



Wayne E. Bahr, Global Director
Automotive Safety Office
Sustainability, Environment & Safety Engineering

Fairlane Plaza South, Suite 400
330 Town Center Drive
Dearborn, MI 48126-2738

March 9, 2017

Stephen A. Ridella, Director
Office of Defects Investigation
Office of Enforcement
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE, W45-302
Washington, DC 20590

Dear Mr. Ridella:

Subject: PE16-017:NEF-103swm

The Ford Motor Company (Ford) response to the Agency's letter (received January 18, 2017) concerning reports of allegations of the brake pedal described as being low, soft, or going to the floor, sometimes accompanied by a perceived loss of braking effectiveness, in certain model year 2007 through 2009 Ford Fusion, Mercury Milan, and Lincoln MKZ vehicles, is attached.

If you have any questions concerning this response, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to read "W. E. Bahr".

for Wayne E. Bahr

Attachment

FORD MOTOR COMPANY (FORD) RESPONSE TO PE16-017

Ford's response to this Recall Query information request was prepared pursuant to a diligent search for the information requested. While we have employed our best efforts to provide responsive information, the breadth of the Agency's request and the requirement that information be provided on an expedited basis make this a difficult task. We nevertheless have made substantial effort to provide thorough and accurate information, and we would be pleased to meet with Agency personnel to discuss any aspect of this Recall Query.

The scope of Ford's investigation conducted to locate responsive information focused on Ford employees most likely to be knowledgeable about the subject matter of this inquiry and on review of Ford files in which responsive information ordinarily would be expected to be found and to which Ford ordinarily would refer. Ford notes that although electronic information was included within the scope of its search, Ford has not attempted to retrieve from computer storage electronic files that were overwritten or deleted. As the Agency is aware, such files generally are unavailable to the computer user even if they still exist and are retrievable through expert means. To the extent that the Agency's definition of Ford includes suppliers, contractors, and affiliated enterprises for which Ford does not exercise day-to-day operational control, we note that information belonging to such entities ordinarily is not in Ford's possession, custody or control.

Ford has construed this request as pertaining to vehicles manufactured for sale in the United States, its protectorates, and territories.

Ford notes that some of the information being produced pursuant to this inquiry may contain personal information such as customer names, addresses, telephone numbers, and complete Vehicle Identification Numbers (VINs). Ford is producing such personal information in an unredacted form to facilitate the Agency's investigation with the understanding that the Agency will not make such personal information available to the public under FOIA Exemption 6, 5 U.S.C. 552(b)(6).

Answers to your specific questions are set forth below. As requested, after each numeric designation, we have set forth verbatim the request for information, followed by our response. Unless otherwise stated, Ford has undertaken to provide responsive documents dated up to and including October 21, 2016, the date we received your inquiry. Ford has searched within the following offices for responsive documents: Ford Customer Service Division, Office of the General Counsel, and North American Product Development.

1. State, by make, model and model year, the number of the subject vehicles Ford has manufactured for sale or lease in the United States. Separately, for each subject vehicle manufactured to date by Ford, state the following:
 - a. Vehicle identification number (VIN);
 - b. Make;
 - c. Model;
 - d. Model Year;
 - e. If the vehicle is equipped with ABS. If there is a variation in ABS types (e.g., different between hybrid and gas engines), please indicate the system with which the vehicle is equipped;
 - f. Date of manufacture;
 - g. Date warranty coverage commenced; and
 - h. The State in the United States where the vehicle was originally sold or leased (or

delivered for sale or lease).

Provide the table in Microsoft Access 2010, or a compatible format, entitled "PRODUCTION DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Ford records indicate that the approximate total number of subject vehicles sold in the United States, (the 50 states and the District of Columbia) protectorates, and territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and Virgin Islands) is 555,634. Please note that 64 of the subject vehicles were sold in the United States, but were registered in Canada, and four vehicles are considered "unknown" as to sale or registration.

Model	2007 MY	2008 MY	2009 MY	Total
Fusion	146,314	137,606	103,114	387,034
Milan	35,355	32,606	18,553	86,514
MKZ	32,957	32,455	16,674	82,086
Total	214,626	202,667	138,341	555,634

With regard to subject vehicles equipped with ABS, the table below identifies the number of subject vehicles sold in the United States by model and model year. For 2007 MY, the Anti-lock Brake System (ABS) was optional for the Ford Fusion model, and standard for the Mercury Milan and the Lincoln MKZ. The estimated ABS take rate for the 2007 model year Fusion was 41%. These vehicle VINs have been included in the Access file.

