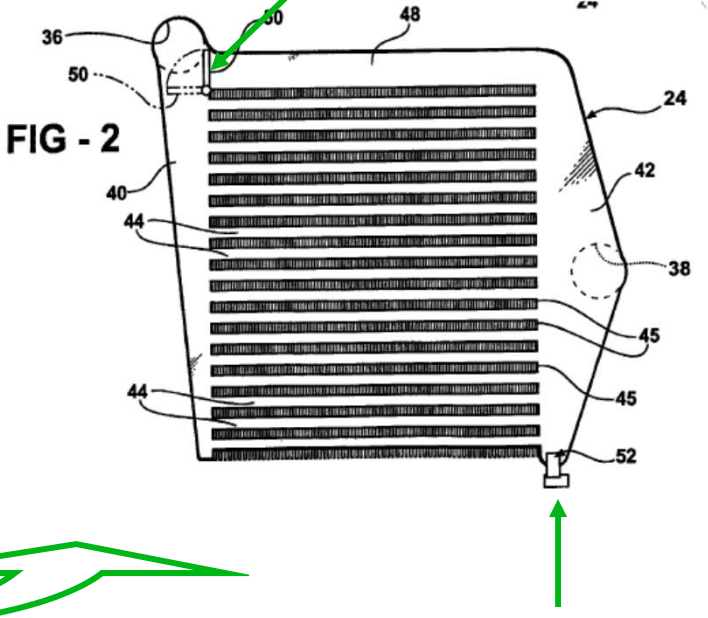
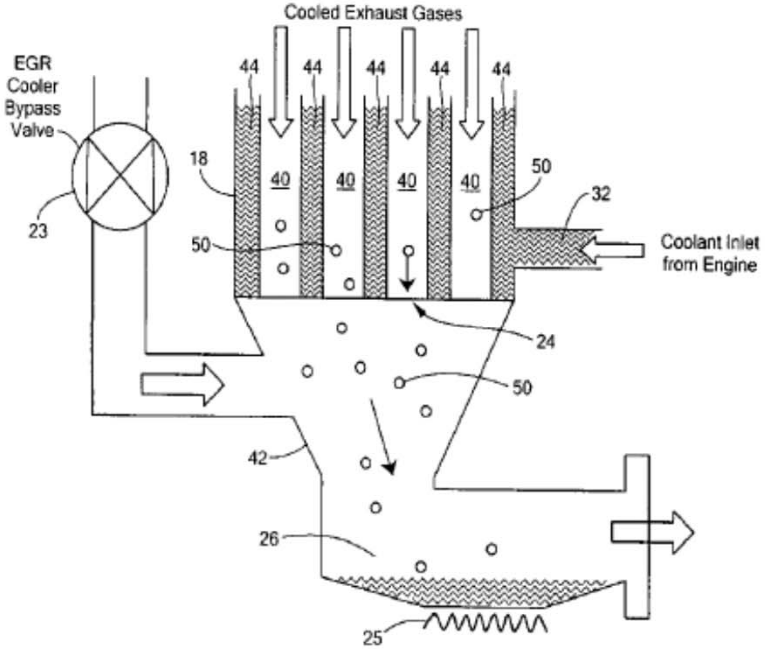


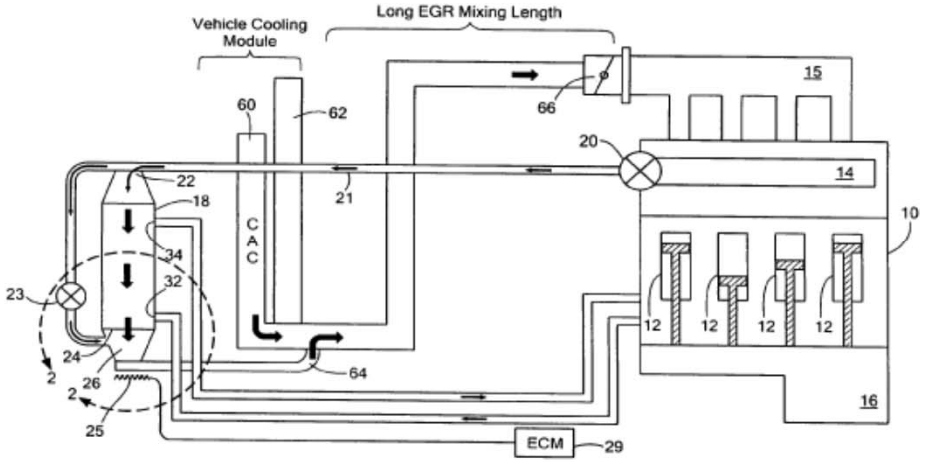
FIG - 2



Patent FORD US7131263 11/2006

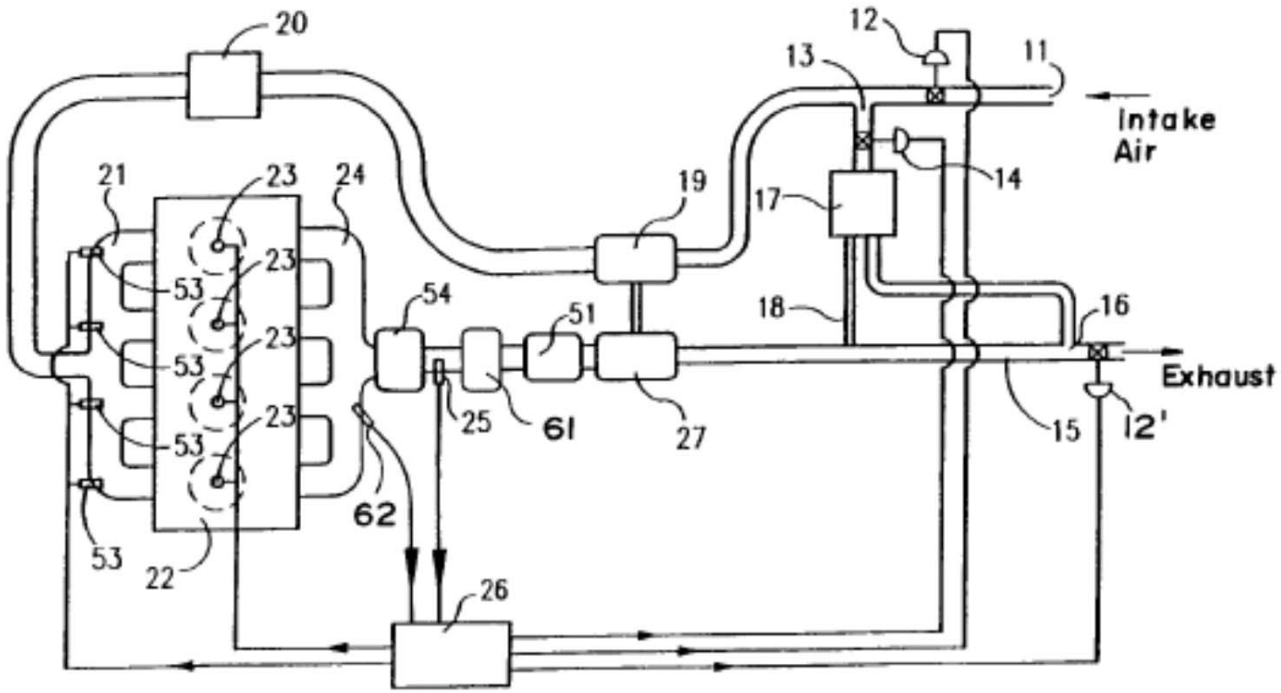
- **<u>Patents objectives</u>: To vaporize condensates in HP EGRc by means of an electric resistance heater.**





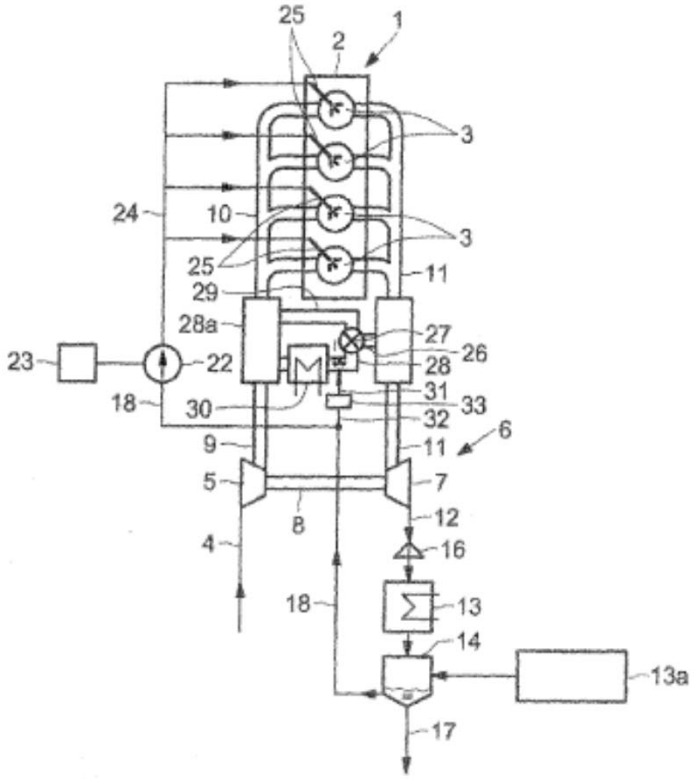
Patent US ENVIRONMENTAL PROT. AGENCY US 6301888 10/2001

- **Patent objectives: To re-inject condensates in exhaust gases after LP EGR connexion.**



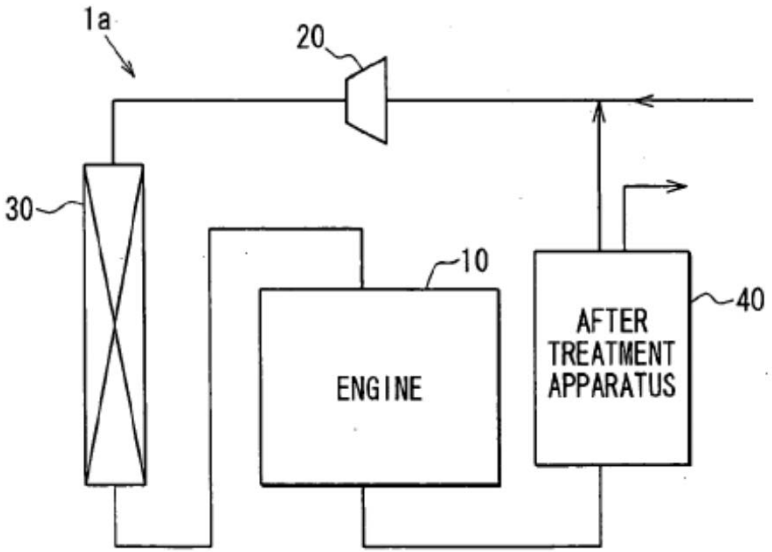
Patent RENAULT EP1617069A1 18/01/2006

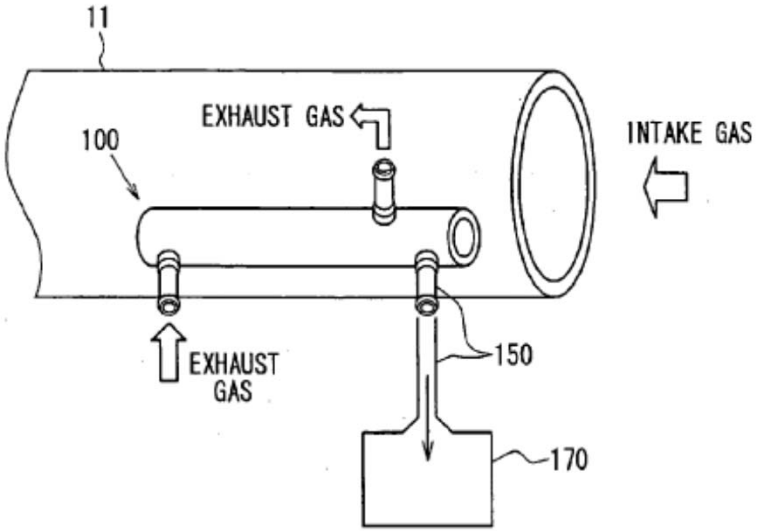
- **Patent objectives: To re-inject exhaust gases condensates in the intake manifold**



Patent DENSO US 20070044469 01/03/2007

- **Patent objectives: separate condensates from EGR gas**





From: Guillermo GUADARRAMA [guillermo.guadarrama@valeo.com]
Sent: Monday, June 18, 2012 10:35 AM
To: Kramer, Michael (M.T.)
Cc: Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS; Tyler, Jim (J.S.)
Subject: Re: FW: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM
Attachments: Performance P415 w-Mask and 6 tube blockerx.pdf

Mike,

The data heat transfer with the cover and the cover + 6 tube blocker is showed on the presentation.

This part is being prepare to be shipped.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Fri, Jun 15, 2012 at 11:06 AM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Ok, thx.

Please also forward same data from in-process and/or PV testing for the present production CAC.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 11:51 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.); Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike,

The presentation that I sent before was missing the complete detail of the part that says Spec. When I say spec is current condition, averages values of 6 parts.

For the 6 tube blockers, we didn't perform that test becasue we don't have the tube blockers down here.

Do you want to stop the shipment to test the part when we get the tube blockers ?

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Fri, Jun 15, 2012 at 10:27 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:

Guillermo, was this test data conducted with the external front CAC air cover in place also? Please confirm.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 11:07 AM
To: Kramer, Michael (M.T.)
Cc: Joseph LUMETTA; Tyler, Jim (J.S.); Larry ENGEL (larry.engel@valeo.com); David CASTILLO
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Michael,

Attached you can find the values that we got from the part that is leaving this morning to Ford USA.

- One part with plastic mask of 27mm opening and trubulator (Internal Fin) with 11 cells and no louvers.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.

CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Wed, Jun 13, 2012 at 3:42 PM, David CASTILLO <david.castillo@valeo.com> wrote:

Michael,

We have a leak on the part we kept at SLP on the crimping area. We are trying to seal it so we can finish the data dP today in the night.

DC.

On Wed, Jun 13, 2012 at 2:49 PM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Need the component performance test data to support meetings tomorrow and need some time to review/digest before-hand. When sending?

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Tyler, Jim (J.S.)
Sent: Wednesday, June 13, 2012 11:52 AM
To: David CASTILLO; Kramer, Michael (M.T.)

Cc: Joseph LUMETTA; Guillermo GUADARRAMA

Subject: RE: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

David, what is the test status of the other part at SLP? Need info by today please.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Tuesday, June 12, 2012 11:11 AM

To: Kramer, Michael (M.T.)
Cc: Tyler, Jim (J.S.); Joseph LUMETTA; Guillermo GUADARRAMA
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike/ Jim,

We have ready the part to be ship to Ford but needs to be before noon on the truck to be with you tomorrow morning.
We will like to test the part we are going to ship to you for heat transfer as well but it will not allow us to ship it before noon so it will be with you until this Thursday morning.
Could we test it or do you prefer to ship it with no testing? There were not request to test it before ship, but we will like to do it.

Please let me know

DC.

On Fri, Jun 8, 2012 at 2:41 PM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Jim, please confirm shipping location.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Friday, June 08, 2012 1:02 PM
To: Kramer, Michael (M.T.)
Cc: Tyler, Jim (J.S.); Joseph LUMETTA; Guillermo GUADARRAMA

Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Ok

We will keep one piece for dP and performance base on matrix test
The other will be ship to Valeo Aurburn Hill or Ford directly?

DC.

On Fri, Jun 8, 2012 at 11:46 AM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Reminder. Ship one to us and keep the other at SLP to perform the performance tests per matrix provided to Joe.

Please provide test completion date.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Friday, June 08, 2012 11:48 AM
To: Tyler, Jim (J.S.)
Cc: Joseph LUMETTA; Guillermo GUADARRAMA; Kramer, Michael (M.T.)
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Jim, Part will be at SLP tomorrow late today are being release by customs at Guadalajara Mexico,

We assembled them and ship them on Monday afternoon.

DC.

On Fri, Jun 8, 2012 at 10:43 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:

Valeo team, what is the status of the 2 CAC builds with the 2013 Outlet tank, 11 cell no louver cores and 27mm cover plates? Are these shipping out to Ford by today, 6/8/12? Please confirm.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Joseph LUMETTA [mailto:joseph.lumetta@valeo.com]
Sent: Tuesday, June 05, 2012 9:27 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.)
Subject: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Hello Jim
Just to let you know the parts are on the way to SLP Mexico.
UPS tracking #s (three packages -2 cores 11 cell louver-less and 5 27 SLS cover plates).

The tracking numbers are 1ZV4197R6741296861
1ZV4197R6741714480
1ZV4197R6740167074

Release	Schedule	Part Number	Quantity	First Req Date
2271636		DL34-9L440-DL-27MM	2	2012/06/08

Ship to FD20T, FORD RESEARCH & ENGINEERING, DEARBORN, MI US

--

Joseph Lumetta
joseph.lumetta@valeo.com
office phone 248-209-8237
fax 248-209-8282
cell 248-709-4710

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Phone
Mobile [redacted]

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Phone :
Mobile [redacted]

--

Phone : ([redacted]
Mobile : [redacted]

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--

Phone : [redacted]
Mobile [redacted]

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Heat Transfer Results for CAC P415 With Mask

Version 1 June 18th, 2012

PE13-018 031123

valeo added

PERFORMANCE RESULTS

With Cover only

With Mask

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHR GE AIR FLOW (kg/hr)	432	70.3	84.4	87.6
	684	56.6	74.6	79.2
	1037	45.3	64.5	70.9

Current Condition
(Spec Showed on Drawing)

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHR GE AIR FLOW (kg/hr)	432	73.9	88.0	91.0
	684	61.0	82.4	87.6
	1037	48.6	74.0	81.3

VARIATION DUE TO 11CELLS NO LOUVERS BETWEEN 5-15%

PE13-018 031124

EXTERNAL PRESSURE DROP

With Cover only

With Mask

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	62.9	264.4	602.3

Current Condition
(Spec Showed on Drawing)

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	70.0	314.0	704.0

INTERNAL PRESSURE DROP

With Mask

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	1.82	4.09	9.04

Current Condition
(Spec Showed on Drawing)

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	1.37	2.99	6.11

VARIATION DUE TO 27mm COVER PLASTIC ADDITION

PE13-018 031125

PERFORMANCE RESULTS

With Cover + 6 tube blocker

With Mask + 6 Tube Blocker

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHR GE AIR FLOW (kg/hr)	432	67.7	80.2	87.0
	684	55.7	74.2	79.9
	1037	43.9	65.2	73.5

Current Condition (Spec Showed on Drawing)

HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81	3.27	5.7
CAHR GE AIR FLOW (kg/hr)	432	73.9	88.0	91.0
	684	61.0	82.4	87.6
	1037	48.6	74.0	81.3

VARIATION DUE TO 11CELLS NO LOUVERS AND 6 TUBE BLOCKER = BETWEEN 5-13%

PE13-018 031126

EXTERNAL PRESSURE DROP

With Cover + 6 tube blocker

With Mask + 6 Tube Blocker

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	82.9	355.8	795.6

Current Condition

ΔP External AIR (Pa)	AIR VELOCITY (m/s)		
	0.81	3.27	5.7
INT. FLOW 0.288 kg/s	70.0	314.0	704.0

INTERNAL PRESSURE DROP

With Mask + 6 Tube Blocker

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	1.72	3.88	8.39

Current Condition

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)		
	432	684	1037
EXT. FLOW 1.08 kg/s	1.37	2.99	6.11

VARIATION DUE TO 27mm COVER PLASTIC ADDITION

PE13-018 031127

From: Guillermo GUADARRAMA [guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 12:21 PM
To: Kramer, Michael (M.T.)
Cc: Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS; Tyler, Jim (J.S.)
Subject: Re: FW: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM
Attachments: MCR_1013726_Supplied_Signed_PVPR_ CAC_P415_02102012_Engr_Signed.pdf

Mike,

Attached you will find the last PVP&R that we sent to you and approved by Ford.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Fri, Jun 15, 2012 at 11:06 AM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Ok, thx.

Please also forward same data from in-process and/or PV testing for the present production CAC.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 11:51 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.); Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike,

The presentation that I sent before was missing the complete detail of the part that says Spec. When I say spec is current condition, averages values of 6 parts.

For the 6 tube blockers, we didn't perform that test becasue we don't have the tube blockers down here.

Do you want to stop the shipment to test the part when we get the tube blockers ?

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Fri, Jun 15, 2012 at 10:27 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:

Guillermo, was this test data conducted with the external front CAC air cover in place also? Please confirm.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 11:07 AM
To: Kramer, Michael (M.T.)
Cc: Joseph LUMETTA; Tyler, Jim (J.S.); Larry ENGEL (larry.engel@valeo.com); David CASTILLO
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Michael,

Attached you can find the values that we got from the part that is leaving this morning to Ford USA.

- One part with plastic mask of 27mm opening and trubulator (Internal Fin) with 11 cells and no louvers.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico

Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Wed, Jun 13, 2012 at 3:42 PM, David CASTILLO <david.castillo@valeo.com> wrote:

Michael,

We have a leak on the part we kept at SLP on the crimping area. We are trying to seal it so we can finish the data dP today in the night.

DC.

On Wed, Jun 13, 2012 at 2:49 PM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Need the component performance test data to support meetings tomorrow and need some time to review/digest before-hand. When sending?

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Tyler, Jim (J.S.)
Sent: Wednesday, June 13, 2012 11:52 AM
To: David CASTILLO; Kramer, Michael (M.T.)

Cc: Joseph LUMETTA; Guillermo GUADARRAMA

Subject: RE: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

David, what is the test status of the other part at SLP? Need info by today please.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Tuesday, June 12, 2012 11:11 AM
To: Kramer, Michael (M.T.)

Cc: Tyler, Jim (J.S.); Joseph LUMETTA; Guillermo GUADARRAMA
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike/ Jim,

We have ready the part to be ship to Ford but needs to be before noon on the truck to be with you tomorrow morning.
We will like to test the part we are going to ship to you for heat transfer as well but it will not allow us to ship it before noon so it will be with you until this Thursday morning.
Could we test it or do you prefer to ship it with no testing? There were not request to test it before ship, but we will like to do it.

Please let me know

DC.

On Fri, Jun 8, 2012 at 2:41 PM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Jim, please confirm shipping location.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Friday, June 08, 2012 1:02 PM
To: Kramer, Michael (M.T.)
Cc: Tyler, Jim (J.S.); Joseph LUMETTA; Guillermo GUADARRAMA

Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Ok

We will keep one piece for dP and performance base on matrix test
The other will be ship to Valeo Aurburn Hill or Ford directly?

DC.

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Please provide test completion date.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
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To: Tyler, Jim (J.S.)
Cc: Joseph LUMETTA; Guillermo GUADARRAMA; Kramer, Michael (M.T.)
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Jim, Part will be at SLP tomorrow late today are being release by customs at Guadalajara Mexico,

We assembled them and ship them on Monday afternoon.

DC.

On Fri, Jun 8, 2012 at 10:43 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:

Valeo team, what is the status of the 2 CAC builds with the 2013 Outlet tank, 11 cell no louver cores and 27mm cover plates? Are these shipping out to Ford by today, 6/8/12? Please confirm.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Joseph LUMETTA [mailto:joseph.lumetta@valeo.com]
Sent: Tuesday, June 05, 2012 9:27 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.)
Subject: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Hello Jim
Just to let you know the parts are on the way to SLP Mexico.
UPS tracking #s (three packages -2 cores 11 cell louver-less and 5 27 SLS cover plates).

The tracking numbers are 1ZV4197R6741296861
1ZV4197R6741714480
1ZV4197R6740167074

Release	Schedule	Part Number	Quantity	First Req Date
2271636		DL34-9L440-DL-27MM	2	2012/06/08

Ship to FD20T, FORD RESEARCH & ENGINEERING, DEARBORN, MI US

--

Joseph Lumetta
joseph.lumetta@valeo.com
office phone 248-209-8237
fax 248-209-8282
cell 248-709-4710

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Phone
Mobile [redacted]

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Phone :
Mobile [redacted]

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Phone : [redacted]
Mobile : [redacted]

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Phone : [redacted]
Mobile [redacted]

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PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

Valeo

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PPCR# 839	ECR / ECO 25511				
MODEL YEAR: 2012	COMPONENT / ASSY: CAC	VALEO P/N: M150754	DRAWING & REV: MCAD 100033922 Rev B	SUPPLIER NAME: Valeo Termico	CUSTOMER APPROVAL: NAME SIGN DATE
PROJECT APPLICATION (#): FORD F-Series GTDI	CUSTOMER: FORD	CUSTOMER P/N: BL34-9L440-AC	ASSEMBLY PLANT: VEC SLP	ORIGINATOR: GUILLERMO GUADARRAMA	[redacted] 2/17/12

PVP&R No. PV11-167 — DATE ORIG: Feb-15th-2011 — REVISION No. 18 — DATE REV: Jan 17th 2012

APPROVALS:
- R&D MANAGER / R. Sanchez
- SUPERVISOR / E. Barrios
- LAB MANAGER / J. A. Rodriguez
- QUALITY DIRECTOR / Kacha Nuñez
- PROJECT MANAGER / Jose Martinez
- Other:

TEST PLAN / TEST REPORT

BL34-9L440-AB, Baseline

ITEM	PROCEDURE / STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No./CCT	NOTES / SUMMARY RESULTS / ACTIONS
NON FUNCTIONAL TESTING															
1	CPS-0032, II.A Class A	**LEAK TEST** Test conditions: Test pressure: 207±14 kPa (g) Test time: 20 sec (for prototype stage) Test medium: ambient compressed air	VEC SLP	Pressure loss less than 17.2 kPa	PASS 100%	PV	ALL	D	Oct-18-10	Oct-19-10	All	D	OK	TR 4327	Samples tested in the EOL, leaks rate<17.2 Kpa@15 sec Additional leak test was performed in, leaks rate<17.2 Kpa@20 sec
2	CPS-0032, II.B Class A	**INTERNAL CLEANLINESS** Test description: Measure the internal clean less per SAE-J1726, air to air CAC Filter size: 11µm	VEC SLP	CAC must meet internal surface SAE-J1726 requirements Max weight: 25 mg Maximum particle size: 3.175 mm Maximum particle area: 2.58 mm² non ferrous metal particle size <0.65mm , sand < 0.3mm	PASS 100%	PV	2	D	Oct-22-10	Oct-25-10	2	D	OK	TR 4743	Max weight: Sample 1--> 12.3 mg, Sample 2--> 17.9 mg Maximum particle size: Sample 1--> 0.432 mm, Sample 2--> 0.347 mm Maximum particle area: Sample 1--> 0.2349 mm2, Sample 1--> 0.5483 mm²
3	CPS-0032, II.C Class A	**INTERNAL VOLUME**	VEC SLP	RECORD	N/A	PV	2	D	Oct-22-10	Oct-25-10	2	D	OK	TR 4743	Internal volume: Sample 1--> 7.9 lts , Sample 2--> 8.0 lts
4	CPS-0032, II.D Class A	**WEIGHT** Core weight, including tubes, inlet fins, side plates, headers total weight: core plus inlet/outlet tanks	VEC SLP	RECORD	N/A	PV	2	D	Oct-22-10	Oct-25-10	2	D	OK	TR 4743	Weight: Sample 1--> 5.89 Kg, Sample 2--> 5.9 Kg
FUNCTIONAL TEST AND RESTRICTIONS															
5	CPS-0032, IV.A Class A	**HEAT TRANSFER** Charge side: Q=0.288 Kg/s (50% On each port) Charge air inlet temp = 125±1 1°C Charge air inlet pressure = 200 Kpa A Ambient temp = 25°C Air Speed (5.7 m/s) = 1.08 Kg/s	VEC SLP	Performance operation point 0.288 Kg/s/1.07 Kg/s — Units CAC Effectiveness 81.3 ± 5% — % Max internal Pressure Drop 6.5 — kPa 9-point matrix to be printed on the drawing. CAC Effectiveness and Cooling air flow = 0.154, 0.82, 1.08 kg/s Charge Air Flow = 0.12, 0.19 & 0.288 kg/s	PASS 100%	PV	5	D	Oct-19-10	Oct-25-10	5	D	OK	TR 2009	9-point matrix to be printed on the drawing, CAC effectiveness and pressure drop

PV average

Charge Side Kg/s	Charge Side Kg/hr	CAC Effy (%) ±5% — Ambient Side Kg/s (m/s): 0.154 (0.81)	0.82 (3.27)	1.08 (5.7)	IPD (Kpa) +10% @ 1.08 kg/s
0.12	432	73.9	88.0	91.0	1.37
0.19	684	81.0	82.4	87.8	2.66
0.288	1037	48.6	74.0	81.3	6.11
EPD (Pa) + 10%		70	314	704	

ITEM	PROCEDURE / STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No./CCT	NOTES / SUMMARY RESULTS / ACTIONS
6	CPS-0032, IV.E Class B (See exception)	**HOT PRESSURE CYCLE** Cycle pressure: 0 to 150 kPa-g ± 21 Kpa, instead of 210 KPa Charge Inlet Temperature: 185°C±5°C instead of 205°C±5.0°C Test Medium: Compressed Air Cycle Rate: 50 cycles/min (± 10 Cycles/min)	VEC SLP	250,000 375,000 MINIMUM CYCLES to pass the test 321,750 500,000 TARGET CYCLES After enduring twice the minimum requirement (750,000) the test can be accelerated by increasing the high pressure to 210 kPa in order to produce a failure	PASS 100%	PV	4	D	Oct-21-10	Nov-14-10	4	D	OK	TR 4341	Four samples reached 750,000 cycles successful **Two samples were tested in TUV US lab** Sample I17814-1, leak rate <0.4 psig, Sample I-17614-7, leak rate <0.8 psig **Two samples were tested in VEC SLP lab** Samples LR 101874 & LR101875, no leaks or bubbles under water
7	CPS-0032, IV.F Class C (See exception)	**THERMAL CYCLE** Cold charge air temp: 30±5°C Hot charge temp=185°C ±5.0°C Charge air flow (cold & hot) 18 ± 2.5 Kg/min Cycle rate (equal hot & cold)= 30 ± 2.0 cycles/hour Ambient air face velocity: 2 ± 0.5 m/s Ambient Air Temperature: 30 ± 1°C	VEC SLP	3,750 5,000 MINIMUM CYCLES to pass the test specification as After enduring twice the minimum requirement 7,500, the test can be accelerated by turning off the ambient airflow in order to produce the failure, or stop **at 8,000 cycles**	PASS 100%	PV	2	D	Oct-18-10	Oct-29-10	2	D	OK	TR 4324	After 7,500 cycles the test was accelerated by turning off the ambient airflow and continued up to 8,000 cycles At 8,000 cycles leak test was performed and no leaks detected Test was stopped at the end of 8,000 cycles
8	CPS-0032, V.G Class A	**PROOF PRESSURE / BURST** Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	RECORD Sample CAC must meet the acceptance requirement for leak No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst Increased pressure at a slow rate until leakage occurs	PASS 100%	PV	2	D	Oct-22-10	Oct-24-10	2	D	OK	TR 4321	Burst test Sample 1--> 896 Kpa (Un-crimping Outlet Tank) Sample 2--> 861 Kpa (Un-crimping Inlet Tank) No fins collapsed before 300 Kpa were detected in both samples
9	CPS-0032, V.G Class B (See exception)	**HOT AGE TEST** Chamber Temperature = 185°C ± 5.0°C, instead of 205°C	VEC SLP	The CAC shall not develop a crimp or tank leakage that exceed a leak of 500 cc/min at 207 kPa after enduring min. time requirement Minimum life inlet side: 160 200 hrs Minimum life Outlet side: 60 75 hrs	PASS 100%	PV	2	D	Oct-27-10	Nov-05-10	2	D	OK	TR 4334	OK, samples meet 200 hrs. successful no leaks detected after test Samples were leak tested under water, no bubbles were detected After 200 hrs. Samples were exposed 50hrs. More to complete 250hrs @185°C, no bubbles **After 250 hrs. Samples were exposed 25hrs. at 205°C, leak were detected (Outlet tanks)** Sample 1) leak rate=460 cc/min, sample 2) leak rate=110 cc/min
10	VEC REC 20012 Rev A	Metallurgical Analysis / Braze quality	VEC SLP	The CAC shall meet the minimum requirement requested on VEC specification	100% Pass	PV	2	D	Oct-22-10	Oct-26-10	2	D	OK	TR 4744	OK, samples meet 100% braze quality evaluation per VEC REC 0012 Rev A

PE13-018 031136

PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

Valeo

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PPCR# 839	FCR / ECO 25511				
MODEL YEAR: 2012	COMPONENT / ASSY: CAC	VALEO P/N: M150754	DRAWING & REV: MCAD 100033922 Rev B	SUPPLIER NAME: Valeo Termico	CUSTOMER APPROVAL: NAME SIGN DATE
PROJECT APPLICATION(S): FORD F-Series GTDI	CUSTOMER: FORD	CUSTOMER P/N: BL34-9L440-AC	ASSEMBLY PLANT: VEC SLP	ORIGINATOR: GUILLERMO GUADARRAMA	

PVP&R No. PV11-167
DATE ORIG: Feb 15th 2011
REVISION No. 16
DATE REV: Jan 17th, 2012

APPROVALS:
R&D MANAGER / R. Sanchez
SUPERVISOR / E. Barrios
LAB MANAGER / J. A. Rodriguez
QUALITY DIRECTOR / Karina Nuñez
PROJECT MANAGER / José Martinez
Other:

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT RESULT	ACTUAL RESULT REPORT No/CODE	NOTES / SUMMARY RESULTS / ACTIONS
11	CPS-0031 IV-I Class A	EXTERNAL CORROSION Test conditions: ASTM-G85-A3 (SWAAT)	VEC SLP	The CAC shall meet the acceptance requirement for leak (Pressure loss less than 17.2 kPa), after enduring minimum of 31 days. Use surrogate Data from AL34-6K775-AA (>21 days)	PASS 100%	PV	6	D	N/A	N/A	N/A	N/A	OK	TR 3770	Surrogate test report 3770
12	Valeo PCD 1703, PCD 1714	Vibration test Tri-Axial test Road Load data from DPG or MPG testing	VEC AH	Minimum hours: Test life cycles (206 hrs) After completion, the CAC shall have no distortion and no cracks, functional and meet the criteria of the Leak test	PASS 100%	PV	2	D	Oct-15-10	Oct-31-10	2	D	OK	TR 55407	OK, no leaks or structural damages on both samples after 206hrs

