INFORMATION REDACTED PURSUANT TOTHE FREEDOM
OF INFORMATION ACT (FOIA), 5 U.S.C.552(B)(6)

PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

DSP Vacuum Pump Discussion

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

EXTERNAL Brake Failures

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8GR[redacted]
1GNLC2EC3FR[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC6FR[redacted]
1GNLC2EC4FR[redacted]
1GNLC2EC5FR[redacted]
1GNLCDECXGR[redacted]
1GNLCDEC5GR[redacted]
1GNLC2EC1FR[redacted]
1GNLC2EC5FR[redacted]
1GNLC2EC7FR[redacted]
1GNLC2EC2FR[redacted]
1GNLC2ECXFR[redacted]
1GNLCDEC4GR[redacted]
1GNLCDEC1GR[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC8FR[redacted]
1GNLC2EC3FR[redacted]
1GNSKDEC2G[redacted]
1GNSKDEC6GR[redacted]
1GNLC2EC5FR[redacted]
1GNSK2EC1FR[redacted]
1GNLC2EC6FR[redacted]
1GNSKDEC4GR[redacted]
1GNLCDEC6GR[redacted]
1GNLCDEC2GR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC4HR[redacted]
1GNLC2EC7FR[redacted]
1GNLCDEC1JR[redacted]

PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

EXTERNAL RE Thank You

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8GR[redacted]	16	7	In
7884	1GNLC2EC3FR5[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXGR[redacted]	16	5	In
8117	1GNLCDEC5GR[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4GR[redacted]	16	7	
8136	1GNLCDEC1GR[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2GR[redacted]	16	9	In
8144	1GNSKDEC6GR[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4GR[redacted]	15	3	
8112	1GNLCDEC6GR[redacted]	16	3	
8113	1GNLCDEC2GR[redacted]	16	3	
8195	1GNLCDEC1HR[redacted]	17	3	
8267	1GNLCDEC4HR[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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EXTERNAL Thank You

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Brian/Fitz

Brian Fitzpatrick (LT/715)
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[redacted] Cell
brian.fitzpatrick@state.de.us

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FW EXTERNAL-1

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

RE EXTERNAL

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

RE Thank You-1

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

RE Thank You-4

From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional “fail safe” to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn’t happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

PE18-012

GM

3-27-2019

Q3

0001-Delaware_Police_State

Vehicle With Repeat Hard Pedal Vacuum Pump Replacements

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0002-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4GR
1GNLCDEC1GR
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR5
1GNSKDEC2GR
1GNSKDEC6GR
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4GR
1GNLCDEC6GR
1GNLCDEC2GR
1GNLCDEC1HR
1GNLCDEC4HR
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8GR[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6F[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXGR[redacted]	16	5	In
8117	1GNLCDEC5GR[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4GR[redacted]	16	7	
8136	1GNLCDEC1GR[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2GR[redacted]	16	9	In
8144	1GNSKDEC6GR[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4GR[redacted]	15	3	
8112	1GNLCDEC6GR[redacted]	16	3	
8113	1GNLCDEC2GR[redacted]	16	3	
8195	1GNLCDEC1HR[redacted]	17	3	
8267	1GNLCDEC4HR[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Stay Safe….Have a great weekend.
Brian/Fitz

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[redacted] Cell
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From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
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GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

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- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
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Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0003-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8GR[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXGR[redacted]	16	5	In
8117	1GNLCDEC5GR[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4GR[redacted]	16	7	
8136	1GNLCDEC1GR[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2GR[redacted]	16	9	In
8144	1GNSKDEC6GR[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4GR[redacted]	15	3	
8112	1GNLCDEC6GR[redacted]	16	3	
8113	1GNLCDEC2GR[redacted]	16	3	
8195	1GNLCDEC1HR[redacted]	17	3	
8267	1GNLCDEC4HR[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
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Thanks
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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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Fleet Account Executive-Service
General Motors Fleet
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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0004-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8GR[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
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- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
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From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
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586-533-6048
Kevin.J.Minor@gm.com

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0005-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8GR[redacted]
1GNLC2EC3FR[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC6FR[redacted]
1GNLC2EC4FR[redacted]
1GNLC2EC5FR[redacted]
1GNLCDECXGR[redacted]
1GNLCDEC5GR[redacted]
1GNLC2EC1FR[redacted]
1GNLC2EC5FR[redacted]
1GNLC2EC7FR[redacted]
1GNLC2EC2FR[redacted]
1GNLC2ECXFR[redacted]
1GNLCDEC4GR[redacted]
1GNLCDEC1GR[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC8FR[redacted]
1GNLC2EC3FR[redacted]
1GNSKDEC2GR[redacted]
1GNSKDEC6GR[redacted]
1GNLC2EC5FR[redacted]
1GNSK2EC1FR[redacted]
1GNLC2EC6FR[redacted]
1GNSKDEC4GR[redacted]
1GNLCDEC6GR[redacted]
1GNLCDEC2GR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC4HR[redacted]
1GNLC2EC7FR[redacted]
1GNLCDEC1JR[redacted]

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8GR[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXGR[redacted]	16	5	In
8117	1GNLCDEC5GR[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4GR[redacted]	16	7	
8136	1GNLCDEC1GR[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2GR[redacted]	16	9	In
8144	1GNSKDEC6GR[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4GR[redacted]	15	3	
8112	1GNLCDEC6GR[redacted]	16	3	
8113	1GNLCDEC2GR[redacted]	16	3	
8195	1GNLCDEC1HR[redacted]	17	3	
8267	1GNLCDEC4HR[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
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Brian and Lonnie,

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- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

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Stay Safe….Have a great weekend.
Brian/Fitz

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1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
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Cc: Kevin J Minor <kevin.j.minor@gm.com>
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From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