Model	2007 MY*	2008 MY	2009 MY	Total
Fusion	60,583	137,606	103,114	301,303
Milan	35,355	32,606	18,553	86,514
MKZ	32,957	32,455	16,674	82,086
Total	128,895	202,667	138,341	469,903

*NOTE: For 2007 MY, Anti-lock Brake System (ABS) was optional on the Ford Fusion, and standard on the Mercury Milan, and Lincoln MKZ. The ABS system was standard for all three models for the 2008 and 2009 model years.

Specific details for items "a" through "h" may be found in Appendix A, in Microsoft Access 2010, per NHTSA's request.

2. State, by make, model and model year, the number of the subject vehicles Ford has manufactured for sale or lease in the United States and federalized territories for which Ford sold an extended service plan. Separately, for each vehicle, state the following (if a vehicle had more than one plan, such as a maintenance plan and an extended service repair plan, then list the vehicle separately for each plan that it had):
 - a. Vehicle identification number (VIN);
 - b. Make;
 - c. Model;
 - d. Model Year;

- e. Name of the extended service plan;
- f. The mileage at which the extended service plan expires; and
- g. The number of months from the warranty start date at which the extended service plan expires.

Provide the table in Microsoft 2010, or a compatible format, entitled 'EXTENDED SERVICE PLAN DATA.' See Enclosure 1, Data Collection Disc, for a pre-formatted table which provides further details regarding this submission.

Answer

For 2007-2009 model year Ford Fusion and Mercury Milan vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage began at the warranty start date and lasted for three years or 36,000 miles, whichever occurred first. For the 2007-2009 model year Lincoln MKZ, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage began at the warranty start date and lasted for 4 years, or 50,000 miles, whichever occurred first.

Optional Extended Service Plans (ESPs) are available to cover various vehicle systems, time in service, and mileage increments. The details of the various plans are provided in Appendix E. As of the date of the information request, 108,577 new vehicle ESP policies had been purchased for 2007-2009 model year Fusion / Milan / MKZ subject vehicles. Because ESP plans are dynamic, and customers may purchase or cancel plans for both new and used vehicles and vehicles may be removed for various circumstances (e.g., crash damage or abuse) Ford does not have this information in the format requested. Please let us know if NHTSA has any questions regarding specific VIN(s).

3. State the number of each of the following, received by Ford, or of which Ford is otherwise aware, which relate to, or may relate to, the alleged defect in the subject vehicles:
- a. Consumer complaints, including those from fleet operators;
 - b. Field reports, including dealer field reports;
 - c. Reports involving a crash, injury or fatality;
 - d. Property damage claims;
 - e. Third-party arbitration proceedings where Ford is or was a party to the arbitration; and
 - f. Lawsuits, both pending and closed, in which Ford is or was a defendant or codefendant.

For subparts "a" through "f" state the total number of each item (e.g., consumer complaints, field reports, etc.) separately. Multiple incidents involving the same vehicle are to be counted separately. Multiple reports of the same incident are also to be counted separately (i.e., a consumer complaint and a field report involving the same incident in which a crash occurred are to be counted as a crash report, a field report and a consumer complaint).

In addition, for items "c" through "f" provide a summary description of the alleged problem and causal and contributing factors and Ford's assessment of the problem, with a summary of the significant underlying facts and evidence. For items "e" and "f" identify the parties to the action, as well as the caption, court, docket number, and date on which the complaint or other document initiating the action was filed.

Answer

For purposes of identifying reports of incidents that may be related to the alleged defect and any related documents, Ford has gathered "owner reports" and "field reports" maintained by

Ford Customer Service Division (FCSD), and claim and lawsuit information maintained by Ford's Office of the General Counsel (OGC).

Descriptions of the FCSD owner and field report systems and the criteria used to search each of these are provided in Appendix B.