PV11-055, Production change validation for: C.A.C. --> Process Layout change for Separator, Turbulator, tube assy & Core Builder Machines
BL34-9L440-AB, NO Index change

NON FUNCTIONAL TESTING

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	RESULT	REPORT No/CODE	NOTES / SUMMARY RESULTS / ACTIONS
1	Valeo Drawings	DIMENSIONAL INSPECTION	VEC	Core Assy must meet special characteristics for following characteristics: - Header to header Length - Header to header parallelism - Core Perpendicularity - Separator & Turbulator Amplitude All dimensional shall be compared before and Layout modification including CpK Requirement	PASS	PV	3 Pcs for Dimension al Report 25 Pcs for CpK analysis	D	03-May-11	04-May-11	3 pcs for Dimension al 25 Pcs for Cpk	D	OK	TR 5849	Comparative Analysis done with parts produced before and after layout modification
2	VEC REC0012	Braze quality / Adherence	VEC	Core shall meet VEC REC0012 for Adherence between separator to tube and Turbulator to tube (Compare before and After layout movement)	PASS	PV	2	D	02-May-11	04-May-11	1	D	OK	TR 5848 TR 5848-A	

FUNCTIONAL TEST AND RESTRICTIONS

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	RESULT	REPORT No/CODE	NOTES / SUMMARY RESULTS / ACTIONS
3	CPS-0032, IV-G Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa + 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	Sample CAC must meet the acceptance requirement for leak test III A No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst Increased pressure at a slow rate until leakage occurs & Record the Value	PASS 100%	PV	6	D	04-May-11	04-May-11	6	D	OK	TR4569	No fin collapse or tube deformation before 300 Kpa Average Burst pressure of Six Samples = 808 kPa (878, 792, 772, 813, 827, 788 Kpa)
4	CPS-0032, IV-A Class A	HEAT TRANSFER Charge side: Q=0.288 Kg/s (50% On each port) Charge air inlet temp = 125±1.1°C Charge air inlet pressure = 200 Kpa-A Ambient temp = 25°C Air Speed (5.7 m/s) = 1.08 Kg/s	VEC SLP	Performance operation point 0.288 Kg/s/1.07 Kg/s — Units CAC Effectiveness 81.3 ± 5% — % Max internal Pressure Drop 6.5 — kPa	PASS 100%	PV	2	D	05-May-11	05-May-11	2	D	OK	TR 4576	Performance results flow-->0.288 Kg/s@1.07 kg/s CAC Effective (%) 83.9 PD (initial) 6.3 kPa

Change Description:
Production change validation for: C.A.C. --> PARTS ASSEMBLED ON BACK UP AHAUS PRESS (PV11-026)
BL34-9L440-AB, NO Index change (Alert A12447585)

NON FUNCTIONAL TESTING

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	RESULT	REPORT No/CODE	NOTES / SUMMARY RESULTS / ACTIONS
1	M150754	CRIMPING MEASUREMENT	VEC SLP	Meet crimping measurement 100%	PASS 100%	PV	5	D	12-May-11	12-May-11	5	D	OK	N/A	
2	CPS-0032, III-A Class A See Deviation	LEAK TEST Test conditions: Test pressure: 207±14kPa (g) Test time: 15 sec Test medium: ambient compressed air	VEC SLP	Pressure loss less than 17.2 kPa Deviation: Pressure loss less than 3.8 Kpa at EOL	PASS 100%	PV	ALL	D	12-May-11	12-May-11	All	D	OK	N/A	Samples meet leak test on EOL, adjusted to 3.8 Kpa

FUNCTIONAL TEST AND RESTRICTIONS

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	RESULT	REPORT No/CODE	NOTES / SUMMARY RESULTS / ACTIONS
3	CPS-0032, IV-G Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa + 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	RECORD Sample CAC must meet the acceptance requirement for leak No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst Increased pressure at a slow rate until leakage occurs	PASS 100%	PV	6	D	13-May-11	13-May-11	6	D	OK	TN 4582	No fin collapse or tube deformation before 300 Kpa Individual Burst pressure results of Six Samples (758, 827, 834, 744, 758, 789 KPa)

PRODUCT VALIDATION PLAN & REPORT

****CONFIDENTIAL****

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

				PPC Ref	839
				ECR / ECO	25511

MODEL YEARS	COMPONENT / ASSY.	VALEO P/N	DRAWING & REV.	SUPPLIER NAME	CUSTOMER APPROVAL
2012	CAC	M150754	MCAD 100033922 Rev B	Valeo Termico	NAME SIGN DATE
PROJECT APPLICATION (S)	**CUSTOMER**	**CUSTOMER P/N**	**ASSEMBLY PLANT**	**DESTINATION**	
FORD F-Series GTDI	FORD	BL34-9L440-AC	VRC SLP	GUILLERMO GUADARRAMA	

APPROVALS		
	R&D MANAGER / R. Sanchez	QUALITY DIRECTOR / Karina Nuñez
	SUPERVISOR / E. Barrios	PROJECT MANAGER / Jose Martinez
	LAB MANAGER / J. A. Rodriguez	Other

FVP&R No: PV11-167
DATE ORIG: Feb-15th-2011

REVISION No: 16
DATE REV: Jan 17th, 2012

TEST PLAN | **TEST REPORT**

ITEM	PROCEDURE / STANDARD	TEST DESCRIPTION	RESP.	ACCEPTANCE CRITERIA	TARGET RQTD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT RESULT	ACTUAL RESULT REPORT No. / COMM.	NOTES / SUMMARY RESULTS / ACTIONS
Change Description: Production change validation for: C.A.C. --> CRIMPING PRESS ROTATED 90°- LAY OUT CHANGE (PV11-066) BL34-9L440-AB, NO Index change (Alert A12456128)															
NON FUNCTIONAL TESTING															
1	M150754	CRIMPING MEASUREMENT	VEC	Meet crimping measurement 100%	PASS	PV	5	D	19-May-11	19-May-11	5	D	OK	N/A	See dimensional report inspection
			SLP		100%										
FUNCTIONAL TEST AND RESTRICTIONS															
2	CPS-0032, IV.C Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC	RECORD Sample CAC must meet the acceptance requirement for leak No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst Increased pressure at a slow rate until leakage occurs	PASS	PV	6	D	19-May-11	19-May-11	6	D	OK	TR 4607	No fin collapse or tube deformation before 300 Kpa Individual Burst pressure results of Six Samples (758.4, 789.3, 896, 841.1, 841.1, 848 KPa)
			SLP		100%										
Change Description: Production change validation for: C.A.C. --> NEW EOL EQUIPMENT TO IMPROVE PRODUCTION RATE (PV11-026) BL34-9L440-AB, NO Index change															
NON FUNCTIONAL TESTING															
1	M150754	CAC DIMENSIONAL	VEC	CAC must meet Vehicle mounting point per drawing approved	PASS	PV	10	D	19-May-11	20-May-11	30	D	OK	N/A	R&R Capability study done-- 50 samples OK Additional study correlation was performed on 30 samples Pearson study results 0.530
			SLP	100033922	100%										
2	CPS-0032, II.A Class A	LEAK TEST Test conditions Test pressure: 207±14 kPa (g) Test time: 15 sec Test medium: ambient compressed air	VEC	Pressure loss less than 17.2 kPa Deviation: Pressure loss less than 3.9 Kpa at EOL	PASS	PV	ALL	D	19-May-11	19-May-11	All	D	OK	N/A	Samples tested on production EOL Samples meet leak test on EOL, adjusted to 3.9Kpa
			SLP		100%										
Change Description: Production change validation for: C.A.C. --> CURRENT P415 AHAUS PRESS WITH NEW SPEED PARAMETERS (PV11-027) BL34-9L440-AB, NO Index change															
NON FUNCTIONAL TESTING															
1	M150754	CRIMPING MEASUREMENT	VEC	Meet crimping measurement 100%	PASS	PV	5	D	23-May-11	24-May-11	5	D	OK	N/A	See crimping study
			SLP		100%										
2	CPS-0032, II.A Class A	LEAK TEST Test conditions Test pressure: 207±14 kPa (g) Test time: 15 sec Test medium: ambient compressed air	VEC	Pressure loss less than 17.2 kPa Deviation: Pressure loss less than 3.9 Kpa at EOL	PASS	PV	ALL	D	23-May-11	23-May-11	ALL	D	OK	N/A	Samples meet leak test on EOL, adjusted to 3.9 kpa
			SLP		100%										
FUNCTIONAL TEST AND RESTRICTIONS															
3	CPS-0032, IV.E Class B (See exception)	HOT PRESSURE CYCLE Cycle pressure: 0 to 150 kPa g ± 21 Kpa, instead of 210 kPa Charge inlet Temperature: 185°C±5°C instead of 205°C±5.0°C Test Medium: Compressed Air Cycle Rate: 50 cycles/min (± 10 Cycles/min)	VEC	280,000 375,000 MINIMUM CYCLES to pass the test 330,760 500,000 TARGET CYCLES	PASS	PV	3	D	01-Jun-11	08-Jun-11	3	D	OK	TBD	Both samples reached 375,000 minimum cycles OK 375,000 cycles is the minimum requirement to pass the test Parts reached 500,000 cycles OK, and on going
			SLP		100%										
4	CPS-0032, IV.G Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC	RECORD Sample CAC must meet the acceptance requirement for leak No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst Increased pressure at a slow rate until leakage occurs	PASS	PV	6	D	23-May-11	03-Jun-11	6	D	OK	TR 4490	No fin collapse or tube deformation before 300 kpa Individual Burst pressure results of Six Samples (827, 834, 896, 800, 827, 814 kPa)
			SLP		100%										

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PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PPCR#	839
ECR / ECO	25511

PVP&R No. PV11-1n7	REVISION No. 16
DATE ORIG: Feb-15th-2011	DATE REV: Jan 17th, 2012

MODEL YEARS	COMPONENT / ASSY	VALEO P/N	DRAWING & REV	SUPPLIER NAME	CUSTOMER APPROVAL
2012	CAC	M150754	MCAD 100033922 Rev B	Valeo Termico	NAME SIGN DATE
PROJECT APPLICATION(S)	**CUSTOMER**	**CUSTOMER P/N**	**ASSEMBLY PLANT**	**ORIGINATOR**	
FORD F-Series GTDI	FORD	BL34-9L440-AC	VEC SLP	GUILLERMO GUADARRAMA	

APPROVALS

R&D MANAGER / R. Sanchez	QUALITY DIRECTOR / Karina Nuñez
SUPERVISOR / E. Barrios	PROJECT MANAGER / Jose Martinez
LAB MANAGER / J. A. Rodriguez	Other

Change Description:

Production change validation for: C.A.C. --> HOSE STOP ADDED ON INLET TANK (BOTTOM PIPE) WPTS 12424014 (PV11-044)

BL34-9L440-AC

ITEM	PROCEDURE / STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	RESULT	REPORT No./CODE	NOTES / SUMMARY RESULTS / ACTIONS
NON FUNCTIONAL TESTING															
1	M150778	INLET PORT SPIDER PLOT MEASUREMENT	VEC SLP	Meet Spider plot measurement (100033938)	PASS 100%	PV	30	D	07/13/2011	07/14/2011	30	D	OK	N/A	See dimensional Report
FUNCTIONAL TEST AND RESTRICTIONS															
2	CPS-0032, IV.G Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	RECORD Sample CAC must meet the acceptance requirement for leak No fin collapse or tube deformation before 300 Kpa Test annotation/Burst	PASS 100%	PV	6	D	07/13/2011	07/15/2011	6	D	OK	TR 4702	Sample / Pressure @300kPa / Observations LB111266 Satisfactory Crimping failure LB111267 Satisfactory Crimping failure LB111268 Satisfactory Crimping failure LB111269 Satisfactory Crimping failure LB111262 Satisfactory Crimping failure LB111263 Satisfactory Crimping failure

Change Description:

Production change validation for: C.A.C. --> Double Sourcing for FIN & Turbulator [Yinbang RWA material] (PV11-008) + Zhongding Gasket ["Q6113KC Red-Silicone Zhongding material"] (PV11-007)

BL34-9L440-AC

ITEM	PROCEDURE / STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQD	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	RESULT	REPORT No./CODE	NOTES / SUMMARY RESULTS / ACTIONS
1	CPS-0032, IV.G Class B (See exception)	HOT AGE TEST Chamber Temperature = 180°C ± 2.0°C, instead of 205°C	VEC SLP	CAC shall not develop a crimp or tank leakage that exceeds a leak of 500 sccm at 207 kPa after enduring min. time requirement of 500 sccm at 207 kPa after enduring Minimum life Inlet side: 140 200 hrs Minimum life Outlet side: 60 75 hrs	PASS 100%	PV	2	D	7/11/2011	7/29/2011	2	D	OK	TR 4703	Sample / 200 Hours Required / Leak Rate / Observations LA 111176 OK 1 No leaks detected during or after the testing LA 111177 OK 0 No leaks detected during or after the testing
2	CPS-0032, IV.A Class A	LEAK TEST Test conditions: Test pressure: 207±14 kPa (g) Test time: 15 sec Test medium: ambient compressed air	VEC SLP	Pressure loss less than 17.2 kPa Deviation: Pressure loss less than 3.8 Kpa at EOL	PASS 100%	PV	ALL	D	7/11/2011	7/24/2011	ALL	D	OK	N/A	Samples met leak test on EOL, adjusted to 3.8 Kpa
FUNCTIONAL TEST AND RESTRICTIONS															
3	CPS-0032, IV.A Class A	HEAT TRANSFER Charge side: Q=0.288 kg/s (50% Or each port) Charge air inlet temp = 125±1.1°C Charge air inlet pressure = 200 Kpa A Ambient temp = 25°C Air Speed (5.7 m/s) = 1.08 Kg/s	VEC SLP	Performance operation point 0.288 Kg/s/1.07 Kg/s — Units CAC Effectiveness 91.3 ± 5% — % Max Internal Pressure Drop 5.5 — kPa 9-point matrix to be printed on Fin drawing, CAC Effectiveness and pressure drop Cooling air flow = 0.154, 0.62, 1.08 kg/s Charge Air Flow = 0.12, 0.18 & 0.288 kg/s	PASS 100%	PV	5	D	7/14/2011	7/16/2011	5	D	OK	TR 4088	AVERAGE VALUES OF 5 PIECES (see table below)
4	CPS-0032, IV.E Class B (See exception)	HOT PRESSURE CYCLE Cycle pressure: 0 to 150 kPa-g ± 21 Kpa, instead of 210 kPa Charge inlet Temperature: 185°C±3°C instead of 205°C±5.0°C Test Medium: Compressed Air Cycle Rate: 50 cycles/min (± 10 Cycles/min)	VEC SLP	260,000 375,000 MINIMUM CYCLES to pass the test specification 331,350 500,000 TARGET CYCLES	PASS 100%	PV	4	D	7/11/2011	7/24/2011	4	D	OK	TR 4706 TR4793	SAMPLE ID / LEAK RATE @ 378,000 / LEAK RATE @ 500,000 LB 111206 0 kPa 0 kPa LB 111207 0 kPa 0 kPa LB 111446 0 kPa 0 kPa LB 111447 2.07 kPa 3.7 kPa

CHARGE AIR PRESSURE: 1.7 bar (abs); T CHARGE SIDE: 150°C ± 1%; AMBIENT: 25 ± 1%; HEAT TRANSFER (kW)

CHARGE AIR FLOW kg/s \ COOLING AIR FLOW kg/s	0.154 (0.81)	0.62 (3.25)	1.08 (5.7)	P Internal Air (kPa)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P External Air (Pa)	[illegible]	[illegible]	[illegible]	

* 1.08 kg/s EXT. FLOW
** 0.288 kg/s INT. FLOW

PRODUCT VALIDATION PLAN & REPORT

Valeo

CONFIDENTIAL

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PPCR# 839	ECR / FCO 25511	PVPAR No. PV11-167	DATE ORIG: Feb-15th-2011	REVISION No. 16	DATE REV. Jan 17th, 2012

MODEL YEARS	COMPONENT / ASSY	VALEO P/N	DRAWING & REV.	SUPPLIER NAME	CUSTOMER APPROVAL:
2012	CAC	M150754	MCAD 100033922 Rev B	Valeo Termico	NAME SIGN DATE
PROJECT APPLICATION (S)	**CUSTOMER**	**CUSTOMER P/N**	**ASSEMBLY PLANT**	**ORIGINATOR**	
FORD F-Series GTDI	FORD	BL34-9L440-AC	VEC SLP	GUILLERMO GUADARRAMA	[redacted] 2/15/12

APPROVALS:

R&D MANAGER / R. Sanchez	QUALITY DIRECTOR / Karina Nuñez
SUPERVISOR / E. Barrios	PROJECT MANAGER / José Martinez
LAB MANAGER / J. A. Rodriguez	Other:

TEST PLAN / TEST REPORT

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No. / DATE	NOTES / SUMMARY RESULTS / ACTIONS
5	CPS-0032, IV.G Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	RECORD Sample CAC must meet the acceptance requirement for leak test No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst: Increased pressure at a slow rate until leakage occurs	PASS 100%	PV	6	D	7/12/2011	7/18/2011	6	D	OK	TR 4883	Sample / Leak @ 300 kPa (30sec) / Burst Pressure (kPa / PSI) / Observations LB111160 OK 738 / 107 INLET TANK DETTACHED LB111161 OK 768 / 110 LEAK ON CRIMPING, OUTLET TANK LB110703 OK 820 / 118 INLET TANK DETTACHED LB110704 OK 827 / 120 INLET TANK DETTACHED LB110706 OK 768 / 110 INLET TANK DETTACHED LB110738 OK 734 / 107 INLET TANK DETTACHED
6	VEC REC 20012 Rev A	Metallurgical Analysis / Braze quality	VEC SLP	The CAC shall meet the minimum requirement requested on VEC specification	100% Pass	PV	2	D	7/11/2011	7/18/2011	2	D	OK	TR 5668	The brazed requirements were met according to Valeo standard VEC REC 0012 REV A
7	CPS-0031, IV.I Class A	EXTERNAL CORROSION Test conditions: ASTM G85-A3 (SWAAT)	VEC SLP	The CAC shall meet the accept. req. for leak test II.A (Press. loss < 17.2 kPa), after enduring min. of 21 days	PASS 100%	PV	2	D	7/11/2011	7/31/2011	2	D	OK	TR 4831	Sample / 504 Hours Tested / Total hours Tested / Leak Rate after testing / Observations LB 110650 OK 668 0 Nor leak, nor corrosion detected after testing. LB 110651 OK 669 0 Nor leak, nor corrosion detected after testing.

Change Description:
Production change validation for: C.A.C. --> Lay Out change (EOL) (PV11-103)
BL34-9L440-AC

NON FUNCTIONAL TESTING

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No. / DATE	NOTES / SUMMARY RESULTS / ACTIONS
1	CPS-0032, II.C Class A	DIMENSIONAL	VEC SLP	Meet the Dimensional specifications according to the drawing (Mounting Points)	N/A	PV	2	D	09/22/2011	09/22/2011	8	D	OK	N/A	See dimensional Report
2	CPS-0032, II.A Class A	LEAK TEST Test conditions: Test pressure: 207±14 kPa (g) Test time: 20 sec (for prototype stage) Test medium: ambient compressed air	VEC SLP	Pressure loss less than 17.2 kPa [illegible]	PASS 100%	PV	ALL	D	09/22/2011	09/22/2011	8	4	OK	N/A	Samples met leak test on EOL, adjusted to 3.9 Kpa
FUNCTIONAL TEST AND RESTRICTIONS															
3	CPS-0032, IV.G Class A	PROOF PRESSURE / BURST Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±3.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	RECORD Sample CAC must meet the acceptance requirement for leak No fin collapse or tube deformation before 300 Kpa Test acceleration/Burst: Increased pressure at a slow rate until leakage occurs	PASS 100%	PV	2	D	09/22/2011	09/22/2011	8	4	OK	TR 4822	Sample / Leak @ 300 kPa (30sec) / Burst Pressure (kPa / PSI) / Observations LB111695 OK 921 / 134 INLET TANK DETTACHED LB111696 OK 901 / 131 INLET TANK DETTACHED LB111697 OK 910 / 132 OUTLET TANK DETTACHED LB111698 OK 863 / 125 INLET TANK DETTACHED LB111699 OK 918 / 133 INLET TANK DETTACHED LB111700 OK 889 / 129 INLET TANK DETTACHED

* **OBJECTIVE:**
SREA #021 051611: Production change validation for: C.A.C. P415 --> Fin Pitch change from 1.2 mm to 1.4 mm (PV11-092)
BL34-9L440-AC

NON FUNCTIONAL TESTING

ITEM	PROCEDURE/ STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT	REPORT No. / DATE	NOTES / SUMMARY RESULTS / ACTIONS
1	CPS-0032, II.A Class A	LEAK TEST Test conditions: Test pressure: 207±14 kPa (g) Test time: 15 sec Test medium: ambient compressed air	VEC SLP	Pressure loss less than 17.2 kPa Deviation: Pressure loss less than 3.9 Kpa at EOL	PASS 100%	PV	ALL	D	08-Nov-11	22-Dec-11	ALL	D	OK	N/A	Samples met leak test on EOL, adjusted to 3.9 Kpa

Valeo

PRODUCT VALIDATION PLAN & REPORT

CONFIDENTIAL

OBJECTIVE: VALIDATION CAC P415 GTDI, 57MA proposal (Plastic tanks)

PPCR#	839
ECR / ECO	25511

PV&R No: PV11-167 — DATE ORIG: Feb 15th 2011 — REVISION No: 16 — DATE REV: Jan 17th 2012

MODEL YEAR	COMPONENT / ASSY	VALEO P/N	DRAWING & REV	SUPPLIER NAME	CUSTOMER APPROVAL
2012	CAC	M150754	MCAD 100033922 Rev B	Valeo Termico	NAME SIGN DATE
PROJECT APPLICATION(S)	**CUSTOMER**	**CUSTOMER P/N**	**ASSEMBLY PLANT**	**ORIGINATOR**	[redacted] 2/15/12
FORD F-Series GTDI	FORD	BL34-9L440-AC	VEC SLP	GUILLERMO GUADARRAMA	

APPROVALS

R&D MANAGER / R. Sanchez	QUALITY DIRECTOR / Karina Nuñez
SUPERVISOR / J.E. Barrios	PROJECT MANAGER / Jose Martinez
LAB MANAGER / J. A. Rodriguez	Other

TEST PLAN / TEST REPORT

ITEM	PROCEDURE / STANDARD	TEST DESCRIPTION	RESP	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES QTY	SAMPLES TYPE	TIMING START	TIMING COMPLETED	SAMPLES TESTED QTY	SAMPLES TESTED TYPE	ACTUAL RESULT RESULT	REPORT No. (TTR)
FUNCTIONAL TEST AND RESTRICTIONS														
2	CPS-0032, IV A Class A	**HEAT TRANSFER** Charge side: Q'=0.288 Kg/s (50% On each port) Charge air inlet temp = 135±1.1°C Charge air inlet pressure = 300 Kpa-A Ambient temp = 25°C Air Speed (6.7 m/s) = 1.08 Kg/s	VEC SLP	Performance operation point 0.288 Kg/s/1.07 Kg/s — Units CAC Effectiveness TBD — % Max Internal Pressure Drop 6.5 — kPa Cooling air flow: = 0.40, 1.08 kg/s Charge Air Flow = 0.12, 0.19 & 0.288 kg/s	PASS 100%	PV	5	D	08-Nov-11	02-Dec-11	5	D	OK	TR 4950
3	CPS-0032, IV G Class A	**PROOF PRESSURE / BURST** Pressure: 300 Kpa ± 21 kPa Ramp Time: 10 sec ±2.0 sec Hold time: Min. 30 sec Test Medium: Water	VEC SLP	RECORD Sample CAC must meet the acceptance requirement for leak test No fin collapse or tube deformation below 300 Kpa Test acceleration/Burst increased pressure at a slow rate until leakage occurs	PASS 100%	PV	6	D	10-Dec-11	15-Dec-11	6	D	OK	TR 4965
4	PDT NVZ 15016	**Metallurgical Analysis / Braze quality**	VEC SLP	The CAC shall meet the minimum requirement requested on VEC specification	100% Pass	PV	2	D	20-Dec-11	22-Dec-11	2	D	OK	TR 7321

NOTES / SUMMARY RESULTS / ACTIONS

Item 2 (TR 4950):

TARGET Performance were based on PV Results
Average Results of 5 samples

PITCH 1.4 VALUES

CHARGE AIR FLOW (kg/s) \ COOLING AIR FLOW (kg/s)	[illegible]	[illegible]	[illegible]	ΔP (kPa)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ΔP External (Pa)	[illegible]	[illegible]	[illegible]	

Item 3 (TR 4965):

Sample	Leak @ 300 kPa (30sec)	Burst Pressure (kPa / PSI)	Observations
LB112372	OK	665 / 96	Leak on crimping outlet tank.
LB112373	OK	634 / 92	Leak on crimping outlet tank.
LB112374	OK	648 / 94	Leak on crimping outlet tank.
LB112375	OK	621 / 90	Leak on crimping outlet tank.
LB112376	OK	648 / 94	Leak on crimping outlet tank.
LB112377	OK	814 / 118	Tank Detachment.

Item 4 (TR 7321):

2 CAC's met succesfully the brazed requirements according to Valeo standard PDT NVZ 15016.

PROCEDURE	TEST DESCRIPTION	ACCEPTANCE CRITERIA	TARGET REQ'D	TEST STAGE	SAMPLES TESTED	SAMPLE TYPE	ACTUAL RESULTS
SPECIFY THE GOVERNING TEST PROCEDURE OR STANDARD	PROVIDE A BRIEF DESCRIPTION OF EACH TEST	SPECIFY CYCLES, MILES, VOLTS, MINIMUM VALUES, NO FAILURES, ETC.	STATE REQ'D RELIABILITY OR NO FAILURES	ED= ENGINEERING DESIGN DV= DESIGN VALIDATION PV= PRODUCTION VALIDATION CC= CONTINUOUS CONFORMANCE	LIST QUANTITY TESTED, SAMPLES TYPE, ETC.	A= PROTOTYPE (HAND MADE) B= PROTOTYPE (TOOLED) C= PROGRAM LEVEL D= INITIAL PRODUCTION	LIST RESULT IN TERMS OF EG. RMS/CPK, PASS OR NO FAILURE

PV CHANGES CONTROL:

PVP&R Rev.	Date	Change description
1	22-Mar-11	PV released for customer approval, base on PV 08-005 signed and passed. Customer part number BL34-9L440-AC
2	13-Abr-11	PV released for customer approval. Hose stop change added
3	06-May-11	PV released for customer approval. Process lay out change. Updated PV results
4	13-May-11	PV results added for parts assembled on back up AMADA press (PV11-026)
5	19-May-11	PV results added for parts assembled CRIMPING PRESS ROTATED 90° LAY OUT CHANGE (PV11-005)
6	24-May-11	Added PV11-046 HOSE STOP ADDED ON INLET TANK (BOTTOM DWG) [illegible]
7	07-Jun-11	Updated results related to PV11-027
8	06-Jul-11	Update results of PV11-044
9	15-Jul-11	Update results of PV11-007 & PV11-008
10	18-Ago-11	Update results of PV11-007 & PV11-008
11	18-Ago-11	Update PV11-103 Lay Out Change for EOL
12	23-Sep-11	Update PV11-103 results. Lay Out Change for EOL
13	07-Oct-11	Addition of PV11-033 For Pitch change from 1.2 mm to 1.4 mm
14	12-Oct-11	Addition of PV11-091 Change side plate thickness reduction from 1.7 mm to 1.5 mm
15	24-Nov-11	Alternative core validation
16	7-Jan-12	PV11-092 updated

From: Guillermo GUADARRAMA [guillermo.guadarrama@valeo.com]
Sent: Monday, June 18, 2012 7:49 PM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.); Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS
Subject: Re: FW: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM
Attachments: Performance P415 w-Mask and 6 tube blockerx.pdf

Jim,

The presentation was clarified.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Mon, Jun 18, 2012 at 9:51 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:
Guillermo, the presentation can be further improved for clarity by adding Internal or External depending which cover or blocker is being referenced.

For example, 'with Internal Cover only'. Instead of 'with Cover only'.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Monday, June 18, 2012 10:35 AM
To: Kramer, Michael (M.T.)
Cc: Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS; Tyler, Jim (J.S.)
Subject: Re: FW: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike,

The data heat transfer with the cover and the cover + 6 tube blocker is showed on the presentation.

This part is being prepare to be shipped.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Fri, Jun 15, 2012 at 11:06 AM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Ok, thx.

Please also forward same data from in-process and/or PV testing for the present production CAC.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 11:51 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.); Joseph LUMETTA; Larry ENGEL (larry.engel@valeo.com); David CASTILLO; Eduardo BARRIOS
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike,

The presentation that I sent before was missing the complete detail of the part that says Spec. When I say spec is current condition, averages values of 6 parts.

For the 6 tube blockers, we didn't perform that test becasue we don't have the tube blockers down here.

Do you want to stop the shipment to test the part when we get the tube blockers ?

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico

Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Fri, Jun 15, 2012 at 10:27 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:

Guillermo, was this test data conducted with the external front CAC air cover in place also? Please confirm.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Guillermo GUADARRAMA [mailto:guillermo.guadarrama@valeo.com]
Sent: Friday, June 15, 2012 11:07 AM
To: Kramer, Michael (M.T.)
Cc: Joseph LUMETTA; Tyler, Jim (J.S.); Larry ENGEL (larry.engel@valeo.com); David CASTILLO
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Michael,

Attached you can find the values that we got from the part that is leaving this morning to Ford USA.

- One part with plastic mask of 27mm opening and trubulator (Internal Fin) with 11 cells and no louvers.

Regards/Saludos,

Guillermo Guadarrama
Valeo Engine Cooling, SLP
Eje 130 Esq. C.F.E.
CP 78395 AP 6-082
San Luis Potosi, Mexico
Tel: +52 (444) 826-66-00, Ext. 6229
mail: guillermo.guadarrama@valeo.com

On Wed, Jun 13, 2012 at 3:42 PM, David CASTILLO <david.castillo@valeo.com> wrote:

Michael,

We have a leak on the part we kept at SLP on the crimping area. We are trying to seal it so we can finish the data dP today in the night.

DC.

On Wed, Jun 13, 2012 at 2:49 PM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Need the component performance test data to support meetings tomorrow and need some time to review/digest before-hand. When sending?

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Tyler, Jim (J.S.)
Sent: Wednesday, June 13, 2012 11:52 AM
To: David CASTILLO; Kramer, Michael (M.T.)

Cc: Joseph LUMETTA; Guillermo GUADARRAMA

Subject: RE: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

David, what is the test status of the other part at SLP? Need info by today please.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Tuesday, June 12, 2012 11:11 AM
To: Kramer, Michael (M.T.)
Cc: Tyler, Jim (J.S.); Joseph LUMETTA; Guillermo GUADARRAMA
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Mike/ Jim,

We have ready the part to be ship to Ford but needs to be before noon on the truck to be with you tomorrow morning.
We will like to test the part we are going to ship to you for heat transfer as well but it will not allow us to ship it before noon so it will be with you until this Thursday morning.
Could we test it or do you prefer to ship it with no testing? There were not request to test it before ship, but we will like to do it.

Please let me know

DC.

On Fri, Jun 8, 2012 at 2:41 PM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Jim, please confirm shipping location.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Friday, June 08, 2012 1:02 PM
To: Kramer, Michael (M.T.)
Cc: Tyler, Jim (J.S.); Joseph LUMETTA; Guillermo GUADARRAMA

Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Ok

We will keep one piece for dP and performance base on matrix test
The other will be ship to Valeo Aurburn Hill or Ford directly?

DC.

On Fri, Jun 8, 2012 at 11:46 AM, Kramer, Michael (M.T.) <mkramer1@ford.com> wrote:

Reminder. Ship one to us and keep the other at SLP to perform the performance tests per matrix provided to Joe.

Please provide test completion date.

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: David CASTILLO [mailto:david.castillo@valeo.com]
Sent: Friday, June 08, 2012 11:48 AM
To: Tyler, Jim (J.S.)
Cc: Joseph LUMETTA; Guillermo GUADARRAMA; Kramer, Michael (M.T.)
Subject: Re: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Jim, Part will be at SLP tomorrow late today are being release by customs at Guadalajara Mexico,

We assembled them and ship them on Monday afternoon.

DC.

On Fri, Jun 8, 2012 at 10:43 AM, Tyler, Jim (J.S.) <jtyler1@ford.com> wrote:

Valeo team, what is the status of the 2 CAC builds with the 2013 Outlet tank, 11 cell no louver cores and 27mm cover plates? Are these shipping out to Ford by today, 6/8/12? Please confirm.

Jim Tyler
T1/P552 Cooling
313-805-2565 Bld-2 23P25

From: Joseph LUMETTA [mailto:joseph.lumetta@valeo.com]
Sent: Tuesday, June 05, 2012 9:27 AM
To: Tyler, Jim (J.S.)
Cc: Kramer, Michael (M.T.)
Subject: Parts shipped to Valeo SLP Mexico for the DL34-9L440-0L-27MM

Hello Jim
Just to let you know the parts are on the way to SLP Mexico.
UPS tracking #s (three packages -2 cores 11 cell louver-less and 5 27 SLS cover plates).

The tracking numbers are 1ZV4197R6741296861
1ZV4197R6741714480
1ZV4197R6740167074

Release	Schedule	Part Number	Quantity	First Req Date
2271636		DL34-9L440-0L-27MM	2	2012/06/08

Ship to FD20T, FORD RESEARCH & ENGINEERING, DEARBORN, MI US

--
Joseph Lumetta
joseph.lumetta@valeo.com
office phone 248-209-8237

fax 248-209-8282
cell 248-709-4710

--

Phone : (52) 444 826 6687
Mobile : (52) 1 444 829 1895

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Phone : (52) 444 826 6687
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and its disclosure or reproduction is strictly prohibited.
If you are not the intended recipient, please return it immediately to its sender
at the above address and destroy it.