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GENERAL MOTORS

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brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0006-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G	[redacted]
1GNLC2EC3FR	
1GNLC2ECXFR	
1GNLC2EC6FR	
1GNLC2EC4FR	
1GNLC2EC5FR	
1GNLCDECXG	
1GNLCDEC5G	
1GNLC2EC1FR	
1GNLC2EC5FR	
1GNLC2EC7FR	
1GNLC2EC2FR	
1GNLC2ECXFR	
1GNLCDEC4G	
1GNLCDEC1G	
1GNLC2ECXFR	
1GNLC2EC8FR	
1GNLC2EC3FR	
1GNSKDEC2G	
1GNSKDEC6G	
1GNLC2EC5FR	
1GNSK2EC1FR	
1GNLC2EC6FR	
1GNSKDEC4G	
1GNLCDEC6G	
1GNLCDEC2G	
1GNLCDEC1H	
1GNLCDEC4H	
1GNLC2EC7FR	
1GNLCDEC1JR	

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3F[redacted]	15	9	In
7892	1GNLC2ECXF[redacted]	15	5	In
7898	1GNLC2EC6F[redacted]	15	5	In
7926	1GNLC2EC4F[redacted]	15	5	In
7927	1GNLC2EC5F[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1F[redacted]	15	4	In
7877	1GNLC2EC5F[redacted]	15	4	In
7919	1GNLC2EC7F[redacted]	15	4	In
7900	1GNLC2EC2F[redacted]	15	7	
7942	1GNLC2ECXF[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXF[redacted]	15	1	In
7901	1GNLC2EC8F[redacted]	15	9	In
7884	1GNLC2EC3F[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5F[redacted]	15	3	
7905	1GNSK2EC1F[redacted]	15	3	
7915	1GNLC2EC6F[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7F[redacted]	15	1	
8489	1GNLCDEC1J[redacted]	18	MCSAP	
7938	1GNLC2EC4F[redacted]	15	6	

The ones in yellow have h[redacted]an one pump replaced.
I did get to perform the fo[redacted]cuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR
1GNLCDEC5GR

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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General Motors Fleet
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1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional “fail safe” to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn’t happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0007-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Some additional information and questions:

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

Confidentiality Note: This message is intended only for the person or entity to which it is addressed. It may contain confidential and/or privileged material. Any review, transmission, dissemination or other use, or taking of any action in reliance upon this message by persons or entities other than the intended recipient is prohibited and may be unlawful. If you received this message in error, please contact the sender and delete it from your computer.

From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR [redacted]
1GNLCDEC1HR
1GNLCDEC5GR

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
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GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

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Subject: RE: Thank You

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Some additional information and questions:

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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0009-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1J

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1H[redacted]
1GNLCDEC5G[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

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Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1H
1GNLCDEC5G

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
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- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
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30501 Van Dyke Ave.
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586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0010-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

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Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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[redacted] Cell
brian.fitzpatrick@state.de.us

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Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0011-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G	16	7	In
7884	1GNLC2EC3FR	15	9	In
7892	1GNLC2ECXFR	15	5	In
7898	1GNLC2EC6FR	15	5	In
7926	1GNLC2EC4FR	15	5	In
7927	1GNLC2EC5FR	15	5	In
8104	1GNLCDECXG	16	5	In
8117	1GNLCDEC5G	16	5	Out
7922	1GNLC2EC1FR	15	4	In
7877	1GNLC2EC5FR	15	4	In
7919	1GNLC2EC7FR	15	4	In
7900	1GNLC2EC2FR	15	7	
7942	1GNLC2ECXFR	15	7	
8107	1GNLCDEC4G	16	7	
8136	1GNLCDEC1G	16	7	
7911	1GNLC2ECXFR	15	1	In
7901	1GNLC2EC8FR	15	9	In
7884	1GNLC2EC3FR	15	9	In
7987	1GNSKDEC2G	16	9	In
8144	1GNSKDEC6G	16	9	In
7722	1GNLC2EC5FR	15	3	
7905	1GNSK2EC1FR	15	3	
7915	1GNLC2EC6FR	15	3	
7983	1GNSKDEC4G	15	3	
8112	1GNLCDEC6G	16	3	
8113	1GNLCDEC2G	16	3	
8195	1GNLCDEC1H	17	3	
8267	1GNLCDEC4H	17	1	
7912	1GNLC2EC7FR	15	1	
8489	1GNLCDEC1JR	18	MCSAP	
7938	1GNLC2EC4FR	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

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Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
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Cc: Kevin J Minor <kevin.j.minor@gm.com>
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Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
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Customer Care & Aftersales
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Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
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Kevin.J.Minor@gm.com

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0012-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3F[redacted]	15	9	In
7892	1GNLC2ECXF[redacted]	15	5	In
7898	1GNLC2EC6F[redacted]	15	5	In
7926	1GNLC2EC4F[redacted]	15	5	In
7927	1GNLC2EC5F[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1F[redacted]	15	4	In
7877	1GNLC2EC5F[redacted]	15	4	In
7919	1GNLC2EC7F[redacted]	15	4	In
7900	1GNLC2EC2F[redacted]	15	7	
7942	1GNLC2ECXF[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXF[redacted]	15	1	In
7901	1GNLC2EC8F[redacted]	15	9	In
7884	1GNLC2EC3F[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5F[redacted]	15	3	
7905	1GNSK2EC1F[redacted]	15	3	
7915	1GNLC2EC6F[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7F[redacted]	15	1	
8489	1GNLCDEC1J[redacted]	18	MCSAP	
7938	1GNLC2EC4F[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
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Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
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- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
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Some additional information and questions:

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- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

