

INFORMATION Redacted PURSUANT TO THE FREEDOM OF

INFORMATION ACT (FOIA), 5 U.S.C. 552(B)(6)

Ticket 315251

03/28/2011

**Ticket Information**

Status: Closed
Type: Tech - General
Sales Org: G & W DIESEL SERVICES
Email: mbogard@gwdiesel.com
Assigned To: WILLES, FRED

Time Tracking

Time Entered: 07/15/08 10:58:15AM
Time Resolved: 08/12/08 04:12:36PM
Initial Entry Time (min.): 1
Resolution Time (min.): 46
Total Time (min.): 47

Job Information

Job Number: 18435
Unit Number: 1
Work Order Number: 7021165
Drawing Number: 18435AD
Delivery Date: 10/9/2006
Chassis Type: SABER - Contender - Florida
Body Type: SE-Custom Contender (Fla)
Aerial Type:
Aerial Serial #:
Pump Type: Pump, 1500 CSUY Single Stage, Waterous
Pump Serial #: 125860
Foam System:
Front Axle Model:
Rear Axle Model: PS25160KFPF42
Paint Code: #90 RED
Engine Make: Engine, Caterpillar C9 400 hp, 1100 Torque, 2004
Engine Model:
Engine Serial #: [REDACTED]
Trans. Make: Trans, Allison Gen IV 3000 EVS P
Trans. Model:
Trans. Serial #: 6510674922
Pressure Control:

Customer Information

Name: [REDACTED]
Address: [REDACTED]
City: RAINBOW CITY
State: AL
ZIP: [REDACTED]
Country: US

Contacts

Date/Time	Taken By	Submit Method	Call Type	Status	Requestor	Phone Cell	E-Mail	Resolution Date/Time
1 07/15/08 10:58:15AM	KRINGS, ERIC	Phone	Dealer	Closed	Coker, Barry	[REDACTED]		08/12/08 04:12:30PM
Issue: Erratic engine operation on a caterpillar. When you hit the preset on the class 1 governor to increase, the throttle is very erratic when going up until it levels out. Resolution: 7/15 1147 hrs fw : This has a history of this same problem . was suppose to have been resolved in Aug of 07. Told Barry to find out from the cat shop what was done at that time								
2 07/15/08 01:04:48PM	FOX, MARY	Phone		Closed	Pippen, John	[REDACTED]	JPippen@gwdiesel.com	08/12/08 04:12:22PM

Issue: JOHN PIPPEN CALLING - YOU WANTED TO TALK TO HIM ABOUT WHAT WAS DONE TO CAT ENGINES**Resolution:** 7/15 1311 hrs fw: Told John to get one truck in there to troubleshoot the 200 rpm surging problem. he



said he will try to do that for the week of 7/21
8/12 1611 hrs fw: email fopr [REDACTED]
red,

Cat came out to the units and downloaded a file In ECM for the surge
Issue.

Talked to the [REDACTED] today and he said so far no problems.
I Informed the Chief If any Issues arises give me a call.

Type Information

Alert: ☐
Out Of Service: ☐
Call Back: ☐
Wega: ☐
Delivery Issue < 90 Days: ☐
Florida Job: ☐
Military/Government: ☐
Interest Hold: ☐
Future Tech Check: 1: ☐
Future Tech Check: 2: ☐
Future Tech Check: 3: ☐
Future Tech Check: 4: ☐
Future Tech Check: 5: ☐
N/A: ☐
Product Area: Chassis Custom
Failure Location:
Component Failed: Engine-Cat
Complaint:
Cause:
Correction:

Reason Information

Operator Error: ☐
Parts Required: ☐
Parts Failure: ☐
Manufacturing Error: ☐
Engineering Error: ☐
N/A: ☐
Original ETC:
Current ETC:

Measureables

No Measureable Required: ☒

Measurables - Parts

Part Identification - Not available on Web: ☐
Part identification - Available on Web: ☐
Lack of tech. training: ☐
Incomplete Information: ☐
Incorrect Job #: ☐
Info avall from Maint-Op manual: ☐
Duplicate Request: ☐
Other (see notes): ☐
Main part # supplied by dealer: ☐
Main part # not supplied by dealer: ☐
Dealer having customer call direct: ☐
Dealer request part # verification: ☐
Pricing not available on Web: ☐

Measurables - Complaints

Not Valid: ☐
Shipping Issue: ☐
Pricing Dispute: ☐
Order Entry Issue: ☐
Call Center Issue: ☐
Parts Quality Issue: ☐
Response Time Issue: ☐
Parts Availability: ☐
Poor Dealer Service: ☐
Unknown Complaint: ☐

Measurables - Technical

Emergency: ☐
NOT Real Emergency: ☐
Customer should have called Dealer: ☐
Customer called Dealer first: ☐
Customer or Dealer did no troubleshooting: ☐
No Prints/Engineering to assist Pierce tech: ☐
Future Tech Measureable 1: ☐
Future Tech Measureable 2: ☐
Future Tech Measureable 3: ☐
Wrong quantity: ☐
Poor packaging: ☐
Vendor issue: ☐
Mispick: ☐
Other: ☐

①

Pricing available on Web: ☐
Dealer ordered wrong part: ☐
Pierce shipped order incomplete: ☐
Pierce shipped wrong parts: ☐

Notes

[None]



Ticket 251761

04/05/2011

Ticket Information

Status: Closed
Type: Tech - Out of Service
Sales Org: G & W DIESEL SERVICES - F & E
Email: mbogard@gwdiesel.com
Assigned To: MILLER, WAYNE

Time Tracking

Time Entered: 07/19/07 11:26:29AM
Time Resolved: 09/10/07 10:58:40AM
Initial Entry Time (min.): 5
Resolution Time (min.): 75
Total Time (min.): 80

Job Information

Job Number: 18506
Unit Number: 1
Work Order Number: 7068110
Drawing Number: 18506AD
Delivery Date: 12/26/2006
Chassis Type: SABER - Contender - Florida
Body Type: SE-Custom Contender (Fla)
Aerial Type:
Aerial Serial #:
Pump Type: Pump, 1500 CMU Two Stage, Waterous
Pump Serial #: 126595
Foam System:
Front Axle Model: FL941CAX237
Rear Axle Model:
Paint Code: #134 RED
Engine Make: Engine, Caterpillar C9 400 hp, 1100 Torque, 2004
Engine Model:
Engine Serial #: [REDACTED]
Trans. Make: Trans, Allison Gen IV 3000 EVS P
Trans. Model:
Trans. Serial #: 6510692385
Pressure Control:

