



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

ODI RESUME

Investigation: EA05-003
Prompted By: PE04-070, Consumer Complaints
Date Opened: 02/15/2005 Date Closed: 11/02/2005
Principal Investigator: Scott Yon
Subject: Engine Stalling

Manufacturer: Ford Motor Company
Products: MY 2003 - 2004 Ford F-Super Duty/Excursion with 6.0L Diesel
Population: 393,876

Problem Description: The engine stalls and may or may not restart.

FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	134	2,900*	2,943
Crashes/Fires:	5	20	23
Injury Incidents:	2	4	5
# Injuries:	5	4	8
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other:	0	9,000*	9,000

Description of Other: Warranty claims for engine stalling.

Action: This Engineering Analysis is closed. Recall 05V-270.

Engineer: D. Scott Yon

Date: 11/02/2005

Div. Chief: Jeffrey L. Quandt

Date: 11/02/2005

Office Dir.: Kathleen C. DeMeier

Date: 11/02/2005

Summary: In a June 7, 2005 letter, Ford notified ODI that it would be conducting a safety recall of approximately 180,000 Ford F-Super Duty, Excursion and E-Series vehicles equipped with 6.0L diesel engines to correct two wiring related conditions that could result in engine stall (NHTSA Recall No. 05V-270, Ford No. 05S34). The affected vehicles were built between September 29, 2003 and May 31, 2004. According to Ford, vehicles with the conditions may stall without warning and may or may not restart. Ford will instruct owners of vehicles included in the recall to take their vehicles to a dealer to have the Fuel Injector Control Module wire harness upgraded or replaced and or have a new Injection Control Pressure sensor connector installed.

During a May 2005 presentation to ODI, Ford identified a number of potential failure mechanisms that could affect engine performance in various segments of the subject vehicle population, including the wiring conditions addressed by 05V-270. The wiring conditions, which both affect engine fueling, were the most likely conditions to result in engine stall. The recalled vehicles comprise approximately 43% of the subject vehicle population and account for 75 of the 113 ODI reports that have a valid VIN (66%). The VOQ complaint rate for the recall population is 45/100k while the rate for vehicles outside the recall population is 17/100k and their trend (by date of receipt) is declining.

Based on the analysis, ODI believes Ford's actions are sufficient to address the current safety risks and the investigation is thus closed. The closing of this investigation does not constitute a finding by NHTSA that a safety related defect does not exist. Further action will be taken if warranted by future circumstances.

* - Estimated number of vehicles incurring engine stall, see Summary Report for further information.

SUMMARY REPORT - ENGINEERING ANALYSIS 05-003**DATE OPENED:** February 15, 2005**DATE CLOSED:** November 2, 2005**SUBJECT:** Engine stalling.**SUBJECT VEHICLES:** 393,876 model year (MY) 2003 and 2004 Ford Excursion SUV's and F Super Duty trucks built with the 6.0 L diesel engine.**ALLEGED DEFECT:** The engine stalls (stops running) and may or may not restart¹.**BASIS AND BACKGROUND:** Preliminary Evaluation (PE) 04-070 was opened in October 2004 and subsequently upgraded to EA05-003. The basis for investigation was Office of Defects Investigation (ODI) vehicle owner questionnaires (VOQs). NHTSA Recall No. 05V-270 (Ford No. 05S34) addresses approximately 180,000 Ford F-Super Duty, Excursion and E-Series vehicles equipped with 6.0L diesel engines for wiring related conditions that could result in engine stall.**SYSTEM DESCRIPTION:** The 6.0L engine is of V-8 configuration. Ford introduced the 6.0L engine to the subject vehicles during MY 2003 production as a replacement for the 7.3L diesel. Each cylinder has a fuel injector. The volume and timing of the fuel injection is controlled by an electronic control module, the Fuel Injection Control Module (FICM). The FICM is a microprocessor based device which uses engine sensors (inputs) to calculate fuel quantity and injection timing; it has control software, referred to by Ford as an "engine calibration" stored within resident programmable memory. The FICM produces electrical signals which control a shuttle valve within the injector. The shuttle valve controls the flow of high pressure engine lubricating oil that acts on a plunger which injects diesel fuel into the cylinder. The high pressure oil is produced by an engine driven oil pump that pressurizes a rail (manifold) which travels to each injector. The injector control pressure (ICP) sensor monitors the rail and produces a proportional FICM signal.**POPULATION:** Table 1 shows subject vehicle counts by model and MY.