The following categorizations were used in the review of reports located in each of these searches:

Category	Definition
A1	The customer or technician alleged a brake performance concern – and the ABS/HCU was changed or identified as the causal component.
A2	The customer or technician alleged a brake pedal feel concern – and the ABS/HCU was changed or identified as the causal component.
A3	The customer or technician alleged a brake performance concern – and something other than the ABS/HCU was identified as the cause.
A4	The customer or technician alleged a brake pedal feel concern – and something other than the ABS/HCU was identified as the cause.
A5	The customer or technician alleged a brake performance concern – and it was ambiguous if the ABS/HCU was the cause.
A6	The customer or technician alleged a brake pedal feel concern – and it was ambiguous if the ABS/HCU was the cause.
A7	There was no mention of brake pedal feel or brake pedal performance – but, the ABS/HCU was replaced.
A8	Brake pedal performance and brake pedal feel were both ambiguous – but, the ABS/HCU was replaced.

We are providing electronic copies of reports categorized as B as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these reports is insufficient to support a determination that they pertain to the alleged defect.

Owner Reports: Records identified in a search of the FMC360 database, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described above. The number and copies of relevant owner reports identified in this search for the alleged defect are provided in the FMC360 portion of the two databases, separated by subject and peer vehicles, in the respective Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive (i.e., non-ambiguous) duplicate owner reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately.

Legal Contacts: Ford is providing, in Appendix B, a description of Legal Contacts and the activity that is responsible for this information. Ford has not identified any Legal Contacts that are responsive to the Agency's request.

Field Reports: Records identified in a search of the Common Quality Indicator System (CQIS) database, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described above. The number and copies of relevant field reports identified in this search that allege brake pedal feel, extended brake pedal travel, brake

performance, and/or extended stopping distance, or allegations of ABS concerns in a subject vehicle are provided in the CQIS portion of the database contained in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive duplicate field reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately. In addition, field reports that are duplicative of owner reports are provided in Appendix C but are not included in the field report count.

VOQ Data: Of the VOQs provided, 6 were for vehicles that are not subject vehicles, and 29 were not in the model year scope. 25 records did not have a VIN reported so Ford is unable to search its databases for corresponding reports. For the remaining, Ford made inquiries of its FMC360 database for customer contacts, its CQIS database for field reports, and its AWS system for warranty repairs regarding the vehicles identified on the VOQs with full VINs.

Crash/Injury/Fatality Incident Claims: NHTSA identified 14 reports of accident allegations in the VOQs provided by the Agency. One of the VOQs with an accident allegation (ODI 10690173) did not have a VIN recorded in the VOQ. Of the 13 remaining VOQs with accident allegations, Ford does not believe there is a clear description of an accident in the VOQ Summary in three of the VOQs (10938483, 10938986, 10939506); and one of the alleged accidents (ODI 10713269) has a description that Ford believes is too ambiguous to determine if an accident occurred. Of the remaining 9 VOQs that allege accidents, Ford did not identify any alleged injuries or fatalities that may be related to the alleged defect. One of the alleged accidents was ambiguous (ODI 10713269). The customer claims an accident occurred in front of him and vehicle's brakes "did not respond", however, the record does not specifically state the customer was involved in a crash. It also mentions a second incident of the same nature occurred, but clearly states no accident occurred at that time.

Claims, Lawsuits, and Arbitrations: For purposes of identifying incidents that may relate to the alleged defect in a subject vehicle, Ford has gathered claim and lawsuit information maintained by Ford's OGC. Ford's OGC is responsible for handling various legal matters, including product liability lawsuits, claims, and consumer breach of warranty lawsuits and arbitrations against the Company.

Lawsuits and claims gathered in this manner were reviewed for relevance and categorized in accordance with the categories described above.

We are providing the requested detailed information, where available, on the responsive and ambiguous lawsuits and claims in our Log of Lawsuits and Claims, provided in Appendix C in the Legal Claim/Lawsuits tab. The number of relevant lawsuits and claims identified is also provided in this log. To the extent available, copies of complaints, first notices, or FMC360 reports relating to matters shown on the log are provided in Appendix D. With regard to these lawsuits and claims, Ford has not undertaken to contact outside law firms to obtain additional documentation.