Heat Transfer Results for CAC P415 With Mask

Version 3 June 18th, 2012

PE13-018 031149

valeo added

Internal Cover

Current Condition

Internal Cover + 6 Tube Blocker

PE13-018 031150

PERFORMANCE RESULTS

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		0.81		
CHARGE AIR FLOW (kg/hr)	432	73.9	70.3	67.7
	684	61.0	56.6	55.7
	1037	48.6	45.3	43.9

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		3.27		
CHARGE AIR FLOW (kg/hr)	432	88.0	84.4	80.2
	684	82.4	74.6	74.2
	1037	74.0	64.5	65.2

		Current	W/ Internal Mask ONLY	W/ Internal Mask + 6 tube blocker
HEAT REJECTION (EFFICENCY %)		AIR VELOCITY (m/s)		
		5.7		
CHARGE AIR FLOW (kg/hr)	432	91.0	87.6	87.0
	684	87.6	79.2	79.9
	1037	81.3	70.9	73.5

PE13-018 031151

EXTERNAL PRESSURE DROP

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)			
	432	684	1037	
EXT. FLOW 1.08 kg/s	70.0	314.0	704.0	Current
	62.9	264.4	602.3	W/ Internal Mask ONLY
	82.9	355.8	795.6	W/ Internal Mask + 6 tube blocker

PE13-018 031152

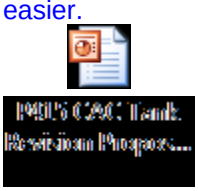
INTERNAL PRESSURE DROP

ΔP Internal Air (mbar)	CAHRGE AIR FLOW (kg/hr)			
	432	684	1037	
EXT. FLOW 1.08 kg/s	1.4	3.0	6.1	Current
	1.7	3.9	8.4	W/ Internal Mask ONLY
	1.8	4.1	9.0	W/ Internal Mask + 6 tube blocker

PE13-018 031153

From: Huang, Larry (L,.)
Sent: Wednesday, February 22, 2012 9:42 AM
To: Kramer, Michael (M.T.); Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Allan, Valerie (V.J.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Alright, Valeo proposed "Drain-Cock Tube Insert" idea to avoid assembly/sealing issue, shown on the 1st slide in attached file. If this idea works, it makes the tank revision simpler, like one for radiator drain cock. That make "tube-into-tank" easier.



From the meeting yesterday, Option I ("to-be-tested" port location) still has hard issues on tooling. The proposed revision of Option I is to insert the tube through the wall from engine side and at a higher position, but the tube tip will reach to the point where Jim Palm's is testing, shown on Slide 1. The issue is that the tank wall shape is complicated there, and the tank revision is much more difficult than other two Alternative proposals.

Alternative II and III can let the tube tip to the real lowest point (close to the header), and are relatively easier to tool. But Alternative II may have the conflict to EBPV for 2013, and Alternative III needs to see study the constrain from the bracket and tie bar.

Valeo is going to bring back their studies on all three proposals above to the meeting this afternoon. By the way, they also reported the progress on "water perforation baffle" design, as attached.

Palm,
Would you please let us know if you have any concern on the proposals discussed above (and shown in the attached file), in terms of "effectiveness of draining water away"?

Thank you all

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Tuesday, February 21, 2012 9:31 AM
To: Kramer, Michael (M.T.)
Cc: Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

That is a good question. With a bent tubing, assembly is a chanllege job. Let's discuss it with Valeo this afternoon.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Kramer, Michael (M.T.)
Sent: Tuesday, February 21, 2012 9:27 AM
To: Huang, Larry (L,.)
Cc: Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

How going to get the tube through/sealed to the TOC like fitting?

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
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From: Huang, Larry (L,.)
Sent: Tuesday, February 21, 2012 9:16 AM
To: Kramer, Michael (M.T.)
Cc: Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Yes, all CAD images showing the port locations are in vehicle position (orientation). Yes, "ease tooling" is the biggest factor to consider to keep the "tube-into-tank" proposal, "Alt II". Considering the port close to header, Valeo suggested to us TOC-like fitting, to make the port location more flexible. The challenge is how to assemble the "bent" tube, before or after crimp (likely after)? We will discuss more this afternoon. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Kramer, Michael (M.T.)
Sent: Tuesday, February 21, 2012 9:03 AM
To: Palm, Jim (J.R.); Kramer, Michael (M.T.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Huang, Larry (L,.)
Subject: FW: P415 CAC Design Change Options, Timing, and Cost

1) Is the port location being determined by vehicle package, ease of tooling mods, or both?

2) Regarding alternative II, any ideas on how to make other than Bob in his garage …….

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt

Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Huang, Larry (L,.)
Sent: Monday, February 20, 2012 6:10 PM
To: Palm, Jim (J.R.); Kramer, Michael (M.T.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Palm,
Discussed the proposed drain-port location, which matches your testing location, with Valeo in the meeting today. They may only be able to locate port close to the engine side of the tank, and the position would be significantly higher than what you are going to test out (the lowest point, closer to the grill side). I asked them to work with their tank tool supplier further, to see if this port location is doable in terms of tooling, no matter how difficult it would be.
<< Message: CONCEPT REVIEW - P415 Molded Pipe at >>

Valeo suggested to stay with the tube-into-tank idea, which we discussed last Friday, but to use a fitting (like those used in-radiator-tank TOC) to hold a metal tube. The tank tool revision may only needs a couple of weeks. I think the "tube-into-tank" idea might be more flexible (and easier) in terms of the tool revision, since it would only need a flat area on the tank, see "Alternative II" in the attached file. Plus, "upper ward sucking" would be more robust to the debris or oil, (downward drain hole with 2mm ID might be vulnerable to the debris and oil).

<< File: P415 CAC Tank Revision Proposals _022012-b.ppt >>
Bob Meyer suggested a "transverse drain port", see "Alternative III" in the attached file.

Palm,
Would you take a look at the alternative II and III, to see if they work? We will have the meeting 2:30pm with Valeo, and would like to have your input by then. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Monday, February 20, 2012 12:45 PM
To: Tyler, Jim (J.S.); Meyer, Robert (R.H.); Palm, Jim (J.R.); Kramer, Michael (M.T.); Ladd, John (J.R.); Andersen, Erik (E.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

To ensure the CAC design revision proposal to match the development testing, Jim sketched his testing hardware configuration, as attached. Correspondingly, I just updated the CAC design change proposal as attached, to be discussed in the meeting with Valeo this afternoon. Please take a look at both files and provide input before or during the meeting. Thanks.

<< File: Water Drain System_Palm_022012.pdf.pdf >> << File: P415 CAC Tank Revision Proposals _022012.ppt >>

Regards,

Larry Huang
Global Cooling/Heat Exchangers

Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Thursday, February 16, 2012 3:17 PM
To: Satish NADELLA; Joseph LUMETTA; Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Blas-Fernando GUTIERREZ
Cc: Kramer, Michael (M.T.); Ladd, John (J.R.)
Subject: P415 CAC Design Change Options, Timing, and Cost
When: Monday, February 20, 2012 2:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Audio + Webex, Audio Dial 313-621-3673, Meeting ID: 85694781#

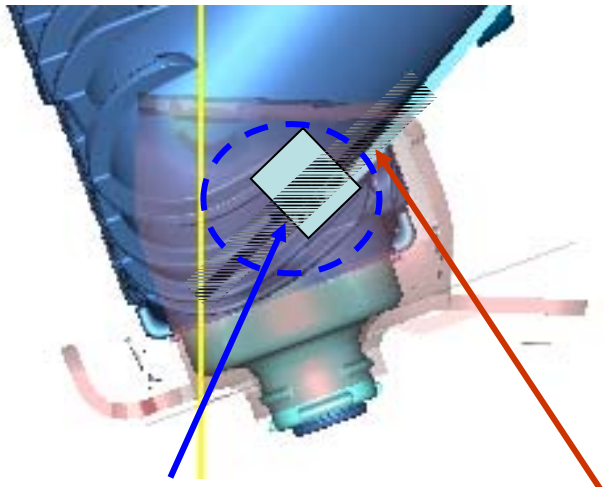
Two options to be discussed:
1) Water-drain port design
2) Water perforation design

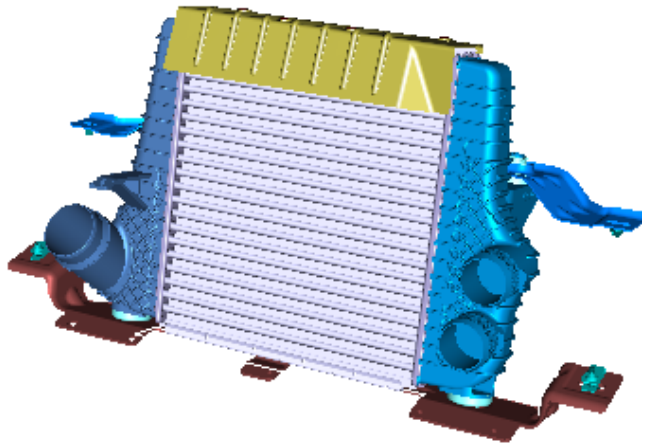
Updated proposals.
<< File: P415 CAC Tank Revision Proposals _021812.ppt >> << File: P415 Charge Air Cooler Drain Port Proposal.doc >>

Webex Link:
==========
Online Meeting Summary
==========
TOPIC: Webex Meeting
Meeting Link: https://ford.webex.com/ford/j.php?ED=171093662&UID=483694722&RT=MiMxMQ%3D%3D
DATE: Monday, February 20, 2012
TIME: 2:00 pm, Eastern Standard Time (New York, GMT-05:00)
MEETING NUMBER: 713 836 927
PASSWORD: (This meeting does not require a password.)
HOST KEY: 691567
Audio: %TeleconferencingInfo%

%TeleconferencingInfoAttendee%

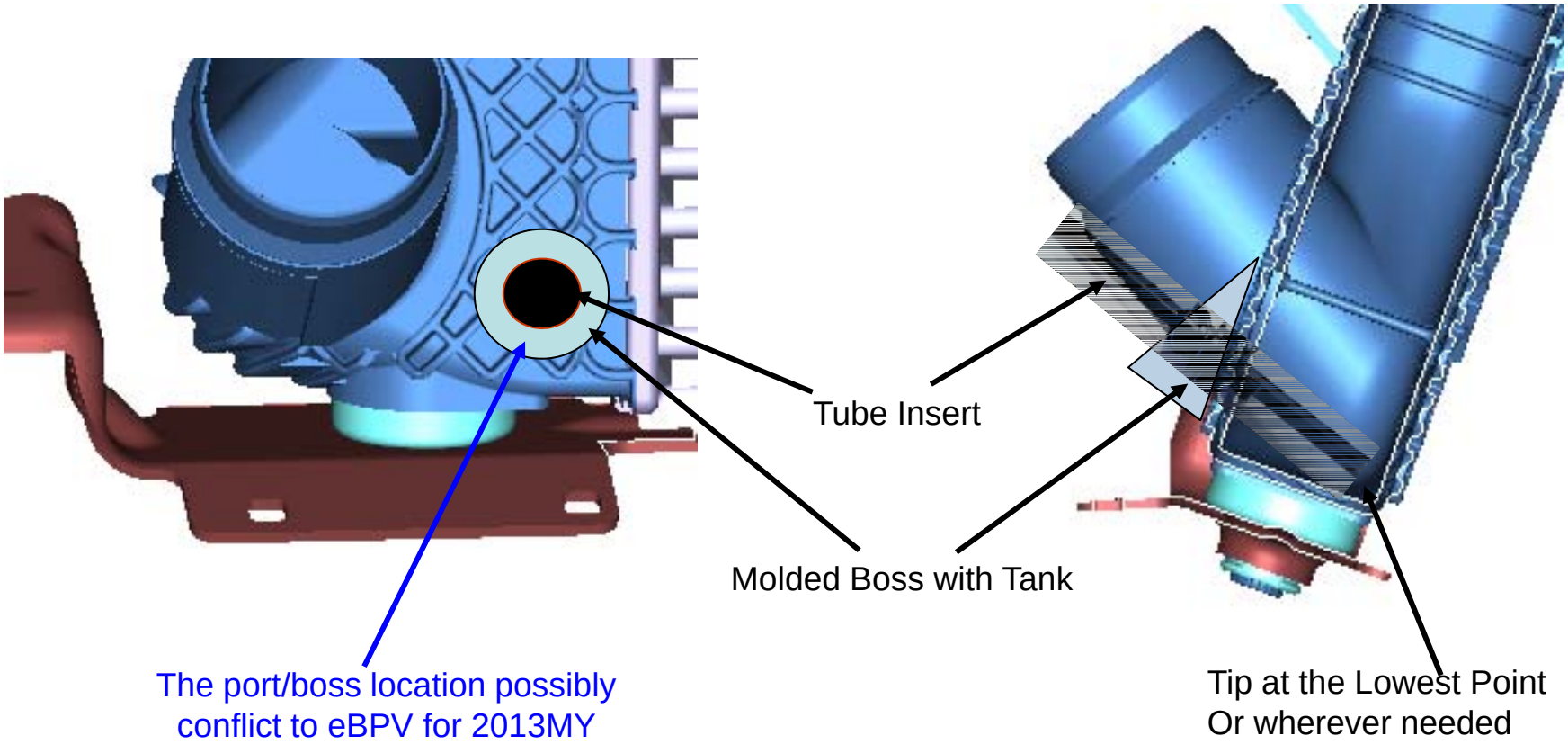
P415 CAC Outlet Tank Design Change
Revised Option I -- Adding Vacuum-Drained Port



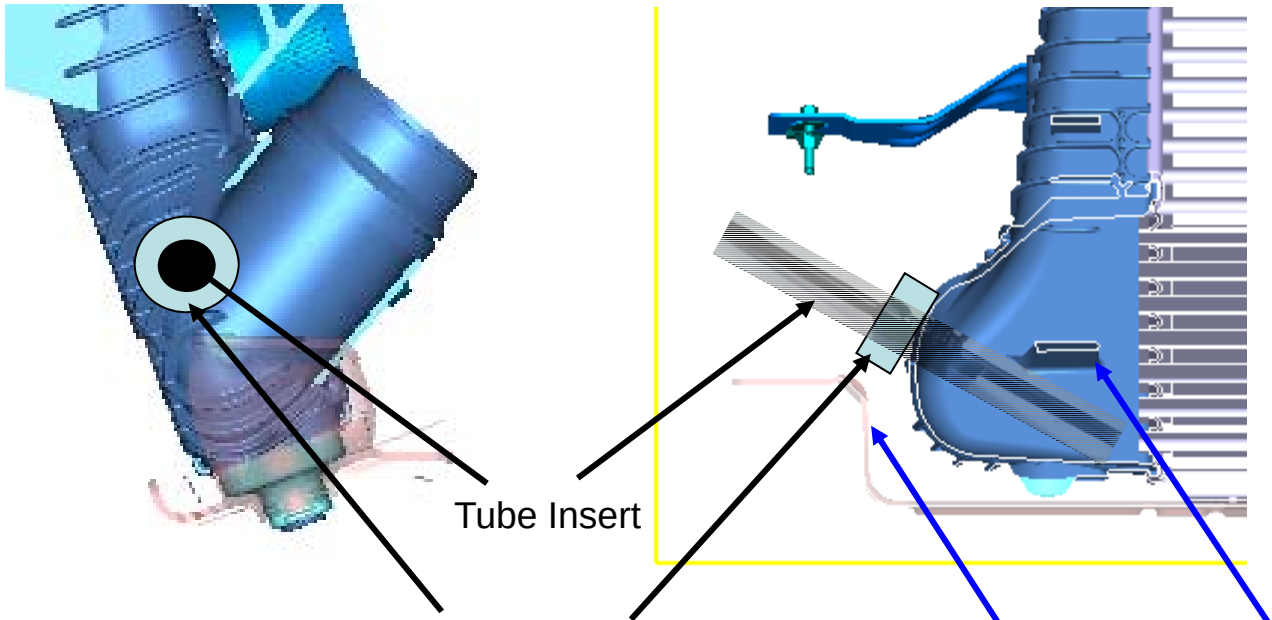


Tank wall in this are needs to be reshaped,
for tube to pass through tank wall here

Vacuum-Drained Port
Alternative II – Tube with Fitting



Vacuum-Drained Port
Alternative III – Transverse Drain Port

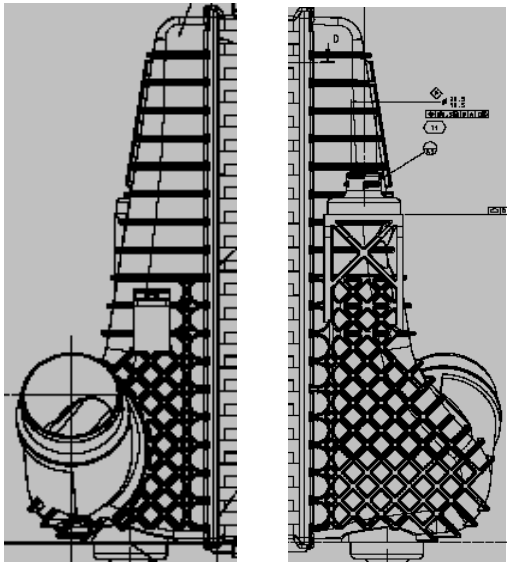


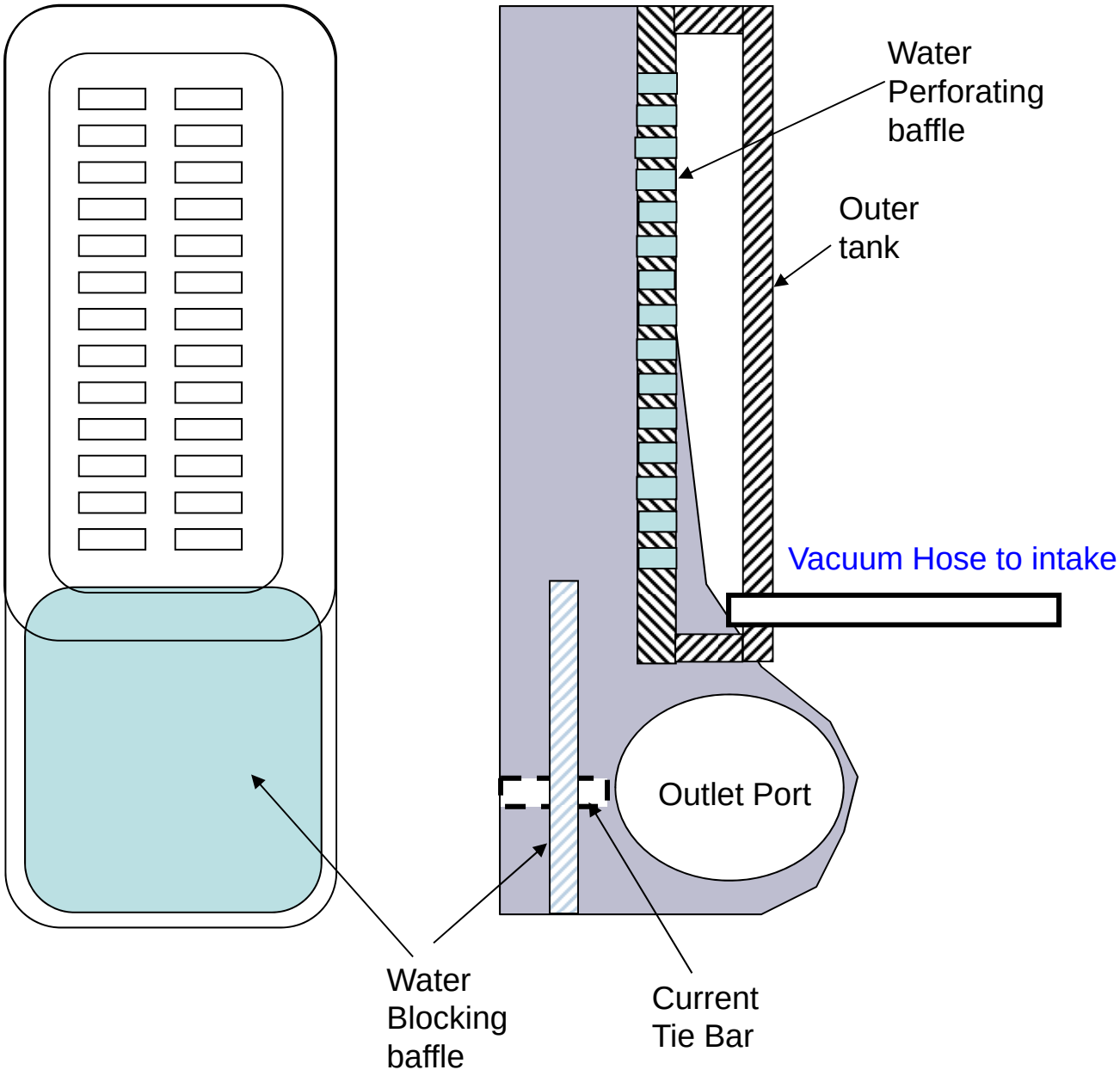
Need to consider bracket outside and tie bar inside

P415 CAC Tank Revision, Water Perforating, Option II

Fasteners

Current P415 CAC Outlet Tank



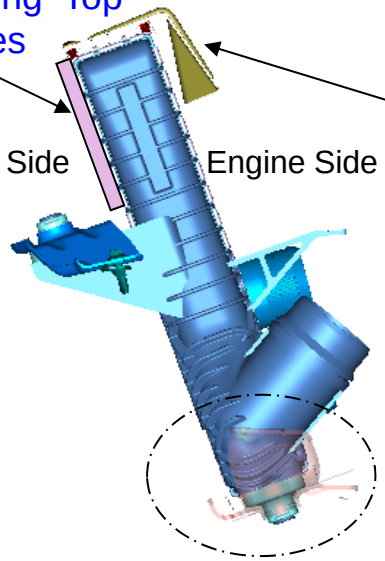


Covering Top
6 Tubes

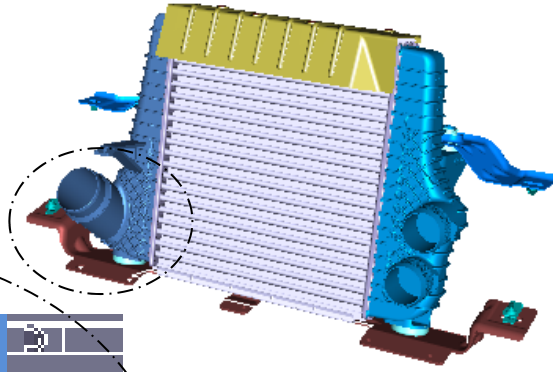
Existing Upper Shield
to be modified for
Blocking 6 tubes from
grill side

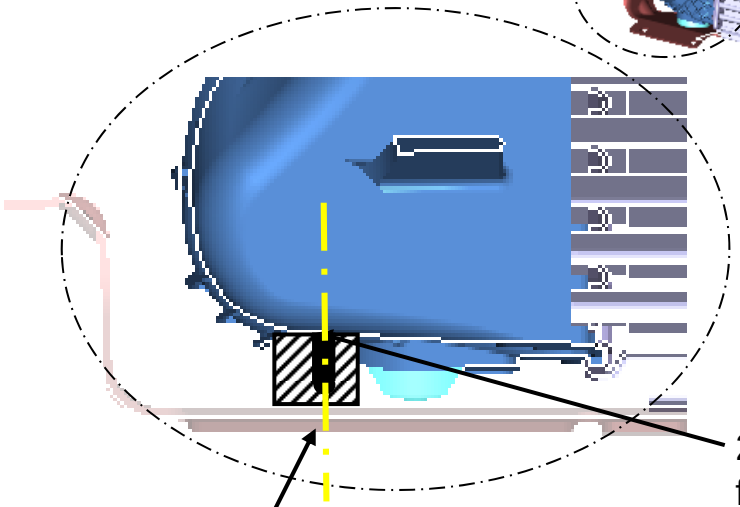
Drill Side

Engine Side



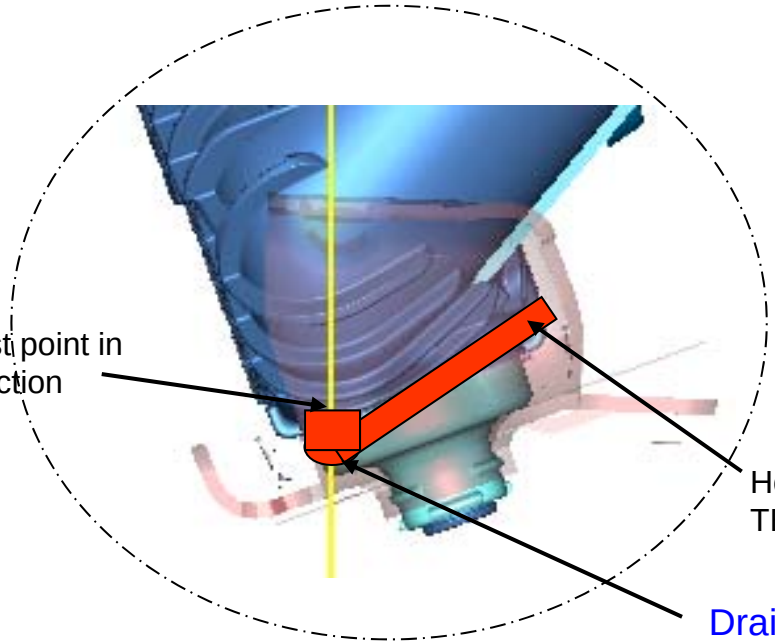
Side View -- On-Vehicle Orientation





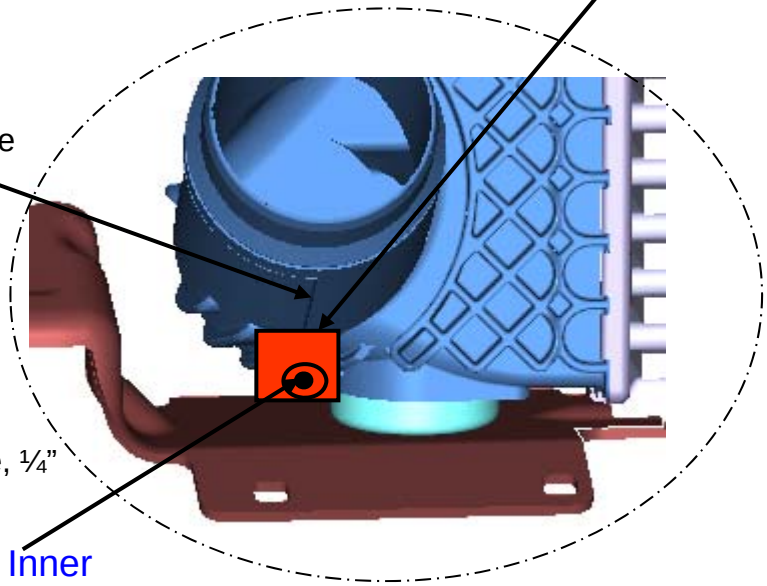
2mm hole,
flushed with tank

Tank mold
Parting Line



Lowest point in
X-direction

Hose Port,
TBD hose size, ¼”