Model	Model Year		Totals
	2003	2004	
EXCURSION	8,416	11,019	19,435
F-SUPER DUTY	140,950	233,491	374,441
Totals	149,366	244,510	393,876

Table 1: Subject vehicle production by Model and Model Year

CORRESPONDENCE: During PE04-070, ODI sent Ford an Information Request (IR) on October 15, 2004. Ford responded on December 2, 2004, and submitted a request for confidential treatment for portions of its response to NHTSA's Office of Chief Counsel.² NHTSA did not make any further formal inquiries, but informally requested certain updated information related to population and complaint data. On May 18, 2005, Ford presented to ODI a technical analysis of its investigation of the alleged defect and its findings. Ford voluntarily submitted a copy of its May 2005 presentation with a request for confidentiality². This presentation is summarized in a September 27, 2005 ODI memorandum to the file¹.

¹ This definition does not include allegations stating that the engine performs poorly or fails to produce the expected response to throttle application. Many consumers use the term "stall" in a broad manner, but only those reports where the complaint indicated the engine stopped running were considered within the scope of this investigation.

² Redacted copies of the non-confidential portions of the documents are available at ODI's website, <http://www-odi.nhtsa.dot.gov>.

In June, 2005 Ford submitted a Part 573 Defect and Noncompliance Information Report² advising that it would be conducting a safety recall of approximately 180,000 Ford F-Super Duty, Excursion and E-Series vehicles equipped with 6.0L diesel engines to correct two wiring related conditions that could result in engine stall (NHTSA Recall No. 05V-270, Ford No. 05S34). The affected vehicles were built between September 29, 2003 and May 31, 2004. According to Ford, vehicles with the conditions may stall without warning and may or may not restart. Ford will upgrade or replace the Fuel Injector Control Module wire harness and or install a new Injection Control Pressure sensor connector.

FAILURE MECHANISM: During its May 18, 2005 technical presentation, Ford identified ten (10) potential failure mechanisms that could affect engine operation. No other failure mechanisms have been identified.

PROBLEM EXPERIENCE: The failure report counts, as shown in table 2, are based on ODI's analysis of VOQ reports and Ford IR data.

FAILURE REPORT SUMMARY			
	ODI	Manufacturer	Total
Complaints:	134	2,900*	2,943
Crashes/Fires:	5	20	23
Injury Incidents:	2	4	5
# Injuries:	5	4	8
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	0	9,000*	9,000
Description of Other: Warranty claims for engine stalling.			

Table 2: Failure Report Summary Table * - Estimated values

ODI has received two hundred fourteen (214) VOQs that referenced an engine related performance issue in the subject vehicles. ODI eliminated eighty (80) reports because further investigation revealed that an engine stall condition did not occur³. Twenty-one (21) VOQs did not include a vehicle identification number (VIN)⁴. Of the remaining one hundred thirteen (113) VOQs, seventy-five (75) involved vehicles affected by Recall 05V270. An examination of the VOQ data indicated that the trend by date of receipt of the VOQ for vehicles within the scope of Recall 05V270 is increasing, while the trend for vehicles not within the scope of the recall is decreasing.

In their PE04-070 IR response, Ford submitted 7,970 complaint reports from its MORS database and 11,383 from its CQIS database (total reports = 19,353)^{5,6}. Ford also provided 28,486 warranty claims^{6,7}. ODI's analysis of the submitted data is described in the ODI Discussion section.

ODI has received five (5) reports of crashes. Two (2) of those were also reported to Ford. Four (4) of these crashes involved the vehicle leaving the roadway at low speed after the engine allegedly stalled and caused a loss of control. One (1) crash reportedly occurred while the vehicle was

³ On their face, these reports included statements that indicated a "stall" had occurred. However, through additional investigation, ODI determined the complaint referred to a loss of power or slow throttle response, not an engine stall.

⁴ When the VIN is known the vehicle's production/warranty start date and related Ford reports can be identified.

⁵ MORS reports are from consumer/owner contact; CQIS reports are from field and service technician contact.