Customer Information

Name: [REDACTED]
Address: [REDACTED]
City: LITTLE ROCK
State: AR
ZIP: [REDACTED]
Country: US

Contacts

Date/Time	Taken By	Submit Method	Call Type	Status	Requestor	Phone Cell	E-Mail	Resolution Date/Time
1 07/19/07 11:26:29AM	CERVANTES, GABRIEL	Phone		Closed	Pippen, John	[REDACTED]	JPippen@gwdiesel.com	09/10/07 10:58:38AM

Issue: Engine surges when in pump

Resolution: Heard issues of this happening here at Pierce also fw Trying to find out what Cat is doing for trucks at the plant 1216 hrs fw 7/19
 Cat will put a switch on it to take a snap shot when it acts up. This will be done for one truck 7/19 fw
 Per Joe Barry per Todd Bong who went to [REDACTED], they only get engine surging when pumping at 350-400 psi.
 I spoke to John Pippen and asked if he could investigate why they are pumping at these seemingly ridiculous pressures. John will get back to me. wml 7/30
 I am setting up a conference call with [REDACTED] and John Pippen. wml 8/1 Contender w/ Waterous CM with relief valve w/ ramp throttle.

2 08/01/07 02:46:56PM	CERVANTES, GABRIEL	Phone		Closed	Pippen, John	[REDACTED]	JPippen@gwdiesel.com	09/10/07 10:58:33AM
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2

Issue: Joe,

Todd Bong did call me back today.

They did In fact Install the flash file In Eng# 2, Job - 18506 WO - 7068127.

I just talked to [REDACTED] [REDACTED] Informed me that the Engine has not acted up as of today.

[REDACTED] will also check into the surging Issue to see If that is resolved. ([REDACTED] will call me back today.)

After talking with Todd Bong he explained to me that they adjusted the torque curve at the surge point to test.

If everything is operating ok with no surge, no engine problems we can get the other 5 units down loaded with this flash file.

As for the training Ray Pelletier performed most of the training with Jamie Pennington helping as time permitted on the Tech Side Only.

[REDACTED] has always ran with high pressures as these are not the first pumpers they have owned and operated. Two Stage Pumps.

I will keep you Informed as to any new solid Information that I receive.

Thanks,
John Pippen
G & W Diesel Services, Inc.
Fire Apparatus Program Service & Warranty Director
800-458-8748

Resolution: The engine with the new CAT program does "not" surge. All the units now need the update. wmi 8/2

Type Information

Alert: ☐
Out Of Service: ☐
Call Back: ☐
Wega: ☐
Delivery Issue < 90 Days: ☐
Florida Job: ☐
Military/Government: ☐
Interest Hold: ☐
Future Tech Check: 1: ☐
Future Tech Check: 2: ☐
Future Tech Check: 3: ☐
Future Tech Check: 4: ☐
Future Tech Check: 5: ☐
N/A: ☐
Product Area: Chassis Custom
Failure Location:
Component Failed: Engine-Cat
Complaint:
Cause:
Correction:

Reason Information

Operator Error: ☐
Parts Required: ☐
Parts Failure: ☐
Manufacturing Error: ☐
Engineering Error: ☐
N/A: ☐
Original ETC:
Current ETC:

Measureables

No Measureable Required: ☒

2

Measurables - Parts

- Part Identification - Not available on Web: ☐
- Part identification - Available on Web: ☐
- Lack of tech. training: ☐
- Incomplete Information: ☐
- Incorrect Job #: ☐
- Info avail from Maint-Op manual: ☐
- Duplicate Request: ☐
- Other (see notes): ☐
- Main part # supplied by dealer: ☐
- Main part # not supplied by dealer: ☐
- Dealer having customer call direct: ☐
- Dealer request part # verification: ☐
- Pricing not available on Web: ☐
- Pricing available on Web: ☐
- Dealer ordered wrong part: ☐
- Pierce shipped order incomplete: ☐
- Pierce shipped wrong parts: ☐

Measurables - Complaints

- Not Valid: ☐
- Shipping Issue: ☐
- Pricing Dispute: ☐
- Order Entry Issue: ☐
- Call Center Issue: ☐
- Parts Quality Issue: ☐
- Response Time Issue: ☐
- Parts Availability: ☐
- Poor Dealer Service: ☐
- Unknown Complaint: ☐

Measurables - Technical

- Emergency: ☐
- NOT Real Emergency: ☐
- Customer should have called Dealer: ☐
- Customer called Dealer first: ☐
- Customer or Dealer did no troubleshooting: ☐
- No Prints/Engineering to assist Pierce tech: ☐
- Future Tech Measureable 1: ☐
- Future Tech Measureable 2: ☐
- Future Tech Measureable 3: ☐
- Wrong quantity: ☐
- Poor packaging: ☐
- Vendor issue: ☐
- Mispick: ☐
- Other: ☐

Notes

[None]

Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
Printed By: P210884 WILLES, FREDRICK E

Job Number: 19654
Ticket Number: 442512

Customer Name: SHERWOOD FIRE DEPT

Unit #:

Tech Product Area: CCST Tech - General
Tech Comp Failed: ECA

Date
Entered

Contact
#

3/29/10 1

Issue:

[has surging issue with the CAT engine while pumping]

Resolution:

[X]

3/29/10 2

Issue:

[Please attach this to Ticket# 442512]

Thanks,

John Phippen

From: Brian Lee

Sent: Thursday, March 25, 2010 9:22 AM

To: John Phippen

Subject: FW: [REDACTED] Engine 1 Surging during training on March 24, 2010.

Here you go.



*****Pierce Manufacturing - Leading in the Fire Industry with Innovation, not Imitation*****

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From:

Sent: Wednesday, March 24, 2010 4:22 PM

To: mayers@piercemfg.com; Brian Lee; Jamie Pennington

Subject: Fw: [REDACTED] Engine 1 Surging during training on March 24, 2010.

This was recording during a training exercise [REDACTED]

[This afternoon, I've also received two different complaints within the last few days of the same thing happening while on actual runs. What are we going to do about it? It's been three years since we took delivery of Engine 2 and two since we took delivery of Engine 1 and they are still doing the same thing today as they were the day they were delivered.



Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
Printed By: P210884 WILLES, FREDRICK E

Date Contact
Entered #

[REDACTED]

[REDACTED]

" When failure is not an option, train not to fail"

— On Wed, 3/24/10, [REDACTED]

From: [REDACTED]

Subject:

To: [REDACTED]

Date: Wednesday, March 24, 2010, 3:50 PM

Resolution:

[file doesn't open...with this recording?

3/29 1131 hrs fw : Cat to investigate They will go in and take snap shot of what is happening Could be this is happening only at idle and the incoming and outgoing pressures are too close. If this happens the relief valve will be opening and closing putting a load on and off the engine]

Job Number: 19654 Unit #: 1

Ticket Number: 260544
Customer Name: [REDACTED]
Tech Product Area: CCST Tech - General
Tech Comp Failed: ECA

Date Entered: 9/5/07
Contact #: 1
Issue: [REDACTED]
[Engine running rough, has black soot. Needs to deliver truck ASAP.]
Resolution: [REDACTED]
[Truck going to Thompson Cat. John is contacting Todd Bong 9/05/07 dms]

Ticket Number: 263919
Customer Name: [REDACTED]
Tech Product Area: CCST Tech - Out of Service
Tech Comp Failed: ECA

Date Entered: 9/24/07
Contact #: 1
Issue: [REDACTED]
[Cat engine is running rough with black smoke]
Resolution: [REDACTED]
[They will have CAT look at this, as it was in the shop on Sep 5th for the same problem. There is nothing that can be done until Cat gets approval from EPA to change some settings 9/25 fw]

Date Entered: 9/25/07
Contact #: 2
Issue: [REDACTED]
[calling back]
Resolution: [REDACTED]
[As you are aware of Caterpillar has used its allotment of EPA Exemption Labels for 2007. The last label were used to correct the surging issue with the 6 units. At this time Caterpillar is in the process of certifying the test file that was installed in the units, we are also requested additional labels from the EPA. We will provide the new certified software or an exemption label with the test software as soon as the approval is given.
Cat has recieved the exemption |
labels and will be going to install new programming 10/9 fw]

Ticket Number: 271331
Customer Name: [REDACTED]
Tech Product Area: ELEC Tech - On Site
Tech Comp Failed: GAGE

Date Entered: 11/6/07
Contact #: 1
Issue: [REDACTED]
[Speedometer issues]
Resolution: [REDACTED]
[The speedo is bad and will need to be replaced. I gave the calibration code and part number. GVI]

Ticket Number: 283669
Customer Name: SHERWOOD FIRE DEPT
Tech Product Area: CCST Tech - General



Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
Printed By: P210884 WILLES, FREDRICK E

Date Contact
Entered #



Resolution:

Photos in s: drive

Forward to engineering 1/24/08 dms
told him to re do what was there as it has always worked in the past fw 1049 hrs |

Tech Product Area: PUMP Tech - General
Tech Comp Failed: - PBVW



Ticket Number: 308586

Customer Name:

6/9/08 1

Issue:

[Tank fill hose is blowing off.]

Resolution:

[1.5" tank fill. Jamie says it burst off 5 times. He made a swivel assy replacement. I told him either: 1. barb fitting 2. hose or 3. hose clamp must be out of tolerance.
wmi:]

Tech Product Area: CCST Tech - Out of Service
Tech Comp Failed: ECA



Ticket Number: 309613

Customer Name:

6/13/08 1

Issue:

[Please list this unit out of service was towed to Riggs Cat In Little

Rock AR, 10th of June - 08.

COMPLAINT = Low Oil Pressure/Check Engine Light On/Engine Surging

Found Metal debris in oil filter, Riggs has dropped oil pan and found no

Issues other than,

Some cylinder scores not enough to cause failure of the amount of metal
found.

Riggs will be inspecting the gear train and then the Huey pump system.

Chief: Allen Earnhart has expressed his concerns of wanting a new

engine. (Delivered 2]

1 weeks ago

These Engines are the C9 cats, (known Issues)

This Chief also works on the

Issues:

The dept. is spooked about the metal shavings throughout the engine. The
are asking what else could have been affected.

Can CAT prove that nothing else will result from the metal shaving issue
found in the No. 2 piston oil relief valve.

The dept. is stating that they will have to live with this engine on
down the road. If this has caused other things to d]

Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
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Date Contact
Entered #

Complete the life of
the engine, they don't know whether they would not like CAT to put a new
engine in the unit.

Resolution:
[6/13/08 dms waiting to see what Cat finds as source of metal found in filter, John P. to call if he needs help
6/18 0831hrs fw: Work is done and they are just testing]

Tech Product Area: PUMP Tech - General
Tech Comp Failed: BODY

Ticket Number: 321582
Customer Name: [REDACTED]

8/18/08 1
Issue:
[Please open up a ticket number to have someone look at these picture of
[REDACTED]

This unit was delivered first part of year.

I do not think I have seen any unit with rust as bad as this unit on the
underside.

[REDACTED] Eng. 1
Job# 19654
WO# 8041742
(built around March of this year)

Thanks,
John Phippen
G & W Diesel Services, Inc.
Fire Apparatus Program Service & Warranty Director
800-458-8748

-----Original Message-----
From: [REDACTED]
Sent: Friday, Augul
Jst 15, 2008 2:21 PM
To: John Phippen
Cc: Steve Halle; Jessi Collums; Brian Lee; David White
Subject: FW: [REDACTED] Eng. 1 rusting

Sorry Forgot The Pictures.

Attached is the pictures of the truck mentioned below from [REDACTED]
(March or April this year IN SERVICE)

Looks like a lot of Cancer!

Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
Printed By: P210884 WILLES, FREDRICK E

Date Contact
Entered #

Per Jack Rose, Joe Barry is handling. wmi 8/21

Ticket Number: 323238
Customer Name: [REDACTED]
Tech Product Area: CCST Tech - Out of Service
Tech Comp Failed: ECA

8/25/08 1

Issue:

[Engine surging issue with the custom contender and CAT engine.]

Resolution:

8/25/08, BRU, Determined that the engine surges while pumping and is not equipped with a pressure controller. Advised John Pippen that I will be in contact with Todd Bong to resolve this engine problem. John Pippen will be in contact with Todd Bong to determine which CAT facility to bring this unit to.
8/26/08, BRU, advised to monitor the engine parameters with CAT diagnostic tools.