4. Separately, for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 3, state the following information:
 - a. Ford's file number or other identifier used;
 - b. The category of the item, as identified in Request No. 3 (i.e., consumer complaint, field report, etc.);
 - c. Vehicle owner or fleet name (and fleet contact person), street address, email address

- and telephone number;
- d. Vehicle's VIN;
- e. Vehicle's make, model and model year;
- f. Vehicle's mileage at time of incident;
- g. Incident date;
- h. Report or claim date;
- i. Whether a crash is alleged;
- j. Whether property damage is alleged;
- k. Number of alleged injuries, if any; and
- l. Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2010, or a compatible format, entitled "REQUEST NUMBER THREE DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Ford is providing owner and field reports in the database contained in Appendix C in response to Request 3. To the extent information sought in Request 4 is available for owner and field reports, it is provided in the database. To the extent information sought in Request 4 is available for lawsuits and claims, it is provided in the Log of Lawsuits and Claims provided in Appendix D in the Legal Claim/Lawsuits tab.

5. Produce copies of all documents related to each item within the scope of Request No. 3. Organize the documents separately by category (i.e., consumer complaints, field reports, etc.) and describe the method Ford used for organizing the documents. Describe in detail the search methods and search criteria used by Ford to identify the items in response to Request No. 3.

Answer

Ford is providing owner and field reports in the database contained in Appendix C in response to Request 3. Copies of complaints, first notices, or FMC360 reports relating to matters shown on the Log of Lawsuits and Claims provided in Appendix C in the Legal Claim/Lawsuits tab are provided in Appendix D. To the extent information sought in Request 5 is available, it is provided in the referenced appendices.

6. State, by make, model and model year, a total count for all of the following categories of claims, collectively, that have been paid by Ford to date that relate to, or may relate to, the alleged defect in the subject vehicles: warranty claims; extended warranty claims; claims for good will services that were provided; field, zone, or similar adjustments and reimbursements; and warranty claims or repairs made in accordance with a procedure specified in a technical service bulletin or customer satisfaction campaign.

Separately, for each such claim, state the following information:

- a. Ford's claim number;
- b. Vehicle owner or fleet name (and fleet contact person), street address, email address and telephone number;
- c. VIN;
- d. Repair date;
- e. Vehicle mileage at time of repair;

- f. Repairing dealer's or facility's name, telephone number, city and state or ZIP code;
- g. Labor operation number(s);
- h. Problem code(s);
- i. Diagnostic trouble code(s);
- j. Replacement part number(s) and description(s);
- k. Concern stated by customer;
- l. Cause as stated on the repair order;
- m. Correction as stated on the repair order; and
- n. Additional comments, if any, by dealer/technician relating to claim and/or repair.

Provide this information in Microsoft Access 2010, or a compatible format, entitled "WARRANTY DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Records identified in a search of the AWS database, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described in the response to Response 3. The number and copies of relevant warranty claims identified in this search that may relate to the alleged defect in a subject vehicle are provided in the AWS portion of the two databases contained in the respective Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that duplicate claims for an alleged incident were received, each of these duplicate claims was marked accordingly and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one claim associated with their VINs. These claims have been counted separately. Warranty claims that are duplicative of owner and field reports are provided in Appendix C but are not included in the report count above.

Requests for "goodwill, field, or zone adjustments" received by Ford to date that relate to the alleged defect that were not honored, if any, would be included in the FMC360 reports identified above in response to Request 3. Such claims that were honored are included in the warranty data provided. Ford assumes that providing the warranty claims in the electronic database format meets the requirements of this request because the Agency can review or order the claims as desired.

7. Describe in detail the search methods and search criteria used by Ford to identify the claims in response to Request No. 6, including the labor operations, problem codes, diagnostic trouble codes, part numbers and any other pertinent parameters used.

Provide a list of all labor operations, labor operation descriptions, problem codes, and problem code descriptions, diagnostic trouble codes and diagnostic trouble code descriptions applicable to the alleged defect in the subject vehicles. State whether the diagnostic trouble codes are automatically reported to the warranty database electronically or manually entered into the warranty database by a claims administrator.

State, by make, model, and model year, the terms of the new vehicle warranty coverage offered by Ford on the subject vehicles (i.e., the number of months and mileage for which coverage is provided and the vehicle systems that are covered). Describe any extended warranty coverage option(s) that Ford offered for the subject vehicles and state by option, make, model, and model year, the number of vehicles that are covered under each such

extended warranty. State which extended service plans would cover the subject components.

Answer

Detailed descriptions of the search criteria, including all pertinent parameters, used to identify the claims provided in response to Request 5 are described in Appendix B.

