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Steve M. Kenner, Global Director
Automotive Safety Office
Sustainability, Environment & Safety Engineering

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

August 16, 2013

Mr. Frank S. Borris, Director
Office of Defects Investigation
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE, Room W45-302
Washington, DC 20590

Dear Mr. Borris:

Subject: PE13-018:NVS 213dlr

The Ford Motor Company (Ford) response to the agency's June 27, 2013, letter concerning reports of alleged reduced engine power during hard acceleration in F-150 vehicles with 3.5L GTDI engine is attached.

As the agency is aware, Ford has conducted extensive analyses pertaining to the potential for water accumulation in the charge air cooler (CAC) under specific driving conditions, and its potential effect on vehicle performance during hard acceleration. Based on these evaluations, Ford has implemented a series of service actions to address this issue. Vehicle evaluations have shown that a vehicle experiencing a momentary reduction in engine power, due to a cylinder misfire from water ingestion, will continue to maintain its speed, as well as accelerate, albeit at a lower rate.

Ford believes the corrective actions that have been implemented in production and service effectively and appropriately address this issue. Consideration of all the factors relating to this subject supports a conclusion that this does not present an unreasonable risk to safety in these vehicles.

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

Sincerely,

for Steven M. Kenner
Attachment

FORD MOTOR COMPANY (FORD) RESPONSE TO PE13-018

Ford's response to this Preliminary Evaluation 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 Preliminary Evaluation.

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 June 27, 2013, the date of your inquiry. Ford has searched within the following offices for responsive documents: Sustainability, Environment and Safety Engineering, Ford Customer Service Division, Marketing and Sales Operations, Purchasing, Quality, Research, Global Core Engineering, Office of the General Counsel, Vehicle Operations, North American Product Development, and Ford of Europe Product Development.

Request 1

State, by model and model year, the number of 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 installed as original equipment;
- f. Powertrain Control Module (PCM) software version;
- g. Date of manufacture;
- h. Date warranty coverage commenced.; and
- i. 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 2007, or a compatible format, entitled "PE13-018 PRODUCTION DATA." See Enclosure, Data Collection Disc, for a pre-formatted table which provides further details regarding this submission.

Answer

Ford records indicate that the approximate total number of subject vehicles equipped with the 3.5L GTDI engine 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 359,771.

The number of subject vehicles sold in the United States by model and model year is shown below:

Model	2011 MY	2012 MY	2013 MY
F-150 with 3.5L	113,072	139,332	107,367

The requested data for each subject vehicle is provided in Appendix A. Additionally the agency has requested subject component part number and PCM software version. This information is not readily available for each vehicle; however, PCM part numbers and software implementation dates are included in Appendix J1 & J2.

Request 2

State the number of each of the following, received by Ford, or of which Ford are 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 owner reports located in each of these searches:

Category	Allegation
A	Alleged reduction in engine power during acceleration
B	Alleged reduction in engine power - ambiguous
D	Charge air cooler replacement with no alleged reduction in engine power

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

Category	Allegation
A	Alleged reduction in engine power during acceleration
B	Alleged reduction in engine power - ambiguous

We are providing electronic copies of reports categorized as "B" and "D" 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 Master Owner Relations Systems (MORS) 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 that may relate to the agency's request in a subject vehicle are provided in the FMC360 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 (i.e., not 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 notes that five responsive owner reports

were inadvertently designated by our Customer Relations Center (CRC) as "Legal", although there were no related legal contacts or legal files associated with these five reports.

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 may relate to the agency's request 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.

Crash/Injury Incident Claims: For purposes of identifying allegations of accidents or injuries that may have resulted from the alleged defect, Ford has reviewed responsive owner and field reports, and lawsuits and claims. Copies of reports corresponding to these alleged incidents are provided in the MORS, CQIS, and Analytical Warranty System (AWS) portions of the database provided in Appendix C.

VOQ Data: This information request had an attachment that included 250 Vehicle Owner Questionnaires (VOQs), 92 of which were duplicative of the reports received by Ford. Ford made inquiries of its FMC360 database for customer contacts, and its CQIS database for field reports regarding the vehicles identified on the VOQs. Ford notes that in some instances where the VOQ does not contain the VIN or the owner's last name and zip code, it is not possible to query the databases for owner and field reports specifically corresponding to the VOQs.