Drain Port with Inner
Hole ID 2mm

PE13-018 031162

TITLE & DESCRIPTION

CAC 57MA OUTLET TANK

VALEO PART No

M154498

PROGRAM

P415 GTDI

COMPANY

FORD

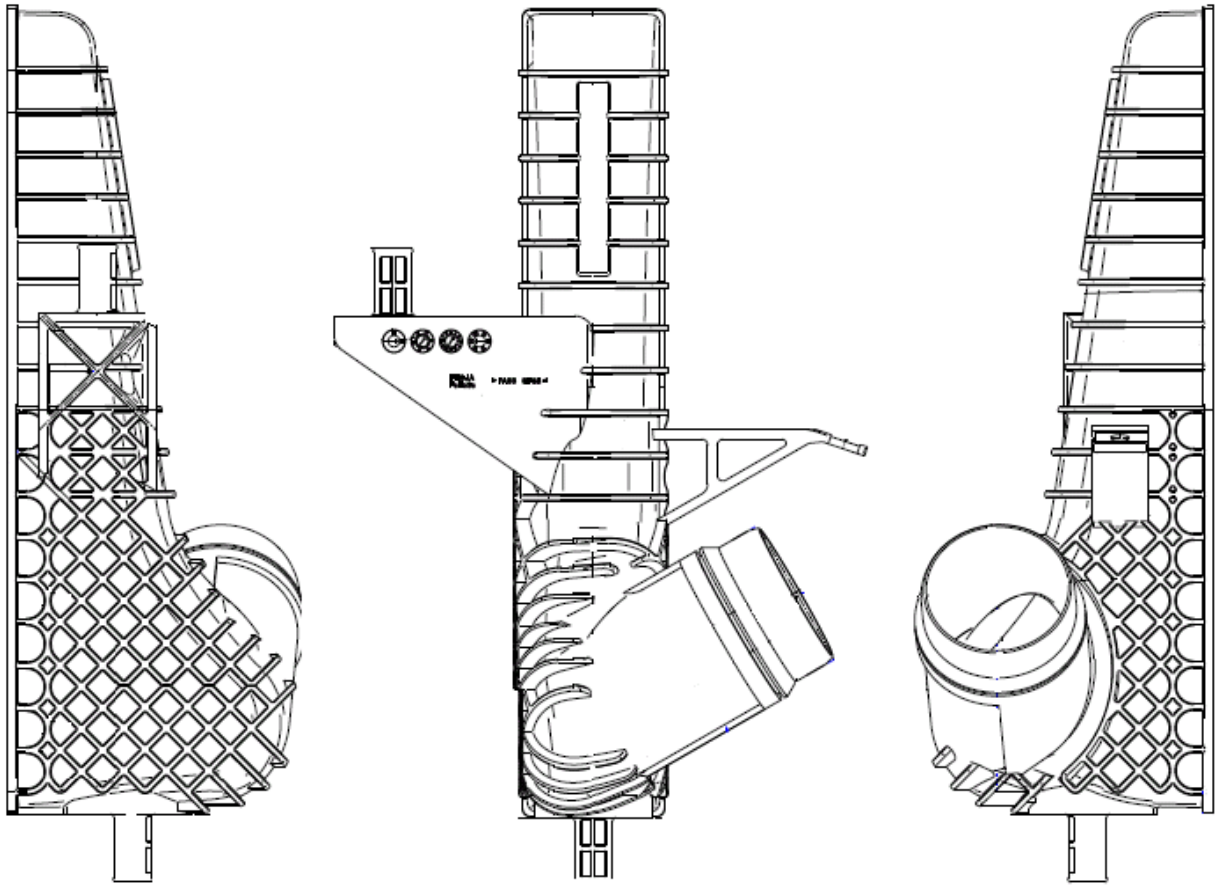
VALEO DRAWING No

100037845

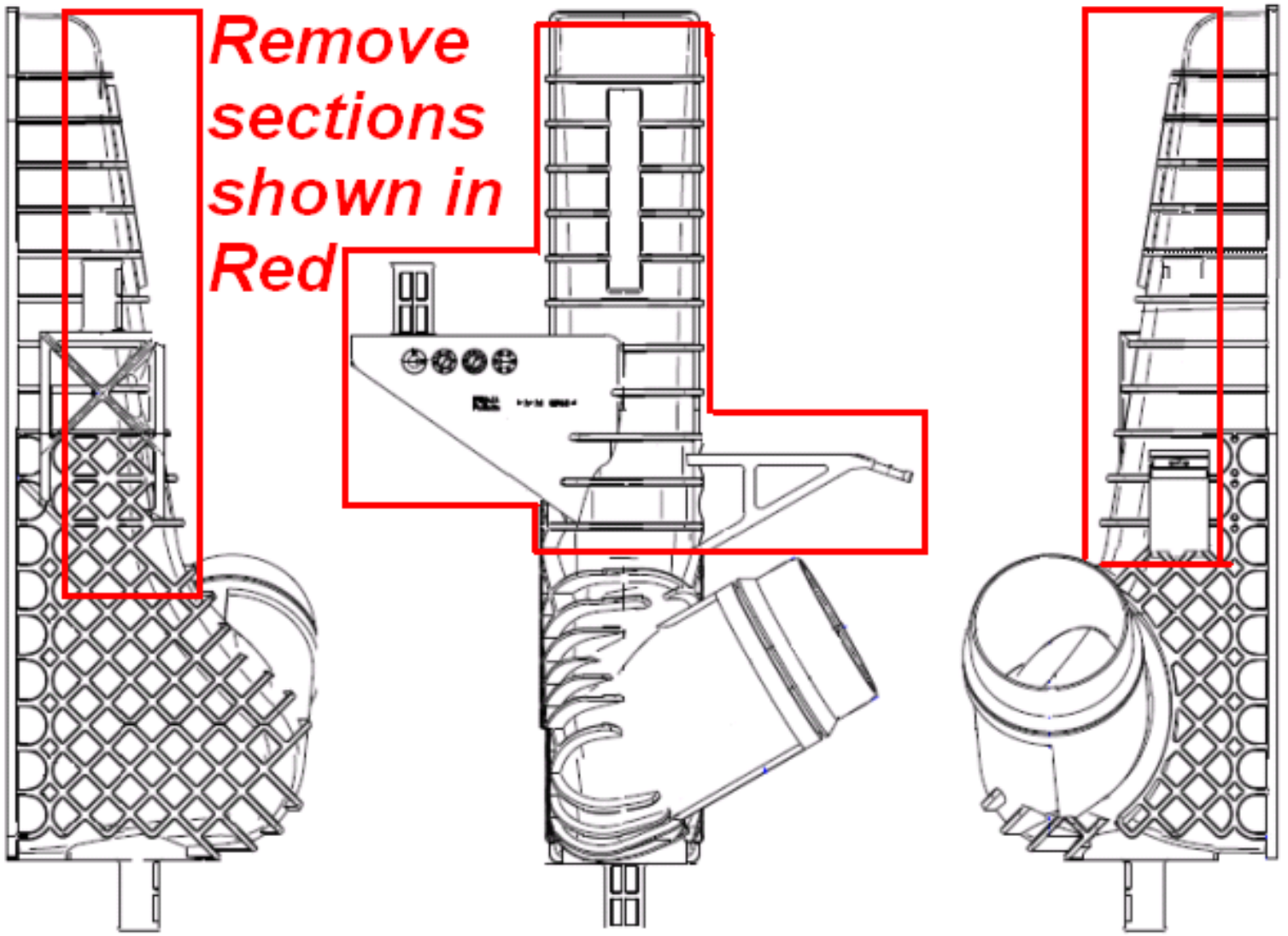
REV

C

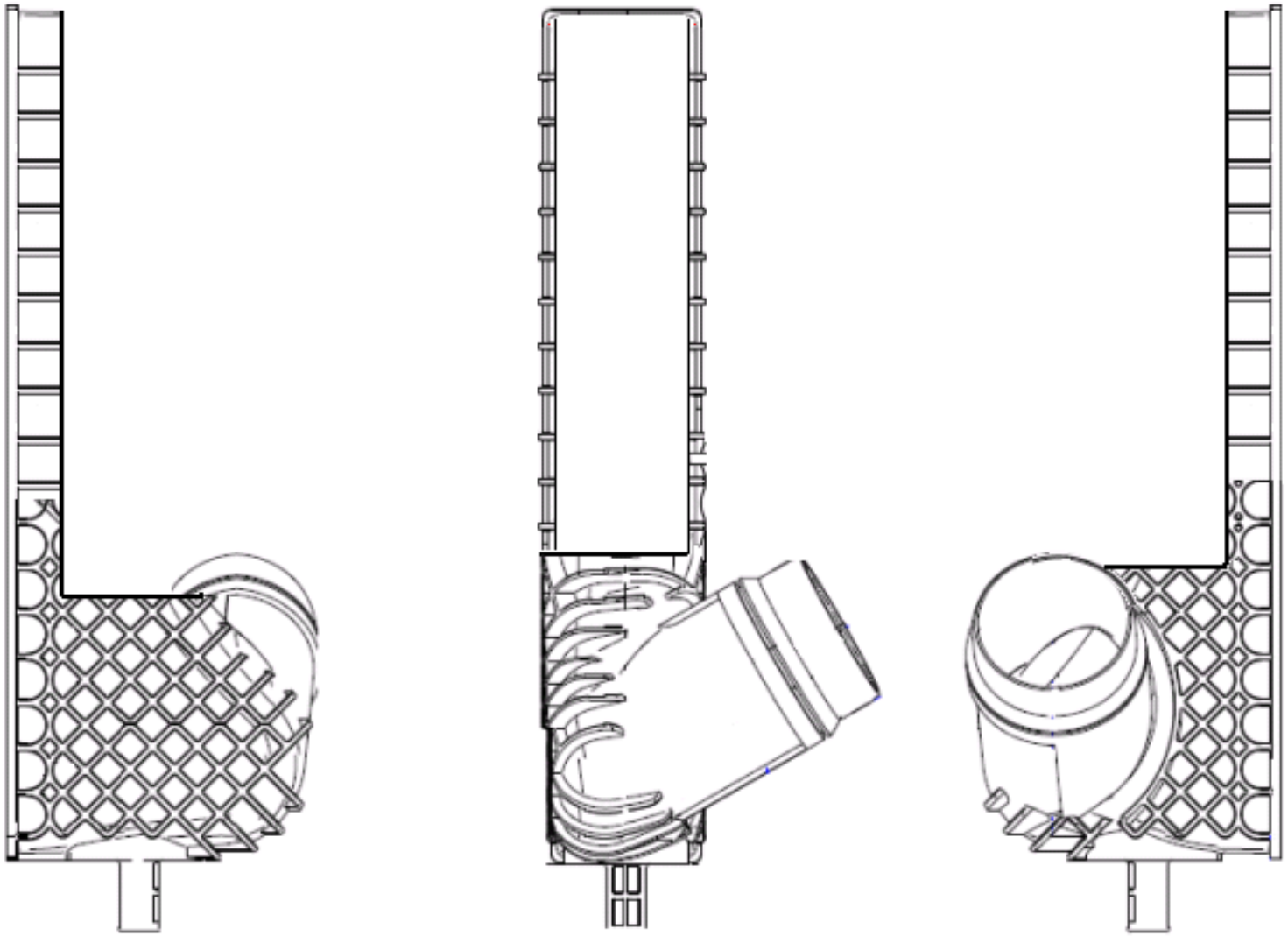
View of Current Part



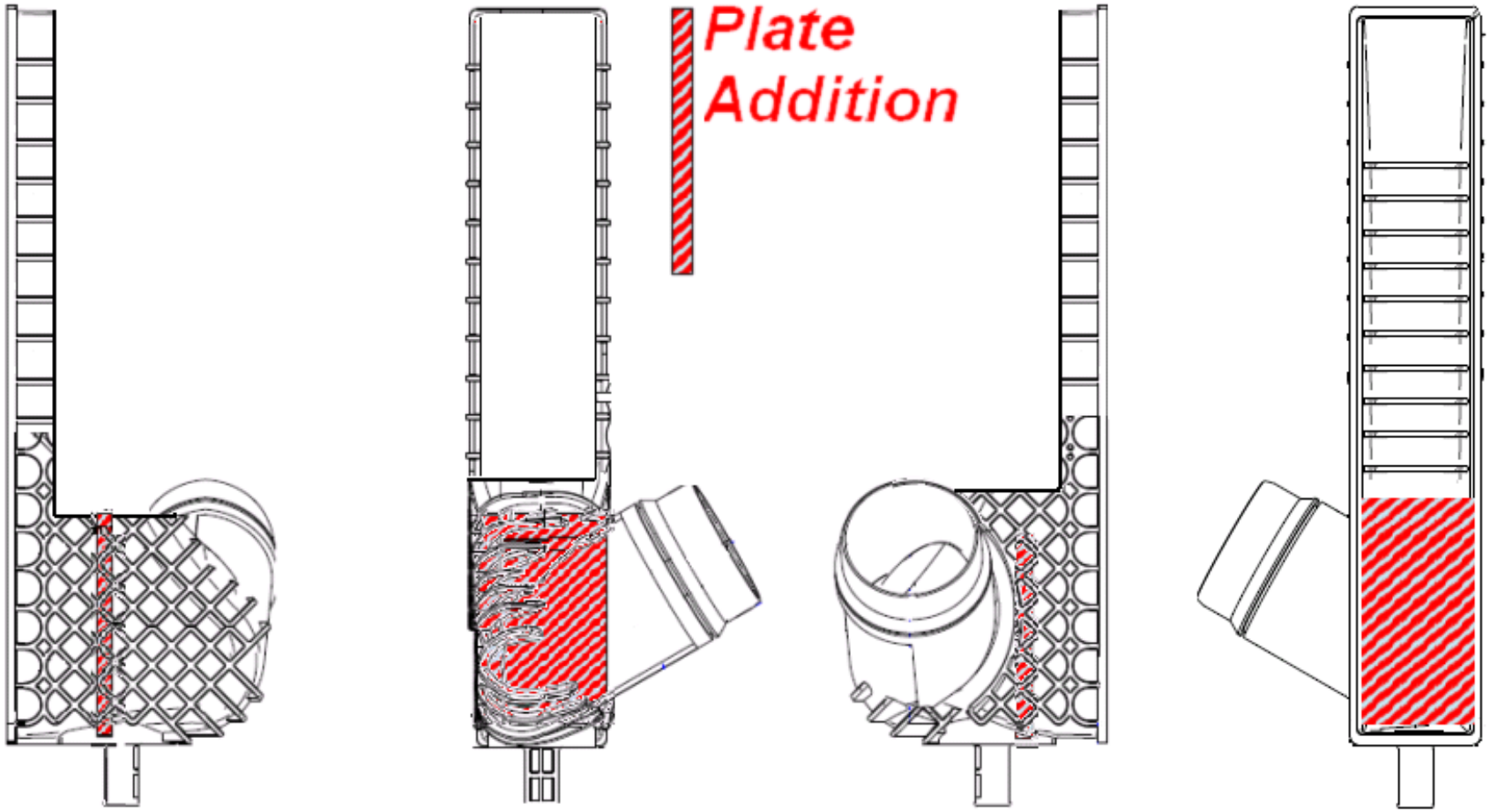
This option would require the removal of the section shown in red. Note the features such as (supports and clips) required by other components.



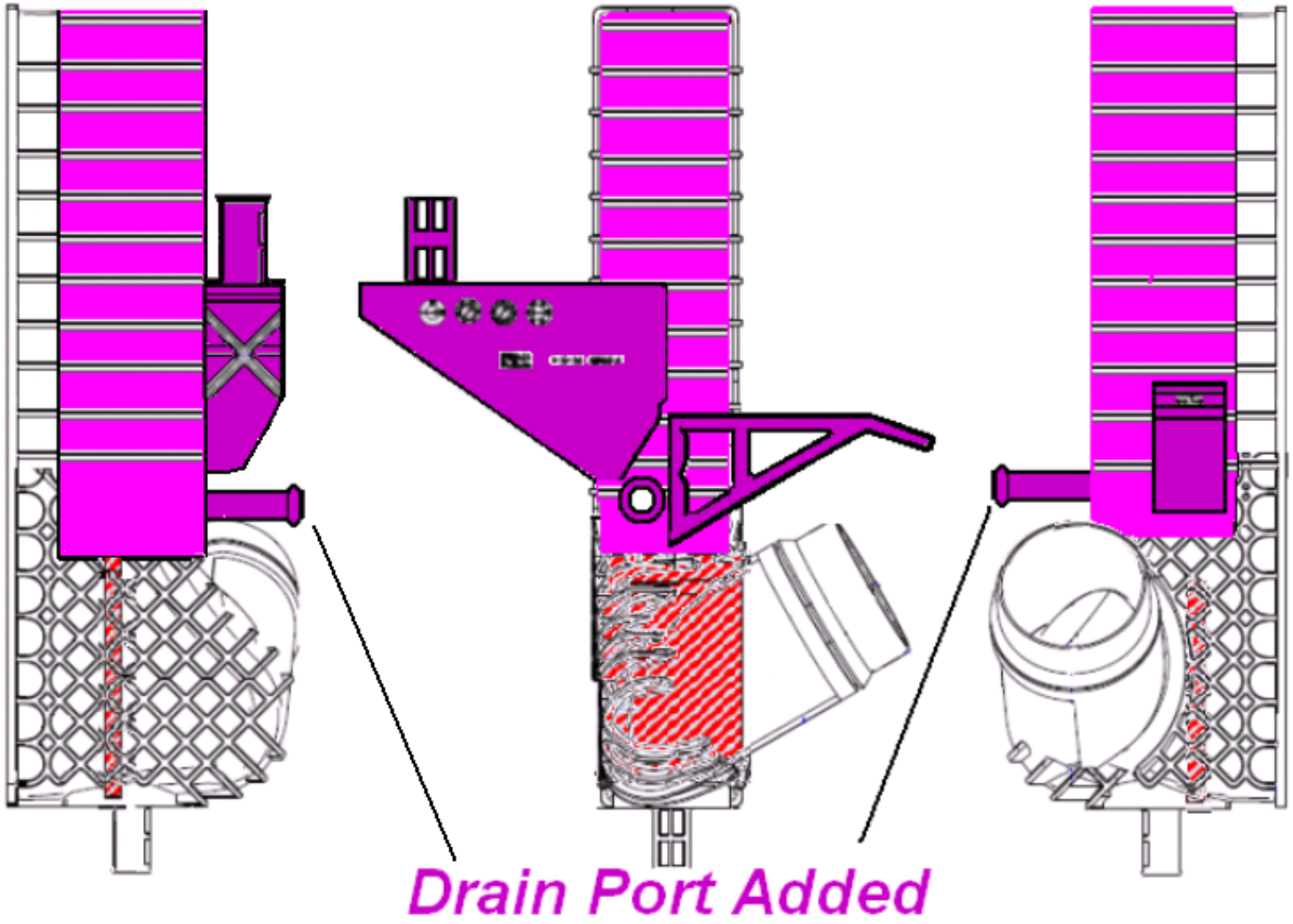
View of tank with section removed



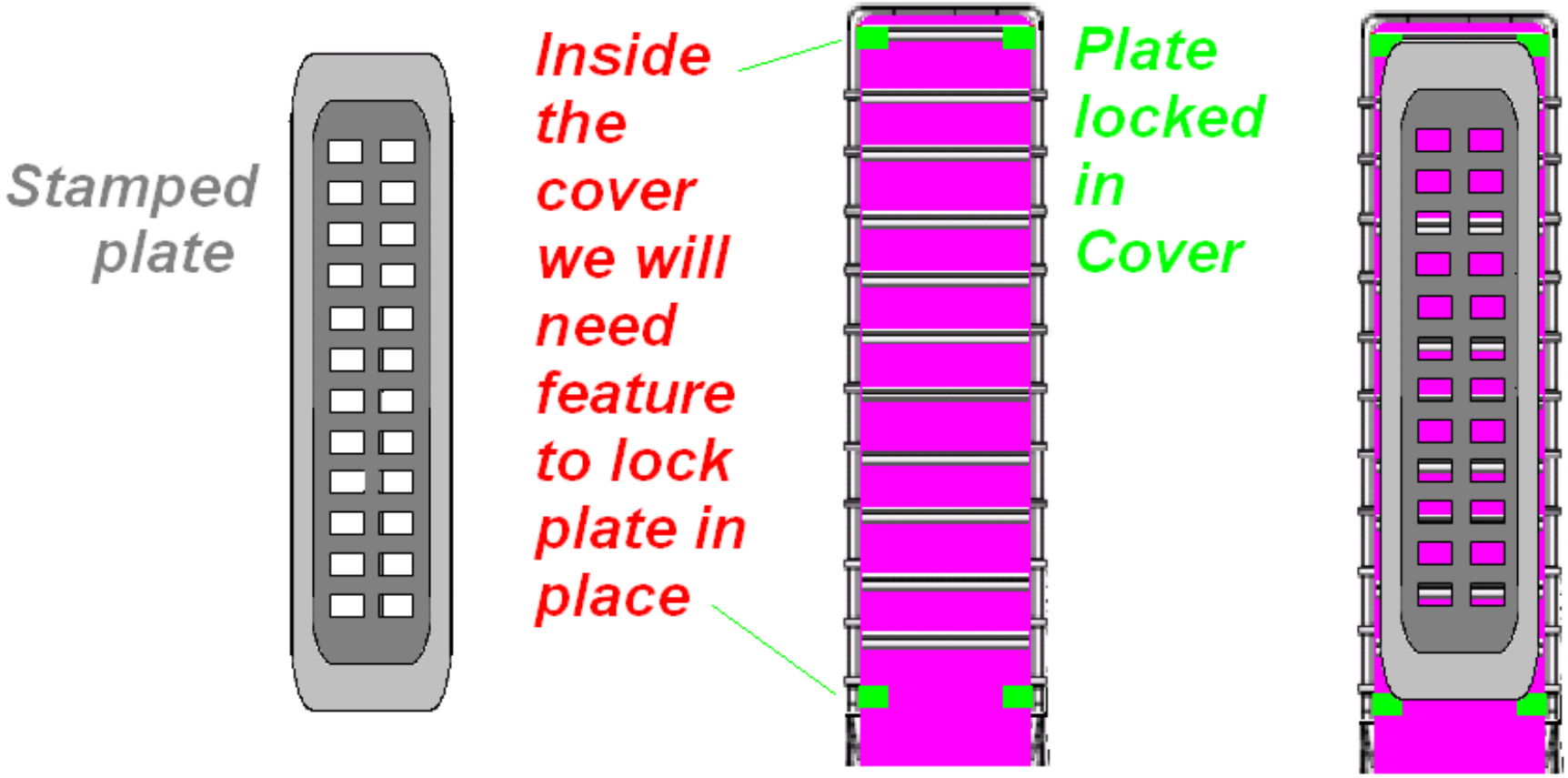
This option would require an additional plate added to this part



A new tank cover is required with features that were on the original tank (Pin / Support / Clip) and a drain port.



The new cover will need a feature to lock a stamped plate into it as shown. Once the plate is installed the cover will be vibration welded to the modified tank



From: Huang, Larry (L,.)
Sent: Wednesday, February 22, 2012 6:42 AM
To: Kramer, Michael (M.T.); Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Allan, Valerie (V.J.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Alright, Valeo proposed "Drain-Cock Tube Insert" idea to avoid assembly/sealing issue, shown on the 1st slide in attached file. If this idea works, it makes the tank revision simpler, like one for radiator drain cock. That make "tube-into-tank" easier.

P415 CAC Tank Revision Proposa...

From the meeting yesterday, Option I ("to-be-tested" port location) still has hard issues on tooling. The proposed revision of Option I is to insert the tube through the wall from engine side and at a higher position, but the tube tip will reach to the point where Jim Palm's is testing, shown on Slide 1. The issue is that the tank wall shape is complicated there, and the tank revision is much more difficult than other two Alternative proposals.

Alternative II and III can let the tube tip to the real lowest point (close to the header), and are relatively easier to tool. But Alternative II may have the conflict to EBPV for 2013, and Alternative III needs to see study the constrain from the bracket and tie bar.

Valeo is going to bring back their studies on all three proposals above to the meeting this afternoon. By the way, they also reported the progress on "water perforation baffle" design, as attached.

P415 Option # 2 changes to cur...

Palm,
Would you please let us know if you have any concern on the proposals discussed above (and shown in the attached file), in terms of "effectiveness of draining water away"?

Thank you all

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Tuesday, February 21, 2012 9:31 AM
To: Kramer, Michael (M.T.)
Cc: Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

That is a good question. With a bent tubing, assembly is a chanllege job. Let's discuss it with Valeo this afternoon.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Kramer, Michael (M.T.)
Sent: Tuesday, February 21, 2012 9:27 AM
To: Huang, Larry (L,.)
Cc: Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

How going to get the tube through/sealed to the TOC like fitting?

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190
Text Page: mkramer1
Page from outside Ford, External email: mkramer1@ford.com

From: Huang, Larry (L,.)
Sent: Tuesday, February 21, 2012 9:16 AM
To: Kramer, Michael (M.T.)
Cc: Palm, Jim (J.R.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Yes, all CAD images showing the port locations are in vehicle position (orientation). Yes, "ease tooling" is the biggest factor to consider to keep the "tube-into-tank" proposal, "Alt II". Considering the port close to header, Valeo suggested to us TOC-like fitting, to make the port location more flexible. The challenge is how to assemble the "bent" tube, before or after crimp (likely after)? We will discuss more this afternoon. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Kramer, Michael (M.T.)
Sent: Tuesday, February 21, 2012 9:03 AM
To: Palm, Jim (J.R.); Kramer, Michael (M.T.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Huang, Larry (L,.)
Subject: FW: P415 CAC Design Change Options, Timing, and Cost

1) Is the port location being determined by vehicle package, ease of tooling mods, or both?

2) Regarding alternative II, any ideas on how to make other than Bob in his garage …….

Mike Kramer
RWD PT Cooling Supv.
Six Sigma Black Belt
Cell Phone: (313) 805-0190

From: Huang, Larry (L,.)
Sent: Monday, February 20, 2012 6:10 PM
To: Palm, Jim (J.R.); Kramer, Michael (M.T.); Ladd, John (J.R.); Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Palm,
Discussed the proposed drain-port location, which matches your testing location, with Valeo in the meeting today. They may only be able to locate port close to the engine side of the tank, and the position would be significantly higher than what you are going to test out (the lowest point, closer to the grill side). I asked them to work with their tank tool supplier further, to see if this port location is doable in terms of tooling, no matter how difficult it would be.
<< Message: CONCEPT REVIEW - P415 Molded Pipe at >>

Valeo suggested to stay with the tube-into-tank idea, which we discussed last Friday, but to use a fitting (like those used in-radiator-tank TOC) to hold a metal tube. The tank tool revision may only needs a couple of weeks. I think the "tube-into-tank" idea might be more flexible (and easier) in terms of the tool revision, since it would only need a flat area on the tank, see "Alternative II" in the attached file. Plus, "upper ward sucking" would be more robust to the debris or oil, (downward drain hole with 2mm ID might be vulnerable to the debris and oil).

<< File: P415 CAC Tank Revision Proposals _022012-b.ppt >>
Bob Meyer suggested a "transverse drain port", see "Alternative III" in the attached file.

Palm,
Would you take a look at the alternative II and III, to see if they work? We will have the meeting 2:30pm with Valeo, and would like to have your input by then. Thanks.

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Monday, February 20, 2012 12:45 PM
To: Tyler, Jim (J.S.); Meyer, Robert (R.H.); Palm, Jim (J.R.); Kramer, Michael (M.T.); Ladd, John (J.R.); Andersen, Erik (E.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

To ensure the CAC design revision proposal to match the development testing, Jim sketched his testing hardware configuration, as attached. Correspondingly, I just updated the CAC design change proposal as attached, to be discussed in the meeting with Valeo this afternoon. Please take a look at both files and provide input before or during the meeting. Thanks.

<< File: Water Drain System_Palm_022012.pdf.pdf >> << File: P415 CAC Tank Revision Proposals _022012.ppt >>

Regards,

Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617

E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Thursday, February 16, 2012 3:17 PM
To: Satish NADELLA; Joseph LUMETTA; Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Blas-Fernando GUTIERREZ
Cc: Kramer, Michael (M.T.); Ladd, John (J.R.)
Subject: P415 CAC Design Change Options, Timing, and Cost
When: Monday, February 20, 2012 2:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Audio + Webex, Audio Dial 313-621-3673, Meeting ID: 85694781#

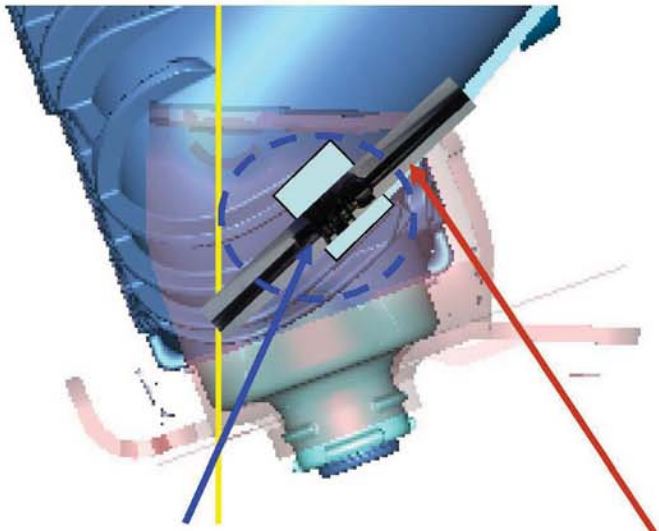
Two options to be discussed:
1) Water-drain port design
2) Water perforation design

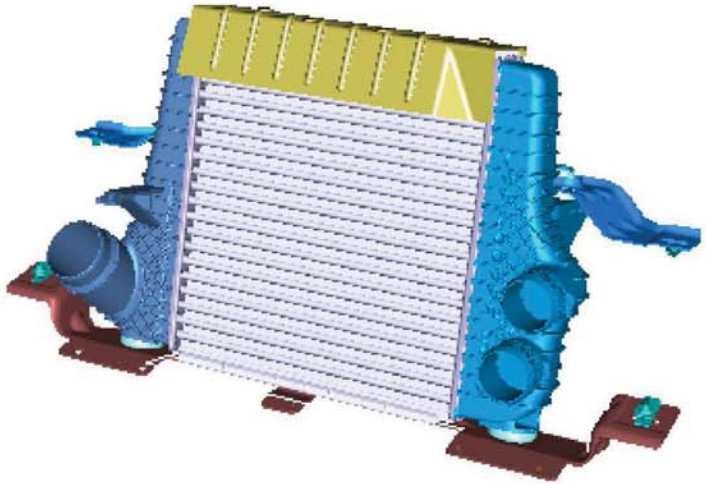
Updated proposals.
<< File: P415 CAC Tank Revision Proposals _021812.ppt >> << File: P415 Charge Air Cooler Drain Port Proposal.doc >>

Webex Link:
==========
Online Meeting Summary
==========
TOPIC: Webex Meeting
Meeting Link: https://ford.webex.com/ford/j.php?ED=171093662&UID=483694722&RT=MiMxMQ%3D%3D
DATE: Monday, February 20, 2012
TIME: 2:00 pm, Eastern Standard Time (New York, GMT-05:00)
MEETING NUMBER: 713 836 927
PASSWORD: (This meeting does not require a password.)
HOST KEY: 691567
Audio: %TeleconferencingInfo%

%TeleconferencingInfoAttendee%

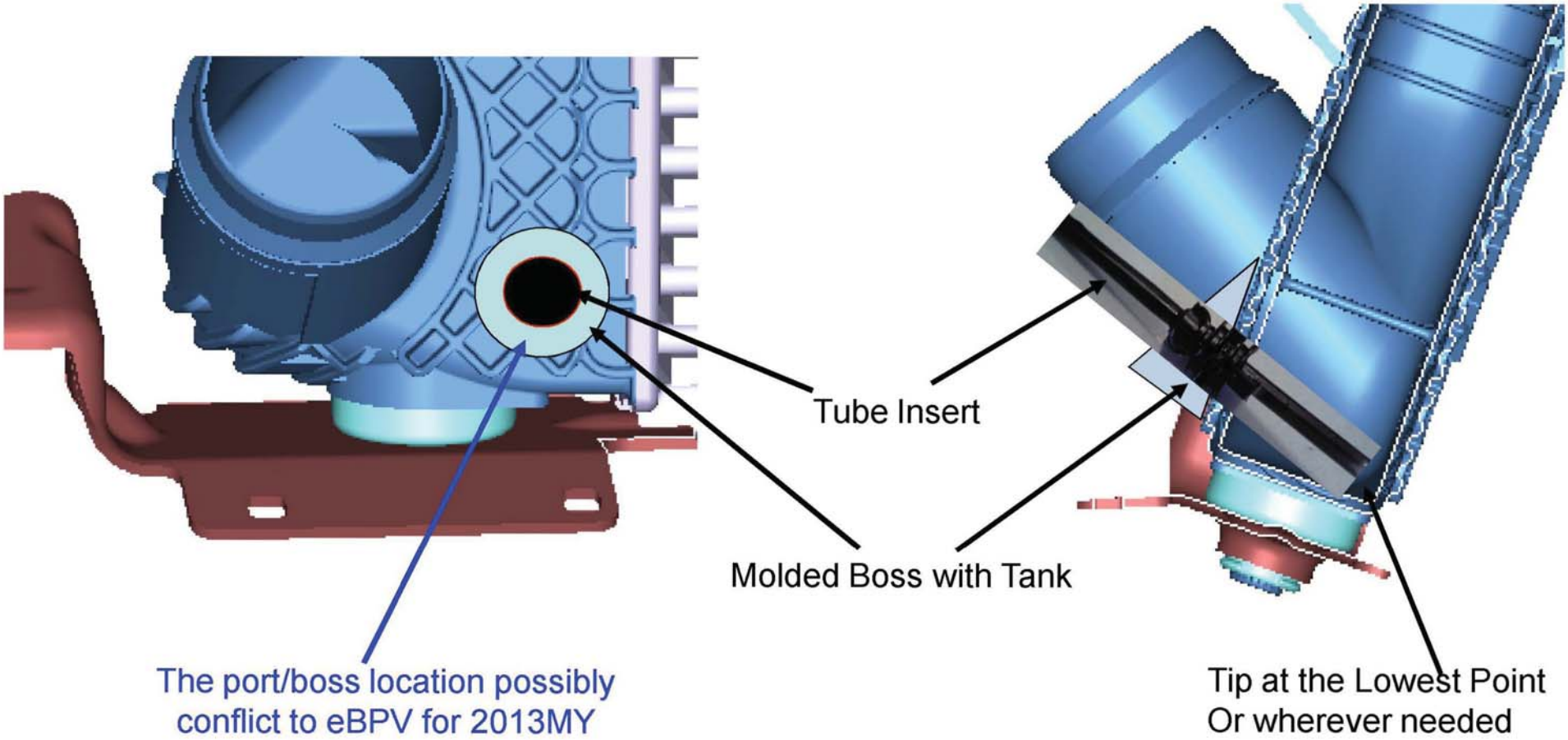
P415 CAC Outlet Tank Design Change
Revised Option I -- Adding Vacuum-Drained Port





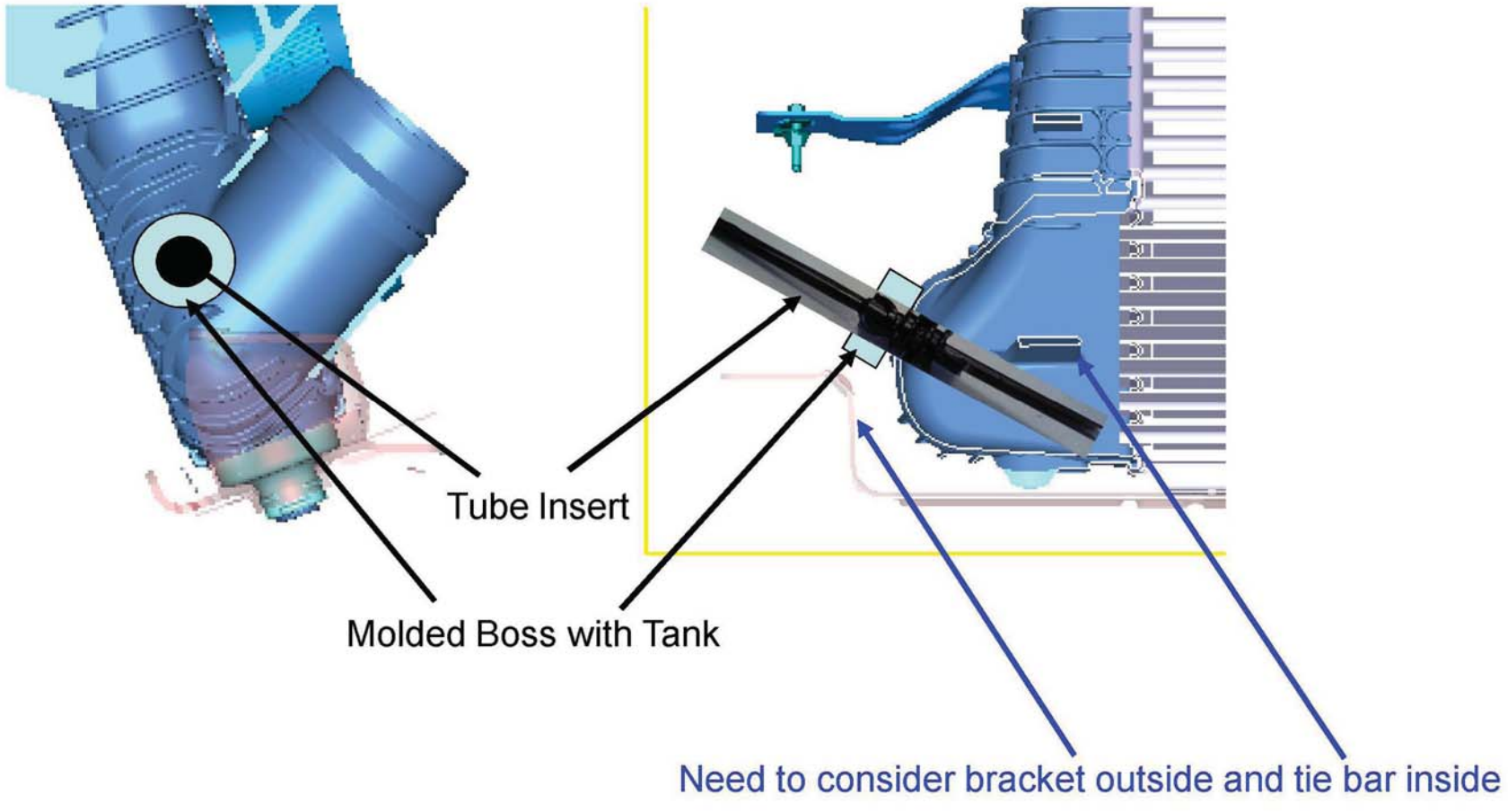
Tank wall in this are needs to be reshaped,
for tube to pass through tank wall here

Vacuum-Drained Port
Alternative II – Tube with Fitting



PE13-018 031174

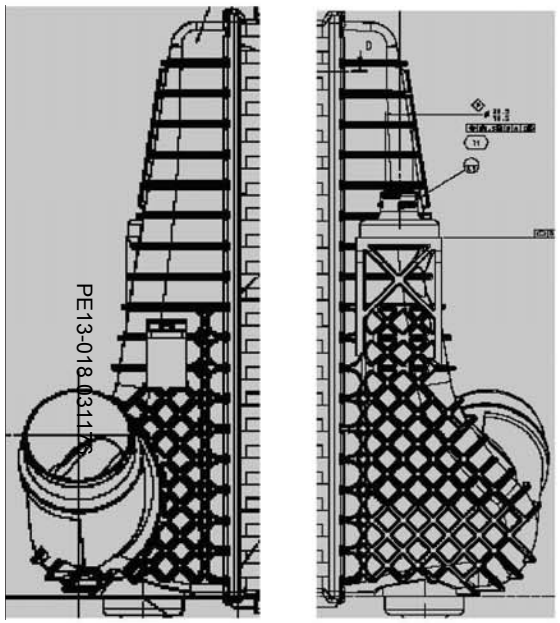
Vacuum-Drained Port
Alternative III – Transverse Drain Port