For 2007-2009 model year Ford Fusion and Mercury Milan vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage began at the warranty start date and lasted for three years or 36,000 miles, whichever occurred first. For 2007-2009 model year Lincoln MKZ vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage began at the warranty start date and lasted for four years, or 50,000 miles, whichever occurred first.

Optional Extended Service Plans (ESPs) are available to cover various vehicle systems, time in service, and mileage increments. The details of the various plans are provided in Appendix E. As of the date of the information request, 108,577 new vehicle ESP policies had been purchased on 2007-2009 model year Fusion / Milan / MKZ subject vehicles.

8. Produce copies of all service, warranty, and other documents that relate to, or may relate to, the alleged defect in the subject vehicles, that Ford has issued to any dealers, regional or zone offices, field offices, fleet purchasers, or other entities. This includes, but is not limited to, bulletins, advisories, informational documents, training documents, or other documents or communications, with the exception of standard shop manuals. Also include the latest draft copy of any communication that Ford is planning to issue within the next 120 days.

Answer

For purposes of identifying communications to dealers, zone offices, or field offices pertaining, at least in part to the alleged defect, Ford has reviewed the following FCSD databases and files: The On-Line Automotive Service Information System (OASIS) containing Technical Service Bulletins (TSBs) and Special Service Messages (SSMs), Internal Service Messages (ISMs) contained in CQIS, and Field Review Committee (FRC) files. We assume this request does not seek information related to electronic communications between Ford and its dealers regarding the order, delivery, or payment for replacement parts, so we have not included these kinds of information in our answer.

A description of Ford's OASIS messages, ISMs, and the Field Review Committee files and the search criteria used are provided in Appendix B.

OASIS Messages: Ford did not identify any responsive OASIS messages (i.e., SSMs or TSBs).

Internal Service Messages: Ford identified one ISM #13-12-024, issued 12/17/2013 for all 2006-2009 MY Fusion/Milan/MKX vehicles equipped with ABS that may have had prior ABS service where the Hydraulic Control Unit (HCU) was replaced and the brake lines were not connected to the HCU in their correct locations.

Field Review Committee: Ford has not identified any field service action communications that may relate to the Agency's request.

Ford currently has no plans to issue communications related to the alleged defect that is the

subject of NHTSA's investigation. Although we do not believe it is related to the alleged defect, due to the broad nature of the request, a copy of Ford's ISM described above is provided in Appendix F.

9. Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, "actions") that relate to, or may relate to, the alleged defect in the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, Ford. For each such action, provide the following information:
- a. Action title or identifier;
 - b. The actual or planned start date;
 - c. The actual or expected end date;
 - d. Brief summary of the subject and objective of the action;
 - e. Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and
 - f. A brief summary of the findings and/or conclusions resulting from the action.

For each action identified, provide copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.

Answer

Ford is construing this request broadly and is providing not only studies, surveys, and investigations related to the alleged defect, but also notes, correspondence, and other communications that were located pursuant to a diligent search for the requested information. Ford is providing the responsive non-confidential documentation in Appendix G.

To the extent that the information requested is available, it is included in the documents provided. If the Agency should have questions concerning any of the documents, please advise.

Ford is submitting additional responsive documentation in Appendix H with a request for confidentiality under separate cover to the Agency's Office of the Chief Counsel pursuant to 49 CFR Part 512. Redacted copies of the confidential documents will be provided under separate cover, on separate media, to the Agency's Office of Chief Counsel as Appendix H – Redacted.

In the interest of ensuring a timely and meaningful submission, Ford is not producing materials or items containing little or no substantive information. Examples of the types of materials not being produced are meeting notices, raw data lists (such as part numbers or VINs) without any analytical content, duplicate copies, non-responsive elements of responsive materials, and draft electronic files for which later versions of the materials are being submitted.

Through this method, Ford is seeking to provide the Agency with substantive responsive materials in our possession in the timing set forth for our response. We believe our response meets this goal. If the Agency would like additional materials, please advise.

10. Describe all modifications or changes made by, or on behalf of, Ford in the design, material composition, manufacture, quality control, supply, or installation of the subject component

or the brake fluid, from the start of production to date, which relate to, or may relate to, the alleged defect in the subject vehicles. For each such modification or change, provide the following information:

- a. The date or approximate date on which the modification or change was incorporated into vehicle production;
- b. A detailed description of the modification or change;
- c. The reason(s) for the modification or change;
- d. The part number(s) (service and engineering) of the original component;
- e. The part number(s) (service and engineering) of the modified component;
- f. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
- g. When the modified component was made available as a service component; and
- h. Whether the modified component can be interchanged with earlier production components.