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 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 sorted in accordance with the categories described above. Ford has also located other lawsuits, claims, or consumer breach of warranty lawsuits, each of which is ambiguous as to whether it meets the alleged defect criteria. We have included these lawsuits and claims as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these lawsuits and claims is insufficient to support a determination that they pertain to the alleged defect.

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 Appendix D. Documents that are protected by attorney-client privilege and that are not being provided with this response are listed in the privilege log provided in Appendix I. With regard to these lawsuits and claims, Ford has not undertaken to contact outside law firms to obtain additional documentation.

Request 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. 2 (i.e., consumer complaint, field report, etc.);
- c. Vehicle owner or fleet name (and fleet contact person), address, and telephone number;
- d. Vehicle owner's address;
- e. Vehicle owner's telephone number;
- f. Vehicle's VIN;
- g. Vehicle's make, model and model year;
- h. Vehicle's mileage at time of incident;
- i. Incident date;
- j. Report or claim date;
- k. Whether a crash is alleged;
- l. Whether property damage is alleged;
- m. Number of alleged injuries, if any; and
- n. Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2007, or a compatible format, entitled "PE13-018 REQUEST NUMBER TWO DATA." See Enclosure, Data Collection Disc, for a pre-formatted table which 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 2. To the extent information sought in Request 3 is available for owner and field reports, it is provided in the database. To the extent information sought in Request 3 is available for lawsuits and claims, it is provided in the Log of Lawsuits and Claims provided in Appendix C in the Legal Claim/Lawsuits tab.

Request 4

Produce electronic 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.

Answer

Ford is providing owner and field reports in the database contained in Appendix C in response to Request 2. 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 4 is available, it is provided in the referenced appendices.

Request 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) 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;
- h. Problem code;
- i. Replacement part number(s) and description(s);
- j. Concern stated by customer; and
- k. Comment, if any, by dealer/technician relating to claim and/or repair.

Provide this information in Microsoft Access 2007, or a compatible format, entitled "PE13-018 WARRANTY DATA." See Enclosure, Data Collection Disc, for a pre-formatted table which 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 according to the following categories:

Category	Allegation
A	Alleged reduction in engine power during acceleration
B	Alleged reduction in engine power - ambiguous
AT	Alleged reduction in engine power during acceleration, TSB performed
BT	Alleged reduction in engine power - ambiguous, TSB performed
CT	No alleged reduction in engine power, TSB performed

The number and copies of relevant warranty claims identified in this search that may relate to the agency's request in a subject vehicle are provided in the AWS 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 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 MORS reports identified above in response to Request 2. Such claims that were honored are included in the warranty data provided.

Request 6

Describe in detail the search criteria used by Ford to identify the claims identified in response to Request No. 5, including the labor operations, problem 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 applicable to the alleged defect in the subject vehicles. 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 in response to Request 5 are described in Appendix B.

For 2011-2013 model year F-150 vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage begins at the warranty start date and lasts for three years or 36,000 miles, whichever occurs 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. The charge air cooler is covered by the Premium Care and Royal Shield ESP. As of the date of the information request, 68,313 new vehicle Premium Care and Royal Shield ESP policies had been purchased on 2011-2013 model year F-150 vehicles.

Request 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 agency's request, 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 (ISM) 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 types 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 has identified five SSMs and six TSBs that may relate to the agency's request and is providing copies of them in Appendix F.

Internal Service Messages: Ford has identified five ISMs that may relate to the agency's request and is providing copies of them in Appendix F.

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 new communications related to the subject of NHTSA's investigation within the next 120 days.

Request 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

In an August 9, 2013 email, Mr. Derek Rinehardt of the agency granted Ford's request for a one week extension to provide this information. Therefore, Ford intends to provide the information responsive to Request 8 in its entirety by the time agreed upon.

Request 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 (1) the subject component; (2) the engine misfire detection logic; or (3) the fuel shutoff catalyst protection logic, 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 numbers (service and engineering) of the original component;
- e. The part number (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

A table of the requested changes is provided in Appendix J1 and J2.

Ford currently has no plans for modifications related to the subject components in the subject vehicles within the next 120 days.