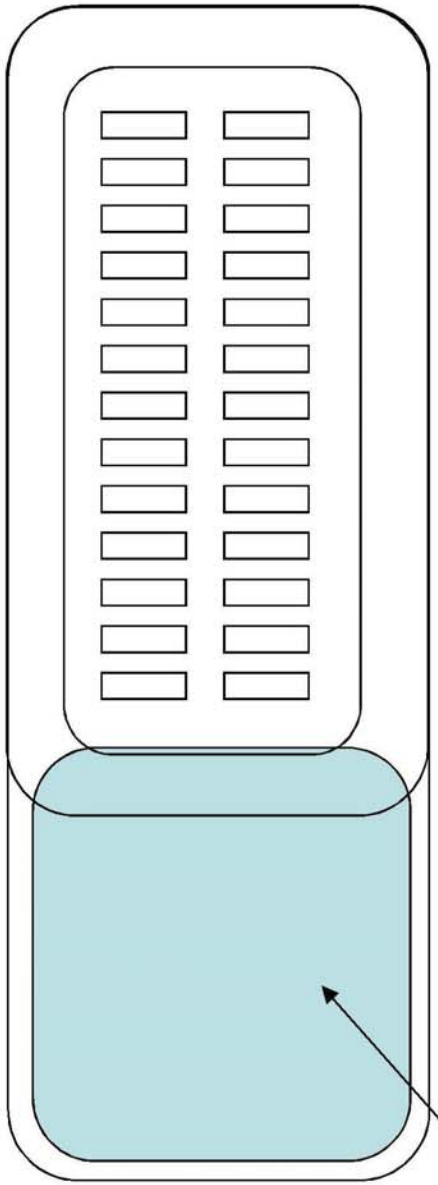


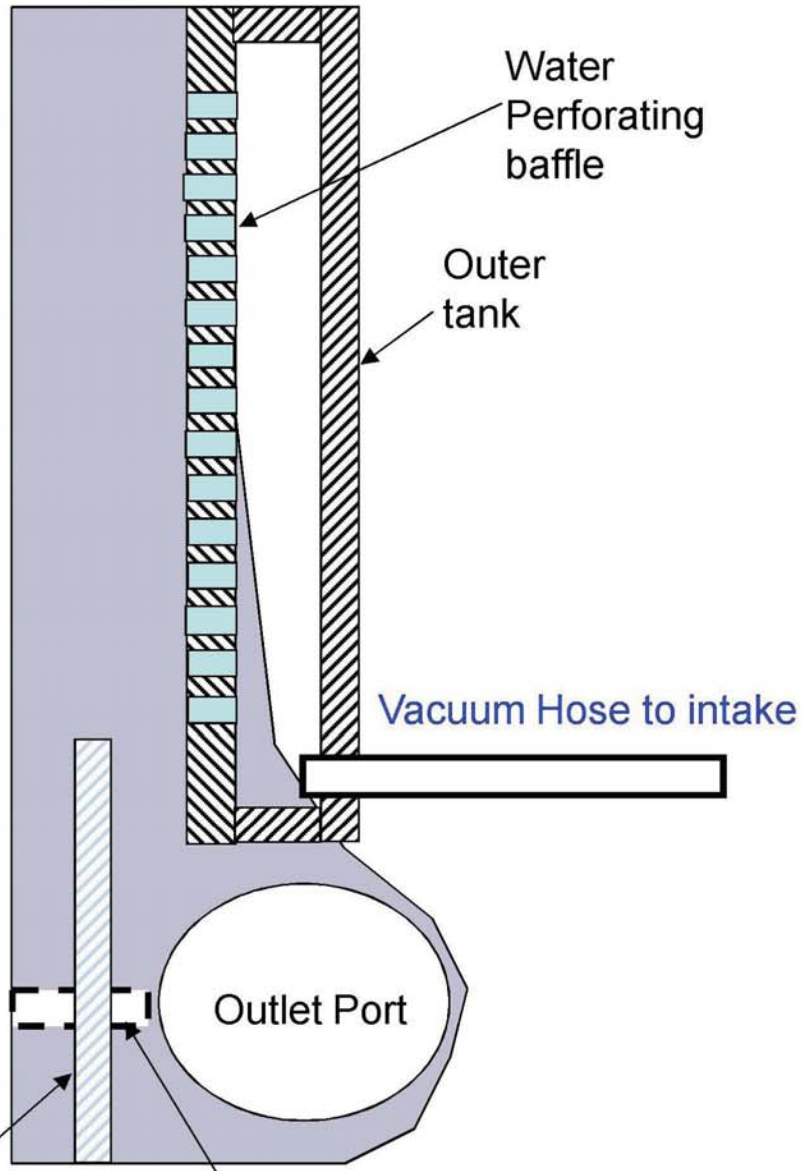
P415 CAC Tank Revision, Water Perforating, Option II

Fasteners

Current P415 CAC Outlet Tank

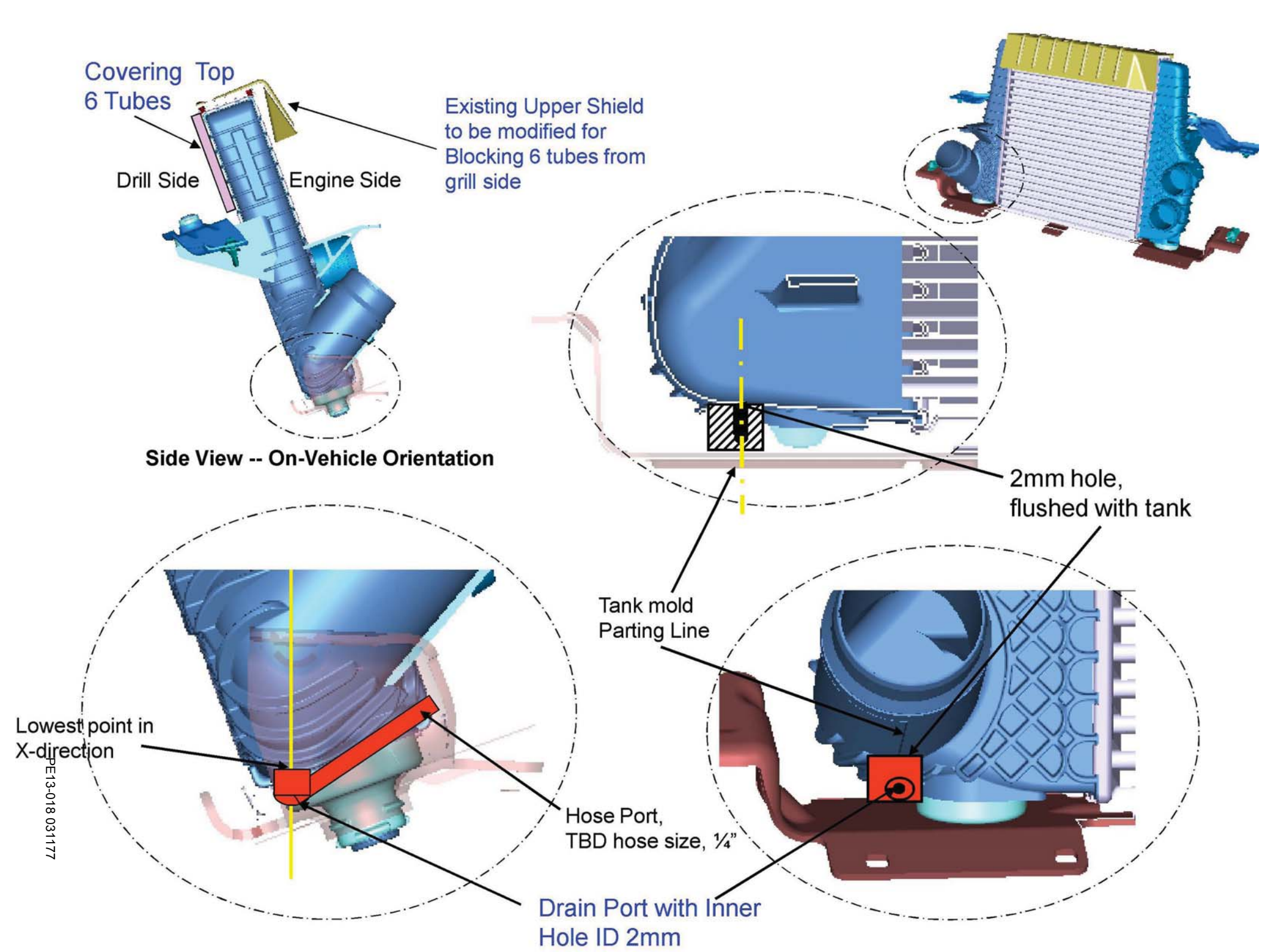




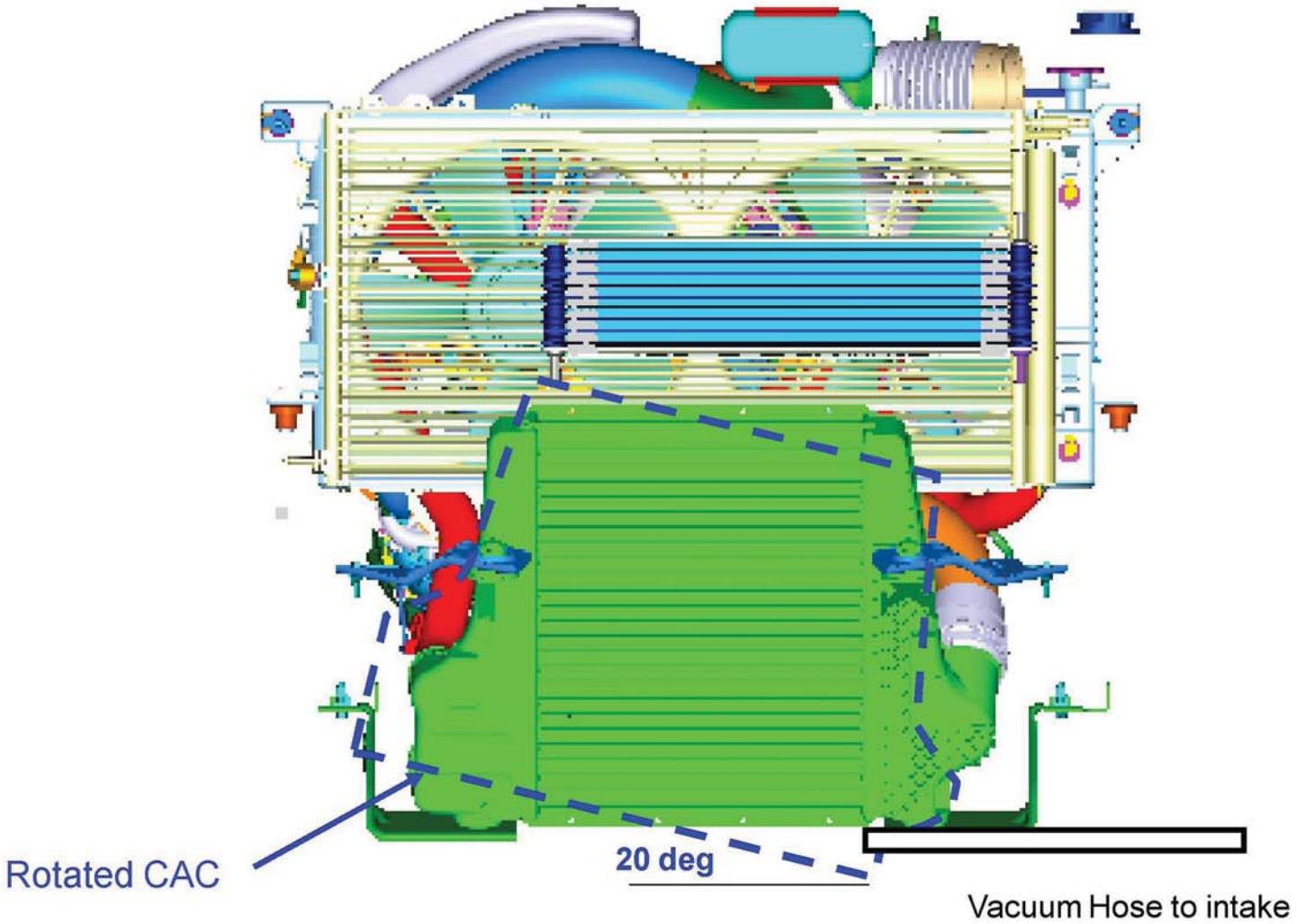


Water
Blocking
baffle

Current
Tie Bar

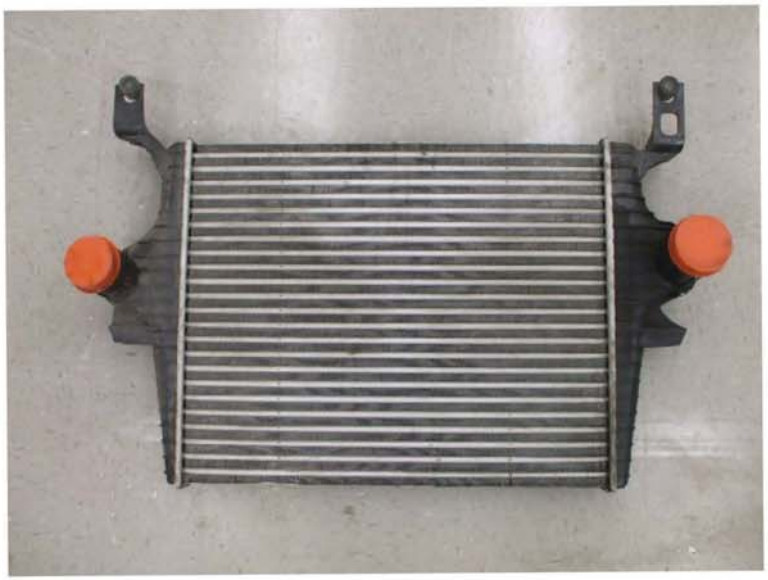

Covering Top
6 Tubes
Existing Upper Shield
to be modified for
Blocking 6 tubes from
grill side
Drill Side
Engine Side
Side View -- On-Vehicle Orientation
2mm hole,
flushed with tank
Tank mold
Parting Line
Lowest point in
X-direction
Hose Port,
TBD hose size, ¼"
Drain Port with Inner
Hole ID 2mm
PE13-018 031177

P415, Proposal for Rotating CAC + Vacuum Tube

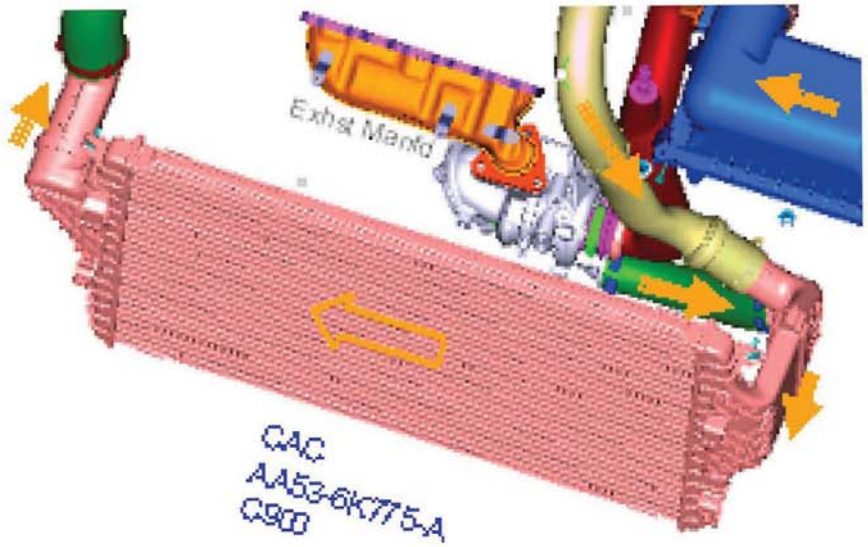


PE13-018 031178

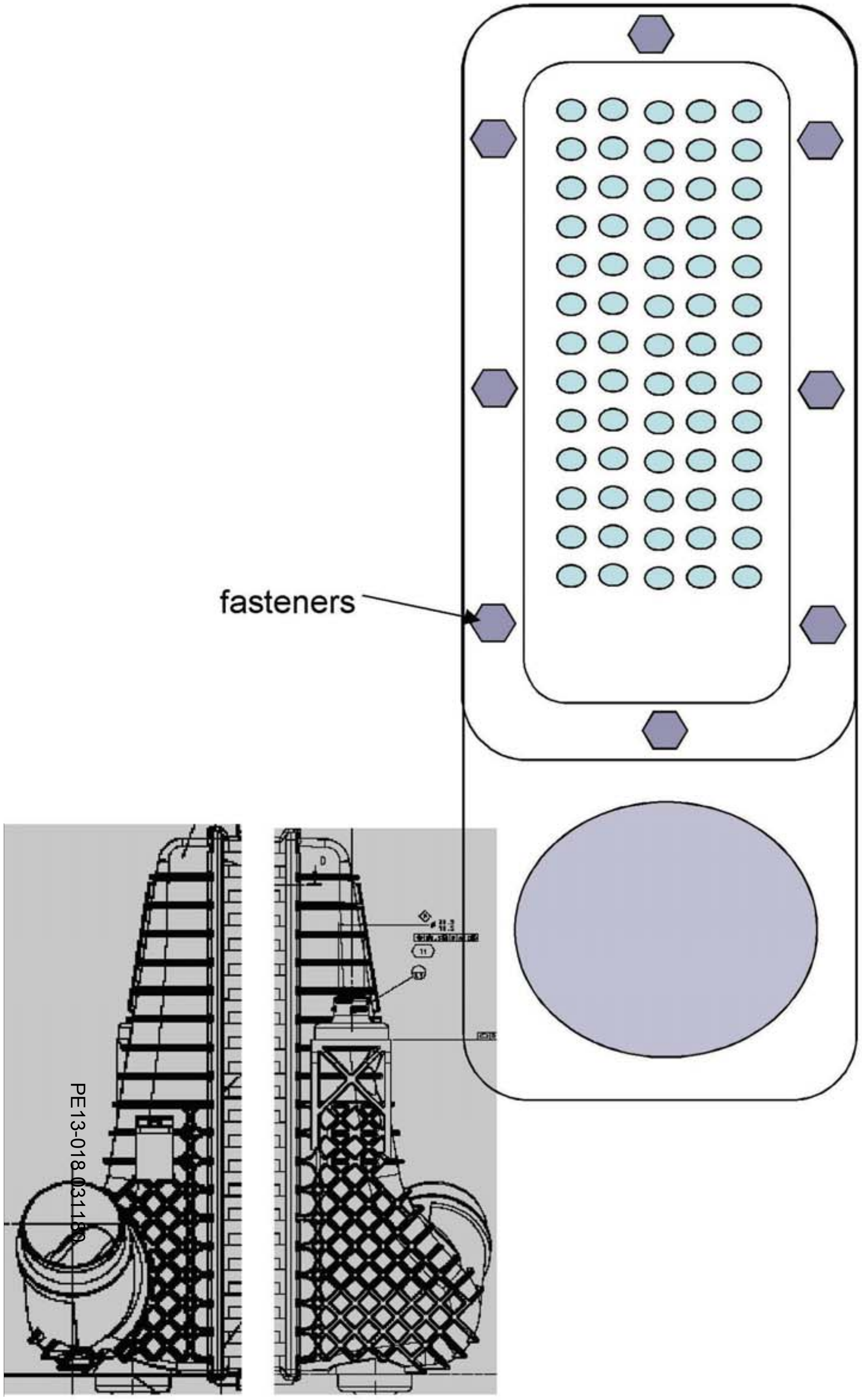
P131 6.0 Diesel CAC

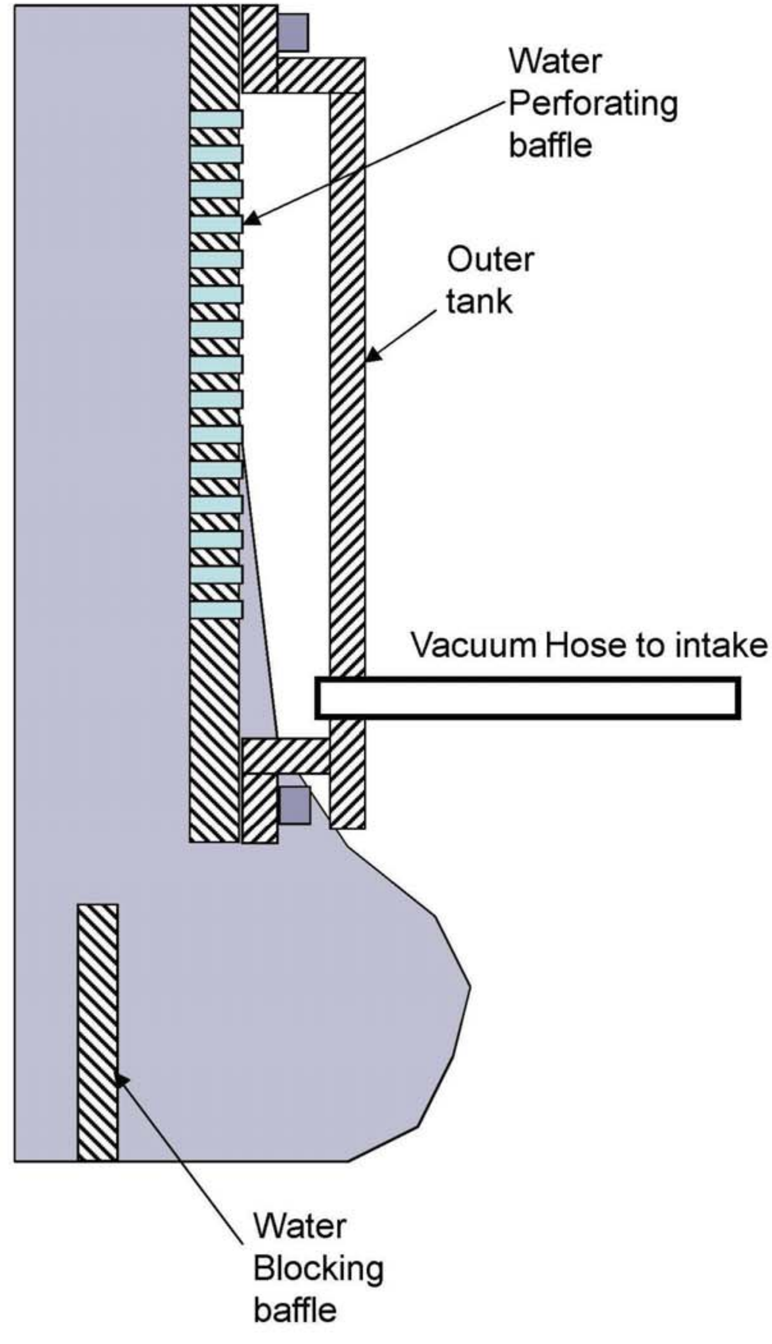


D3 3.5L GTDI CAC

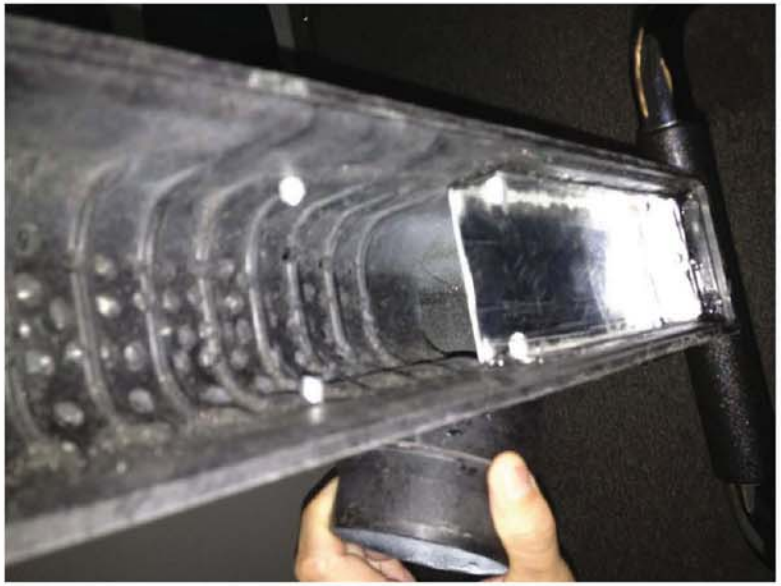


P415 CAC Tank Revision, Water Perforating, Collecting, and Sucking to Intake





Modified and Tested CAC, with perforating baffle



PE13-018 031181

TITLE & DESCRIPTION

CAC 57MA OUTLET TANK

VALEO PART No

M154498

PROGRAM

P415 GTDI

COMPANY

FORD

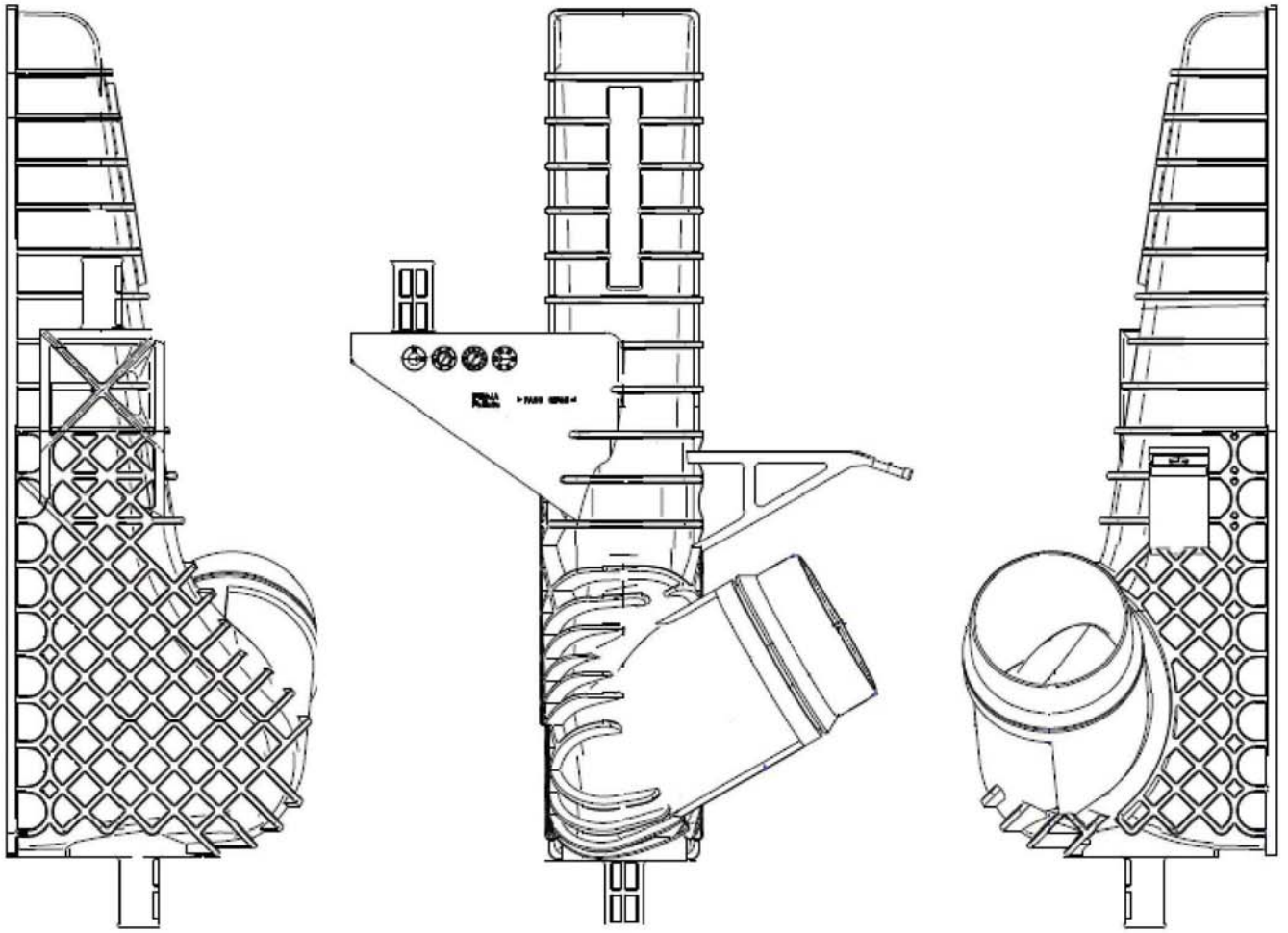
VALEO DRAWING No

100037845

REV

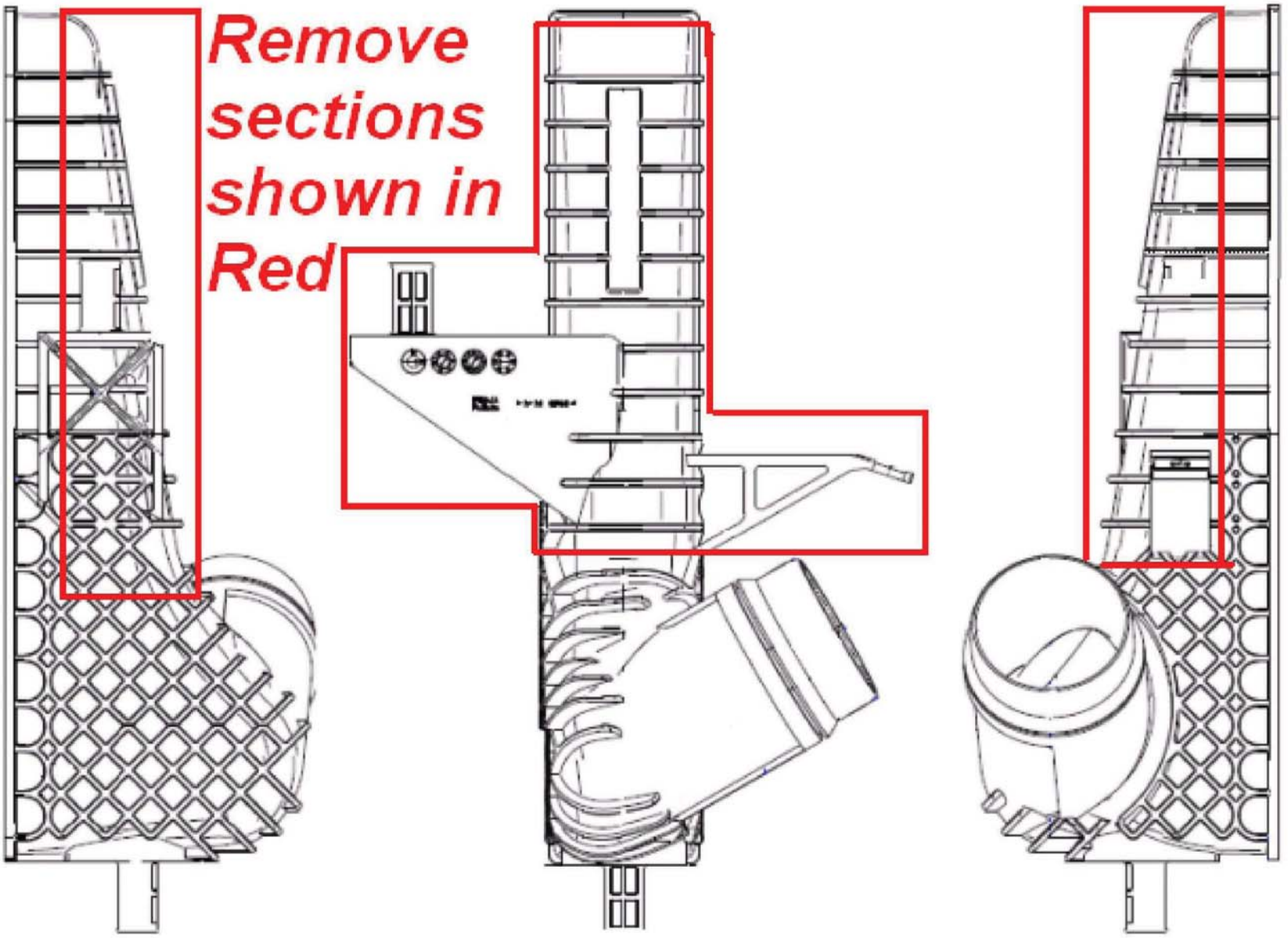
C

View of Current Part



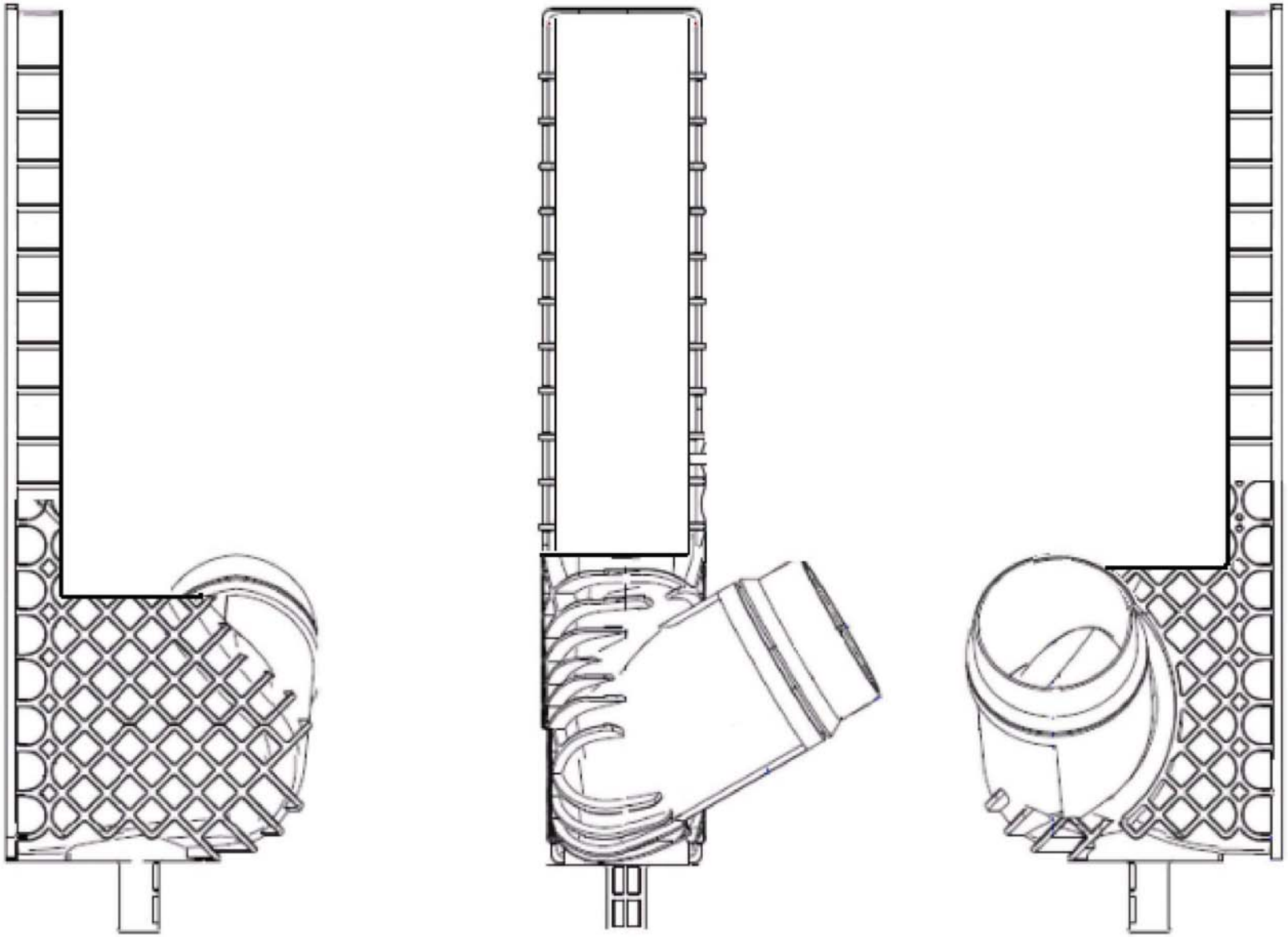
PE13-018 031182

This option would require the removal of the section shown in red. Note the features such as (supports and clips) required by other components.