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586-533-6048

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Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
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From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
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Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
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From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0013-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G	16	7	In
7884	1GNLC2EC3FR	15	9	In
7892	1GNLC2ECXFR	15	5	In
7898	1GNLC2EC6FR	15	5	In
7926	1GNLC2EC4FR	15	5	In
7927	1GNLC2EC5FR	15	5	In
8104	1GNLCDECXG	16	5	In
8117	1GNLCDEC5G	16	5	Out
7922	1GNLC2EC1FR	15	4	In
7877	1GNLC2EC5FR	15	4	In
7919	1GNLC2EC7FR	15	4	In
7900	1GNLC2EC2FR	15	7	
7942	1GNLC2ECXFR	15	7	
8107	1GNLCDEC4G	16	7	
8136	1GNLCDEC1G	16	7	
7911	1GNLC2ECXFR	15	1	In
7901	1GNLC2EC8FR	15	9	In
7884	1GNLC2EC3FR	15	9	In
7987	1GNSKDEC2G	16	9	In
8144	1GNSKDEC6G	16	9	In
7722	1GNLC2EC5FR	15	3	
7905	1GNSK2EC1FR	15	3	
7915	1GNLC2EC6FR	15	3	
7983	1GNSKDEC4G	15	3	
8112	1GNLCDEC6G	16	3	
8113	1GNLCDEC2G	16	3	
8195	1GNLCDEC1H	17	3	
8267	1GNLCDEC4H	17	1	
7912	1GNLC2EC7FR	15	1	
8489	1GNLCDEC1JR	18	MCSAP	
7938	1GNLC2EC4FR	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Stay Safe….Have a great weekend.
Brian/Fitz

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(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
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Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR
1GNLCDEC5GR

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
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GENERAL MOTORS

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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
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30501 Van Dyke Ave.
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Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

Confidentiality Note: This message is intended only for the person or entity to which it is addressed. It may contain confidential and/or privileged material. Any review, transmission, dissemination or other use, or taking of any action in reliance upon this message by persons or entities other than the intended recipient is prohibited and may be unlawful. If you received this message in error, please contact the sender and delete it from your computer.

From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional “fail safe” to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn’t happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

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Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0014-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G	16	7	In
7884	1GNLC2EC3FR	15	9	In
7892	1GNLC2ECXFR	15	5	In
7898	1GNLC2EC6FR	15	5	In
7926	1GNLC2EC4FR	15	5	In
7927	1GNLC2EC5FR	15	5	In
8104	1GNLCDECXG	16	5	In
8117	1GNLCDEC5G	16	5	Out
7922	1GNLC2EC1FR	15	4	In
7877	1GNLC2EC5FR	15	4	In
7919	1GNLC2EC7FR	15	4	In
7900	1GNLC2EC2FR	15	7	
7942	1GNLC2ECXFR	15	7	
8107	1GNLCDEC4G	16	7	
8136	1GNLCDEC1G	16	7	
7911	1GNLC2ECXFR	15	1	In
7901	1GNLC2EC8FR	15	9	In
7884	1GNLC2EC3FR	15	9	In
7987	1GNSKDEC2G	16	9	In
8144	1GNSKDEC6G	16	9	In
7722	1GNLC2EC5FR	15	3	
7905	1GNSK2EC1FR	15	3	
7915	1GNLC2EC6FR	15	3	
7983	1GNSKDEC4G	15	3	
8112	1GNLCDEC6G	16	3	
8113	1GNLCDEC2G	16	3	
8195	1GNLCDEC1H	17	3	
8267	1GNLCDEC4H	17	1	
7912	1GNLC2EC7FR	15	1	
8489	1GNLCDEC1JR	18	MCSAP	
7938	1GNLC2EC4FR	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Brian/Fitz

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Cc: Judy, Lonnie (DSP)
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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

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1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
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GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

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- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0015-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
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Thanks
Lonnie

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Sent: Friday, December 07, 2018 12:26 PM
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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: 248/320-8615

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0016-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3F
1GNLC2ECXF
1GNLC2EC6F
1GNLC2EC4F
1GNLC2EC5F
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1F
1GNLC2EC5F
1GNLC2EC7F
1GNLC2EC2F
1GNLC2ECXF
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXF
1GNLC2EC8F
1GNLC2EC3F
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5F
1GNSK2EC1F
1GNLC2EC6F
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1J

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR6[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
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From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

Confidentiality Note: This message is intended only for the person or entity to which it is addressed. It may contain confidential and/or privileged material. Any review, transmission, dissemination or other use, or taking of any action in reliance upon this message by persons or entities other than the intended recipient is prohibited and may be unlawful. If you received this message in error, please contact the sender and delete it from your computer.

From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
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Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

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Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0017-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

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- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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Cc: Judy, Lonnie (DSP)
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(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1H [redacted]
1GNLCDEC5G [redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR6[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
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The 90 kPa should be equal to 26.5 inches of vac.

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Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0018-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

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Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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Cc: Judy, Lonnie (DSP)
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR [redacted]
1GNLCDEC1HR
1GNLCDEC5GR

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
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Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

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GENERAL MOTORS

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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
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brian.fitzpatrick@state.de.us

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- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional “fail safe” to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn’t happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0019-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3F
1GNLC2ECXF
1GNLC2EC6F
1GNLC2EC4F
1GNLC2EC5F
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1F
1GNLC2EC5F
1GNLC2EC7F
1GNLC2EC2F
1GNLC2ECXF
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXF
1GNLC2EC8F
1GNLC2EC3F
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5F
1GNSK2EC1F
1GNLC2EC6F
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1J