Request 10

Provide a detailed description of the misfire detection and catalyst protection logic for the subject vehicles, including the following information:

- a. Describe the misfire detection system in the subject vehicles;
- b. Describe the catalyst protection fuel shutoff logic in the subject vehicles, including the conditions necessary for fuel shutoff to individual cylinders;
- c. Provide copies of all regulations that relate to requirements for misfire detection or catalyst protection fuel shutoff in the subject vehicles;
- d. Provide copies of all Ford engineering requirements related to misfire detection, fuel shutoff, catalyst protection and/or conditions for resetting normal operation following fuel shutoff mode;
- e. State the maximum number of cylinders that may be subjected to misfire related fuel shutoff and cite the basis/requirement from the documents furnished in 10.c and 10.d, including the engineering basis for the maximum number of cylinders and whether the number is the same for all vehicles or differs depending on variables such as the number of engine cylinders;
- f. State whether Ford has considered alternative fuel shutoff strategies, including reset criteria (e.g., test fire any disabled fuel injector once every 15 ignition cycles), and describe all regulations and/or Ford engineering requirements that would relate to such changes (e.g., whether requests for exemptions/waivers are required, the process for making such requests, and the criteria for review/approval); Describe the effects on engine performance when operating with maximum fuel shutoff in effect and provide horsepower and torque curves for operating with (1) full engine power, and (2) maximum fuel shutoff mode;
- g. Provide curves for maximum vehicle accelerations as a function of vehicle speed when operating with (1) full engine power, and (2) maximum fuel shutoff mode; and
- h. State the volumetric efficiency of the subject engine.

Answer

- a. The misfire detection monitor is explained in Ford's On Board Diagnostics (OBD II) compliance submission provided in Appendix K – Confidential.
- b. The fuel shut off feature is explained in Ford's OBD II compliance submission provided in Appendix K – Confidential.
- c. The subject vehicles comply with all federal and California OBD II regulations. A portion of the California regulation that refers to fuel shut off control is provided in Appendix L.
- d. Ford has no specific requirements beyond meeting the OBD II regulations.
- e. This information is provided in Ford's response to part 10.a of this request.
- f. Ford is continually looking for ways to improve misfire detection as a way to improve driveability and improve catalyst protection within the limits of Federal and California OBD II regulations. The effects of engine performance during fuel shut off mode are evaluated in our response to part 10.g of this request.
- g. Ford is providing Vehicle Speed curves for maximum vehicle acceleration (Wide open Throttle) from 50 to 70 mph with water ingestion and maximum fuel shut off, along with Vehicle Speed curves showing full engine power in Appendix M – Confidential.
- h. Volumetric Efficiency is provided in Appendix N – Confidential.

Request 13

Produce one sample of each of the following for each version used in the subject vehicles as original equipment or service parts (note that :

- a. CAC assembly;
- b. CAC inlet and outlet end pieces/chambers (for original CAC only);
- c. CAC core (with tube ends and turbulators visible); and
- d. Air deflector plates.

Answer

Ford notes the original design version of the charge air cooler is no longer available and there is no service stock of these parts. Therefore, used parts were obtained from the field. Ford has shipped the following parts in accordance with the agency's request:

- 1) One used BL34-9L440-AD 2011MY-2013MY job#1 CAC assembly
- 2) One used BL34-9L440-AD 2011MY-2013MY job#1 CAC disassembled
- 3) One DL34-9L440-AC 2013MY current production revised CAC assembly
- 4) One DL34-9L440-AC 2013MY current production revised CAC disassembled
- 5) One CL3Z-19E672-A air deflector
- 6) One DL34-3G4610-AA revised air deflector

Request 14

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-Mercury 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 charge air coolers by part number (both service and engineering) and year of sale, where available, in Appendix J1. Information pertaining to production and service usage for each part number, and supplier point of contact information, is included in Appendix J1.

Finally, no kits have been developed for use in service repairs to the subject vehicles that relate or may relate to the alleged defect in the subject vehicles.

Request 15

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; and
- 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

The agency's investigation pertains to reports of reduced engine power during hard acceleration, including specific reference to charge air cooler performance under certain specific conditions. As the agency is aware, Ford has conducted extensive analyses pertaining to the potential for moisture accumulation in the charge air cooler (CAC) under specific driving conditions and its potential effect on vehicle performance during hard acceleration. Vehicle evaluations, conducted to duplicate the failure mode believed to have been experienced by owners, found that the vehicles did not decelerate, but rather exhibited acceleration levels that may be lower than drivers would prefer for a short period of time. As further described below, Ford believes that this vehicle performance, even during the relatively specific circumstances associated with this condition, does not present an unreasonable risk to safety.