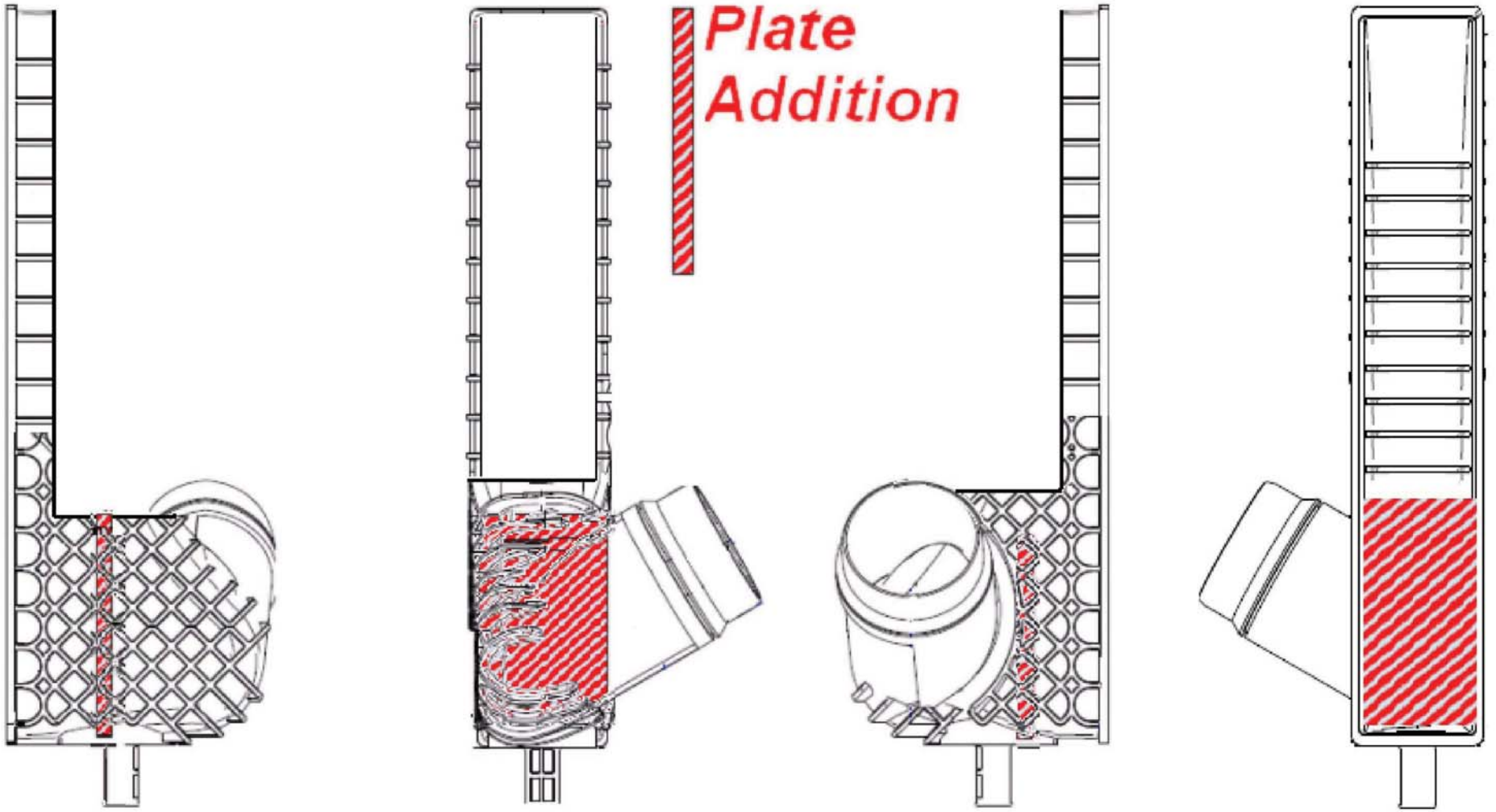
PE13-018 031183

View of tank with section removed



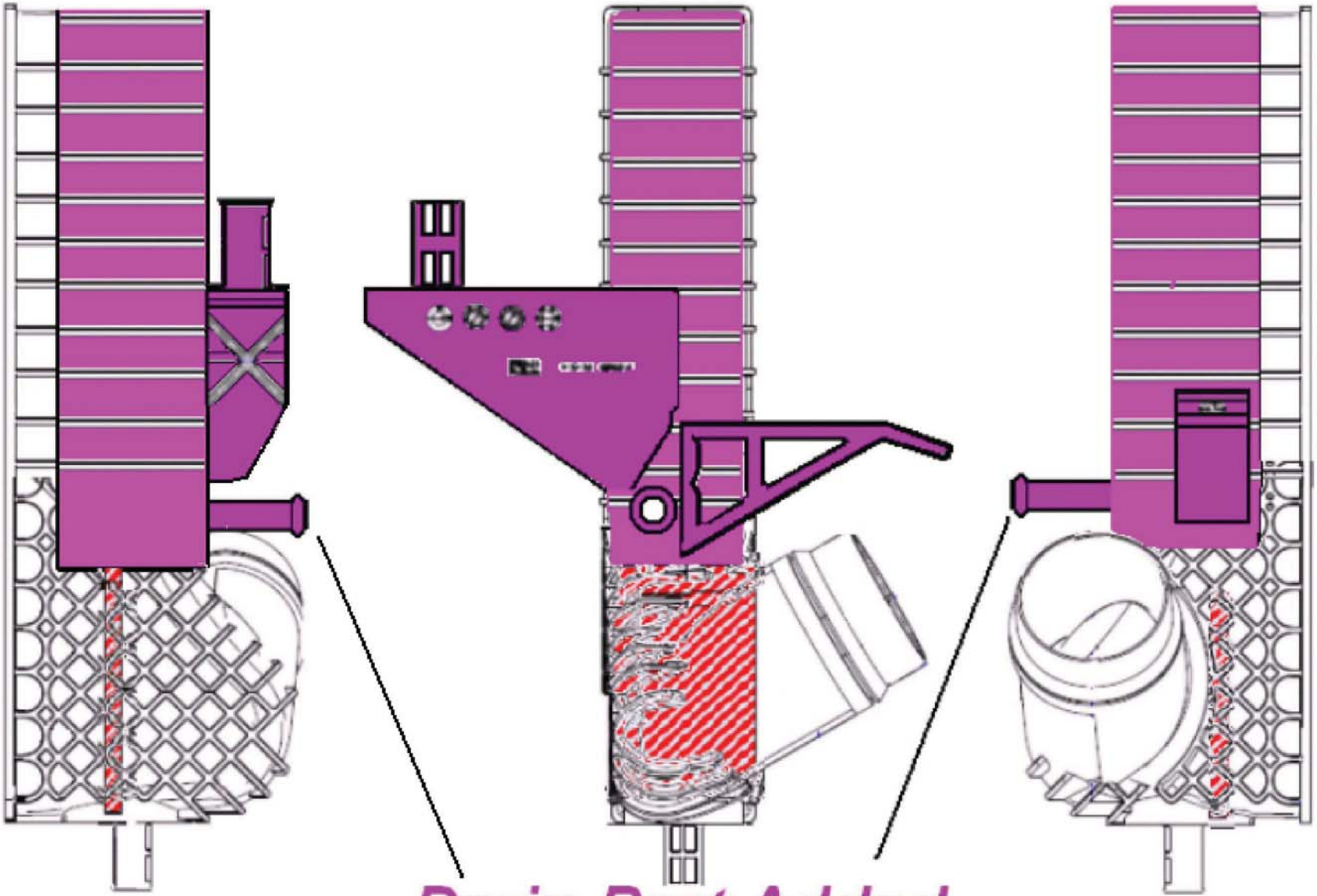
PE13-018 031184

This option would require an additional plate added to this part



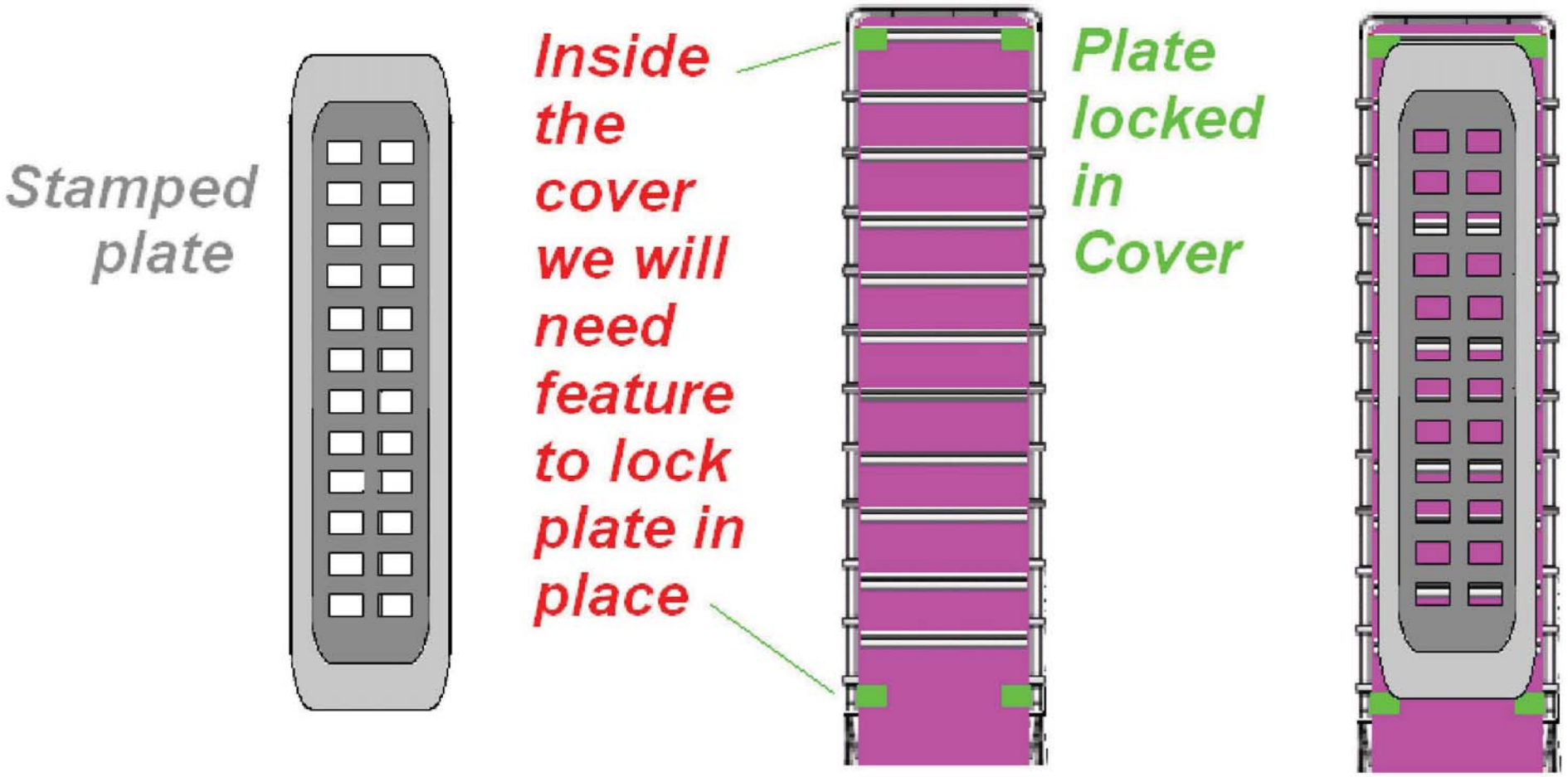
PE13-018 031185

A new tank cover is required with features that were on the original tank (Pin / Support / Clip) and a drain port.



PE13-018 031186

The new cover will need a feature to lock a stamped plate into it as shown. Once the plate is installed the cover will be vibration welded to the modified tank



PE13-018 031187

Valeo

Presentation title

Name of Speaker - Function

PE13-018 031188

Version xx – Month xx, Year

valeo added

Always place client logo on the right hand corner with a maximum size equivalent to the Valeo logo

Title: Arial, black, 40 pt

Subtitle: Arial, black, 24 pt

Date: Arial, black, bold, 14 pt

PE13-018 031189

valeo added

Ut la augiam am irilisci tat, vent alit
Ut doloboreet accummy

- **Tet venim del eum ad ming esto odolorem volore**
  - Commodigna faccum verci et
  - nulluptate modigna am
- **Mincidunt ut volobor eriliquat**
  - Duis aute commy
  - Ut doloboreet accummy
  - Ut la augiam am irilisci tat, vent alit

Take away message so that you understand what I mean to say

PE13-018 031190

Title: Arial 26pt Bold, in black
Sub-title: Arial 22pt

- **Text: Arial 22pt Bold**
  - Arial 18pt, black
    - Arial 16pt, grey

- **Bottom area elements (from left to right):**
  - valeo added stamp
  - Date:
    - To update, go into "Affichage" then "En-tête et pied de page" and select your preference
    - Arial 10pt, Grey is determinated in the color palette R128 V128 B128
  - Slide number: Green is determinated in the color palette R130 V230 B0
  - Valeo logo

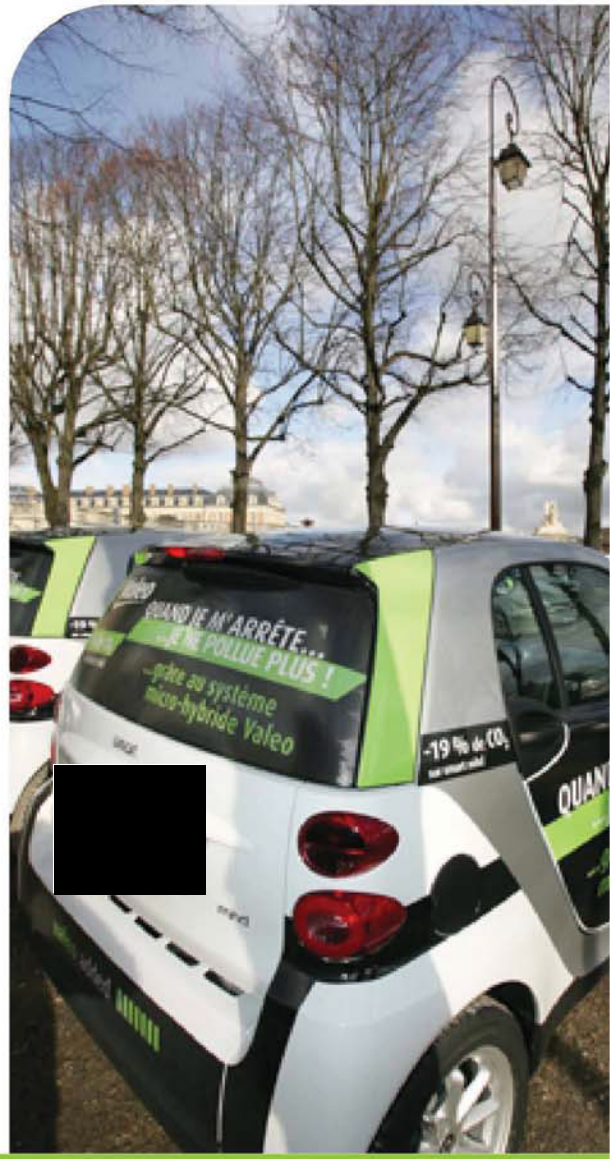
Arial is the recommended font throughout the presentation (22 pt, white)

PE13-018 031191

Always place client logo on the right bottom corner, equidistant from the grey line, with a maximum height equivalent to the Valeo logo.

Slide example of text with photo

- **Tet venim del eum ad ming esto odolorem volore**
- **Commodigna faccum verci et, vero od tio dolor iniatInnovation gains market traction**
- **nostionsecte duis niscinc llam, venissed deleseq isisi.**
- **Duiscil dolorti**
  - ➔ Lorem incilit, quamcon voluptat auguer se corpera
    – alit vel inis digna



PE13-018 031192

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Section title

Subtitle or name of Speaker

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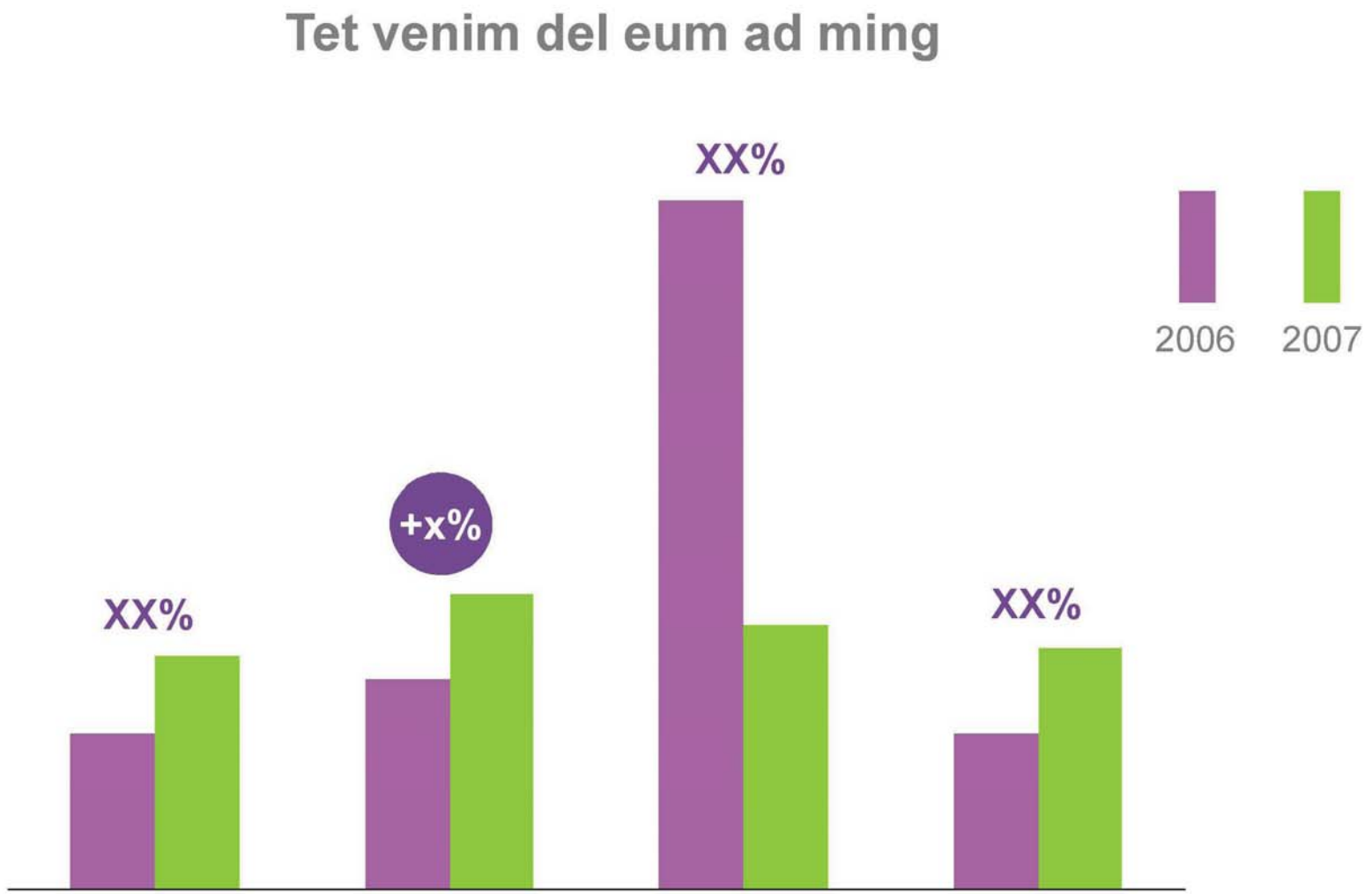
Title: Arial, black, 40 pt

Subtitle: Arial, black, 24 pt

PE13-018 031194

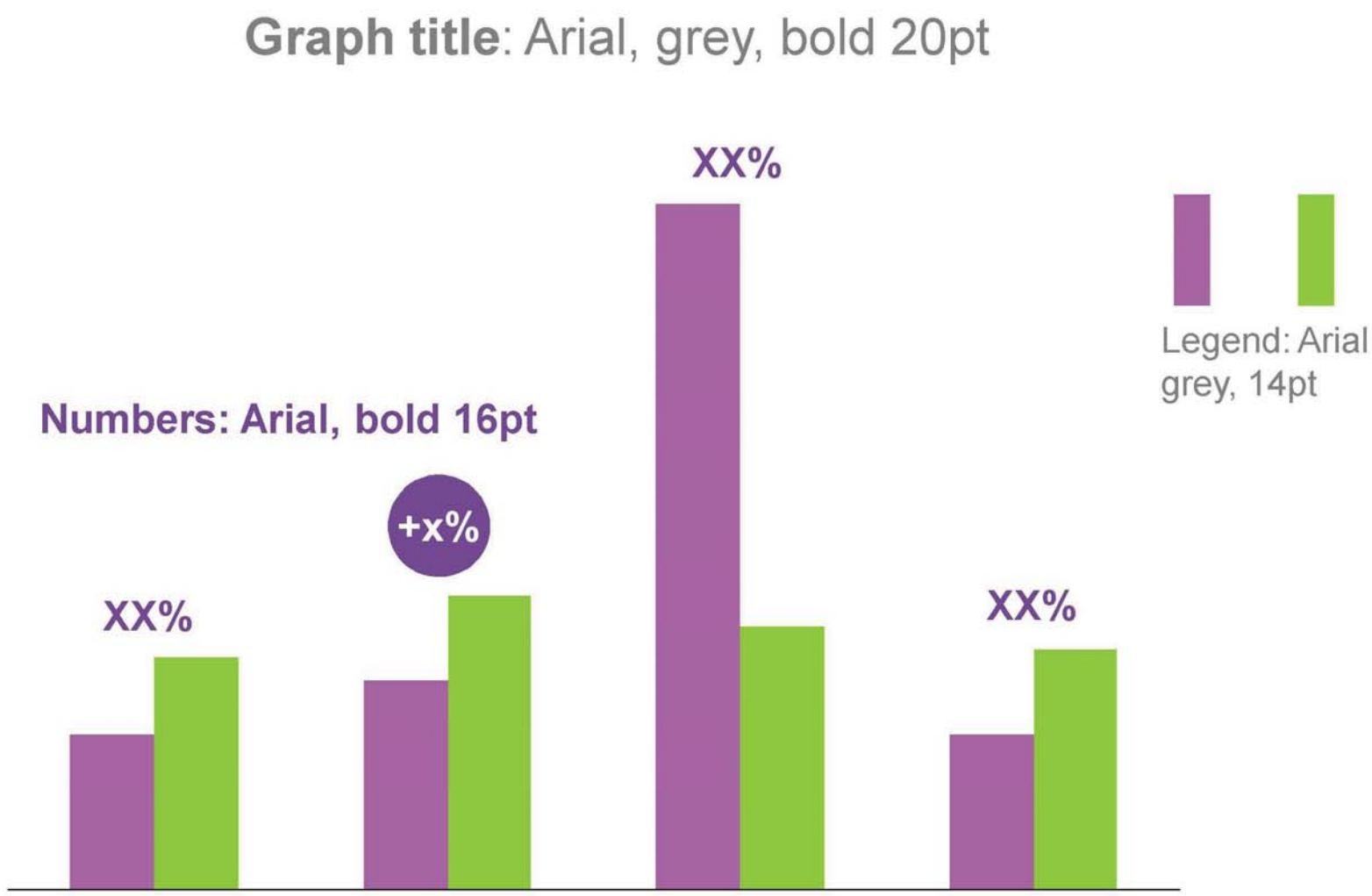
Esto odolorem volore



PE13-018 031195

Always place client logo on the right bottom corner, equidistant from the grey line, with a maximum height equivalent to the Valeo logo.

Title: Arial, black, bold 26pt

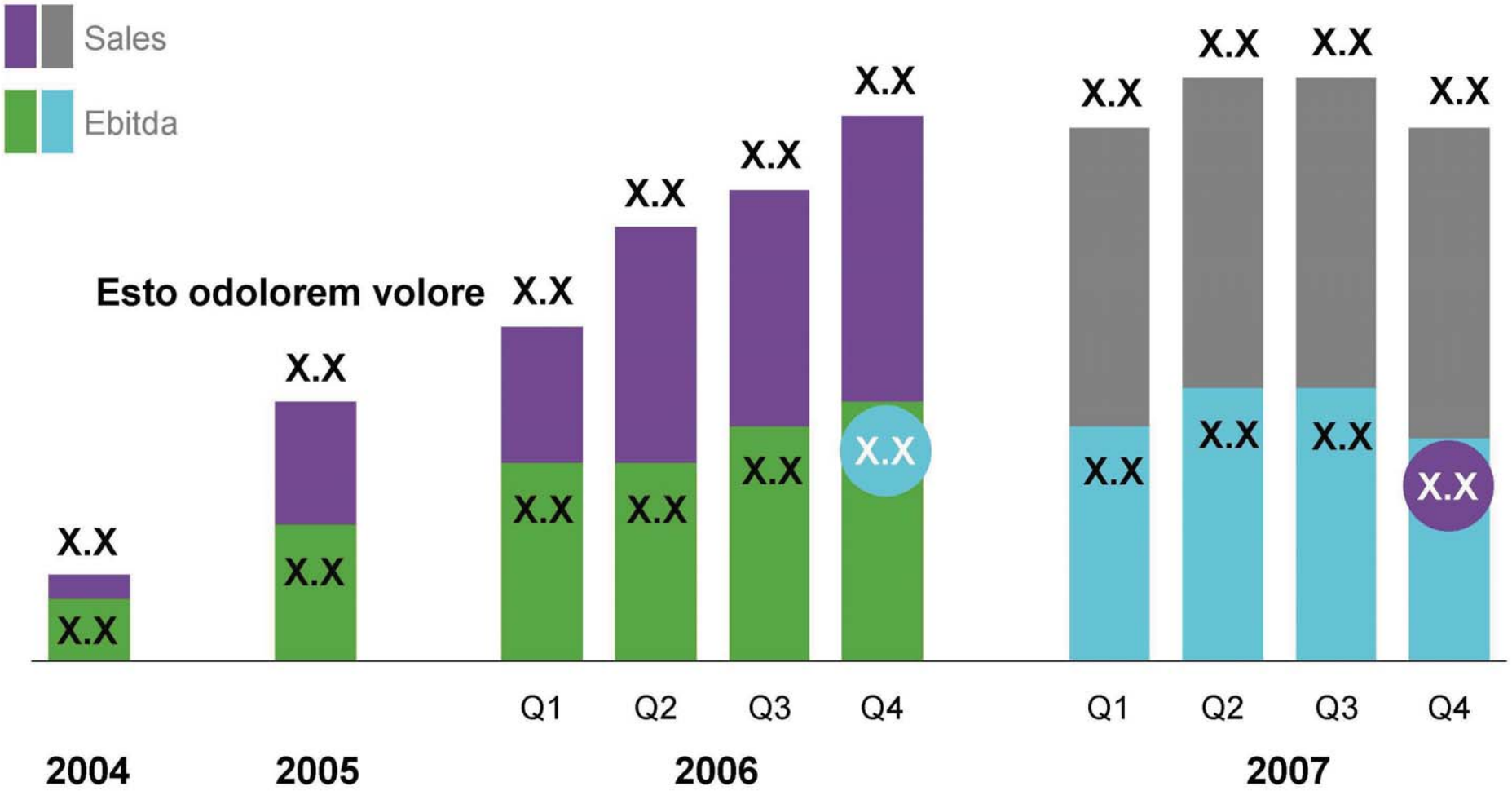


Most important bars in green

PE13-018 031196

Always place client logo on the right bottom corner, equidistant from the grey line, with a maximum height equivalent to the Valeo logo.

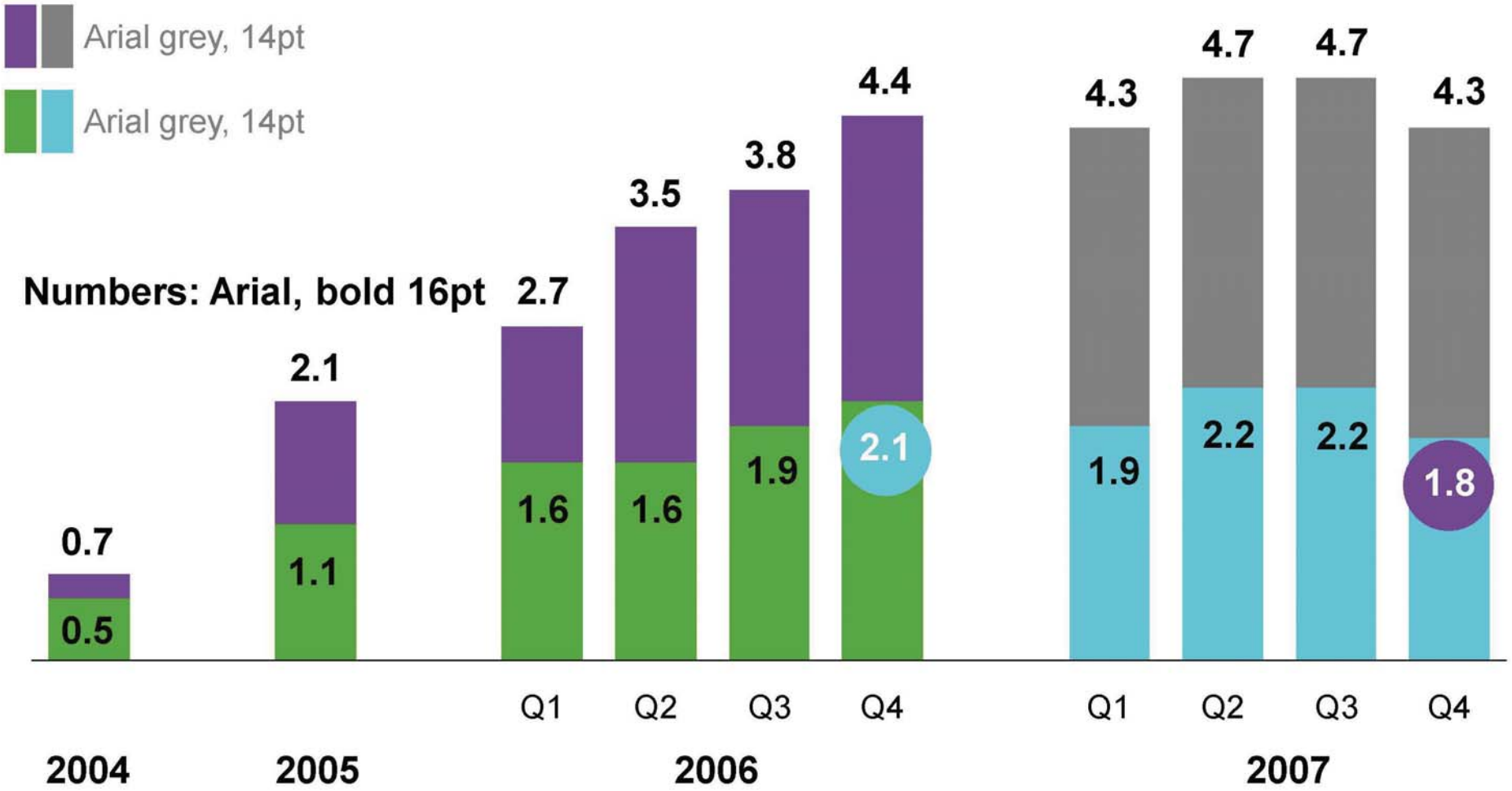
Esto odolorem volore



PE13-018 031197

Always place client logo on the right bottom corner, equidistant from the grey line, with a maximum height equivalent to the Valeo logo.

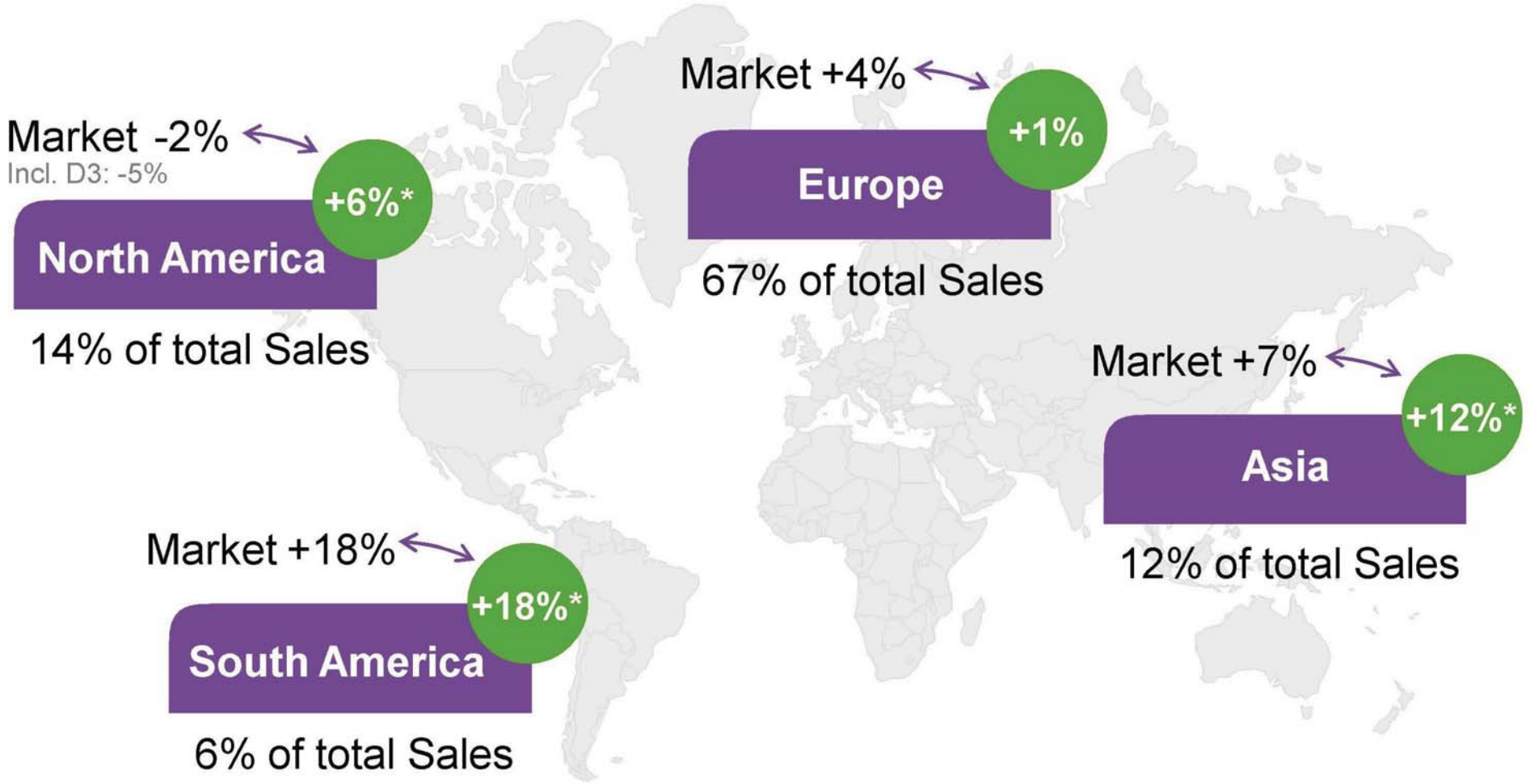
Title: Arial, black, bold 26pt



PE13-018 031198

Always place client logo on the right bottom corner, equidistant from the grey line, with a maximum height equivalent to the Valeo logo.

