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

ODI RESUME

Investigation: EA 02-022
Prompted By: PE-02-040
Date Opened: 09/09/2002 Date Closed: 01/16/2004
Principal Investigator: TOM BOWMAN
Subject: ENGINE STALLING

Manufacturer: FORD MOTOR COMPANY
Products: MY 2000 - 2002 FORD FOCUS
Population: 832,300

Problem Description: VEHICLE STALLS DUE TO CONTAMINATION BLOCKING THE INTAKE MESH ON THE FUEL DELIVERY MODULE FILTER LOCATED IN THE FUEL TANK.

FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	442	8358	8800
Crashes/Fires:	19	19	19
Injury Incidents:	9	9	9
# Injuries:	10	10	10
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	0	24938	24938

*Description of Other: WARRANTY CLAIMS AS OF AUG, 2003

Action: ODI IS CLOSING THIS INVESTIGATION. REFER TO CLOSING REPORT FOR FURTHER DETAILS.

Engineer: *Thomas Bowman* Date: *01/16/2004*
Div. Chief: *Richard Boyd* Date: *01/16/2004*
Office Dir.: *Kathleen C. DeMeter* Date: *01/16/2004*

Summary: Clogging of the fuel delivery module (FDM) filters in the subject vehicles can lead to stalling and other related symptoms. These symptoms become increasingly obvious to the driver as the clogging gradually increases over extended periods of driving. Stalling in these vehicles is most likely to occur when accelerating through a right hand turn such as merging into freeway traffic when the fuel level in the fuel tank is less than 1/4 full.

More than 90% of the stalling complaints pertain to the "original" design FDM installed in my 2000 and 2001 (partial year) Focus vehicles. Ford has decided to conduct a campaign (03V-482) to address stalling in these vehicles. The smaller number and rate of complaints associated with the "interim" and "current" FDM designs indicate improvement but also reflect a shorter time in service for these designs. Accordingly, ODI will monitor the stalling performance of my 2001 - 2002 Focus vehicles equipped with "interim" and "current" design FDMs.

Closing Report – EA02-022

Engine Stalling in Model Year 2000 – 2002 Ford Focus Vehicles

CONTENTS

(1) Subject

This Engineering Analysis was opened on September 9, 2002, and addresses alleged stalling and related conditions in Model Year (MY) 2000 through 2002 Ford Focus vehicles due to a clogging of the fuel delivery module (FDM) filters. As the investigation proceeded, ODI learned that the FDMs installed in the subject vehicles consisted of three design versions:

"Original design" FDMs were installed in all Model Year 2000 and the majority of Model Year 2001 Focus vehicles manufactured from March, 1999 (Job #1) through June 13, 2001.

"Interim design" FDMs were installed in late MY 2001and early MY 2002 vehicles manufactured between June 13, 2001, and December 12, 2001.

"Current design" FDMs were installed in MY 2002 vehicles manufactured after December 13, 2001.

(2) Discussion of Engine Stalling

Engine stalling may be caused by the design of the fuel management system, fuel quality, manufacturing quality, vehicle mileage, vehicle age, vehicle environment, usage factors, maintenance practices, or a combination of these and other factors.

Stalling incidents may occur randomly or occur predictably under certain types of driving events, such as cold or wet weather stalls, stalling at idle, stalling under power demand, stalling in a turn, etc.

The severity of engine stalls may vary from a momentary, marginally perceptible engine hesitation while driving or idling to a complete engine stall in which the engine comes to a complete stop. In some cases, the vehicle cannot be restarted following the stalling event.

Consumers and servicing technicians use various terms to describe engine stall conditions such as "stalls," "hesitates," "sputters," "shudders," "stumbles," "surges," " shakes," "shuts off," "turns off," "runs rough," "misses," "bucks/jerks," loses power," "stops," "quits," or "dies." The vehicle-to-vehicle variability of stalling symptoms combined with the subjectivity of the descriptive language reporting these symptoms makes it difficult to develop objective and consistent criteria to assess the severity, frequency, and characteristics of stalling complaints.

In general, the stalling symptoms associated with FDM clogging in the subject vehicles gradually worsen as the debris in the mesh of the FDM filter accumulates. The clogging causes symptoms that generally increase in frequency and severity over time prior to a complete engine stall (shut down) occurring.

This investigation led to the following findings:

(1) Stalling was frequently, but not always, caused by a clogged FDM filter.

(2) The clogging was progressive in nature. Owners that ODI interviewed typically reported that their vehicles had initially exhibited a minor hesitation under specific driving circumstances. Over time, the hesitation/stalling became more persistent, more frequent, and more apparent to the owners. Owners who did not have their vehicles repaired promptly could frequently identify and describe the driving circumstances that would consistently induce stalling symptoms in their vehicles (see Item 3 below).