Charge Air Cooler Moisture

As part of Ford's normal process to continually monitor reports and claims contained in its various data systems, an increase in the number of engine misfire claims was observed in early 2011, on 2011 and 2012 model year Ford F-150 vehicles equipped with the 3.5L GTDI engine. Ford initiated an investigation to identify and understand potential root causes in an effort to increase customer satisfaction and address warranty performance. Analyses of customer comments identified a significant number of allegations of intermittent engine stumble and/or misfire at or near wide open throttle (WOT) after an extended steady-speed drive at highway speeds, especially in very humid or rainy conditions. The predominant root cause of these specific symptoms was determined to be moisture accumulation in the CAC.

As part of Ford's root cause analysis, vehicle testing was conducted in an environmental chamber in an effort to duplicate these symptoms. In early 2012, a misfire condition was duplicated following prolonged steady-speed operation under significantly humid and rainy conditions. Analysis found that while operating in these conditions at steady-speed without significant throttle tip-ins or transmission downshifts, condensation could form and accumulate inside the CAC tubes due to the efficiency of the charge air cooler. This condensation could then be ingested into the engine during particularly hard acceleration (boosted engine) conditions such as at or near WOT. An engine misfire could occur if the amount of condensed water released from the CAC exceeded the engine's operating threshold for water ingestion.

Based on the engine configuration and air intake system design of these vehicles, up to three cylinders could misfire during the water ingestion depending on the amount of water that had accumulated in the CAC. This misfire could occur for up to a couple of seconds. The driver may notice reduced acceleration during this short water ingestion period. If the misfire is sufficient, to protect the catalyst and to meet OBD II emissions regulations, the powertrain's Failure Mode and Effects Management (FMEM) system is designed to disable the fuel injectors of the misfiring cylinders (up to two) when this occurs. No more than two injectors will be shut off during this FMEM mode. The fuel shut off will continue for the minimum 30 seconds as required by OBD II regulations and until the driver tips out of the throttle. After 30 seconds the vehicle will resume normal operation on its own. If a misfire is detected on two subsequent drive cycles, a check engine light will illuminate.

Ford conducted multiple vehicle evaluations to better understand the potential effect this misfire condition would have on engine power, vehicle speed, and vehicle control. For vehicle evaluation purposes the CAC was filled with between three and eight ounces of water, which was determined to be the largest volume of condensation the system would likely be capable of accumulating during any specific operating conditions previously described. To simulate the conditions described by drivers in their allegations, the vehicles were then driven at a steady highway speed (e.g. 55 mph) when the gas pedal was moved to the wide open throttle (WOT) position, forcing a transmission downshift from 6th gear to 2nd gear. Increased engine rpm and air flow caused the test water to be ingested into the engine and, if a misfire was detected, caused the system to enter the FMEM mode previously described. The vehicle behavior caused by these drive evaluations was similar to that observed in the environmental chamber testing. In these evaluations conducted by Ford, the driver experienced a momentary (a few seconds) reduction in engine power when the water was being ingested and misfires were detected in 2-3 cylinders. During these evaluations the driver experienced a steady increase in vehicle speed when one or two injectors were disabled during the FMEM strategy. After 30 seconds the fuel shut off [FMEM mode] was deactivated and the vehicle accelerated at a normal rate. There was no detrimental effect on vehicle control.