9/16/08, BRU, Todd Bong has identified the problem with the CAT engine and is working on a solution to resolve it.
9/17/08, We have informed John Pippen with G&W that CAT is getting closer to resolving this issue and to convey that to the fire department.

9/22/08, BRU, Called and left a message for Todd Bong to contact me with the status of the ECM revision for the [REDACTED] unit.

9/23/08, BRU, Kenneth from CAT will be going to the Sherwood fire department on Wednesday 9/24 to perform testing and collect additional data to develop the software needed to resolve the problem. Ken will also be in contact with John Pippen.

9/25/08, BRU, Determined that CAT E&E techs have collected data on Wednesday and are using the data collected to come up with a resolution. The unit is at the fire department and it is being used as a back-up unit.
10/17/08, BRU, Spoke with Todd bong and he advised me that the engineers at CAT are still working on a software update but have not come up with a solution at this point.
10/28/08, BRU Still no results, will call Todd again.
11/4/08, BRU, T

[his unit has been delivered to Rigs CAT facility in Little Rock. Todd Bong will be working with Rigs to resolve the problem with the CAT ECM.]

11/7/08 2

Issue:

[John calling in for an update. - read him the last line from 11/4/08]

Resolution:

11/13/08, BRU, Todd Bong and CAT technicians tested both of the [REDACTED] units on Tuesday and Wednesday, Todd claims that the operator from the fire department could only get one of the units to surge for a total of 15 seconds after several hours of pumping under various conditions. The CAT tech was able to determine why the engine surged and feels that they can prevent this condition from occurring again with a software revision for these two engine ECM's. Todd feels that the revision should be complete, tested and ready to install in these units in about week to 10 days.

Todd also determined that one of the [REDACTED] units had pieces of an O-ring in the pressure relief valve causing the valve to remain open and the engine to drop in speed. This valve and O ring have been replaced with a revised valve that incorporates a screen to prevent this fail from occurring.

11/21/08, BRU, Todd Bong informed me that the engineer that was working on this revision has been hospitalized a

[and that CAT will not be able to resolve this until after December 1.

3

Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
Printed By: P210884 WILLES, FREDRICK E

Date Contact
Entered #

12/01/08, BRU, Called and left a message for Todd requesting an update on the software development.
12/01/08, BRU, Todd Bong expects that he will have the program revisions completed, installed and tested by Friday 12/05/08.
12/05/08, BRU, Per conversation with Todd Bong the new software has been installed and the chief was driven it back to the department without any problems.

Ticket Number: 329214 Customer Name: Tech Product Area: PUMP Tech - General
Tech Comp Failed: PBVW

9/25/08 1
Issue: Plumbing issue - large diameter discharge. control handle is mounted on top mount pumper. water is getting into handle and its rusted up to the point where you cannot see if its open/closed etc. |
Resolution: Jamie will send photos to the contact center. it is the dial indicator that is corroding. wmi |

9/26/08 2
Issue: PICTURE INCLUDED THIS TIME

Eng. 1 & Eng. 2
Job# 19654
WO# 8041742
RO# 108209

Issue:
The large diameter discharge control handle is holding water / moisture inside and discoloring the label for how much the valve is open or closed.

These two trucks are top mounts pumpers. The side mount pumpers have the handles mounted at a different angle which sheds the water better.

(INCLUDED PICTURE)

Please advise.

G & W Diesel|

3

3/30/11 9:37:52
Page - 22

Pierce Manufacturing, Inc.
Call Tracking History By Truck

R5642500 PMISOP0001
Printed By: P210884 WILLES, FREDRICK E

Date Contact
Entered #

If this does not fix problem, follow these steps:

1. Turn relief pressure down to 75 psi while pump is operating at higher pressure say 125.
2. Cycle relief valve on and off while flowing water. You should see master gauge fluctuate between 75 psi and 125 psi. This will cycle the relief valve that will remove any debris that may be trapped inside.

If this does not fix problem you need to flush out relief valve drain, which is a snubber drain located most likely on the PS pump panel.

1. With relief valve |
| off, open up the snubber while the pump is running.

If problem is not fixed, look for any leaking or kinked tubing that is associated with pressure relief valve circuit.

Lastly, WITH THE WATER PUMP OFF, remove 3/8" plastic tubing from main relief valve at the pump. With a gauge installed to monitor pressure, blow air into pump relief and monitor pressure. There should not be any pressure drop on the gauge. If there is, the internal o-ring of the main pump relief is leaking.

Please |

| see if any of this fixes your problem. If not, we will hopefully gather more information along the way that will help us diagnose the problem.

JOE BARRY SENT THIS TO JOHN PIPPEN.

3/27/09 4

Issue: |
| Please review this email and let's discuss.

— Forwarded by Joe Barry/PMI/OTC on 03/27/2009 11:01 AM —

"Jamie Pennington" <jpennington@pro-fire.com>

03/27/2009 10:30 AM

To

"Bobby Wharton" <bwharton@gwdiesel.com>, "Tom Walley" <twalley@piercemfg.com>, "Mike Ayers" <mayers@piercemfg.com>, "JBarry@piercemfg.com", "Jeff Kuntz" <jkuntz@pro-fire.com>, "John Pippet" <jpippet@gwdiesel.com>

cc

"David White" <dwhite@gwdiesel.com>

Subject

RE: [REDACTED]

ging Issue

Date Entered	Contact #
--------------	-----------

Sherwood F.D. Eng. 2
Job# 19654
WO# 8041737
Fire Dept. Contact: [REDACTED]
I understand the relief valve could be some form of an issue, but a few months ago we could get the unit to surge with the tank to pump fully open, tank fill cracked open, running around 1100 rpm, & the relief valve SHUT OFF. The unit would jump up to around 1300 then back down to around 1050. After a

short period of time it would correct itself and quit surging.
lg.
(Note that CAT has done some more updates since then)

After pulling the screen out of the pilot valve and pilot valve in the off position, there was no water pouring out the screen port. From what I have personally seen it was a little more noticeable when the pressure relief valve is in the on position.

(Also)
I personally have seen a truck, almost identical to this one, at the end of February surge with no pump engaged. The engine was just at an idle. This truck has the
I same relief valve and pump throttle system. it surged up and down for over 30 seconds.

[REDACTED] Eng. 2 Job# 18506 WO# 7068127)

Some of the firemen at [REDACTED] are also on the Little Rock FD. (Which has 7 of these units set up with the same pump, throttle, & CAT engine)
They have stated they are seeing similar issues out of these trucks but not as bad.