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3F[redacted]	15	9	In
7892	1GNLC2ECXF[redacted]	15	5	In
7898	1GNLC2EC6F[redacted]	15	5	In
7926	1GNLC2EC4F[redacted]	15	5	In
7927	1GNLC2EC5F[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1F[redacted]	15	4	In
7877	1GNLC2EC5F[redacted]	15	4	In
7919	1GNLC2EC7F[redacted]	15	4	In
7900	1GNLC2EC2F[redacted]	15	7	
7942	1GNLC2ECXF[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXF[redacted]	15	1	In
7901	1GNLC2EC8F[redacted]	15	9	In
7884	1GNLC2EC3F[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5F[redacted]	15	3	
7905	1GNSK2EC1F[redacted]	15	3	
7915	1GNLC2EC6F[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7F[redacted]	15	1	
8489	1GNLCDEC1J[redacted]	18	MCSAP	
7938	1GNLC2EC4F[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1H[redacted]
1GNLCDEC5G[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

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- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
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- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
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Some additional information and questions:

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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Brian and Lonnie,

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- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0020-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3F
1GNLC2ECXF
1GNLC2EC6F
1GNLC2EC4F
1GNLC2EC5F
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1F
1GNLC2EC5F
1GNLC2EC7F
1GNLC2EC2F
1GNLC2ECXF
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXF
1GNLC2EC8F
1GNLC2EC3F
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5F
1GNSK2EC1F
1GNLC2EC6F
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1J

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1H[redacted]
1GNLCDEC5G[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Sent: Monday, January 28, 2019 12:33 PM
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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1H
1GNLCDEC5G

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

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- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

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GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0020-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G[redacted]
1GNLC2EC3FR[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC6FR[redacted]
1GNLC2EC4FR[redacted]
1GNLC2EC5FR[redacted]
1GNLCDECXG[redacted]
1GNLCDEC5G[redacted]
1GNLC2EC1FR[redacted]
1GNLC2EC5FR[redacted]
1GNLC2EC7FR[redacted]
1GNLC2EC2FR[redacted]
1GNLC2ECXFR[redacted]
1GNLCDEC4G[redacted]
1GNLCDEC1G[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC8FR[redacted]
1GNLC2EC3FR[redacted]
1GNSKDEC2G[redacted]
1GNSKDEC6G[redacted]
1GNLC2EC5FR[redacted]
1GNSK2EC1FR[redacted]
1GNLC2EC6FR[redacted]
1GNSKDEC4G[redacted]
1GNLCDEC6G[redacted]
1GNLCDEC2G[redacted]
1GNLCDEC1H[redacted]
1GNLCDEC4H[redacted]
1GNLC2EC7FR[redacted]
1GNLCDEC1JR[redacted]

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3F[redacted]	15	9	In
7892	1GNLC2ECXF[redacted]	15	5	In
7898	1GNLC2EC6F[redacted]	15	5	In
7926	1GNLC2EC4F[redacted]	15	5	In
7927	1GNLC2EC5F[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1F[redacted]	15	4	In
7877	1GNLC2EC5F[redacted]	15	4	In
7919	1GNLC2EC7F[redacted]	15	4	In
7900	1GNLC2EC2F[redacted]	15	7	
7942	1GNLC2ECXF[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXF[redacted]	15	1	In
7901	1GNLC2EC8F[redacted]	15	9	In
7884	1GNLC2EC3F[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5F[redacted]	15	3	
7905	1GNSK2EC1F[redacted]	15	3	
7915	1GNLC2EC6F[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7F[redacted]	15	1	
8489	1GNLCDEC1J[redacted]	18	MCSAP	
7938	1GNLC2EC4F[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

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From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1H [redacted]
1GNLCDEC5G [redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Thank You,

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Kevin.J.Minor@gm.com

GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0022-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G[redacted]
1GNLC2EC3FR[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC6FR[redacted]
1GNLC2EC4FR[redacted]
1GNLC2EC5FR[redacted]
1GNLCDECXG[redacted]
1GNLCDEC5G[redacted]
1GNLC2EC1FR[redacted]
1GNLC2EC5FR[redacted]
1GNLC2EC7FR[redacted]
1GNLC2EC2FR[redacted]
1GNLC2ECXFR[redacted]
1GNLCDEC4G[redacted]
1GNLCDEC1G[redacted]
1GNLC2ECXFR[redacted]
1GNLC2EC8FR[redacted]
1GNLC2EC3FR[redacted]
1GNSKDEC2G[redacted]
1GNSKDEC6G[redacted]
1GNLC2EC5FR[redacted]
1GNSK2EC1FR[redacted]
1GNLC2EC6FR[redacted]
1GNSKDEC4G[redacted]
1GNLCDEC6G[redacted]
1GNLCDEC2G[redacted]
1GNLCDEC1H[redacted]
1GNLCDEC4H[redacted]
1GNLC2EC7FR[redacted]
1GNLCDEC1JR[redacted]

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
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Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Stay Safe….Have a great weekend.
Brian/Fitz

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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
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1GNLCDEC1HR[redacted]
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Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Sent: Monday, January 28, 2019 12:33 PM
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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
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Customer Care & Aftersales
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Kevin.J.Minor@gm.com

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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0023-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G[redacted]
1GNLC2EC3F
1GNLC2ECXF
1GNLC2EC6F
1GNLC2EC4F
1GNLC2EC5F
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1F
1GNLC2EC5F
1GNLC2EC7F
1GNLC2EC2F
1GNLC2ECXF
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXF
1GNLC2EC8F
1GNLC2EC3F
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5F
1GNSK2EC1F
1GNLC2EC6F
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1JR[redacted]

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

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Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Stay Safe….Have a great weekend.
Brian/Fitz

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1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR
1GNLCDEC5GR

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
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From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
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Customer Care & Aftersales
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GENERAL MOTORS