Service Repair

To address this unique misfire condition, an air deflector plate was developed to block the top 6 tubes of the CAC, thus reducing the potential for condensation build up within the CAC. The deflector plate was released for service and a service bulletin TSB 12-6-4 was issued on June 7, 2012 to inform dealers of the remedy which included improved misfire detection software to mitigate induced catalyst damage. Following this initial TSB, a new CAC was developed to further reduce condensation. This new CAC, along with the air deflector, was implemented into production on September 17, 2012. A corresponding service bulletin TSB 12-10-19 was issued on October 30, 2012, for 2011-2012MY vehicles, and TSB 12-11-15 was issued for 2013MY vehicles on November 23, 2013. These TSBs were issued to inform dealers of the improved remedy which included the new CAC and air deflector. TSB 12-10-19 was later superseded by TSB 13-3-3 which provided more effective diagnostic instructions for the technician to identify and repair unrelated misfire issues (e.g. bad coil, spark plug, etc.). Finally, TSB 13-3-3 was superseded by TSB 13-8-1 on August 2, 2013, which consists of a new air deflector plate, eliminating the need to install a new CAC for affected vehicles. Ford's analysis of warranty data shows that the permanent corrective actions taken in production and the service actions are proving to be effective.

Analysis of Reports

Most owner reports identified in response to this request do not express concern for loss of vehicle speed. Many customers expressed their dissatisfaction with the difficulty dealers were having diagnosing and repairing their concern the first time. Other customers were also dissatisfied with the amount of time it took to have their vehicle repaired, leading to increased vehicle down time and multiple visits to fix the same issue. This situation was compounded by a shortage of parts when the new service CAC was first released. CAC service parts were temporarily backordered and some customers waited several days or weeks for their vehicle to be repaired. Though a small percentage of customer reports did sometimes allege significant vehicle speed loss associated with this subject, these characterizations are inconsistent with vehicle behavior observed during Ford's extensive testing.

While we understand that the agency's investigation primarily relates to the charge air cooler, the agency requested reports alleging reduced engine power during hard acceleration based on any cause. Field reports provided in response to the agency's request reveal that assistance is often requested when diagnosing intermittent driveability symptoms. Reduced engine power can occur on any vehicle line for a wide variety of reasons, including ignition coils, spark plugs, catalytic converter, throttle body, turbocharger, or powertrain control module. Because of the intermittent nature of the symptoms, it is often challenging to properly diagnose the source of such driveability allegations, and to verify the repair. It is not uncommon for a technician to seek assistance in the diagnosis of these symptoms, and the unique condition relating to water ingestion from the CAC on these vehicles can be particularly difficult to diagnose because of the relative inability for a technician to duplicate the concern. It is also not uncommon for a technician to perform a known TSB that may be related to particular symptom while not actually addressing the root cause on that particular vehicle. Specifically, it is noted that the charge air cooler was replaced in a large number of warranty claims on these vehicles where the symptoms were inconsistent with a CAC water ingestion related issue.

Vehicle Drive

On June 20, 2013, two representatives from the agency participated in a vehicle evaluation of two F-150 vehicles at Ford's Dearborn Development Center (DDC) test facility. For the purpose of the vehicle evaluation, the CACs were filled with 8 ounces of water immediately prior to each drive in order to initiate a misfire on up to three cylinders at WOT. In order to

force a 6-2 downshift, the vehicles were driven up to 70 mph, coasted back to 50 mph, then the gas pedal was moved to the WOT position. Wide open throttle was maintained until the vehicle accelerated to a speed of 80 mph. At WOT there was a momentary reduced acceleration rate noticed but no loss of speed, followed by the steady increase in vehicle speed to 80 mph (which was achieved during the FMEM reduced operation mode). The FMEM reduced operation mode expired after 30 seconds and the vehicle resumed normal operation. The vehicle did not lose speed at any time during the misfire drive evaluation.

Conclusion

Ford has conducted extensive investigation into reports of reduced engine power on hard acceleration in these vehicles, and has implemented a series of service actions to address the water ingestion issue. Vehicle evaluations have shown that a vehicle experiencing momentary reduced engine power based on water ingestion will continue to maintain its speed and will typically still accelerate, although at a lower rate. Ford is not aware of any reports alleging that customers were unable to maintain control of their vehicle. Steering and braking remain unaffected, and Ford identified no accident or injury allegations pertaining to this subject.

Ford's review of warranty claims that are the subject of this investigation indicates that most are associated with the subject TSBs. The majority of the owner reports that are the subject of this investigation involve customers seeking assistance with getting their vehicle repaired properly or more quickly, rather than a concern for reduced vehicle performance.

Consideration of all the factors relating to this subject supports a conclusion that this does not present an unreasonable risk to safety in these vehicles. Ford believes the corrective actions that have been implemented in production and service are effective and appropriate to address this issue.

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