Also, provide the above information for any modification or change that Ford is aware of which may be incorporated into vehicle production within the next 120 days.

Answer

Ford is providing a table summarizing the requested information in Appendix I and engineering drawings for the ABS system are provided in Appendix H with a request for confidentiality under separate cover to the Agency's Office of the Chief Counsel pursuant to 49 CFR Part 512.

11. Produce exemplar samples of each design version of the subject component.

Answer

Ford is providing exemplar parts representing the two substantive design configurations for the 2007-2009 model years; including an 8-valve design for ABS only, and a 12-valve design that includes functionality for ABS, traction control, and electronic stability control. The exemplar parts are representative of the parts that were in use during the subject period (i.e., 2007-2009). These exemplar parts will be forthcoming as soon as possible within the next 2 weeks.

12. State the number of each of the following that Ford has sold that may be used in the subject vehicles by component name, part number (both service and engineering/production), model and model year of the vehicle in which it is used and month/year of sale (including the cut-off date for sales, if applicable):
- a. Subject component;
 - b. Any kits that have been released, or developed, by Ford for use in service repairs to the subject component/assembly.

For each component part number, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number). Also identify by make, model and model year, any other vehicles of which Ford is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production or service usage.

AnswerABS (ECU / HCU) Supplier

Jeremy McClain, Director of Systems & Technology
Continental Automotive Systems Inc.
One Continental Dr.
Auburn Hills, MI 48326
jeremy.mcclain@continental-corporation.com
+1-248-393-6133

Brake Fluid Supplier

Seiji Daito, Senior Vice President
CCI Manufacturing IL Corporation
15550 Canal Bank Road – P.O. Box#339
Lemont, IL 60439
Seiji.daito@cci-corporation.com
630-739-1116

As the Agency is aware, Ford service parts are sold in the U.S. to authorized Ford and Lincoln dealers. Ford has no means to determine how many of the parts were actually installed on vehicles, the vehicle model or model year on which a particular part was installed, the reason for any given installation, or the purchaser's intended use of the components sold.

Ford is providing the total number of Ford service replacement HCU and ECU assemblies by part number (both service and engineering), year of sale, where available, and supplier point of contact information in Appendix J.

13. Provide the following information regarding the subject vehicle brake system and the alleged defect condition:
- A schematic of the brake hydraulic system and description of system operation in each mode of brake control;
 - Identification of all brake system control valves that may contribute to the alleged defect; and
 - A detailed description of all brake system diagnostics related to the alleged defect condition.

Answer

Ford is providing information regarding the subject vehicle brake system, the subject components and the alleged defect condition detailed in Request 10 "a" through "h" in Appendix K. (Per "a" and "b" above, the schematic of the brake hydraulic system and a table showing the ABS control valves are included in Appendix K.) Ford is also providing specification and design requirements for the subject components in Appendix H with a request for confidentiality under separate cover to the Agency's Office of the Chief Counsel pursuant to 49 CFR Part 512.

Based on Ford's investigation, it appears that a stuck ABS normally-closed valve is not capable of setting a Diagnostic Trouble Code (DTC) or Malfunction Indicator Lamp (MIL).

For the 2007 - 2009 model years, Continental manufactured the tandem master cylinder assembly, and the ABS assemblies (i.e., ECU and HCU). CCI manufactured the brake fluid.

14. Furnish Ford's assessment of the alleged defect in the subject vehicle, including:

- a. The causal or contributory factor(s);
- b. The failure mechanism(s);
- c. The failure mode(s);
- d. Common difficulties that may be encountered by dealership technicians in diagnosing the alleged defect (e.g., DTC codes not set or remaining in the system);
- e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring or subject component was malfunctioning;
- f. The risk to motor vehicle safety that it poses; and
- g. The reports included with this inquiry.

Answer

a. The causal or contributory factor(s):

In late November 2016, NHTSA provided owner contact information for three VOQs that were filed on NHTSA's website to Ford. Ford further evaluated those reports. From mid-December 2016 to mid-January 2017, Ford contacted two of the three owners of vehicles and coordinated drive evaluations of their vehicles in Ann Arbor, MI (ODI Reference # 10905557), and in North Riverside, IL (ODI Reference # 10911159), at a Ford dealership of the owner's choice. Both vehicles were driven to the dealerships for the evaluation by their respective owners.