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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0024-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G	16	7	In
7884	1GNLC2EC3FR	15	9	In
7892	1GNLC2ECXFR	15	5	In
7898	1GNLC2EC6FR	15	5	In
7926	1GNLC2EC4FR	15	5	In
7927	1GNLC2EC5FR	15	5	In
8104	1GNLCDECXG	16	5	In
8117	1GNLCDEC5G	16	5	Out
7922	1GNLC2EC1FR	15	4	In
7877	1GNLC2EC5FR	15	4	In
7919	1GNLC2EC7FR	15	4	In
7900	1GNLC2EC2FR	15	7	
7942	1GNLC2ECXFR	15	7	
8107	1GNLCDEC4G	16	7	
8136	1GNLCDEC1G	16	7	
7911	1GNLC2ECXFR	15	1	In
7901	1GNLC2EC8FR	15	9	In
7884	1GNLC2EC3FR	15	9	In
7987	1GNSKDEC2G	16	9	In
8144	1GNSKDEC6G	16	9	In
7722	1GNLC2EC5FR	15	3	
7905	1GNSK2EC1FR	15	3	
7915	1GNLC2EC6FR	15	3	
7983	1GNSKDEC4G	15	3	
8112	1GNLCDEC6G	16	3	
8113	1GNLCDEC2G	16	3	
8195	1GNLCDEC1H	17	3	
8267	1GNLCDEC4H	17	1	
7912	1GNLC2EC7FR	15	1	
8489	1GNLCDEC1JR	18	MCSAP	
7938	1GNLC2EC4FR	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
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- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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Brian/Fitz

Brian Fitzpatrick (LT/715)
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1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

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1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

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- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

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Customer Care & Aftersales
30501 Van Dyke Ave.
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586-533-6048
Kevin.J.Minor@gm.com

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

Confidentiality Note: This message is intended only for the person or entity to which it is addressed. It may contain confidential and/or privileged material. Any review, transmission, dissemination or other use, or taking of any action in reliance upon this message by persons or entities other than the intended recipient is prohibited and may be unlawful. If you received this message in error, please contact the sender and delete it from your computer.

From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional “fail safe” to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn’t happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

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Executive Staff Support Officer/Special Projects
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Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0025-Delaware_Police_State

PE18-012

GM

3-27-2019

Q3

0027-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3F
1GNLC2ECXF
1GNLC2EC6F
1GNLC2EC4F
1GNLC2EC5F
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1F
1GNLC2EC5F
1GNLC2EC7F
1GNLC2EC2F
1GNLC2ECXF
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXF
1GNLC2EC8F
1GNLC2EC3F
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5F
1GNSK2EC1F
1GNLC2EC6F
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1J

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

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Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048

Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

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1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1H
1GNLCDEC1H
1GNLCDEC5G

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
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GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

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- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
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Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Thank You,

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586-533-6048
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0026-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G [redacted]
1GNLC2EC3F
1GNLC2ECXF
1GNLC2EC6F
1GNLC2EC4F
1GNLC2EC5F
1GNLCDECXG
1GNLCDEC5G
1GNLC2EC1F
1GNLC2EC5F
1GNLC2EC7F
1GNLC2EC2F
1GNLC2ECXF
1GNLCDEC4G
1GNLCDEC1G
1GNLC2ECXF
1GNLC2EC8F
1GNLC2EC3F
1GNSKDEC2G
1GNSKDEC6G
1GNLC2EC5F
1GNSK2EC1F
1GNLC2EC6F
1GNSKDEC4G
1GNLCDEC6G
1GNLCDEC2G
1GNLCDEC1H
1GNLCDEC4H
1GNLC2EC7F
1GNLCDEC1J

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
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Thanks
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[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

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1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

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Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

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Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
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- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
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Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn't happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

Confidentiality Note: This message is intended only for the person or entity to which it is addressed. It may contain confidential and/or privileged material. Any review, transmission, dissemination or other use, or taking of any action in reliance upon this message by persons or entities other than the intended recipient is prohibited and may be unlawful. If you received this message in error, please contact the sender and delete it from your computer.

From: Kevin J Minor
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Judy, Lonnie (DSP); Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
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Kevin.J.Minor@gm.com

GENERAL MOTORS

From: Fitzpatrick, Brian (DSP) [mailto:Brian.Fitzpatrick@state.de.us]
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

I would like to thank each of your for helping DSP to solve this critical issue. I realize that a company as large as GM gets pulled in many different directions and you all have timelines that you must meet, but when a major safety issue is identified it should be all hands on deck to correct the problem and identify a way to test and be proactive ensuring it doesn’t happen moving forward. A service bulletin after the fact when braking is concerned is probably not the best safety/corporate solution.

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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0027-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8GR[redacted]
1GNLC2EC3FR
1GNLC2ECXFR
1GNLC2EC6FR
1GNLC2EC4FR
1GNLC2EC5FR
1GNLCDECXGR
1GNLCDEC5GR
1GNLC2EC1FR
1GNLC2EC5FR
1GNLC2EC7FR
1GNLC2EC2FR
1GNLC2ECXFR
1GNLCDEC4GR
1GNLCDEC1GR
1GNLC2ECXFR
1GNLC2EC8FR
1GNLC2EC3FR
1GNSKDEC2GR
1GNSKDEC6GR
1GNLC2EC5FR
1GNSK2EC1FR
1GNLC2EC6FR
1GNSKDEC4GR
1GNLCDEC6GR[redacted]
1GNLCDEC2GR
1GNLCDEC1HR
1GNLCDEC4HR
1GNLC2EC7FR
1GNLCDEC1JR

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

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Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Subject: [EXTERNAL] Thank You

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From the end user of this product, I just wanted to say thanks…your actions today are very much appreciated

I look forward to a final definitive solution and know you will work expeditiously to provide it.

Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
Delaware State Police
Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

Nothing in this message is intended to constitute an electronic signature unless a specific statement to the contrary is included in this message.