These 2 units at [REDACTED] & the 7 units at Little Rock have had the block heaters installed. (Which has helped out on tal king off with low power issue until engine is warm)
Also all the units should now be on (AS CAT PUTS IT) the 3rd generation of Huie pump.

ON THE RELIEF VALVE SIDE

R5642500 PMISOP0001

Pierce Manufacturing, Inc.

3/30/11 9:37:52

Printed By: P210884 WILLES, FREDRICK E

Call Tracking History By Truck

Page - 24

Date Entered	Contact #
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We have two units with a similar set up in Rainbow City, Alabama. They have NOT

been complaining about engine surge. (or at least not to us)

There units were made in the same time frame but have a Class 1 pressure

governor.

Which means they are using a transducer and not a relief valve, but they do

have

a differen

It throttle system going to the engine.

Job# 18435 WO#s 7021165 & 7021174.

COULD THE THROTTLE SYSTEM GOING TO THE ECM BE DIFFERENT, CAUSING AN ISSUE?

Thank you,

Jamie Pennington

G & W Diesel / Pro-Fire

1355 Thomas G. Wilson Dr.

Conway, AR 72032

(501) 327-3200 Phone

(501) 327-3208 Fax

Resolution:

[Michael Ayers went to pump this apparatus and verified a CAT surge. CAT going to Sherwood 4/13 to 4/16. wmi]

Ticket Number:

363443

Customer Name:

[REDACTED]

Tech Product Area: CCST Tech - General

Tech Comp Failed: INFO

3/20/09

1

Issue:

It would like to start another ticket for Sherwood F.D. AGAIN on the CAT engine surging issues.

[REDACTED] F.D. Eng. 2

Job# 19654

WO# 8041737

Fire Dept. Contact:

[REDACTED]

Please read the note below. The chief is not very happy with his two sister trucks.

The CAT issues are not going away. (even after the block heaters have been installed)

Thank you,

Jamie Pennington

G & W Diesel / Pro-Fire

1355 Thomas G. Wilson Dr.

3

R5642500 PMISOP0001

Printed By: P210884 WILLES, FREDRICK E

Pierce Manufacturing, Inc.
Call Tracking History By Truck

3/30/11 9:37:52

Page - 25

Date Contact
Entered #

Conway, AR 72032
(501) 327-3200 |

Phone

(501) 327-3208 Fax

(870) 514-6688 Cell

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

From: Alan Earnhart [mailto:shrd310gae@yahoo.com]

Sent: Friday, March 20, 2009 1:23 PM

To: Jamie Pennington

Subject: E-2 Surge

Jamie,

On 03-10-09 we were using the pump on E-2 to supply the pressure needed for our annual NFPA hose test when the engine began to surge uncontrollably. We had 4, 5" lines, 300' long laid off of 4 of the discharges, with a 3" supply from the hydrant to the drill
|ver side 2 1/2" intake. We also had the booster line pulled off of the reel flowing water so that the pump would not overheat. We charged all of the lines and bled off all of the trapped
|air, closed the nozzles and ran the pressure up to 100 p.s.i to check for leaks. At this point the engine began to surge uncontrollably, jumping from around 100 p.s.i. to over 200 p.
|s.i. on the master discharge gage. The operator had to go back to an idle before the problem would correct itself. The same thing
| happened when we tried to test the 3" hose. We used the same lay out except we were using 3" instead of 5" hose.

" When failure is not an option, train not to fail"

Resolution:

3/20 1454 hrs fw emailed this

Jamie

Do you know if they were in pressure or rpm mode when the surging occurred? It sounds as though it was pressure mode. I would be interested to know if they had switched to rpm mode
if it would of continued

These units do not have a Capt.. psi gov.
They have a Waterous relief valve and a toggle switch throttle.
Wayne is working on this on a seperate ticket |

Ticket Number: 380282

Customer Name:

Tech Product Area: ELEC Tech - Out of Service

Tech Comp Failed: MISC

6/12/09

1

3

Printed By: P210884 WILLES, FREDRICK E

Call Tracking History By Truck

Page -

26

Date Entered	Contact #
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Issue:

[ADAPT A PRESSURE GOVERNOR ON A SYSTEM THAT HAS A TOGGLE SWITCH FOR THE PUMP THROTTLE - JOE BARRY AND SOMEONE FROM CAT WANT THIS DONE

JAMIE WAS TOLD TO CONTACT GARY VANEVENHOVEN TO GET SOME WIRING DIAGRAMS]

Resolution:

[I emailed the diagrams to Jamie. GV]

6/17/09	2
---------	---

Issue:

[Conference call with Jamie, Niel, Rueben, & Paul.]

Resolution:

[Jamie will install a Class 1 gov temporarily tomorrow. 6-18-09 GV]

6/18/09	3
---------	---

Issue:

[Jamie calling back on same issue. Rep from CAT there today...He was working with Rubin and Neal--what change is exactly needed for these trucks?]

Resolution:

[I called back and left a message. GV.]

6/25/09	4
---------	---

Issue:

[I]

Resolution:

[Fred has a ticket on this issue now 381786. Cat is working on new engine programming which should be ready by July 13th. GV]

6/25/09	5
---------	---

Issue:

[jamie returning your call, couldn't hear his phone.]

Resolution:

[GV]

6/25/09	6
---------	---

Issue:

[Todd Bong from CAT has advised that they will start working on a program under the "exemption label" for the [REDACTED] trucks to eliminate the surge issue. They plan to have the program complete by July 10th and available to flash into the trucks by July 13th.

(Embedded image moved to file: pic02886.jpg)]

Resolution:

[Just had a conference call with Chief Earnhart, Todd Bong, John Phippen, and myself. The call went better than I expected. The chief stated he is willing to give this one more shot but then he is done. We gave him the July 13th date. He is looking for a truck to use (mainly as back up) while his trucks are down. I asked John to check what they have for used



Date Entered Contact #
equipment. If nothing else we will have to look for a field unit. (Embedded Image moved to file: pic24597.jpg)

Ticket Number:	381786	Customer Name:	[REDACTED]	Tech Product Area:	CCST	Tech - Out of Service
6/22/09	1			Tech Comp Failed:	ECA	
Issue:						
[Engine is surging Two trucks involved]						
Resolution:						
[Cat to come up with new programming by July 13						
6/25 GV. Todd Bong from CAT has advised that they will start working on a program under the "exemption label" for the [REDACTED] trucks to eliminate the surge issue. They plan to have the program complete by July 10th and available to flash into the trucks by July 13th.						
7/16 updates worked fine , but Cat had to remove them as they were a test program. Hope to install final version by 7/24						
7/21... 15 DAY CALL...kh...was not made since J.Barr] ly was handling this on one personally with the dealer.						
7/28...kh/J.Barry...new program was loaded and worked correctly.						