Map example



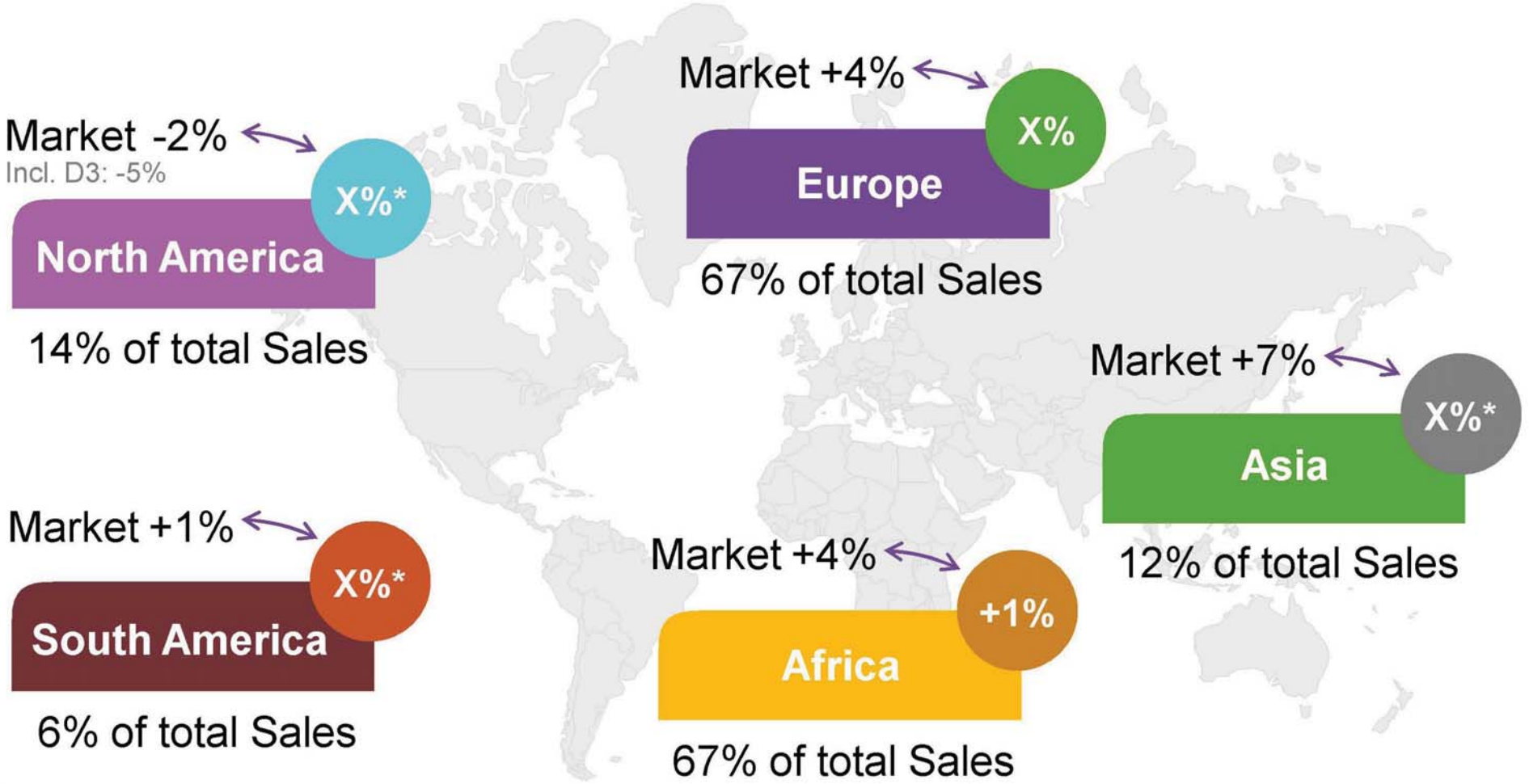
*At same perimeter & exchange rate

PE13-018 031199

Always place client logo on the right bottom corner, equidistant from the grey line, with a maximum height equivalent to the Valeo logo.

Map example with other color combinations

- Copy and paste the color boxes,
- Type text in the text zone
- Map library: see communication home page, map library column



PE13-018 031200

Legend

- Valeo markets/Valeo market shares/Target markets: always in green when compared with other markets

**At same perimeter & exchange rate*

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Table

• Green boxes represent positive result

In euro million	Q4-2007	Q4-2006	*Change*
Total operating revenues*	**2,438**	**2,376**	***+ 2.6%***
Operating income*	**88**	**51**	***+ 72.5%***
as % of total op. revenues	*3.6%*	*2.1%*	*+ 1.5 pt*
Non strategic activities	**(3)**	**42**	***nm***
Net income	**50**	**60**	***- 16.7%***
as % of total op. revenues	*2.1%*	*2.5%*	*- 0.4 pt*

PE13-018 031201

** Excluding the wiring business, sold on December 31, 07, as required by IFRS 5*

Table

• Red boxes represent negative result

In euro million	Q4-2007	Q4-2006	*Change*
Total operating revenues*	**2,438**	**2,376**	***+ 2.6%***
Operating income*	**88**	**51**	***+ 72.5%***
as % of total op. revenues	*3.6%*	*2.1%*	*+ 1.5 pt*
Non strategic activities	**(3)**	**42**	***nm***
Net income	**50**	**60**	***- 16.7%***
as % of total op. revenues	*2.1%*	*2.5%*	*- 0.4 pt*

PE13-018 031202

** Excluding the wiring business, sold on December 31, 07, as required by IFRS 5*

Table
with other color combinations

In euro million	Q4-2007	Q4-2006	*Change*
Total operating revenues*	2,438	2,376	***+ 2.6%***
Operating income*	88	51	***+ 72.5%***
as % of total op. revenues	*3.6%*	*2.1%*	*+ 1.5 pt*
Non strategic activities	(3)	42	***nm***
Net income	50	60	***- 16.7%***
as % of total op. revenues	*2.1%*	*2.5%*	*- 0.4 pt*

PE13-018 031203

** Excluding the wiring business, sold on December 31, 07, as required by IFRS 5*

Table
with other color combinations

In euro million	Q4-2007	Q4-2006	*Change*
Total operating revenues*	2,438	2,376	***+ 2.6%***
Operating income*	88	51	***+ 72.5%***
as % of total op. revenues	*3.6%*	*2.1%*	*+ 1.5 pt*
Non strategic activities	(3)	42	***nm***
Net income	50	60	***- 16.7%***
as % of total op. revenues	*2.1%*	*2.5%*	*- 0.4 pt*

PE13-018 031204

** Excluding the wiring business, sold on December 31, 07, as required by IFRS 5*

Title: Arial 26pt Bold, in black

Table: Arial

Grey italic 16pt	**Bold 18pt**	**Bold 18pt**	***Bold, ital. 18pt***
Black, bold 18pt	**Bold 20pt**	**Bold 20pt**	***Ital. Bold 20pt***
Black, bold 18pt* *Black, italic 18pt*	" *Ital. 18pt*	" *Ital. 18pt*	" *Ital. 18pt*
Black, bold 18pt	"	"	***Ital. Bold 20pt***
Black, bold 18pt *Black, italic 18pt*	" *Ital. 18pt*	" *Ital. 18pt*	" *Ital. 18pt*

PE13-018 031205

- **Note: adapt font sizes according to size of your table without using a smaller size than 14pt**

**Footnote: Arial black, italics, 12 pt*

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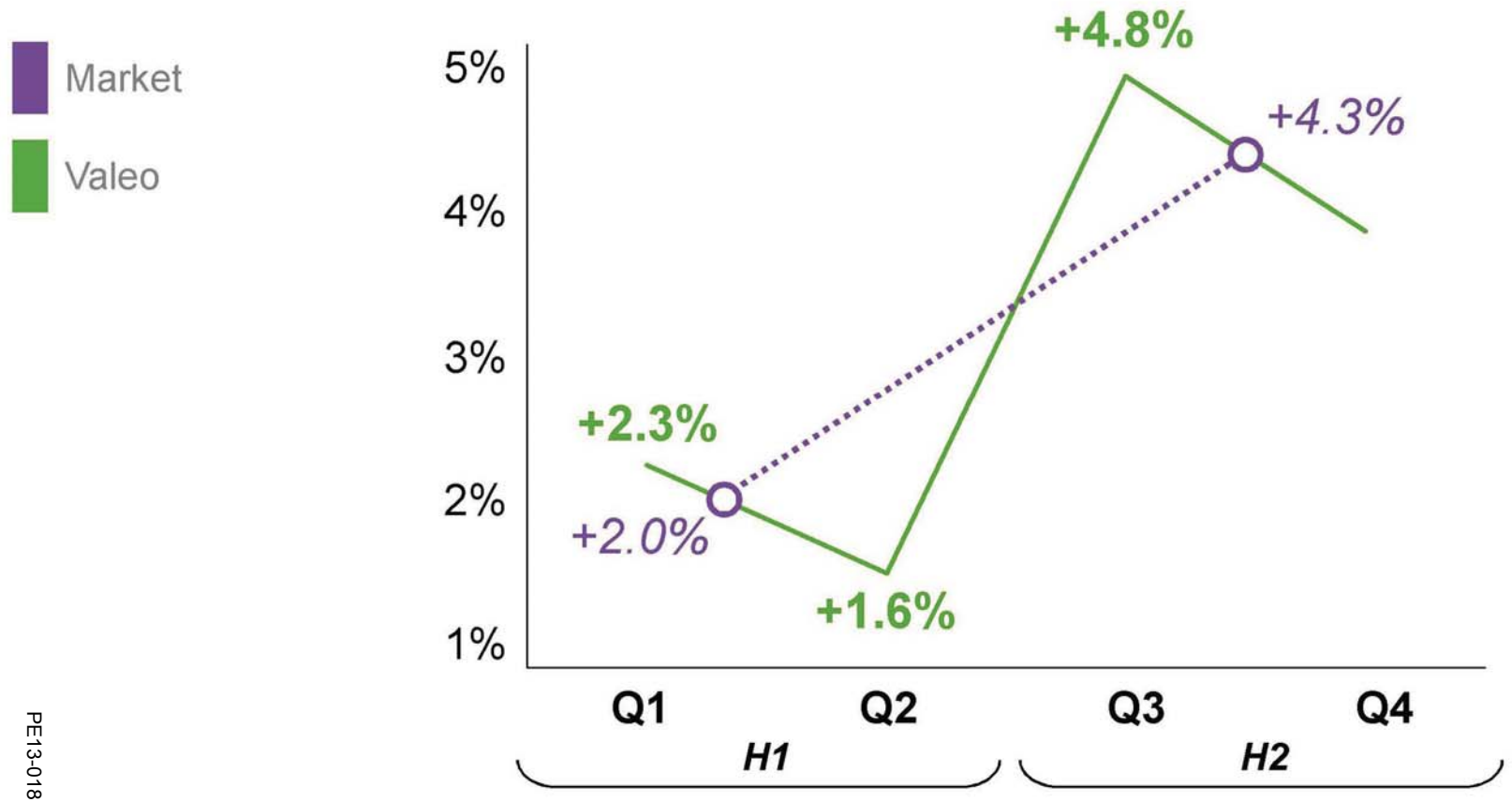
Nostion duis niscinc llam

Commodigna faccum verci
at same perimeter & exchange rate (2007)



PE13-018 031206

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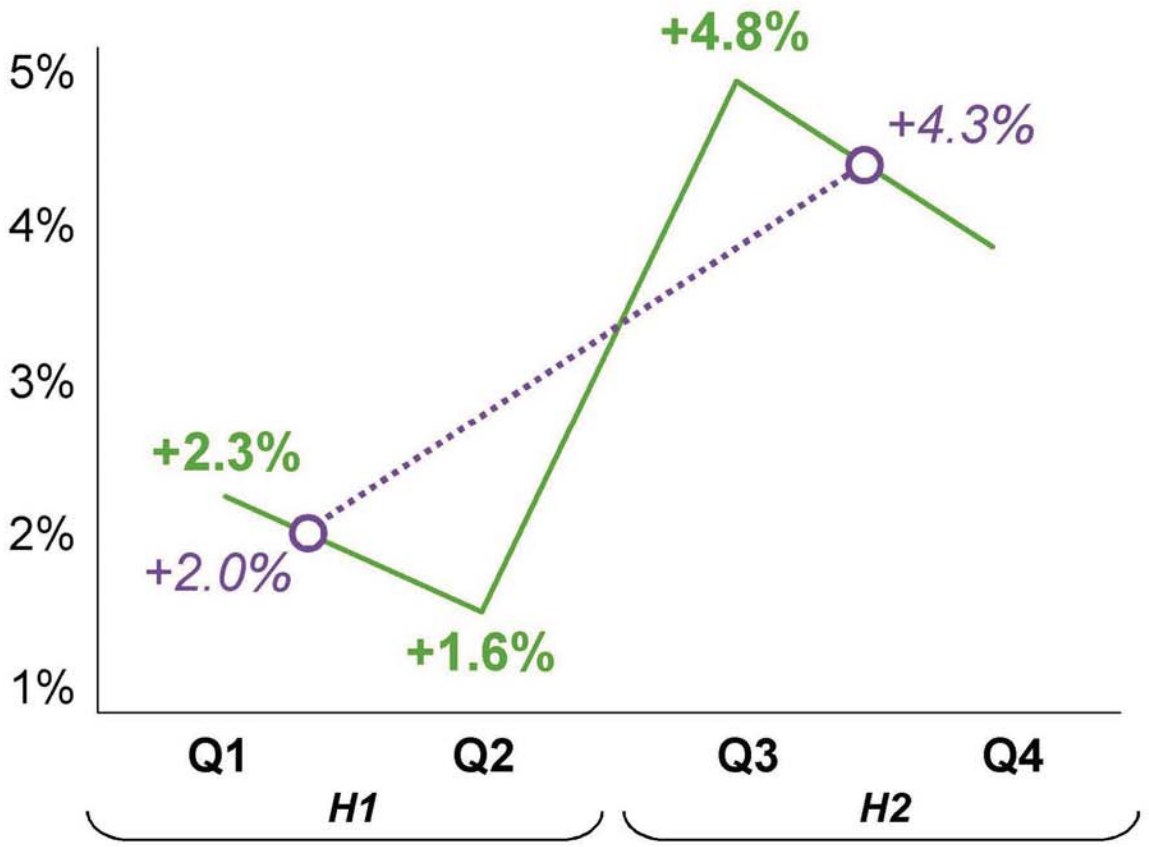
Line chart

Graph title: Arial 20pt, Grey, Bold

Sub-title: Arial black 20pt

Arial, grey, 14pt

Arial, grey, 14pt



PE13-018 031207

- **Valeo curve is always green when compared with other companies.**

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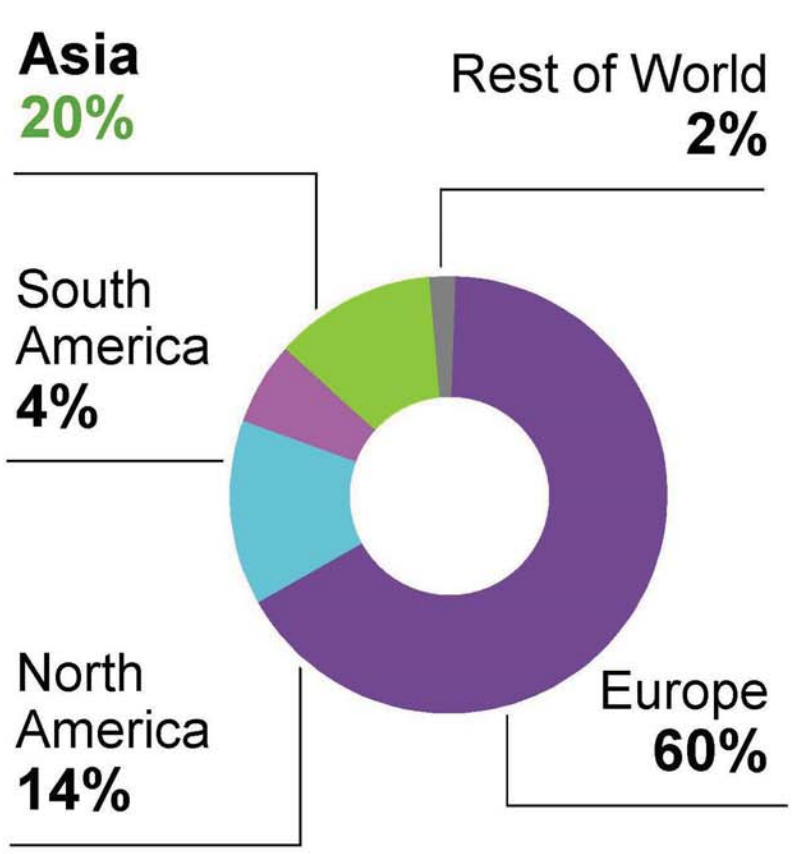
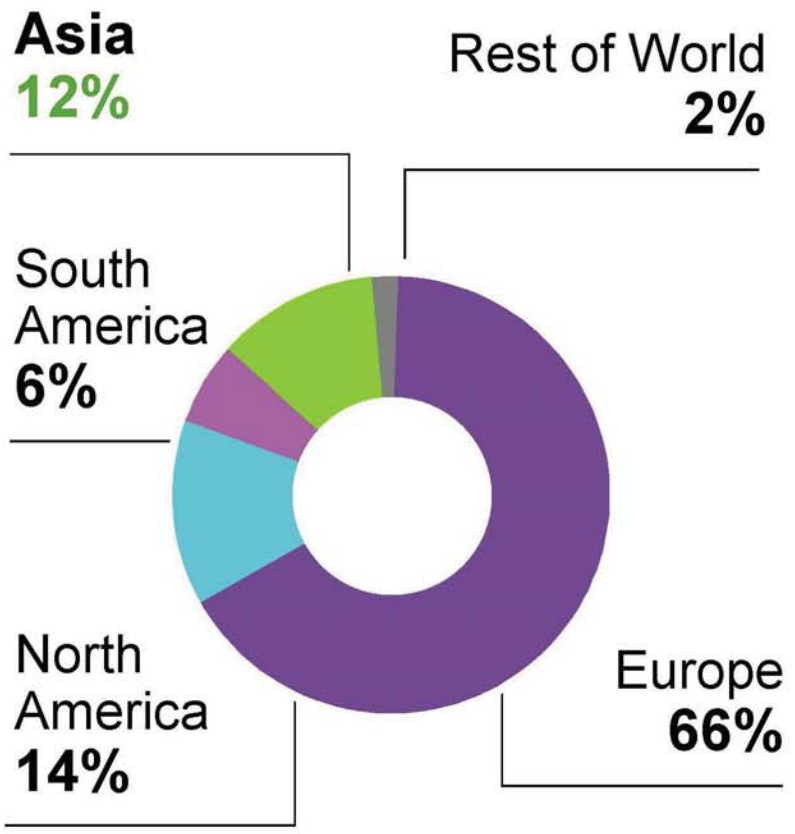
Pie chart

2007

Commodigna faccum verci



Commodigna faccum verci



PE13-018 031208

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Pie chart

faire commentaire mise en exergue chiffre

Date: Arial, black, 20pt

Title: Arial 20pt, Grey, Bold

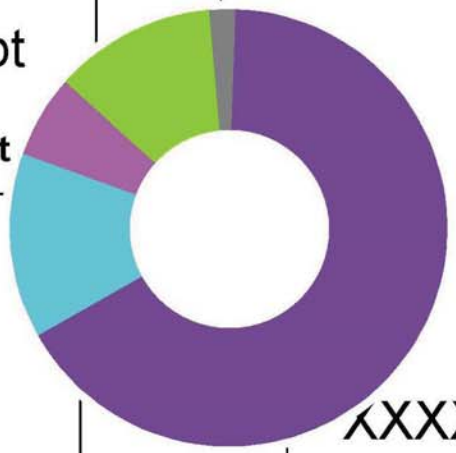
Text:
Arial black 18pt
Valeo number:
Arial green bold 20pt

Text:
Arial black 18pt
Number:
Arial black bold 20pt

North
America
XX%

XXXXXX
XX%

XXXXXX
XX%



Title: Arial 20pt, Grey, Bold

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PE13-018 031209

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Driving Innovation

Thierry Morin - Chairman & CEO

Version xx – Month xx, Year

PE13-018 031210

valeo added

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Title: Arial, black, 40pt

Subtitle: Arial, black, 24 pt

Date: Arial, black, 14pt

PE13-018 031211

Valeo Domains of solutions

Valeo has long been a global leader in the supply of complete systems and solutions for safer, cleaner and more comfortable vehicles. The Group's technological innovation and development activities are organized into three market driven Domains – Driving Assistance, Powertrain Efficiency and Comfort Enhancement, in order to identify systems and modules which answer to essential market needs.

PE13-018 031212

Title: Arial, black, bold 26 pt

Text: Arial, black, 18 pt

PE13-018 031213

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Innovation: the 3 Domains

Driving Assistance ► Safety

Reconciling automobiles and safety by minimizing driver distraction and enhancing visibility, thus contributing to accident prevention.

Powertrain Efficiency ► Environment & Mobility

Reconciling automobiles and the environment by contributing to the creation of cleaner, more fuel-efficient vehicles.

Comfort Enhancement ► Well-being

Reconciling automobiles and well-being by making vehicles easier to use and enhancing driver and passenger comfort.

PE13-018 031214

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Title: Arial, black, bold 26 pt
Subtitle: Arial, black, bold 22pt

Arial (color: R: 242 V:146 B:0) **bold 22pt**

Arial black 18pt

Arial (color: R: 98 V:164 B:34) **bold 22pt**

Arial black 18pt

Arial (color: R: 23 V:41 B:131) **bold 22pt**

Arial black 18pt

PE13-018 031215

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Driving Assistance Domain
Mission

- **Develop affordable end-user friendly innovative solutions**
  - Assisting human vision
  - Supporting comfortable and safe driving
  - Linking into adjacent active and passive safety systems
- **Be a key player in advanced driving assistance**
  - Visibility and Viewing Enhancement
  - Low Speed Maneuvering Solutions
  - Support integrated safety systems through situational awareness
- **Create added value by linking Branches and potential new partners**

PE13-018 031216

Driving Assistance Domain
Key drivers

SAFETY

Examples

CONFIDENCE

EASY TO USE

PE13-018 031217

Enabling a better automotive world

Powertrain Efficiency Domain
Mission

- **Develop clean and efficient engine technology**
  - Electronic valve train
  - Diesel emission
  - Thermal management
  - New combustion techniques
- **Be the mass production micro / mild hybrid provider**
- **Provide efficient transmission technology**

PE13-018 031218

Powertrain Efficiency Domain
Key drivers

ENVIRONMENT & EMISSIONS

Examples

FUEL ECONOMY

FUN TO DRIVE

PE13-018 031219

Enabling a better automotive world

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Comfort Enhancement Domain
Mission

- **Develop high perceived-value functions for end-users**
  - ➔ Welcome home feeling
  - ➔ Intuitive and ergonomic interaction with your car
  - ➔ Individual well-being under all conditions
- **Be a key player in interior controls and comfort**
- **Provide standardization and efficiency in Comfort electronics**

PE13-018 031220

Comfort Enhancement Domain
Key drivers

INTERACTIVITY

Examples

CONVENIENCE

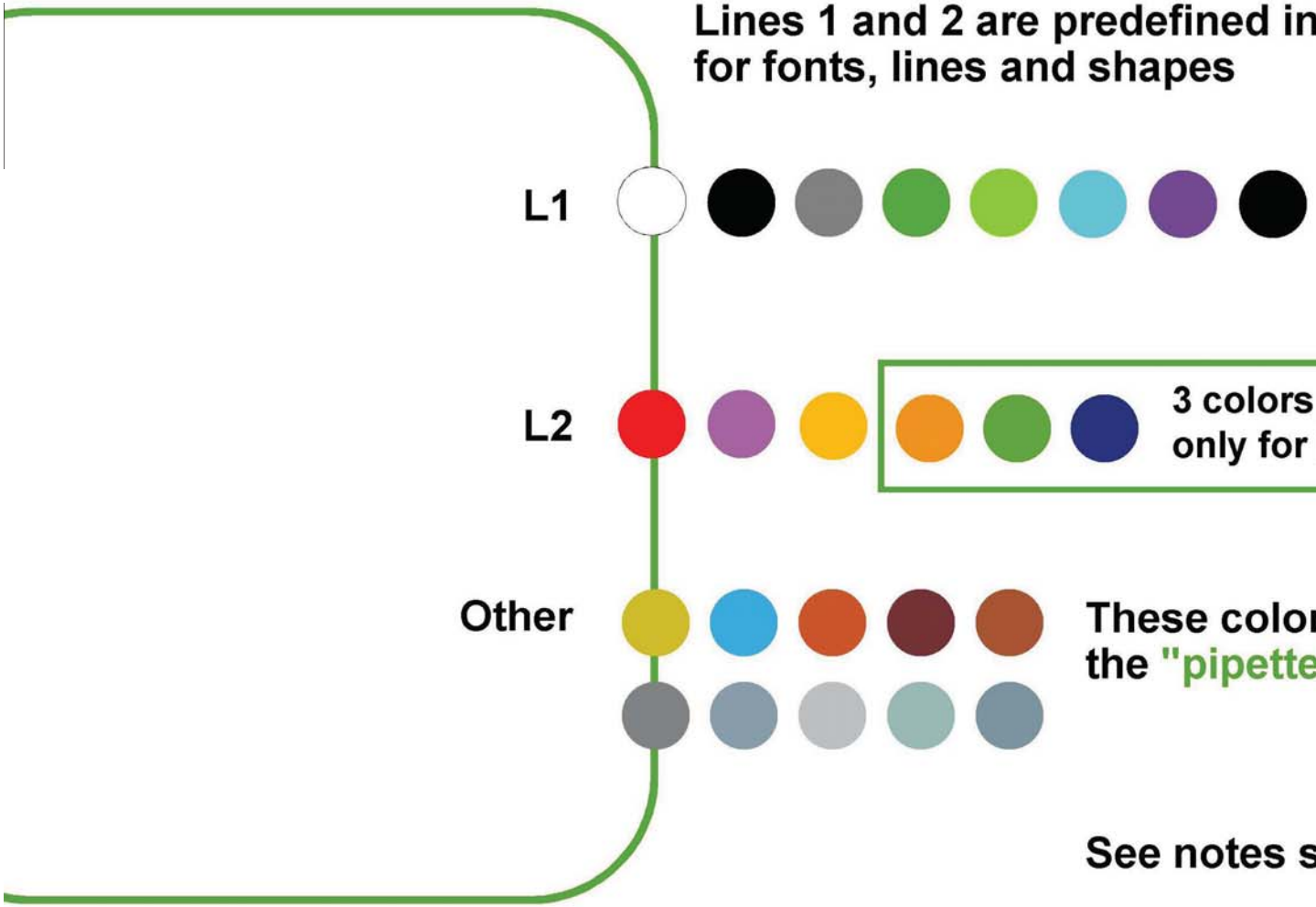
WELCOME HOME FEELING

PE13-018 031221

Enabling a better automotive world

Recommended color choices

Lines 1 and 2 are predefined in the color choices for fonts, lines and shapes



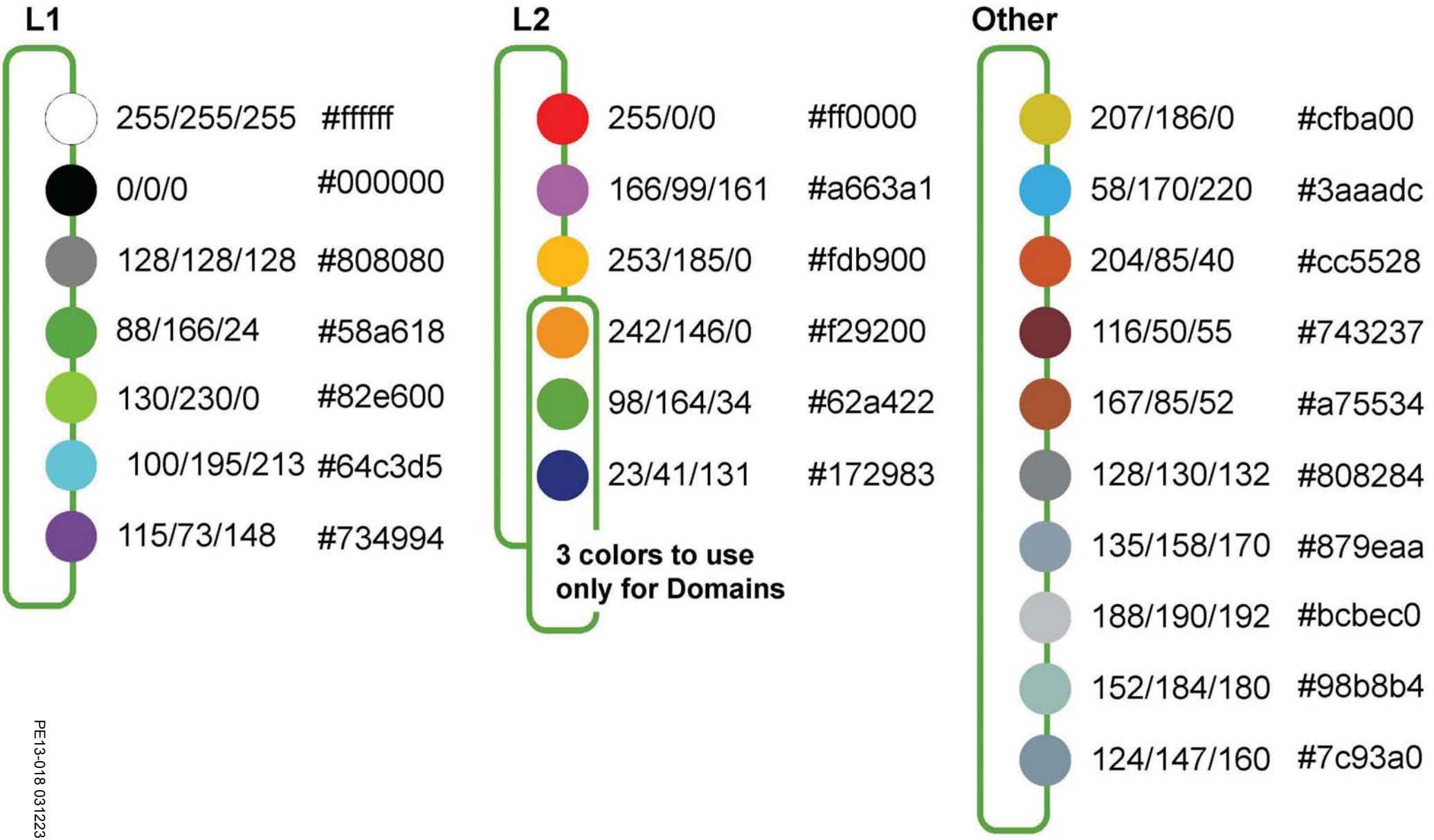
These colors can easily be used with the "pipette" tool.

1 2

See notes section for explanations.