⁶ This count contains duplicate and or multiple reports/claims involving the same vehicle.

⁷ Ford provided warranty claims that repair facilities code as Customer Concern Code D21: engine stalling.

crossing an intersection and reported four (4) injuries. ODI was unable to confirm the extent of the crash and injuries. Ford's documents (MORS report) related to that vehicle do not mention a crash or injury. The twenty (20) Ford crashes reported similar results, i.e., loss of control at low speeds/vehicle disablement due to an alleged engine stall resulting in minor damage and injury. Ford contested many of these reported crashes. Many of the reported allegations of a crash did not include sufficient information to determine a cause of the crash or the extent of the damages and injuries.

DESIGN, MATERIAL AND/OR PRODUCTION MODIFICATIONS: All pertinent product changes are summarized in the September 27, 2005 memorandum to file².

VRTC TESTING: ODI requested that NHTSA's Vehicle Research and Test Center (VRTC) assess the effect of engine stall on power assisted steering and braking systems. The subject vehicles utilize hydro-boost power braking and steering⁸. VRTC evaluated a subject vehicle with an automatic transmission and determined that vehicle inertia would sustain engine rotation (through "back-drive") as long as the transmission remains in gear⁹ and the vehicle remains above a certain speed. Under back-drive conditions, normal power assisted steering and braking is available. VRTC found that power assist was available at speeds above 25 to 30 MPH. Below these speeds, VRTC assessed reserve braking and manual mode braking/steering as no better or no worse than peer vehicles (exhibiting a loss of power assist) in this vehicle class.

VRTC also assessed the braking system's ability to overcome engine surge¹⁰, including wide-open throttle (WOT) application. VRTC reported that the braking system is capable of overcoming engine surge, including WOT, at acceptable levels of brake pedal effort.

FORD'S POSITION: Ford's position is that two failure mechanisms presented a risk of engine stall in the subject vehicles and that these two conditions are addressed by Recall 05V-270. Ford's analysis determined that the risk of engine stall from other failure mechanisms identified by its investigation that affect the 6.0L engines are not likely to result in engine stall, and that these mechanisms occur at low rates and are exhibiting declining trends.

ODI DISCUSSION: Ford identified ten (10) conditions that may cause engine performance issues in the subject vehicles at its technical presentation on May 18, 2005. Two (2) issues (FICM harness and ICP connector) are being addressed through Recall 05V-270. Another failure mechanism involving the ICP sensor could result in a loss of power or stall; the ICP sensor was the subject of an April 2003 field service action (03B05) that has addressed 91% of affected vehicles. Three (3) failure mechanisms (EGR valve coking, EBP sensor, and CAC tube separation) affect emissions control and induction air systems; Ford indicated these mechanisms were incapable of causing engine stall¹¹.

Ford identified three (3) issues that affect engine fueling, injector stiction, cruise control calibration, and pilot injection; however they only occur under specific vehicle operating conditions. According to Ford, injector stiction occurs immediately after a cold engine start, therefore any stalling would occur prior to vehicle drive-away¹². The cruise control calibration issue only occurs during

⁸ Hydro-boost is discussed in the September 27, 2005 memorandum to file, available from the web site.

⁹ ODI notes that, should a stall occur while the vehicle is in motion, drivers should be careful about shifting the transmission to neutral to attempt to restart the vehicle. Doing so eliminates inertial back-drive and affects power assist.

¹⁰ Both the VOQs and Ford data reported engine surge.

¹¹ Because the subject vehicles have diesel engines, which are fuel throttled, it is unlikely that these mechanisms cause an engine to stall. An engine stall occurs due to an absence of fuel, induction air, or both. These failure mechanisms do not affect fueling and are incapable of causing a loss of induction air.

¹² This mechanism does not occur when the engine is warm.

extended (more than three minutes) engine overrun, such as a hill descent, when the cruise control is enabled and activated. In the event a stall occurs due to this mechanism, engine back-drive would be available to provide power assisted steering/braking and the vehicle can be coasted to a safe location for restarting. The pilot injection calibration mechanism occurs during engine idle conditions and results in idle speed fluctuation. Ford advises that stalling is highly unlikely, however if a stall were to occur it would do so when the vehicle is stopped. None of these three mechanisms prevent the vehicle from being immediately restarted. A newly developed engine calibration intended to address these three mechanisms is the subject of Ford's June 13, 2005 technical service bulletin TSB 05-11-05¹³.