4

Sherwood, AR

EMERGENCY 911 – NON-EMERGENCY

Board of Commissioners:

Fire Chief:

TO: Asst.

FROM: Asst.

RE: E-1 Report

DATE: 02-13-09

The following problems were encountered while pumping E-1 after its return from Pro-Fire.

1. At the initial start of the pumping evolution (2- 50', 3" lines, each into a blitzfire with 1" tip, and deluge gun with 1" tip) relieve valve would not close when turned to off position. Completely shut down system and reset-relieve valve. After valve set flowing only a booster, a deluge gun, or a blitzfire relieve valve functioned properly.
2. Restarted initial pumping evolution of both blitzfires, and deluge gun. Surging started at 1020 rpms, with 10 psi. fluctuation. System shut down, pump switched to volume mode and evolution restarted—no problems noted, system shut down and pump returned to pressure mode.
3. Started flowing 2-50', 3" lines into 2- blitzfires with 1" tips. Started surging at 1020 rpms up to 1060 rpm's. Left rpm's at 1060, surged for 15-20 seconds then leveled out and pumped fine with no more surging. Relieve valve in off position during this evolution, and activated by itself during shutdown process.

5

[REDACTED]

Sherwood, AR

EMERGENCY 911 - NON-EMERGENCY

[REDACTED]

TO: G & W Diesel

FROM: [REDACTED]

RE: Surging of Engines on E-1 and E-2

DATE: 03-27-09

To Whom It May Concern:

On today's date I spoke with Jamie from Pro-Fire in reference to the engines on E-1 and E-2 surging while pumping. After speaking with Jamie I had both of these engines meet me at an open parking lot. We connected E-1 to a hydrant with a 5" LDH, set up two blitz fire monitors both being supplied by 2 1/2" hose from the pump, and set up the deluge gun. Results are as follows.

ENGINE 1

RPM Low	RPM High	Intake Psi	Discharge Psi
1111	1130	80	70
1050	1130	80	70
1030	1125	80	70
1080	1110	80	70
1030	1130	80	70

After E-1 evolution all lines we shut down, disconnected from the pump, E-1 pulled out, E-2 backed in hoses reconnected to E-2 and same evolutions performed as were on E-1.

ENGINE 2

RPM Low	RPM High	Intake Psi	Discharge Psi
1070	1140	80	70
1045	1120	80	70
1045	1090	80	70
1050	1100	80	70

During both evolutions hose streams were visibly affected by the surging in the engines. The visible effects noted by myself and others present is enough to raise safety concerns for crew members operating hand lines engaged in active fire suppression operations at the time of the surging.

[REDACTED]

6

[REDACTED]

Training Division

[REDACTED]

To: Chief [REDACTED]

From [REDACTED]

Re: E-2

Date: March 31, 2009

On March 28, 2009 while testing the Lieutenant's on their pumping we experienced some problems with engine 2. With the first applicant, engine 2 pumped normal, but with the second applicant the engine surged making the PSI jump from 50 to 100 pounds and the 1 1/4 and 2 1/2 that we were using jumped off the ground about two foot. With the third applicant the engine performed normal. While the four applicant was pumping he had his 1 1/4 at 224 psi and the 2 1/2 at about 100 psi. When he tried to gate back on his 2 1/2 to pump just 80 psi the pump lost pressure while the pump was still in gear but it was like the pump just shut off; the RPM's dropped, and the tank still had a 1/2 a tank of water. At this time the applicant pulled the primer and the pressure slowly started coming back up and the RPM came back up. He tried to gate back once again and lost pressure for the second time. The applicant went ahead and made his change over from tank water to plug water at which time the pump and engine performed normal.

Here are the steps each applicant performed on this day.

1. Lay and pump a small residential structure fire.
 - a. Stop at the proper distance from the hydrant to allow hoseman to catch hydrant.
 - b. Lay one 3" supply line at the proper speed to the fire scene.
 - c. Spot the pump properly in front of the structure.
 - d. Set Brakes
 - e. Perform all necessary functions in the cab to place pump into operation.
 - f. Put out chock blocks.
 - g. Give signal to hoseman to charge the line.
 - h. Charge one 200 ft 1 1/4" handline and set proper pump pressure to flow 200 gpm with a fog nozzle.
 - i. Make proper connections to allow water from supply to enter the pumper.
 - j. Make change over from tank water to plug water.
 - k. Refill Booster Tank
 - l. Check all gauges and valves to insure proper pressure and flow is maintained.
 - m. Placed apparatus back in service.

Pierce Fire and Rescue Service Center

Limited Warranty

1. LIMITED WARRANTY.

Except as provided below, with respect to each fire or rescue apparatus which it services, repairs, refurbishes or remanufactures, Pierce Manufacturing Inc. ("Pierce") warrants to the user:

(1) For a period of one year after redelivery each new chassis, cab or apparatus body manufactured and installed by Pierce shall be free of defects in material and workmanship;

(2) For a period of one year after redelivery the paint finish on any existing apparatus cab, body or component repainted by Pierce shall be free of defects in material and workmanship;

(3) For a period of 90 days after redelivery components serviced or repaired, but not refurbished or remanufactured, including, but not limited to brakes, suspension, valves, pumps and pump-related accessories, aerial device and related component service, and hydraulic seals shall be free of defects in material and workmanship.

(4) All other applicable limited warranties for water tanks, cabs and bodies, including structures and paint finish, manufactured and installed by Pierce on the apparatus shall apply to the extent of their respective terms and conditions.

This limited warranty shall apply only if the vehicle is properly maintained and used in service which is normal to the particular vehicle. Normal service means service which does not subject the vehicle to stresses or impacts greater than normally result from the careful use of the vehicle or chassis. If the buyer discovers a defect or nonconformity it must notify Pierce in writing within thirty (30) days after the date of discovery. This limited warranty is not transferable by the first user.