Confidentiality Note: This message is intended only for the person or entity to which it is addressed. It may contain confidential and/or privileged material. Any review, transmission, dissemination or other use, or taking of any action in reliance upon this message by persons or entities other than the intended recipient is prohibited and may be unlawful. If you received this message in error, please contact the sender and delete it from your computer.

From: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>
Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek; Kevin J Minor; Jay Ferraro
Cc: Judy, Lonnie (DSP)
Subject: [EXTERNAL] Thank You

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(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger <john.belanger@gm.com>
Cc: Kevin J Minor <kevin.j.minor@gm.com>
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1H [redacted]
1GNLCDEC1H
1GNLCDEC5G

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR
1GNLCDEC5GR

From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

From: Kevin J Minor [mailto:kevin.j.minor@gm.com]
Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Brian and Lonnie,

Thank you for taking the time to go over the concerns you are having with your fleet of Tahoes with our Engineering Group. I was happy that we could pull this meeting off on such short notice. I assure you, once we get the parts back and have a chance to analyze them we'll keep you informed on what we find. Just a couple of additional things to help us in our investigation.

Please remember to:

- Give a breakdown of the repairs performed by your fleet garage vs the dealership. A VIN list with mileage would be very helpful. E-mail this to me.
- Please switch to using the 0W20 oil instead of the 5w30. Not sure if this is a contributor but it will eliminate one piece of the puzzle
- Please provide me with the vacuum readings from your test. (Note: see additional test below from Engineering)
- Make sure the pumps that are installed are the latest part number from the bulletin, indicated by a brass colored fitting. If you replace one with a silver fitting then we don't need that back for analysis. That is the old style pump.
- I'll set up another meeting for next week, probably Thursday.
- If you get another live case on one of the Tahoes with a new pump or a 2018 truck, please contact me and I will look into dispatching a Field Service Engineer.

As usual, after some time to digest the information, the Engineering Group has come up with some additional information and requested the steps below be taken and recorded. Also, there is some additional information below this that describes the system operation.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds.
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle).

Some additional information and questions:

- The Tahoe has "Hydraulic Brake Boost" Assist (HBB). This system will detect when vacuum is too low to reach the pressure the driver is requesting, and use the ESC pump to add additional pressure
- If HBB activates, the vehicle will overall brake normally, but it will feel a little different and the driver may hear the ESC pump run
- This feature will not necessarily activate at very low speeds (Mike Z may be able to detail the range of operating conditions in which it will be active) – in other words, it is possible to get a hard pedal
- The vast majority of field complaints for this issue are during low speed braking.

Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

- Has the hard pedal issue ever been experienced at high speeds? Is there a speed over which the issue has never been experienced?
- Are the DSP officers familiar with HBB? Have they experienced it and do they know what it feels like when activated? If so, has HBB activation been experienced on the complaint cars??

Thank You,

Kevin Minor
Brand Quality Manager – HD Pickup, Police & LD Fleet Truck
Customer Care & Aftersales
30501 Van Dyke Ave.
Warren, MI 48093-2355
586-533-6048
Kevin.J.Minor@gm.com

GENERAL MOTORS

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Sent: Friday, December 07, 2018 10:46 AM
To: Robert Stipek <robert.stipek@gm.com>; Kevin J Minor <kevin.j.minor@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Thank You,

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Cc: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!

PE18-012

GM

3-27-2019

Q3

0033-Delaware_Police_State

From: Robert Stipek
Sent: Monday, December 17, 2018 1:39 PM
To: Judy, Lonnie (DSP)
Cc: Kevin J Minor; Jay Ferraro; Scott VanDerRoest; Brian D. Combs; Ray Romeo
Subject: DSP Vacuum Pump Discussion

Lonnie,

This note is a follow up to our conversation today regarding brake vacuum pump replacement, as referenced in bulletin PIT5361D, for the condition of hard brake pedal or increased pedal effort. To clarify our conversation of last week, GM will provide warranty coverage and support for the repair of any failed brake vacuum pump assembly. However, GM is not able to support a repair claim unless the condition has been verified by you, prior to the replacement of any part. Your repair order complaint must state the condition of a hard pedal or similar concern. Once verified on a road test, repairs may begin based upon a proper diagnosis.

I apologize for any confusion in this matter. As you verify and replace any of these pumps, please hold on to them, as I would expect GM would like to test and inspect any pumps for failure analysis. I will advise you of further progress in our efforts to resolve these failures.

Best Regards,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Tuesday, December 04, 2018 2:30 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP)
Cc: Robert Stipek; Jay Ferraro; Webb, Jason R (DSP)
Subject: [EXTERNAL] Brake Failures

Kevin, Here is the list of all DSP's Vacuum failures. The one that is highlighted has had more than one pump installed on it all before 18k miles and the last one on the list is a 2018 with 7500 miles. Some these have been fixed by local dealers the rest have been repaired in-house. I will be entering them into the warranty system over the next few days. We need a resolution to this problem now.

Fitz, please add anything
Thank you
Lonnie

1GNSKDEC8G	[redacted]
1GNLC2EC3F	
1GNLC2ECXF	
1GNLC2EC6F	
1GNLC2EC4F	
1GNLC2EC5F	
1GNLCDECXG	
1GNLCDEC5G	
1GNLC2EC1F	
1GNLC2EC5F	
1GNLC2EC7F	
1GNLC2EC2F	
1GNLC2ECXF	
1GNLCDEC4G	
1GNLCDEC1G	
1GNLC2ECXF	
1GNLC2EC8F	
1GNLC2EC3F	
1GNSKDEC2G	
1GNSKDEC6G	
1GNLC2EC5F	
1GNSK2EC1F	
1GNLC2EC6F	
1GNSKDEC4G	
1GNLCDEC6G	
1GNLCDEC2G	
1GNLCDEC1H	
1GNLCDEC4H	
1GNLC2EC7F	
1GNLCDEC1J	

From: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>
Sent: Friday, December 07, 2018 4:59 PM
To: Kevin J Minor; Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: [EXTERNAL] RE: Thank You

Kevin
Here is the vin list . The ones marked in were fixed in-house.