The tenth mechanism described by Ford was fuel injector "scuffing," which affects only vehicles built before May 2003¹⁴. Scuffing occurs as the injector ages and causes diesel fuel to leak past the injector plunger and into the engine crankcase thus diluting the engine oil and reducing its viscosity. This causes a reduction in the oil pressure, which operates the fuel injectors and a coincident gradual decline in injected fuel volume. If the leakage continues through vehicle use, the engine can stall due either to a loss of injected fuel or hydro-locking (from crankcase overfilling)¹⁵. Injector related concerns have been the subject of technical service bulletins. ODI's review of Ford reports indicates that injector countermeasures have been effective. Although some level of injector service continues to occur the trend is declining.

Ford provided a significant volume of potentially related complaint and warranty data. ODI first performed a comprehensive search of all records to identify those alleging an injury, crash or loss of control and conducted a thorough review to determine if the incidents were related to the alleged defect. ODI eliminated the records involving vehicles affected by field service action 03B05¹⁶. A sampling process was used to review the remaining records and the approximate number of complaints alleging "engine stall"¹⁷, of some form or type, was established. The values determined for both the recall and non-recall vehicle populations are shown in Table 3 as "Related Complaints"¹⁸. ODI's assessment is that many of these complaints did not involve an actual engine stall, but instead were describing engine performance issues such as hesitation, loss of power, or slow throttle response. Accordingly, adjustment factors for each population were established based on ODI review of warranty data. The number of true engine stall complaints¹⁸, as estimated using the established factors, and the population stall rates, are shown in Table 3.

Estimation of "True Stall" - Ford Reports		
	Non-Recall	Recall 05V270
Population	225,905	167,971
Related Complaints	2,800	4,000
Estimated True Stalls	900	2000
Est. True Stall Rate/100K	398	1191

Table 3: "True Stall" and Stall Rate estimates based on ODI analysis.

¹³ The TSB repair procedure is covered under Ford new vehicle and emissions warranty. ODI understands from complainant/technician interviews that engine calibration upgrade is a commonly applied repair procedure for engine performance related service visits.

¹⁴ This is when Ford introduced a countermeasure in subject vehicle production.

¹⁵ For an engine stall to occur, a significant volume of fuel must leak into the crankcase.

¹⁶ The reports on this vehicle population were mostly related to the condition Ford addressed via the 03B05 program.

¹⁷ ODI is counting complaints containing evidence of engine "stall" occurring, and eliminating all others.

¹⁸ The value is rounded to the nearest hundred and represents a count of distinct vehicles, not stall events.

REASON FOR CLOSING: During its May 2005 presentation to ODI, Ford identified a number of potential mechanisms that could affect engine performance in various segments of the subject vehicle population. The wiring conditions addressed by 05V-270 were the most likely mechanisms to cause an engine stall and could occur under circumstances that created an unreasonable risk to safety. Of the remaining mechanisms Ford identified, one has been addressed through a prior field service action and the others are either incapable of causing a stall, or result in a stall that only occurs under conditions which pose minimal risk to safety. The recalled vehicles comprise approximately 43% of the subject vehicle population and account for 75 of the 113 ODI reports that have a valid VIN (66%). The VOQ complaint trend (by date of receipt) for the recall population is increasing. For vehicles outside the recall population, the estimated stall rate is lower and the complaint trend is declining in both Ford and VOQ data.

Based on the analysis, ODI believes Ford's actions are sufficient to address the current safety risks and the investigation is thus closed. The closing of this investigation does not constitute a finding by NHTSA that a safety related defect does not exist. Further action will be taken if warranted by future circumstances.

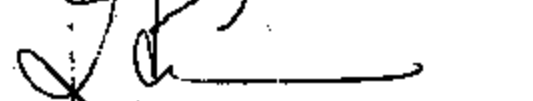

Safety Defects Engineer

12/5/2005
Date

I Concur:


Chief, Vehicle Control Division

12/5/2005
Date


Director, Office of Defects Investigation

12-5-05
Date