Pierce makes no warranty whatsoever as to (1) Integral parts, components, attachments or trade accessories not manufactured by Pierce, but instead, the applicable warranties, if any, of the respective manufacturers thereof shall apply; (2) Any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect or accident; (3) Any vehicle chassis or component, part, attachment or accessory shall have been repaired, altered or assembled in any way by others than Pierce which, in the sole judgment of Pierce, affects the performance, stability or purpose for which it was manufactured; (4) Products or parts which are not defective but which may wear out and have to be replaced during the warranty period including, but not limited to, tires,

fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or sub-assembly into finished products unless the assembly is performed by Pierce.

2. DISCLAIMERS OF WARRANTIES.

THE WARRANTIES SET FORTH IN PARAGRAPH 1 ARE THE EXCLUSIVE WARRANTIES GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTIES OTHERWISE ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S REMEDIES.

If the product fails to conform to the warranties set forth in paragraph 1 and such nonconformity is not due to misuse or improper maintenance, buyer shall notify Pierce as provided in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce any defective part shall be returned to Pierce for examination. Pierce will pay reasonable shipping charges therefor. Within a reasonable time Pierce shall provide, at its option, one of the following (a) repair or replacement of any nonconforming or defective parts; or (b) full refund of the purchase price. Repair or replacement shall be made only by a facility approved in advance by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM NONDELIVERY OR FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT OR FROM THE NEGLIGENCE OF PIERCE OR FROM TORT. This exclusion applies regardless of whether such damages are sought for breach of warranty, breach of contract, negligence or strict liability in tort or under any other legal theory.



We Build Confidence.

An Oshkosh Truck Corporation Company



Service Information System

Shutdown SIS

Previous Screen

8

< Product: NO EQUIPMENT SELECTED
Model: NO EQUIPMENT SELECTED
Configuration: NO EQUIPMENT SELECTED

Service Letter

PRODUCT IMPROVEMENT PROGRAM FOR INSTALLING 365-6842 ENGINE SOFTWARE ON CERTAIN C9 ENGINES INSTALLED IN PIERCE FIRE TRUCKS

Media Number -REBE6387-00

Publication Date -18/08/2010

Date Updated -18/08/2010

CONFIDENTIAL

REBE6387-00



SERVICE LETTER

18Aug2010

U-332

Safety

PRODUCT IMPROVEMENT PROGRAM FOR INSTALLING 365-6842 ENGINE SOFTWARE ON CERTAIN C9 ENGINES INSTALLED IN PIERCE FIRE TRUCKS

1901 1920

PI10816

NOTE: This Program must be administered as soon as possible. When reporting the repair, use "PI10816" as the Part Number and "7751" as the Group Number, "56" as the Warranty Claim Description Code and "T" as the SIMS Description Code.

Exception: If the repair is done after failure, use "PI10816" as the Part Number, "7751" as the Group Number, "96" as the Warranty Claim Description Code, and "Z" as the SIMS Description Code.

PROBLEM

The new software needs to be installed on certain C9 engines installed in Pierce Fire Trucks that are equipped with a two-stage water pump. The

existing software could cause the engine rpms to surge while in PTO (pump mode). The reported surge could cause a fluctuation in water pressure that is being used to fight fires which may, in conjunction with other factors or circumstances, result in a risk of personal injury or death.



AFFECTED PRODUCT

Model	Identification Number
C9	9DG06123, 6534, 7340, 7443, 7738, 8583, 8929, 9098, 9771, 9773

PARTS NEEDED

Qty	Part Number	Description
1	3656842	SOFTWARE GP-ELEK
In order to allow equitable parts availability to all participating dealers, please limit your initial parts order to not exceed 45% of dealership population. This is an initial order recommendation only, and the ultimate responsibility for ordering the total number of parts needed to satisfy the program lies with the dealer.		

ACTION REQUIRED

Install new 365-6842 engine software.

OWNER NOTIFICATION

U.S. and Canadian owners will receive the attached Owner Notification.

SERVICE CLAIM ALLOWANCES

Caterpillar		Dealer Suggested		Customer Suggested	
Parts %	Labor Hrs%	Parts %	Labor Hrs%	Parts %	Labor Hrs%
100%	100%	0%	0%	0%	0%
NOTE: This is a 1.0-hour job					

PARTS DISPOSITION

8

Handle the parts in accordance with your Warranty Bulletin on warranty parts handling.

MAKE EVERY EFFORT TO COMPLETE THIS PROGRAM AS SOON AS POSSIBLE.

COPY OF OWNER NOTIFICATION FOR U.S. AND CANADIAN OWNERS

XYZ Corporation
3240 Arrow Drive
Anywhere, YZ 99999

SAFETY - PRODUCT IMPROVEMENT PROGRAM FOR INSTALLING ENGINE SOFTWARE

MODELS INVOLVED - C9 Engines installed in Pierce Manufactured Fire Trucks

Dear Caterpillar Product Owner:

The engine needs to be reworked on the products listed below. The existing software could cause the engine RPM's to surge while in PTO (pump mode). The reported surge could cause a fluctuation in water pressure that is being used to fight fires which may, in conjunction with other factors or circumstances, result in a risk of personal injury or death. You will not be charged for the service performed.

Contact your local Caterpillar dealer immediately to schedule this service. The dealer will advise you of the time required to complete this service.

Please refer the dealer to their Service Letter dated 18Aug2010 when scheduling this service.

We regret the inconvenience this may cause you, but urge you to have this service performed for your added safety and satisfaction.

Caterpillar Inc.

Identification #(s)

Attached to 18Aug2010 Service Letter



2307 OREGON STREET
POST OFFICE BOX 2566
OSHKOSH, WISCONSIN 54903-2566
920-235-9151



Direct Dial No. 920-237-4237
Cell Phone No. 920-450-2818
Fax No. 920-233-9231
rlackore@oshkoshcorp.com

March 14, 2011

Peter Kivett
Office of Defects Investigation
National Highway Traffic Safety Administration
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
Washington DC 20590

Re: Caterpillar C9 Engine Surging

Dear Mr Kivett:

Pierce and Caterpillar have been working together to address our mutual customer's complaint concerning harmonically induced engine surging on four C9 powered apparatus. The following is a summary of this effort.

The Complaint

Pierce received complaints of engine surging on pumper apparatus at Sherwood Fire Department during a warehouse fire.