Ann Arbor, MI Vehicle

The Ann Arbor, MI vehicle exhibited longer than expected brake pedal travel, but the vehicle still had functional brakes, including audible and tactile ABS function.

North Riverside, IL Vehicle

The North Riverside, IL vehicle did not exhibit any abnormal behavior when evaluated and the brake system functioned as intended.

After completing the drive evaluations, brake fluid samples were taken from both vehicles (i.e., brake master cylinder reservoirs and all four wheel calipers), and the brake master cylinders and ABS module assemblies (i.e., Electrical Control Units (ECU) & Hydraulic Control Units (HCU)) were harvested for evaluation.

Ford, the brake ABS and tandem master cylinder supplier, and the brake fluid supplier continue to review the components and fluid samples harvested from the two vehicles mentioned above.

b. The failure mechanism(s):

Ann Arbor, MI Vehicle

Initial analysis for the Ann Arbor, MI ABS assembly showed a non-functional normally-closed ABS valve armature on the front right brake circuit. This normally-closed ABS valve armature was stuck open. The other three normally-closed ABS valve armatures and all four normally-open ABS valve armatures functioned properly. Visual examination

of the internal valve armature and sleeve identified a yellow gelatinous material in the front right normally-closed valve control. The right front normally-closed ABS valve armature required the use of pliers to remove it from its sleeve. The remaining three normally-closed ABS valve armatures and all four of the normally-open ABS valve armatures were easily removable, from their respective sleeves.

North Riverside, IL Vehicle

Initial analysis of the North Riverside, IL ABS assembly confirmed normal operation of the ABS module. Further investigation by the supplier indicated that the front left normally-closed ABS valve cut out delay (i.e., time for the valve to go from open to closed) was measured at 20 milliseconds (ms), which was approximately 10 ms longer than the cut out delay for the other 3 normally-closed valves on the ABS assembly. Similar to the Michigan vehicle, visual examination of the normally-closed valve armatures and sleeves identified a yellow gelatinous material, primarily in the normally-closed valve sleeves. The front left normally-closed ABS valve armature required the use of tweezers to remove it from its sleeve. All four normally-open ABS valve armatures functioned properly. The remaining three normally-closed ABS valve armatures and all four of the normally-open ABS valve armatures were easily removable, from their respective sleeves.

Initial analysis of the normally-closed ABS valve armatures appear to indicate that a rust preventative zinc coating (only used on the normally-closed armatures) may chemically react (in the presence of higher under hood temperatures) with brake fluids which may not contain adequate corrosion prevention additives. This chemical reaction may have resulted in the formation of the yellow gelatinous material that may cause the normally-closed valves to either respond slowly, or, at times, to remain open or partially open after an ABS activation event. The normally-open ABS valve armatures are coated with a different rust preventative coating from the normally-closed ABS valve armatures; black oxide (i.e., Fe_3O_4). The normally-open black oxide (Fe_3O_4) coated armatures the above vehicles did not appear to exhibit development of the gelatinous material.

Ford, the brake ABS supplier, and brake fluid supplier are currently investigating possible causal and contributory factor(s).

c. The failure mode(s):

Ann Arbor, MI Vehicle

The Ann Arbor, MI vehicle was subjectively evaluated on local roads, and in an empty parking lot. All evaluators considered the brake pedal travel to be longer than expected, but, concluded that the brakes remained functional and were always able to bring the vehicle to a controlled stop at the desired locations. The evaluators did not consider the brakes to be unsafe, and most evaluators thought that the condition was overt enough to warrant review by a service technician. Additionally, since it had recently snowed, all evaluators noted audible ABS system motor function and tactile ABS feedback in the brake pedal feel. The vehicle braking was evaluated at multiple speeds and braking events, including non-ABS and ABS modes.

North Riverside, IL Vehicle

The North Riverside, IL vehicle was subjectively evaluated on local roads and also in an empty parking lot. The vehicle was also equipped with a pedal force transducer and a pedal distance transducer, to allow objective evaluation. Evaluators considered the vehicle's brake system to have operated normally and the objective brake pedal measurements were also considered normal. The vehicle braking was evaluated at multiple speeds and braking events, including non-ABS and ABS modes.

