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September 28, 2018

Stephen A. Ridella, Ph.D.
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: EA18-002rc / NEF-102

The Ford Motor Company (Ford) response to the Agency's letter (received July 20, 2018) 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) during or following and ABS event, in certain model year 2006 through 2012 Ford Fusion and Lincoln Zephyr / MKZ vehicles and 2006-2011 Mercury Milan vehicles, along with the expanded list of Ford vehicles, is attached.

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

Sincerely,

Desi Ujkashevic

Attachment

FORD MOTOR COMPANY (FORD) RESPONSE TO EA18-002

Ford's response to this Engineering Analysis 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 within the prescribed time makes 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 Engineering Analysis.

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).

Per Ford's discussions with the Agency on August 1, 2018 and August 21, 2018, Ford will be providing the Agency an analysis of the records related to 2006-2012 model year Fusion / Milan / Zephyr / MKZ vehicles.

Per Ford's discussion with the Agency on September 4, 2018, for the other 2006-2012 model year Ford vehicles that have zinc-plated ABS valves, due to the broad scope of the request Ford is providing production volumes and approximate count of potentially responsive records based on Ford's computer text-mining algorithms. These counts are included in Appendix C without review.

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 July 20, 2018, 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 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. Subject Component part number and design version (e.g., Mk20, Mk25-1, etc.) installed as original equipment;
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." A pre-formatted data collection file, which provides further details regarding this submission, will be provided to you.

Answer

For the 2006-2012 Fusion / Milan / Zephyr / MKZ vehicles, 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) equipped with an Anti-Lock Brake System (ABS) is 1,447,594. For the 2006-2007 model years, the ABS was optional for the Ford Fusion model, and standard for the Mercury Milan and the Lincoln Zephyr (2006) and MKZ (2007). The ABS system was standard for all Fusion / Milan / MKZ vehicles for the 2008 through the 2012 model years. The 2006-2007 Fusion volumes shown in the table below are for vehicles equipped with the ABS option only.

All of the vehicle volumes listed in the table below are for gas vehicles only.

Model	2006 MY	2007 MY	2008 MY	2009 MY	2010 MY	2011 MY	2012 MY	Total
Fusion	57,614	60,583	137,607	103,114	248,657	197,840	295,398	1,100,813
Milan	27,362	35,355	32,606	18,553	36,165	6080	0	156,121
Zephyr	31,328	0	0	0	0	0	0	31,328
MKZ	0	32,957	32,456	16,674	27,976	19,966	29,303	159,332
Total	116,304	128,895	202,669	138,341	312,798	223,886	324,701	1,447,594

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

In the inquiry, the Agency also stated the subject vehicles should include "all non-hybrid Ford vehicles, regardless of model year, equipped with the Subject Component". The table below provides estimated volumes for all Ford vehicles produced with zinc-plated ABS valves for the 2006 through 2012 model years.

Model	2006 MY	2007 MY	2008 MY	2009 MY	2010 MY	2011 MY	2012 MY	Total
Ford Edge	0	0	0	0	0	133,967	75,449	209,416
Lincoln MKX	0	0	0	0	0	27,060	16,936	43,996
Ford Escape	0	0	219,831	130,636	189,045	198,711	232,796	971,019
Mercury Mariner	0	0	48,371	23,292	29,255	8,580	0	109,498
Ford Explorer	176,537	106,602	88,316	25,578	71,643	82,482	86,483	637,641
Ford Explorer Sport Trac	0	45,255	22,263	4,026	14,154	0	0	85,698
Mercury Mountaineer	30,615	22,528	16,425	2,567	7,078	0	0	79,213
Ford Expedition	0	87,336	76,907	17,839	34,946	0	0	217,028
Lincoln Navigator	0	23,414	21,262	3,527	8,444	0	0	56,647
Ford Focus *	177,111	297,790	179,935	147,639	175,717	91,506	316,822	1,386,520
Ford Fiesta	0	0	0	0	0	76,381	58,836	135,217
Ford Transit Connect	0	0	0	0	36,884	27,586	42,493	106,963
Total	384,263	582,925	673,310	355,104	567,166	646,273	829,815	4,038,856

* Anti-Lock Brakes were optional for Ford Focus vehicles in the 2006 and 2007 model years. The volumes are based on a take rates of 31.6% (2006) and 36.6% (2007).

2. 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	Allegation
A1	Reduced brake performance / extended stopping distance issue; ABS/HCU unit concern
A1A	Reduced brake performance / extended stopping distance after an ABS event; ABS/HCU unit concern
A2	Brake pedal feel issue; ABS/HCU unit concern
A2A	Brake pedal feel issue after an ABS event, ABS/HCU unit concern

Only those vehicle records reviewed since the PE16-017 data analysis was completed on January 18, 2017 have the newer categories of extended stopping distance or brake pedal feel after an ABS event (A1A, A2A).