PE13-018 031222

Recommended color choices for Internet



PE13-018 031223

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Presentation title

Name of Speaker - Function

PE13-018 031224

Version xx – Month xx, Year

valeo added

Agenda example

1 Click here to add text to your title

2 Click here to add text to your title

3 Click here to add text to your title

PE13-018 031225

Agenda example #2

1 Click here to add text to your title

2 Click here to add text to your title

3 Click here to add text to your title

PE13-018 031226

Title: Arial, black, bold, 26pt

1. Text: Arial, black, bold, 24pt

2. Text: Arial, black, bold, 24pt

3. Text: Arial, black, bold, 24pt

PE13-018 031227

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Valeo

Enabling a better automotive world

PE13-018 031228

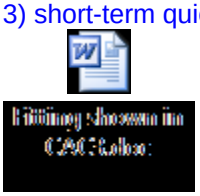
From: Huang, Larry (L,.)
Sent: Tuesday, February 28, 2012 9:01 AM
To: Andersen, Erik (E.)
Subject: RE: P415 CAC Design Change Options, Timing, and Cost

Updates from the meeting yesterday:

1) long-term resolution, fitting D3 core to P415 tanks, (Valeo told us 35% thermal performance downgrade and 1.5 kpa increase. They will present prototype timing and performance data this afternoon. I tried to push for rough estimate of production timing, but they may not provide it today)

2) short-term quick fix -- water drain from grill side, (prototype parts 10 weeks, tank tool and vibration welding tool 24 weeks PPAP)

3) short-term quick fix -- water drain from bottom (tank wall material and fitting ok, need to find sealing/glue material)



Regards,

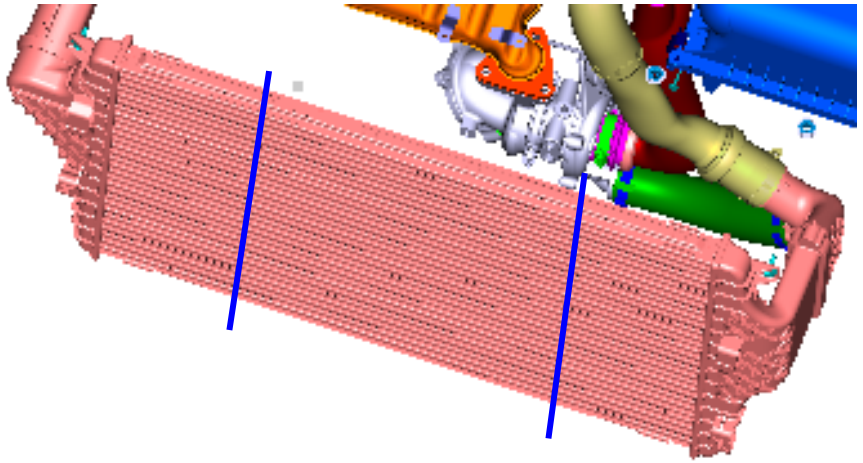
Larry Huang
Global Cooling/Heat Exchangers
Phone/Text Massage: 313-805-2617
E-mail: lhuang3@ford.com
Building #2-3M29, Mail Drop: 1215

From: Huang, Larry (L,.)
Sent: Thursday, February 16, 2012 3:17 PM
To: Satish NADELLA; Joseph LUMETTA; Andersen, Erik (E.); Tyler, Jim (J.S.); Meyer, Robert (R.H.); Blas-Fernando GUTIERREZ; Kramer, Michael (M.T.); Ladd, John (J.R.); Eduardo BARRIOS; Vicente ALVAREZ; Allan, Valerie (V.J.); German BOSHERZ; Norbert BIKOS; 'Larry ENGEL'
Subject: P415 CAC Design Change Options, Timing, and Cost
When: Monday, February 27, 2012 4:00 PM-5:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Audio + Webex, Audio Dial 313-621-3673, Meeting ID: 85694781#

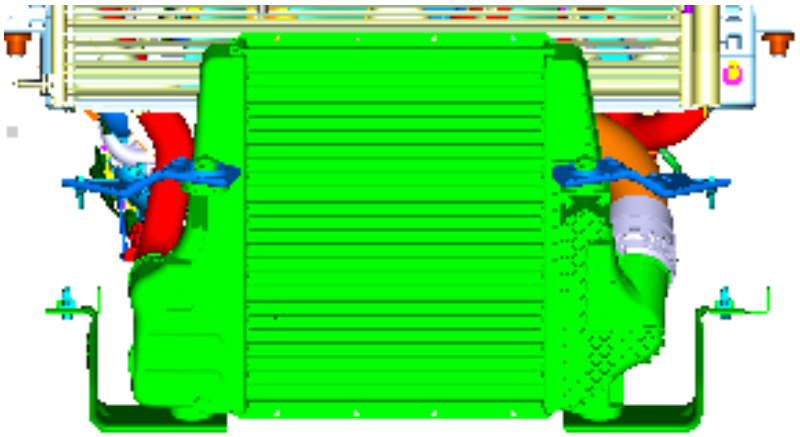
To discuss: Vacuum-drained water port design, timing, and cost.

Webex Link to be sent out just before the meeting

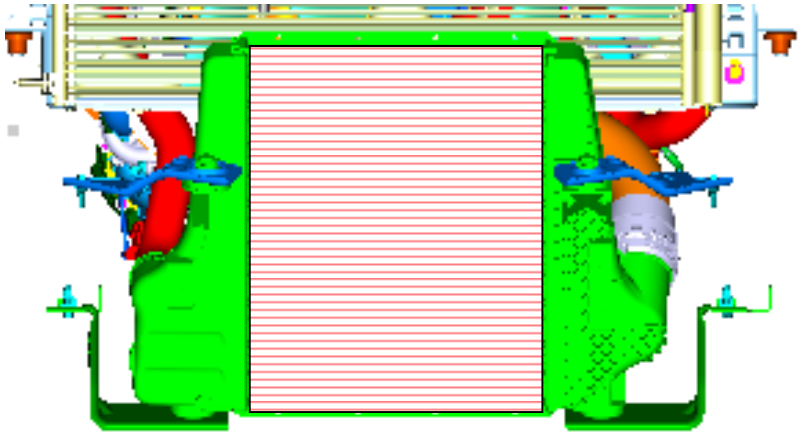
Long-Term Solution --
Cutting and Fitting D3 Core into P415



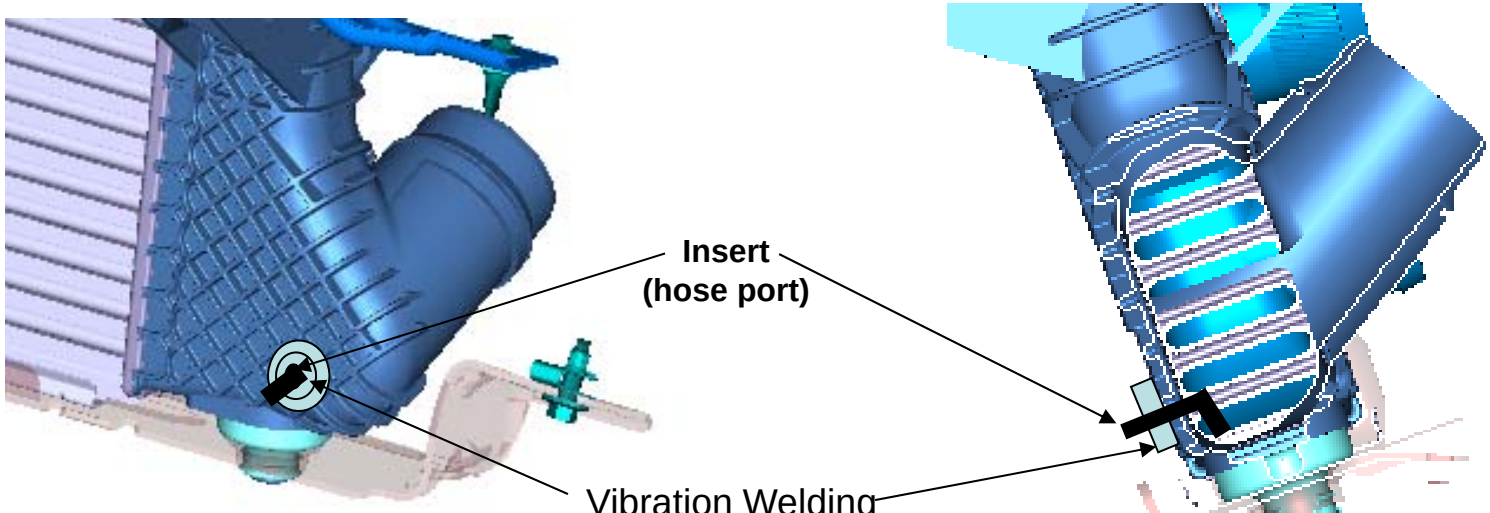
30x716X412 mm



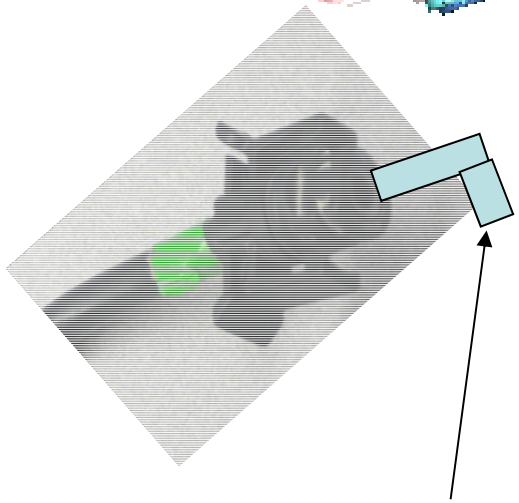
57x382x413 mm



Short Term Retrofit Fix -- Vacuum-Drained Port
Proposal I – Port on Grill Side

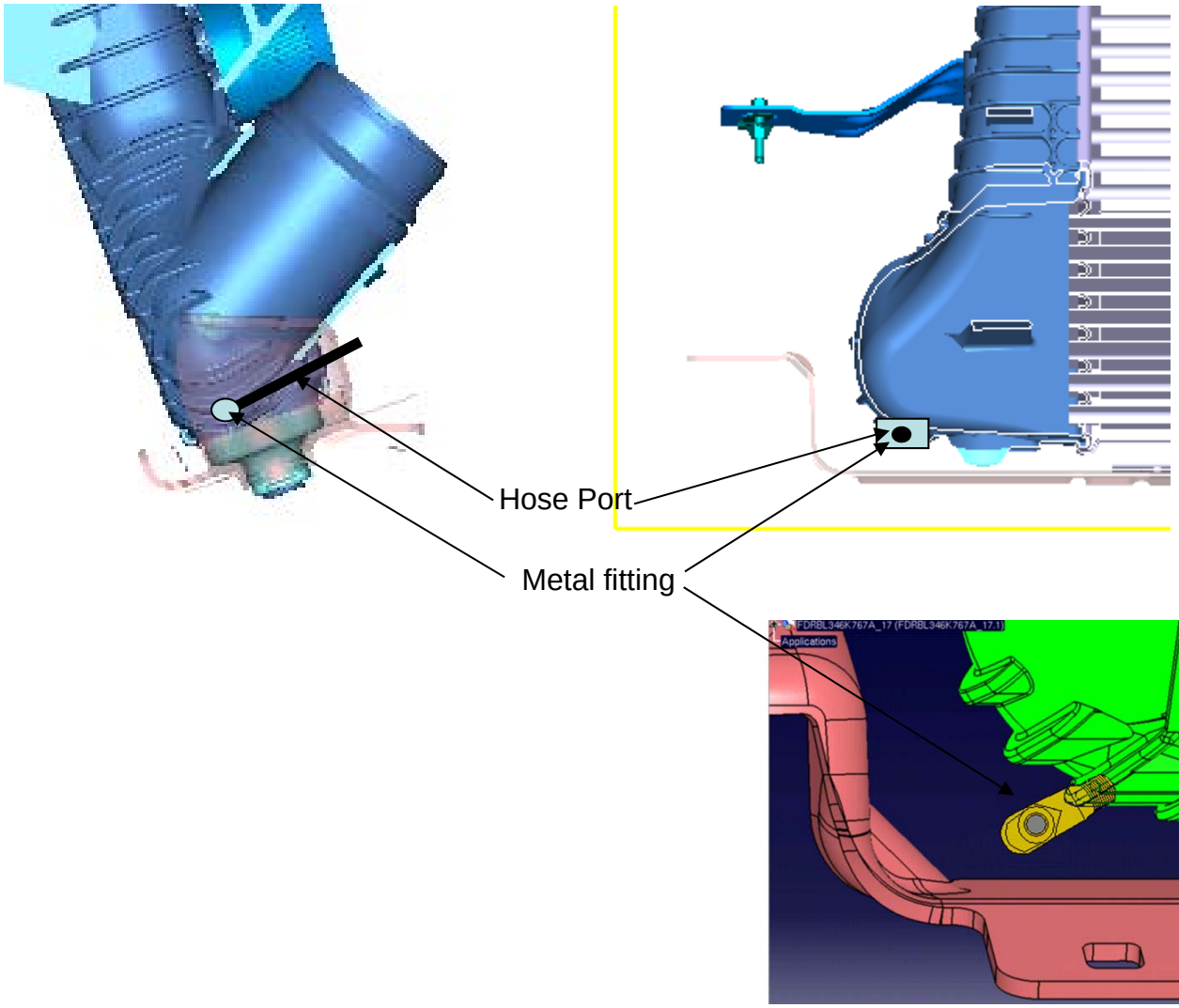


Quick connector (on Degas Bottle)



Need to extend and bend the tube tip down

Short Term Retrofit Fix -- Vacuum-Drained Port
Proposal II – Port on Bottom



P415 - Outlet Tank

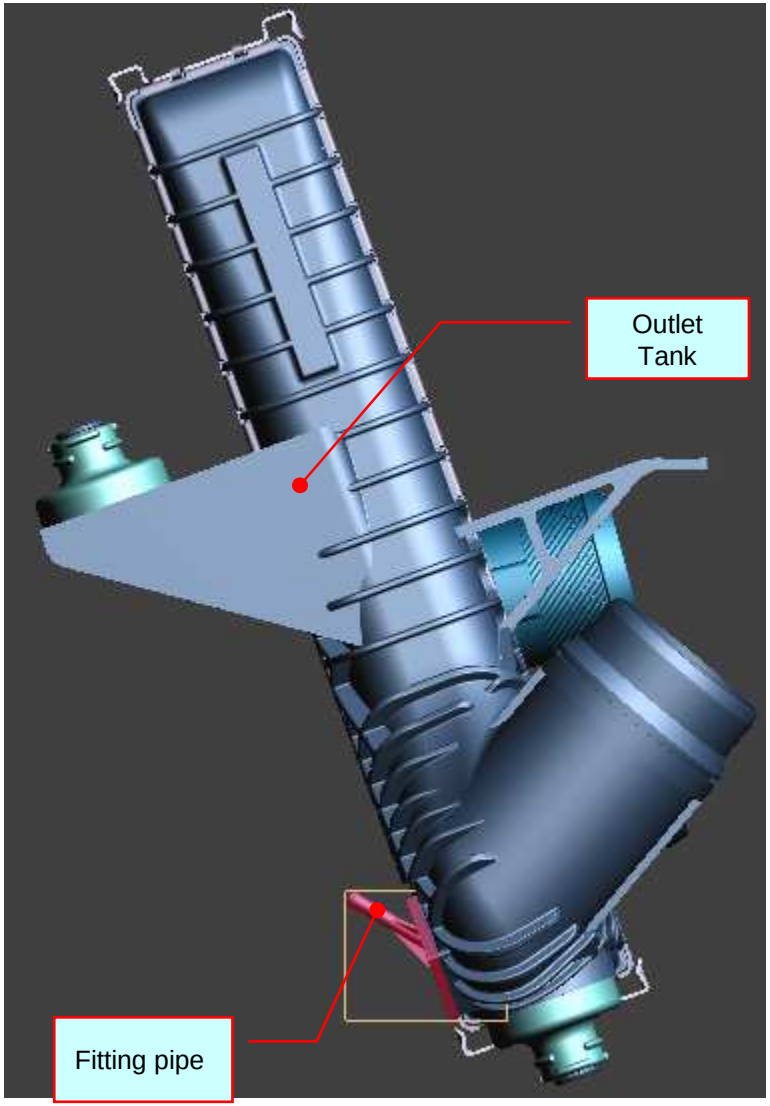
Vibration Welding Concept

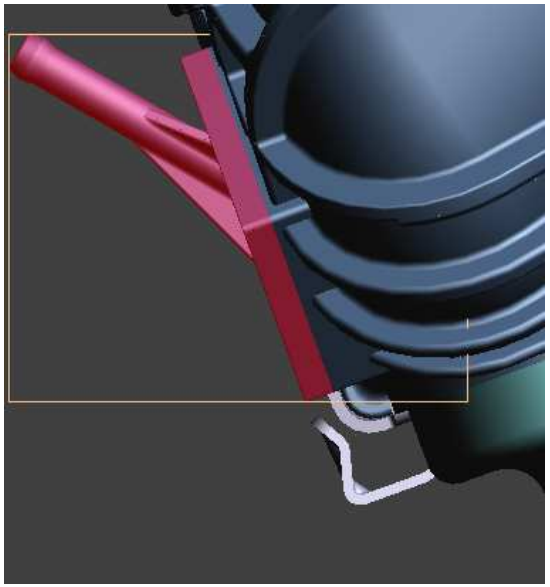
Feb 27th 2012

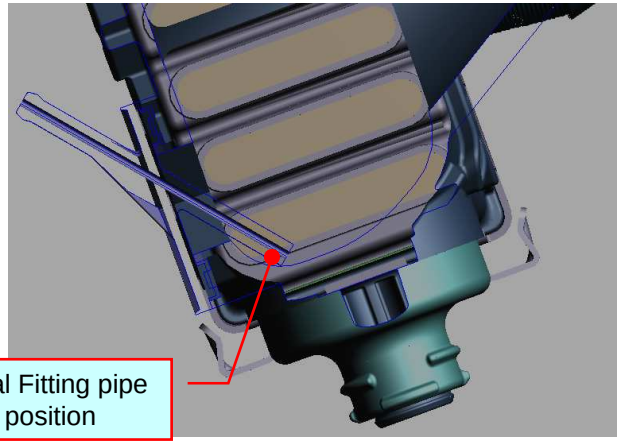
CAC P415 GTDI

valeo added

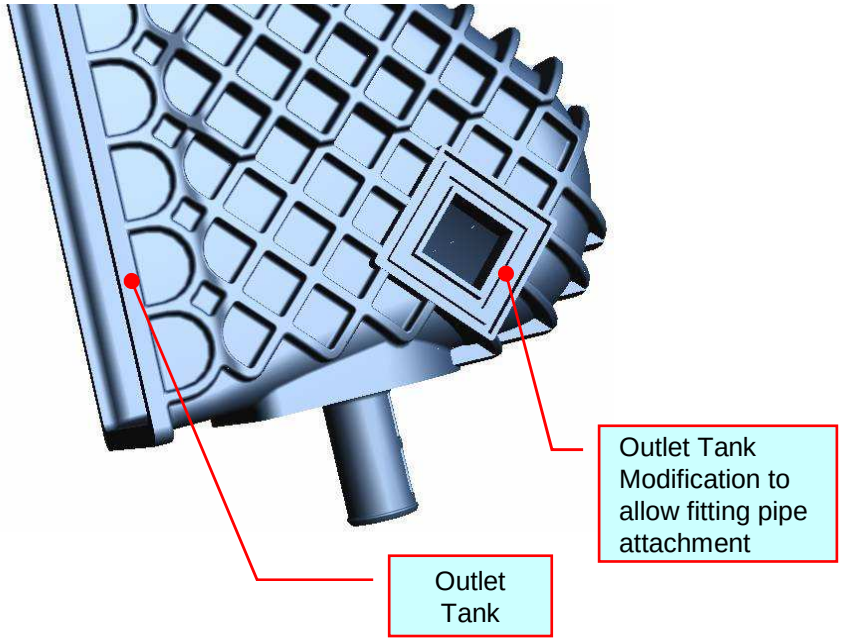
Option: Vibration Welding Process

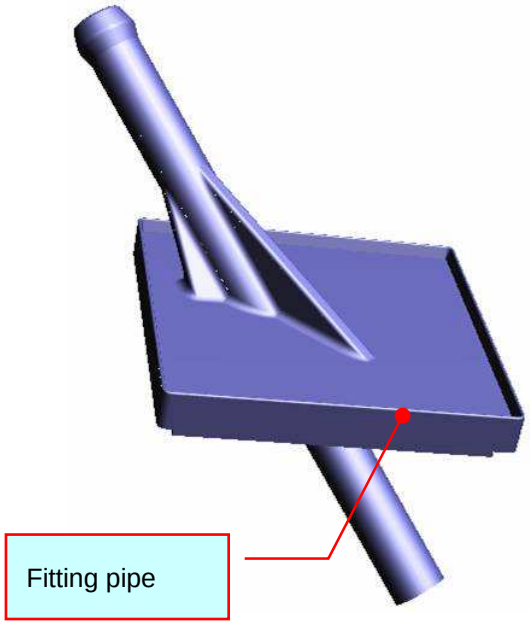






Vacuum-Drained Port
Alternative IV – Vibration Welding Process Elements



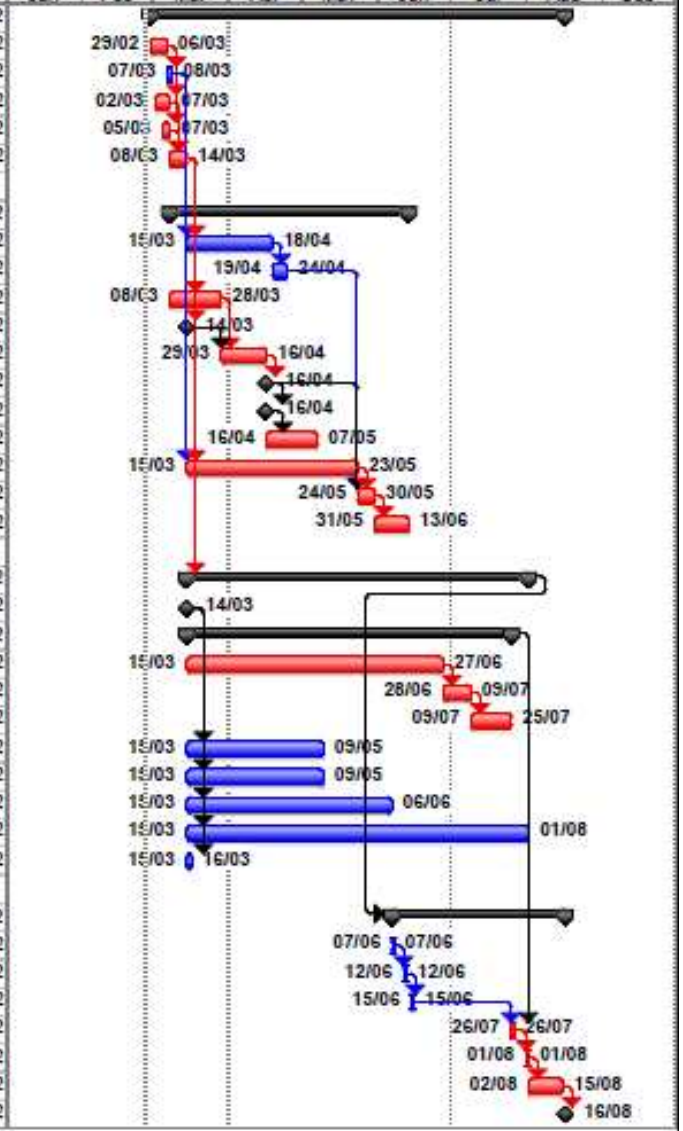


Note: Pipe ∅ must be > 3.0 mm, TBD for production intent

P415 Charge air Cooler
- Vibration Welding concept -

Notes: Production tools, component tools, machines lauch in parallel with Design validation

ID	Task Name	Duration	Start	Finish
1	**P415 CAC -Drain-**	**122 d**	**Wed 29/02/12**	**Thu 16/08/12**
2	Design	5 d	Wed 29/02/12	Tue 06/03/12
3	Design freeze	2 d	Wed 07/03/12	Thu 08/03/12
4	FORD PO	4 d	Fri 02/03/12	Wed 07/03/12
5	Budget release	3 d	Mon 05/03/12	Wed 07/03/12
6	Valeo POs	5 d	Thu 08/03/12	Wed 14/03/12
7				
8	**Validation process**	**70 d**	**Thu 08/03/12**	**Wed 13/06/12**
9	Soft tool manufacture	5 w	Thu 15/03/12	Wed 18/04/12
10	Pipes Transportation	4 d	Thu 19/04/12	Tue 24/04/12
11	Tank -Stock mfg - 1 Week-	3 w	Thu 08/03/12	Wed 28/03/12
12	ALERT Validation for Tank modification	0 d	Wed 14/03/12	Wed 14/03/12
13	Mold Modification	2.5 w	Thu 29/03/12	Mon 16/04/12
14	T1 Modified Mold	0 w	Mon 16/04/12	Mon 16/04/12
15	Mold Satrt production with Closed PORT under ALERT-	0 d	Mon 16/04/12	Mon 16/04/12
16	PSW for New Tank with open port	3 w	Mon 16/04/12	Mon 07/05/12
17	Tool Manufacture for Vibration Welding	10 w	Thu 15/03/12	Wed 23/05/12
18	Assembly trials - Parts for DV	5 d	Thu 24/05/12	Wed 30/05/12
19	DV Testing	2 w	Thu 31/05/12	Wed 13/06/12
20				
21	**Process preparation**	**100 d**	**Wed 14/03/12**	**Wed 01/08/12**
22	ALERT VALIDATED for Process tooling changes	0 d	Wed 14/03/12	Wed 14/03/12
23	**Mold hard tool for Plastic connector+freight+PSW**	**95 d**	**Thu 15/03/12**	**Wed 25/07/12**
24	Mold Manufacture	15 w	Thu 15/03/12	Wed 27/06/12
25	Tool freight	1.5 w	Thu 28/06/12	Mon 09/07/12
26	Component PSW	2.5 w	Mon 09/07/12	Wed 25/07/12
27	EOL fixtures modification	8 w	Thu 15/03/12	Wed 09/05/12
28	Crimping die modification	8 w	Thu 15/03/12	Wed 09/05/12
29	Current Vibration Welding Machine preparation	12 w	Thu 15/03/12	Wed 06/06/12
30	New Vibration welding machine	20 w	Thu 15/03/12	Wed 01/08/12
31	Lay out movements	2 d	Thu 15/03/12	Fri 16/03/12
32				
33	**Trials Process**	**51 d**	**Thu 07/06/12**	**Thu 16/08/12**
34	Trial #1	1 d	Thu 07/06/12	Thu 07/06/12
35	Trial #2	1 d	Tue 12/06/12	Tue 12/06/12
36	Trial #3	1 d	Fri 15/06/12	Fri 15/06/12
37	Valeo FDPR	1 d	Thu 26/07/12	Thu 26/07/12
38	FORD R&R	1 d	Wed 01/08/12	Wed 01/08/12
39	PV Testing	2 w	Thu 02/08/12	Wed 15/08/12
40	PPAP Submission	0 d	Thu 16/08/12	Thu 16/08/12



Quote Soft tool

- **Plastic Connector Mold : 12kusd**
- **Vibration Welding Tooling: 60kusd**
- **Modification for current production Mold: 7 kusd**

Total= 79kusd

- **Lead time for Prototypes: 10 Weeks**
  - Main issue observed: Tooling for Vibration welding
  - Note:
  - Proposal consider to modify current production Mold for outlet tank.
  - Tanks would have a non returnable change but would be possible to maintain production by closing Slot then production could be supported under ALERT while Charge Air Cooler is PPAP with new drain system.

Hard Tool – Estimated cost

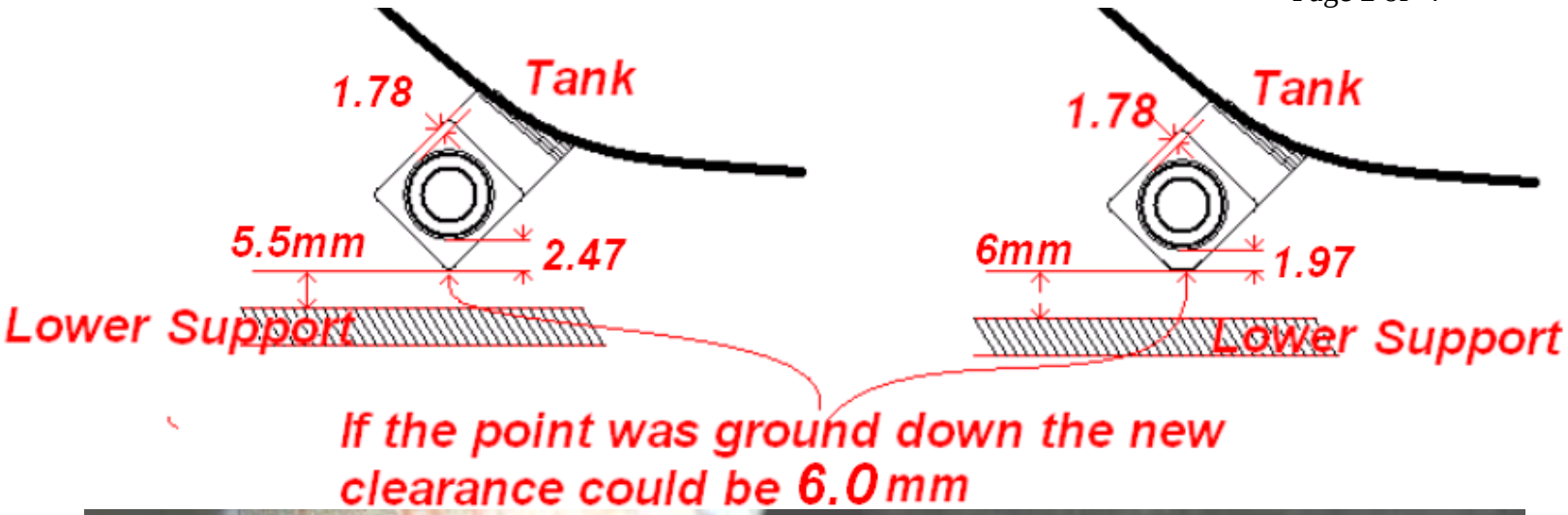
- **Plastic Connector Mold : 100kusd**
- **New gages for Tank and connector and paint caps: 20kusd**
- **Crimping dies and EOL modifications: 70kusd**
- **Vibration Welding Tooling: 60kusd**
- **New Leak test fixture for Tanks: 50kusd**
  - **Sub Total: 300 Kusd**
  - **Additional 438kusd investments for ED&T, packaging and Capital are required**
  - **Total: 738Kusd**
- **Lead time for CAC PPAP: 24 Weeks**
  - Main issue observed: Mold for New connector
- **Piece Price Increase Impact: 4.79usd**

Comments

- **P415 2013 –Critical on Timing – Should be reviewed ASAP if this concept moves forward since timing overlaps..**
- **There are capacity studies also in progress to start May and August this year. An integration for those changes are important to consider depending on the decision for this concept.**
- **Alternatives to analyze...**
  - ➔ 1st Alternative to hold the mold and launch redesign to include a Pipe is an alternative to reduce cost
  - ➔ 2nd Alternative, to analyze scenario to launch a new outlet mold that includes the drain pipe and avoid Vibration welding costs

Enabling a better automotive world

Fitting is a 1/8” NPT elbow with a ¼” barbed end.
Material will be brass
Intent here is to bring the fitting ID (opening) as close as possible to the lowest point in the tank and at the same time install the fitting into section of the tank that has the most material.



If the point was ground down the new clearance could be **6.0** mm

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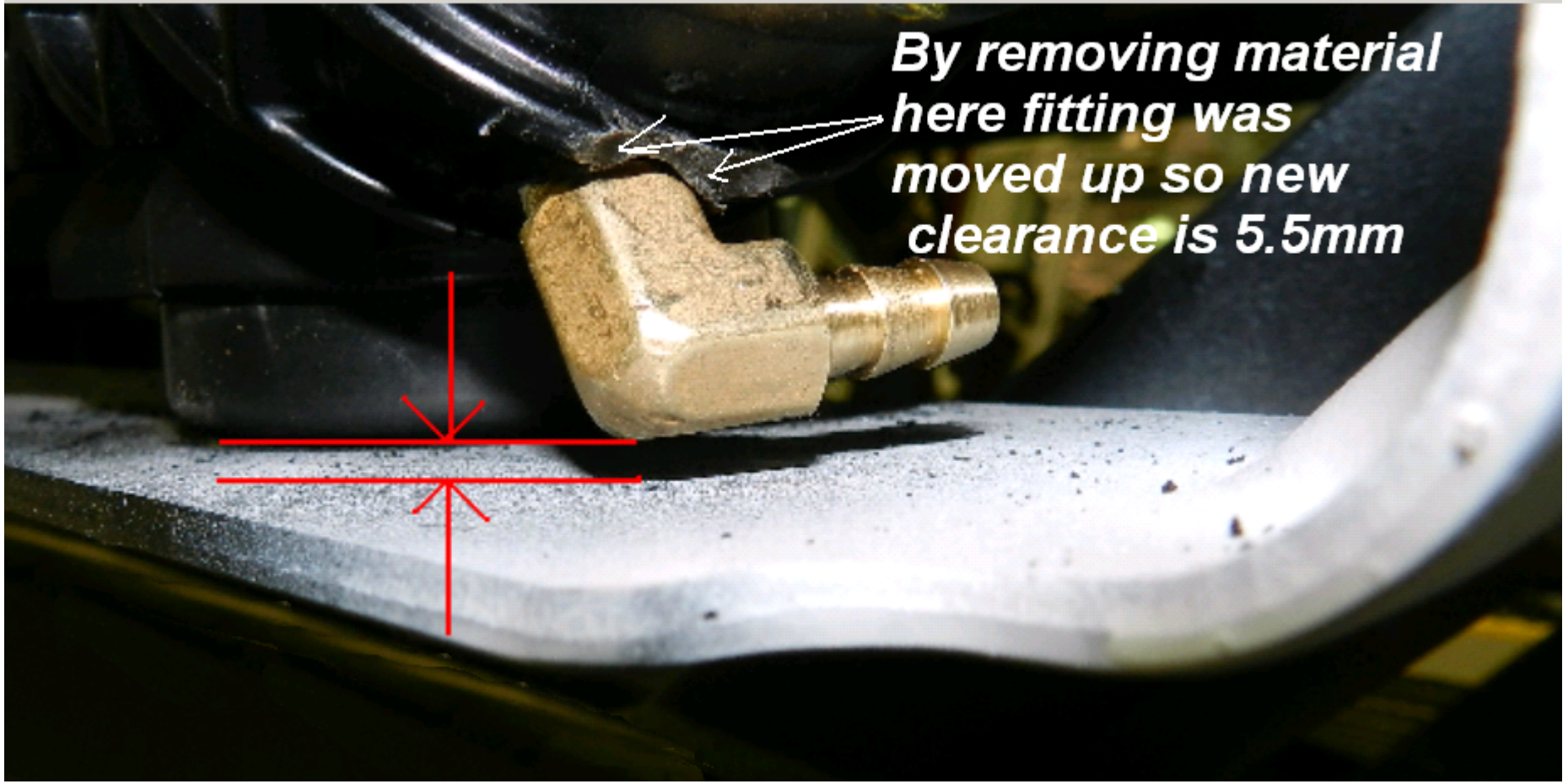
By removing material here fitting was moved up so new clearance is 5.5mm


Note that the
isolator is
compressed due
to installation of
upper support