Unit	Vin	Year	TRP	In/out
8143	1GNSKDEC8G[redacted]	16	7	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7892	1GNLC2ECXFR[redacted]	15	5	In
7898	1GNLC2EC6FR[redacted]	15	5	In
7926	1GNLC2EC4FR[redacted]	15	5	In
7927	1GNLC2EC5FR[redacted]	15	5	In
8104	1GNLCDECXG[redacted]	16	5	In
8117	1GNLCDEC5G[redacted]	16	5	Out
7922	1GNLC2EC1FR[redacted]	15	4	In
7877	1GNLC2EC5FR[redacted]	15	4	In
7919	1GNLC2EC7FR[redacted]	15	4	In
7900	1GNLC2EC2FR[redacted]	15	7	
7942	1GNLC2ECXFR[redacted]	15	7	
8107	1GNLCDEC4G[redacted]	16	7	
8136	1GNLCDEC1G[redacted]	16	7	
7911	1GNLC2ECXFR[redacted]	15	1	In
7901	1GNLC2EC8FR[redacted]	15	9	In
7884	1GNLC2EC3FR[redacted]	15	9	In
7987	1GNSKDEC2G[redacted]	16	9	In
8144	1GNSKDEC6G[redacted]	16	9	In
7722	1GNLC2EC5FR[redacted]	15	3	
7905	1GNSK2EC1FR[redacted]	15	3	
7915	1GNLC2EC6FR[redacted]	15	3	
7983	1GNSKDEC4G[redacted]	15	3	
8112	1GNLCDEC6G[redacted]	16	3	
8113	1GNLCDEC2G[redacted]	16	3	
8195	1GNLCDEC1H[redacted]	17	3	
8267	1GNLCDEC4H[redacted]	17	1	
7912	1GNLC2EC7FR[redacted]	15	1	
8489	1GNLCDEC1JR[redacted]	18	MCSAP	
7938	1GNLC2EC4FR[redacted]	15	6	

The ones in yellow have had more than one pump replaced.
I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted]. This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

Thanks
Lonnie

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Sent: Friday, December 07, 2018 12:26 PM
To: Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
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- Press brake repeatedly with engine off to deplete the vacuum in the booster
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Some additional information and questions:

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Bottom line, there is an additional "fail safe" to ensure that a high level of braking will be available even when vacuum is low.

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Kevin Minor
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Customer Care & Aftersales
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Warren, MI 48093-2355
586-533-6048

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Stay Safe….Have a great weekend.
Brian/Fitz

Brian Fitzpatrick (LT/715)
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Executive Staff Support Officer/Special Projects
1441 N. DuPont Hwy.
Dover, DE. 19904
(302)672-5424 Office
[redacted] Cell
brian.fitzpatrick@state.de.us

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brian.fitzpatrick@state.de.us

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
To: John J. Belanger
Cc: Kevin J Minor
Subject: FW: [EXTERNAL]

John,

Here are the full VINs for the 3 pumps that I dropped off with you, that I collect from Lonnie at Delaware State Police.

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

Thanks,

Robert Stipek
Fleet Account Executive-Service
General Motors Fleet
Eastern Region
Cell: [redacted]

GENERAL MOTORS FLEET

From: Judy, Lonnie (DSP) [mailto:Lonnie.Judy@delaware.gov]
Sent: Monday, January 28, 2019 12:33 PM
To: Robert Stipek <robert.stipek@gm.com>
Subject: [EXTERNAL]

1GNLCDEC1HR[redacted]
1GNLCDEC1HR[redacted]
1GNLCDEC5GR[redacted]

From: John J. Belanger
Sent: Thursday, January 31, 2019 10:20 AM
To: Robert Stipek
Cc: Kevin J Minor
Subject: RE: [EXTERNAL]

Hi Bob,

Here is the address/contact for the Wabco vacuum pumps.

Peter Todman
Engineering Project Manager
WABCO Automotive Ltd.
Batley, West Yorkshire. WF17 6GH
U.K.
0044 (0) 1924595436

Thanks!

From: Robert Stipek
Sent: Thursday, January 31, 2019 10:16 AM
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Cc: Kevin J Minor <kevin.j.minor@gm.com>
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From: David Antanaitis
Sent: Tuesday, December 11, 2018 7:57 AM
To: Kevin J Minor; Judy, Lonnie (DSP); Fitzpatrick, Brian (DSP); Robert Stipek; Jay Ferraro
Cc: Brian D. Combs; Tracy Lucas; Steve C. Bruder; Renee L. Smith; Christopher Wade
Subject: RE: Thank You

Hi Lonnie,

Thank you from the engineering team for your support; we are committed to figure out what is going on with your fleet.

One detail in the test plan below – the repeated brake applies (5 times firm press and return) is a measure of how the demand of the brake system for vacuum pairs up with the ability of the pump to supply vacuum. How fast the brake applies are repeated is important.

Can you please – for steps #4 and #10 in the test plan below – try to apply the brake about 1 time per second? The pedal force can be a "moderate" apply level, it should be a comfortable cycle of apply – release – (1 second has passed) - apply – release (2 seconds have passed).....etc, and note the minimum vacuum you see after 5 applies.

Thank you again, we really appreciate your support.