In the data summary included in Appendix C, Ford has included those records with allegations of extended stopping distance or pedal feel issue (with or without a prior ABS event), with an ABS or HCU identified as the root cause of the issue (categories A1, A1A, A2 and A2A).

Ambiguous reports are not provided in the response. Based on our engineering judgment, the information in these reports is insufficient to support a determination that they pertain to the alleged defect. Records indicating that an ABS/HCU was replaced but did not include brake pedal feel o brake pedal performance comment were not included in the final counts.

Owner Reports: These records are maintained in Ford's FMC360 database, and were searched as described in Appendix B. The results 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, are in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive 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 has not identified any Legal Contacts that are responsive to the Agency's request.

Field Reports: These records are maintained in Ford's Common Quality Indicator System (CQIS) database, and were identified as described in Appendix B. The results 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, allegations of ABS concerns or allegations of brake pedal feel and/or performance after an ABS event 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.

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 (Office of General Counsel). 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 D. 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 also provided in Appendix D. With regard to these lawsuits and claims, Ford has not contacted outside law firms to obtain additional documentation.

3. Separately, for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 2, 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 TWO DATA." A pre-formatted data collection file, which provides further details regarding this submission, will be provided to you.

Answer

Ford is providing owner and field reports for 2006-2012 model year Fusion / Milan / Zephyr / MKZ vehicles in the database contained in Appendix C. 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 is available for lawsuits and claims, it is provided in the Log of Lawsuits and Claims and Lawsuits and Claims files provided in Appendix D.

4. Produce copies of all documents related to each item within the scope of Request No. 2. 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. 2.

Answer

Ford is providing owner and field reports in the database contained in Appendix C. To the extent information is available, copies of complaints, first notices, or FMC360 reports relating to matters shown on the Log of Lawsuits and Claims are provided in Appendix C. The Legal Claim/Lawsuit information can be found in Appendix D. The search criteria used by Ford to identify the items in response to Request No. 2 is provided in Appendix B.

5. State, by 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." A pre-formatted data collection file, which provides further details regarding this submission, will be provided to you.

Answer

Records identified in a search of Ford's warranty database (AWS), as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described in the response to Question 2. 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.

6. Describe in detail the search methods and search criteria used by Ford to identify the claims in response to Request No. 5, 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 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, model, and model year, the number of vehicles that are covered under each such extended warranty.

Answer

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

For 2006-2012 model year Ford Fusion and 2006-2011 model year 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 2006 Zephyr and 2007-2012 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 for 2005-2018 Fusion / Milan / Zephyr / MKZ vehicles are provided in Appendix E. As of the date of the information request, 437,767 new vehicle ESP policies had been purchased on 2006-2012 model year Fusion / Milan / Zephyr / MKZ subject vehicles. There were no Optional Extended Service Plans for the 2008 model year; the ESP plans for that year were carried over from the 2007 plan year (the 2007 plans were extended rather than relaunched with a 2008 plan year assignment).

7. 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: Although we do not believe these ISMs are related to the alleged defect, due to the broad nature of the request, copies of three Ford ISMs described below are provided in Appendix F.

- ISM 13-12-024, issued December 17, 2013 for all 2006-2009 model year 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.
- ISM 04-05-037, issued May 26, 2004 for all 1994-2015 model year Ford vehicles equipped with a vacuum-assisted brake booster, may exhibit a brake step-through condition.

- ISM 07-06-008, issued June 5, 2007 for all 2006-2007 model year Fusion / Milan / Zephyr / MKZ vehicles, may exhibit a low brake fluid indicator or warning message displayed.

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.

8. 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.

9. 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, by Ford or Continental, including changes in the brake fluid used in the subject vehicles, 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. The engineering drawings for the ABS system were provided in Appendix H of Ford's response to PE16-017, which was submitted with a request for confidentiality under separate cover to the Agency's Office of the Chief Counsel pursuant to 49 CFR Part 512.

10. 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; and
    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.

    Answer

    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.

The following is a summary of the supplier contacts:

Continental Automotive Systems – ABS (ECU / HCU) Supplier Contact Information:

Jeremy McClain, Director of Systems & Technology
One Continental Drive, Auburn Hills, MI 48326
jeremy.mcclain@continental-corporation.com
(248) 393-6133

Dow Chemical / Dow Automotive Systems – DOT3 Brake Fluid Supplier Contact Information:

Lisa Wujkowski, Engineer
438 Building, Midland, MI 48667
llwujkowski@dow.com
(989) 636-9956

CCI DOT3 Brake Fluid Supplier Contact Information:

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

BASF H404 DOT 4 Brake Fluid Supplier Contact Information:

Dr. Harald A. Dietl, Strategic Marketing and Product Development Automotive Fluids, Fuel and Lubricant Solutions
Postal Address: BASF SE, G-EVO/MA - J550, 67056 Ludwigshafen, Germany
harald.dietl@basf.com
Phone: +49 621 60-73937 Mobile: +49 172 7470170 Fax: +49 621 60-20995

John Rayba, Global Key Account Manager - Fuel and Lubricant Solutions
100 Park Avenue, Florham Park, NJ 07932
john.rayba@basf.com
(586) 292-6981

11. 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. The risk to motor vehicle safety that it poses;

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; and
f. The reports included with this inquiry.