██████████ is a captain for the ██████████ as well. The complaint from Sherwood. The complaint naturally extended to the trucks in ██████████ as they have the same engine and pump configuration..

The Investigation

Throughout the course of the investigation, Caterpillar personnel performed between 45 and 50 hours of data collection in an attempt to record the complaint. During this time, the surging issue was observed multiple times.

Caterpillar software engineers made changes to the engine programming in an attempt to eliminate what was assumed to be some type of harmonic issue between the engine, the two-stage pump, and the engine governor. New programming was developed, and a temporary EPA exemption was obtained so that the programming could be installed on the trucks.

Software Changes

The changes that were made to the software are:

- Addition of unique PTO governor gains - reduced from normal gains. This makes the engine less responsive to feedback from the pumping system
- Change in hysteresis to prevent toggling of modes due to FARC (fuel air ratio control) - eliminated unstable condition due to current fuel required to drive system compared to FARC fuel limit.
- Change to ACERT mode tuneable parameter that prevented shot mode changes during step changes in desired engine speed produced by the operator
- ET (Cat Electronic Technician Service Tool) programmable ramp rate and bump rpm. This allows the operator to provide a single switched edge in the software. This benefited the governor control because we were making step changes instead of chasing a moving target.

Results of New Software

This new software operated without further surging complaints for 12 months. During this time, Caterpillar completed the EPA certification process to qualify the new software.

Caterpillar Service Bulletin

As a preliminary to the work required to remove the EPA temporary exemption, Caterpillar issued a service bulletin intended to document the recommendation for changes relative to the combination of C9 engine and Waterous two-stage high pressure pump. This bulletin was reviewed by Caterpillar product safety personnel, and the "death or serious injury" comment was added to inform the customers with this engine/pump combination of a potential hazard while fire fighting. This risk is not present while using the engine as a means of propulsion.

Injector Failure Caused Confusion

In January of 2011, personnel on one of the Sherwood trucks reported another incident of surging. Caterpillar investigated and found that one of the injectors on the engine had failed, causing a surging phenomenon. This is not related to the harmonic issue addressed by the software change.

Rainbow City Surging Caused Confusion

In parallel to this activity, there were two trucks for Rainbow City that also complained of surging. These trucks do not have two-stage high pressure pumps, but they did have a very early version of engine software that had been replaced on all the other C9 installations previously. The new software was installed on these two trucks and the surging issue has gone away. Caterpillar, however, believes that the issue would also have been solved by simply updating to the normal production software. They do not believe the Rainbow issue is evidence of a wider problem. They believe that the surging issue at Sherwood and Little Rock is isolated to the unique combination of Cat C9 engine and two-stage high pressure pumps in the [REDACTED] and [REDACTED] configurations of pumphouse, wheelbase, etc...

Custom Design can Cause Unique Reactions

As fire apparatus are very unique, it is possible that the harmonics involved are not produced in

other vehicle configurations. This supposition is supported by the fact that, other than the Rainbow City trucks, there have been no other complaints of surging in the wider population of C9 equipped apparatus. It is also supported by the difficulty that Caterpillar test engineers had in reproducing the phenomenon, even on the [REDACTED] unit.

The total population of C9 powered apparatus is as follows:

Waterous Single-Stage Low-Pressure Pump	136
Waterous Two-Stage High-Pressure Pump	34
Hale Single-Stage Low-Pressure Pump	40
Hale Two-Stage High-Pressure Pump	4
No Pump	27
Total	241

Conclusion

It is Caterpillar's data-based technical conclusion that this surging issue was related to harmonics that are unique to the [REDACTED] configurations. The service bulletin they wrote was intended to be applicable to these units only, and they do not have data to support a field campaign of other fire apparatus powered by C9 engines. They have informed Pierce that they have no further data that would justify updating software in any other Pierce products.

Very truly,

OSHKOSH CORPORATION

R. Lackore

Roger Lackore
Product Safety Director

Cc Todd Bong – Caterpillar
Tom Lane - Caterpillar

Caterpillar C9 Surging Complaint Investigation – April 5, 2011

10

Documented by Todd Bong, Senior Service Engineer

Initial complaint investigation

A trip to [REDACTED] was made on Nov 11, 2008 by a Cat Electronics engineer to work on surge complaints on fire trucks with C9 engines. This trip was used to find root cause of the surge and find a solution. These trucks run 400hp ER engine software; have Allison transmissions, and dual stage water pumps.

Data was taken on two fire trucks (E1 with engine sn D9G07443 and E2 with engine sn D9G06123), with most testing done pumping water from hydrant as the recirculation operation did not lead to resolution or identification of root cause. [REDACTED] unit E1 is Pierce job 19654-02, unit E2 is Pierce job 19654-01.

Two days of testing were conducted to find the surge problem. During 12 hours of testing, only approximately 60 seconds of instability was observed. Based on this instability, the governor gain setting was reduced to 30% of the normal governor gains. This resolved mid-range speed and load instability. A change was also made to the programmed fuel delivery mode hysteresis based on fuel quantity measurements. The hysteresis change was added due to difficulty in reproducing the complaint.

Second investigation of complaint

A subsequent trip was made April 21, 2009 to address the unresolved surge complaint. Up until this point, the true root cause was not known due to the absence of the fire chief making the complaints for the [REDACTED]. Detailed information on the complaint was available during this trip, the root cause was discovered during hydrant operation and is tied to specific speed changes.

The solution was to modify engine software to control mode changes due to step changes in desired engine speed. There were also changes made to the programmable PTO step and ramp rate to provide consistent engine mode changes.

Final trip to investigate complaint

A trip was made July 14, 2009 to test software changes and resolve any remaining issues the fire chief may have had at that time. The Cat Electronics engineer tested and validated the software changes. Since there were still complaints by this particular fire chief, this trip was intended to test additional software logic that prevented changing of the fuel delivery mode induced surging during moderately loaded pumping conditions. Variable tuning was completed for this new strategy, as well as refinement of other stability controlling tune parameters. Numerous tests were conducted to satisfy the fire chief that any and all pumping operations provided stable operating conditions that allowed for consistent water flow and nozzle pressure. Tests were conducted using tank water, hydrant, cannon, dual hose and nozzle, etc.

All changes were reviewed internally. Based on this review, the software was simplified to maintain steady fuel delivery while in active PTO operation. A test file was created and sent to the field. After successful field validation, the software was released to production.