Best Regards,

Dave Antanaitis
Global Technical Integration Engineer – Brake Systems
Brake Systems Engineering
david.antanaitis@gm.com
T [redacted] (cell)

GENERAL MOTORS

From: Kevin J Minor
Sent: Tuesday, December 11, 2018 7:24 AM
To: Judy, Lonnie (DSP) <Lonnie.Judy@state.de.us>; Fitzpatrick, Brian (DSP) <Brian.Fitzpatrick@state.de.us>; Robert Stipek <robert.stipek@gm.com>; Jay Ferraro <jay.ferraro@gm.com>
Cc: Brian D. Combs <brian.d.combs@gm.com>; Tracy Lucas <tracy.lucas@gm.com>; Steve C. Bruder <steve.c.bruder@gm.com>; Renee L. Smith <renee.smith@gm.com>; Christopher Wade <chris.wade@gm.com>
Subject: RE: Thank You

Lonnie,

We have looked over your results and have a few additional tests that we would like you to perform. Also, we want to duplicate the tests on a vehicle at our Proving Ground. Can you supply pictures of how you are tapping into the vent tube?

Also, we can still meet on Wednesday as scheduled but engineering won't be able to attend due to a mandatory meeting. We can still have our conference call to make sure we're still on track or I can reschedule to Thursday around 9 am or Friday.

Here is Engineering's request:

GM believes the vacuum test is showing results that can explain a hard brake pedal. The additional testing below is intended to help isolate the source of the vacuum loss, be it the pump or a leak in the brake system. Ideally the test should be done on the same vehicle as before, but another vehicle that has frequent complaints of hard pedal can work, too:

Brake Booster Vacuum Test

1. Install vacuum gage between the check valve and the brake booster (downstream of the check valve, so that it is measuring vacuum in the booster).
2. Press brake repeatedly with engine off to deplete the vacuum in the booster
3. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
4. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)

Brake Booster Leak Down Test

5. Shut engine off
6. Measure vacuum in the booster WITHOUT TOUCHING the brake pedal, after 10 minutes of letting the vehicle sit with the engine off (vacuum should be basically unchanged if the brake system is not leaking). **VACUUM READING HERE:**

Vacuum Pump Output Test

7. Move the vacuum gage location to the outlet of the vacuum pump. It will be upstream of the brake booster check valve.
8. Press brake repeatedly with engine off to deplete the vacuum in the booster
9. Measure vacuum in Brake Booster (after the check valve) at idle 30 sec after startup. **VACUUM READING HERE:**
10. Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. **VACUUM READING HERE:** Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa (and record vacuum level that it stabilizes at)
11. Install the vacuum gage directly connected to the pump's outlet to verify the pump specific performance:
    50kPa in 5s @300 RPM (pump speed = 500RPM engine speed)
    70kPa in 10s @300 RPM (pump speed = 500RPM engine speed)
    90kPa in 30s @300 RPM (pump speed = 500RPM engine speed)

Thank You,

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Warren, MI 48093-2355
586-533-6048
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GENERAL MOTORS

The ones in yellow have had more than one pump replaced.

I did get to perform the following vacuum test on a 2015 Tahoe vin #1GNLC2EC4FR[redacted] This Tahoe was equipped with a new style pump (brass fitting). We performed all the testing with both 5w30 and 0w20 with no significant difference in any of the test performed.

- Press brake repeatedly with engine off to deplete the vacuum in the booster
- Measure vacuum at idle 30 sec after startup At 30 sec. the reading was 23 inches of vac.
- Measure vacuum while slowly but firmly pressing brake pedal, 5 times or so. Vacuum should fluctuate but return to normal (>90 kPa) level. If it trends downward, measure time it takes to return to > 90 kPa The measured vac. At the start of this test was 25 inches after depressing the pedal 5 times the reading was 5 inches. I than began a stopwatch. After 45 seconds the gauge was back to 25 inches of vac.
- Bring engine up to highway speed (2500 RPM) – vehicle can remain stationary. Measure vacuum after 30 seconds. 27 inches
- With engine at 2500 RPM, measure vacuum while slowly but firmly pressing brake pedal 5 times. Vacuum should fluctuate but return to normal (even more quickly than at idle). It took 34 seconds to return to 25 inches of vac.

I also performed the following test at an idle speed of 600 rpm the vac. was at 25 inches at that time I depressed the brake pedal once and recorded the following measurements. As the pedal was depressed the vac. was 22 inches and 16 inches when I let off the pedal. At that time it took 40.19 sec. to return to 25 inches.
I than performed the the same test except, for the engine rpm was 500. It then took 45 second to return to the 25 inches of vac. I then did the test at 2000rpm, with a 26.34 sec to return to 25 inches of vac.

To perform the test I used the factory line that runs from the vac. pump to the brake booster by adding a tee in the line and adding a vac. gauge.
The 90 kPa should be equal to 26.5 inches of vac.

To answer some of your follow up questions. I have only had this occur at low speeds while I was trying to duplicate the problem. After speaking to DSP's senior mechanic he stated he has only had one of the(model year 2015) Tahoe's with this problem have a hard pedal all the time. This occurred last year when we were first having these problems. The rest have all been at low speeds.

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brian.fitzpatrick@state.de.us

From: John J. Belanger
Sent: Thursday, December 20, 2018 1:46 PM
To: Kevin J Minor; Judy, Lonnie (DSP)
Subject: Vehicle With Repeat Hard Pedal Vacuum Pump Replacements
Attachments: Oil Feed and Return Hole Check.pptx

Kevin, Lonnie,

I thought of something to check on the vehicle that has had multiple hard pedal/vacuum pump replacements. There are oil feed and return holes on the vacuum pump mounting pad on the side of the engine block. One hole is the high pressure engine oil feed to the pump to lubricate the bearings, seals and seal the vane in the pump that creates the vacuum, the oil is returned to the engine through another recessed hole in the mounting pad on the block.

We should verify on this vehicle that the oil feed and return holes are not being blocked by something (debris, not drilled or partially drilled) preventing oil flow through the pump.

I have attached a picture showing the pad and the two holes.

Thanks!