Answer

Summary of Ford's Engineering Analysis

The subject vehicles are equipped with a vacuum assisted hydraulic brake system with an Antilock Brake System (ABS). These vehicles are designed 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.

Investigations of the customer complaints identified that in some instances a "normally closed" ABS valve armature could stick in a position other than fully closed after an ABS activation. In some cases, the valves did open and close, but with some delay (measured in milliseconds). The cause of the valves sticking was due to the presence of zinc carboxylate, resulting from an interaction between aged brake fluid and the zinc coating on the valve armatures.

If a normally-closed ABS valve armature sticks open, the valve may allow fluid to enter a three cubic centimeter (cc) accumulator within the HCU (Hydraulic Control Unit). There is a maximum of 6 cc for both circuits if both ABS valves are stuck in the open position. If the normally-closed valve armature is in close proximity to closing the orifice, 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 brake pedal feel and pressure returns to normal.

Ford's analysis of the ABS HCU valve armatures indicates that the zinc plating used to prevent rust reacted with aged brake fluid within the confines of the valve and in the presence of higher under hood temperatures. This resulted in the formation of the yellow gelatinous zinc carboxylate material that may cause the normally-closed valves to either respond slowly, or, at times remain open or partially open after an ABS activation event. Ford has concluded that the DOT3 brake fluid could react over time with the zinc electroplate to form the yellow gelatinous material. Ford began using BASF-produced DOT4 brake fluid in Fusion / Milan / MKZ vehicles starting on December 16, 2011, resulting in a noticeable decrease in reports of sticking zinc-plated valves.

The ABS diagnostics cannot detect a stuck valve and will not set a DTC (Diagnostic Trouble Code) or MIL (Malfunction Indicator Lamp). 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.

Continental began migrating from zinc-plated valves to black oxide (Fe3O4) plated valves for ABS modules used in Ford production in 2013–2017 model year and Ford service parts in July 2017.

Summary of Ford's Drive Evaluation Analysis of the Alleged Defect

Ford conducted drive evaluations of multiple Fusion vehicles fitted with an electro-mechanical system that was able to actuate one or two of the normally closed ABS valves to simulate the alleged extended pedal travel condition.

As noted in Ford's earlier response to PE16-017, submitted 3/9/2017, drive evaluation analyses of vehicles with a VOQ record of ABS concerns either exhibited a change in brake pedal travel (but retaining functional brakes, including audible and tactile ABS function) or else did not exhibit any abnormal behavior when evaluated and the brake system functioned as intended. Objective brake pedal measurements were also considered acceptable. The vehicle braking was evaluated at multiple speeds and braking conditions, including non-ABS and ABS modes. All Ford internal evaluations concluded that the brakes remained functional and were always able to bring the vehicle to a controlled stop.

Data Analysis of 2006-2012 Fusion / Milan / Zephyr / MKZ Vehicles

Ford data analysis included responsive records for warranty claims (AWS), field reports (CQIS), owner reports (FMC360), and records reported in the previous response, PE16-017. The data showed an overall complaint rate of 0.44 R/1000. This number represents records in which the customer experienced an extended pedal travel or soft pedal (with or without a prior ABS event), and the ABS / HCU was replaced.

A large number of records were found that described an ABS or HCU replaced, but with no mention of any brake pedal experience. Many of these records mention a customer complaint of an ABS light on. While it is possible that some of these ABS concerns may have also included some pedal experience, there is no documentation of it, and the records were therefore not included. Because a stuck ABS valve does not result in an ABS warning light illumination, it is unlikely that these reports are related.

The Agency requested information regarding reports of vehicles that experienced an extended pedal or a soft pedal after an ABS event. An analysis of the Ford database identified a total of 37 records when reported the customer having an ABS event with an extended pedal or soft pedal afterwards.

Conclusion

Ford has determined that there has not been a substantial change in the field data or technical assessment since the PE16-017 response was submitted on March 9, 2017. Ford's engineering analysis showed that while customers driving vehicles with ABS systems that include zinc-plated valves may experience a longer brake pedal travel, the condition does not result in a loss of braking function or loss of vehicle control, and the vehicles can be safely brought to a controlled stop.

Based on the data collected, engineering studies and internal Ford drive evaluations, Ford has not identified an unreasonable risk to safety due to this condition. Ford will continue to monitor this condition to identify any changes in the data.

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