In summary, both of these vehicles (which filed VOQs with NHTSA) were evaluated and considered safe to drive.

- d. Common difficulties that may be encountered by dealership technicians in diagnosing the alleged defect (e.g., DTC codes not set or remaining in the system):

Based on Ford's investigation, it appears that a stuck ABS normally-closed valve is not capable of setting a DTC or Malfunction Indicator Lamp (MIL). From reading the warranty reports, ABS service technicians have the expertise and technical capability to "plug" ports on the ABS assembly to identify if an ABS normally-closed valve armature is stuck open or if other aspects of the ABS assembly are not functioning properly.

- e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring or subject component was malfunctioning:

If a front ABS normally-closed valve armature sticks in the sleeve, the valve may allow fluid to enter a three cubic centimeter (cc) accumulator which is integral to the HCU. If the normally-closed valve armature is in close proximity to closing the orifice, the brakes may function properly, but the brake pedal may gradually move to a lower position, as the accumulator is filled with brake fluid. If the normally-closed valve armature sticks further away from the orifice, the brake pedal will move more quickly to a lower position, as the accumulator is filled with brake fluid. In either case, once the accumulator is filled, the affected brake circuit will develop brake pressure.

- f. The risk to motor vehicle safety that it poses:

When NHTSA issued the Opening Resume on December 20, 2016, there were reportedly 141 VOQ reports related to this issue. In the three week time period from when NHTSA published their media release (December 27, 2016) until when NHTSA issued the Preliminary Evaluation on January 18, 2017, NHTSA reported a total of 399 related VOQs – an increase of 258 VOQs. Based on reported incident dates, the additional VOQs filed during this time period were presumably from owners who may have experienced symptoms related to the condition previously, but may not have had their vehicles diagnosed by a technician, nor had their concern risen to the level compelling them to previously file a VOQ. It is noteworthy that both owners of the VOQ-reported vehicles reviewed by Ford drove their vehicles from their homes to the dealerships for this review.

During Ford's review of reports, many owners mentioned the cost of repair. At least one owner mentioned they felt that the value of their vehicle was about the same as the estimated cost of repair.

The subject vehicles are equipped with a vacuum assisted hydraulic brake system with Antilock Brake Systems (ABS). The vehicles are equipped with a diagonally split brake system, where the front right brake and the rear left brake operate on one hydraulic circuit, and the front left brake and rear right brake operate on a separate hydraulic circuit. The brake master cylinder has two separate circuits, so that in the event of a loss of pressure on one of the circuits, the second circuit will continue to function (although, the pedal travel will increase in the event of a loss of pressure from one hydraulic circuit).

As mentioned previously, slow to respond normally-closed ABS valve armatures may not be detectable by vehicle operators and have little or no effect on brake operation. A normally-closed ABS valve armature that is in close proximity to closing the orifice, may result in the brakes functioning properly, but the brake pedal may gradually move to a lower position, until the accumulator is filled with brake fluid. If a normally-closed ABS valve armature is stuck fully open the brake pedal travel will be greater, as the three cc accumulator is filled with brake fluid. However, once the accumulator has been filled, the affected brake circuit will develop brake pressure and the brakes will respond, including ABS for the non-affected brake circuits.

In addition to reviewing reports to respond to this inquiry, Ford conducted interviews with two owners who filed VOQs, conducted a Ford-employee vehicle clinic to obtain brake fluid samples from subject vehicles, completed a returned part analysis on harvested parts, and evaluated vehicles with test drive evaluations.

Based on the above information, initial analysis of the normally-closed ABS valve armatures appear to indicate that a rust preventative zinc coating (only used on the normally-closed armatures) may chemically react (in the presence of higher under hood temperatures) with brake fluids that may not contain adequate corrosion prevention additives. This chemical reaction may have resulted in the formation of the yellow gelatinous material that can cause the normally-closed valves to either respond slowly, or, at times, to remain stuck in the open or partially open position after an ABS event.

Ford understands that the cost of repair is a customer dissatisfier, however, Ford has not identified an unreasonable risk to safety due to this condition.

Ford continues investigating possible causal and contributory factor(s) and is continuing its analysis of data, ABS assemblies, and fluid samples obtained from the field, including additional engineering evaluations and testing.

###