The subject vehicles began to exhibit symptoms after accumulating sufficient debris in the FDM filter to constrain the fuel flow to the engine under certain driving maneuvers. For vehicles equipped with the "original design"FDMs, symptoms of hesitation or stalling generally became perceptible after the vehicle accumulated between 20,000 and 60,000 miles.

(3) Vehicle owners frequently reported that the stalling or hesitation associated with a clogged FDM occurred when attempting to accelerate the vehicle through an extended right turn when the fuel tank was less than ¼ filled. Drivers may encounter this maneuver when accelerating from a freeway entrance ramp into higher speed traffic.

(4) Hesitation and stalling occurred during driving maneuvers and in circumstances that could pose a risk to safety. One risk is that of a stalled vehicle being struck from behind in situations where drivers of trailing vehicles are not expecting the leading vehicle to slow or stop. A partial or complete stall when attempting to merge into higher speed freeway traffic from slower speed entrance ramp speeds is another safety risk.

(3) Background

ODI opened Preliminary Evaluation PE02-040 on April 4, 2002 based on seven potentially-related non-injury, non-fatal crashes and 72 owner complaints (VOQ) indicating "loss of engine power." The PE addressed MY 2000 and 2001 Focus vehicles. On April 8, 2002, ODI requested information from Ford Motor Company (Ford) and received a response on May 22, 2002.

In response to ODI's inquiry, Ford reported that it had received "7,089 reports and claims of stalling on the subject vehicles." Ford reported that it did not believe that engine stalling in the subject vehicles presented an unreasonable risk to motor safety. In support of its position, Ford offered the following comments:

(1) Ford stated that "there have been two non-described 'accidents' that appear to be of a relatively minor nature and three minor property damage incidents." Ford also stated that none of these reports allege any type of injury or fatality. Using this information, Ford calculated an "'accident rate' of .087 per 10,000 vehicles with no injuries."

(2) Ford referred to an earlier ODI investigation, PE98-057, in which ODI stated, "there is no data indicating that occupants of a stalled vehicle are exposed to greater risk of injury due to the [stalling] condition."

(3) Ford stated that its opinion was consistent with "closures in other safety investigations of engine stalling where the Agency concluded that even with a high number of reports of stalling, the risk of injury or fatality is low."

(4) Ford also stated, "unlike some other causes of stalling, fuel filter contamination is more apt to provide warning in the form of drivability issues that gradually deteriorate allowing for the opportunity to seek repairs before the filter becomes sufficiently plugged to cause a stall condition."

On September 9, 2002, ODI opened EA02-022 based on the information that Ford provided with its May 22, 2002, response and an additional 129 (in addition to the original 72) complaints that owners had made to ODI. At that time, ODI refined the description of the alleged defect as a condition in which the "vehicle stalls at any speed due to contamination blocking the intake mesh on the Fuel Delivery Module located in the fuel tank." ODI also added MY 2002 Ford Focus vehicles to the scope of the investigation based on eleven consumer complaints of stalling in MY 2002 vehicles.

ODI sent Ford a request for information in September 2002, and Ford provided a response on December 6, 2002. In the December response, Ford restated its position outlined in the earlier May 22, 2002 response that, "consistent with other agency findings, there is no evidence that FDM caused engine stalling on the Focus poses an unreasonable risk of accidents or injuries in a relatively large number of reported incidents."

In support of its position, Ford referred ODI to the following:

(1) That a Transportation Systems Center report (Report No. HE702/S7502) [dated June, 1987] had noted that, although the rate of stalling complaints was comparable to the rate of complaints for other safety defect investigations, the rate of stalling related accidents was lower than in most investigations that have led to recalls.

(2) That Ford's analysis had identified no claims of injuries associated with stalling on the subject vehicles and only five reports of minor property damage and that two NHTSA investigations into stalling allegations (EA84-029 and EA84-031) were closed in part because the risk of injury or death appears to be low despite a large number of complaints of stalling vehicles.

(3) That the agency's rationale for closing a prior stalling investigation, PE98-057, was applicable to the subject investigation. Ford supported its position by noting that the closing report in that investigation had stated 'there is no data indicating that occupants of a stalled vehicle are exposed to greater risk of injury due to the [stalling] condition" and "when a vehicle stalls while in motion, this gives the driver time and vehicle momentum with which to maneuver onto the roadway shoulder, away from travel lanes."

ODI sent Ford a Request for updated claims and complaint information on July 14, 2003. Ford provided that information on August 18, 2003.

(4) Population

The following is a summary of the vehicle production of Ford Focus vehicles based on the design level of Fuel Delivery Modules installed.

Estimated Quantity of Ford Focus Vehicles Sold in USA

FDM Design Level	Production Start Date	Production End Date	Estimated Quantity sold in USA
Original	March, 1999 (Job 1)	June 13, 2001	532,300
Interim	June 14, 2001	December 12, 2001	105,000
Current (US)	December 13, 2001	End of MY 2002 (September, 2002)	195,000

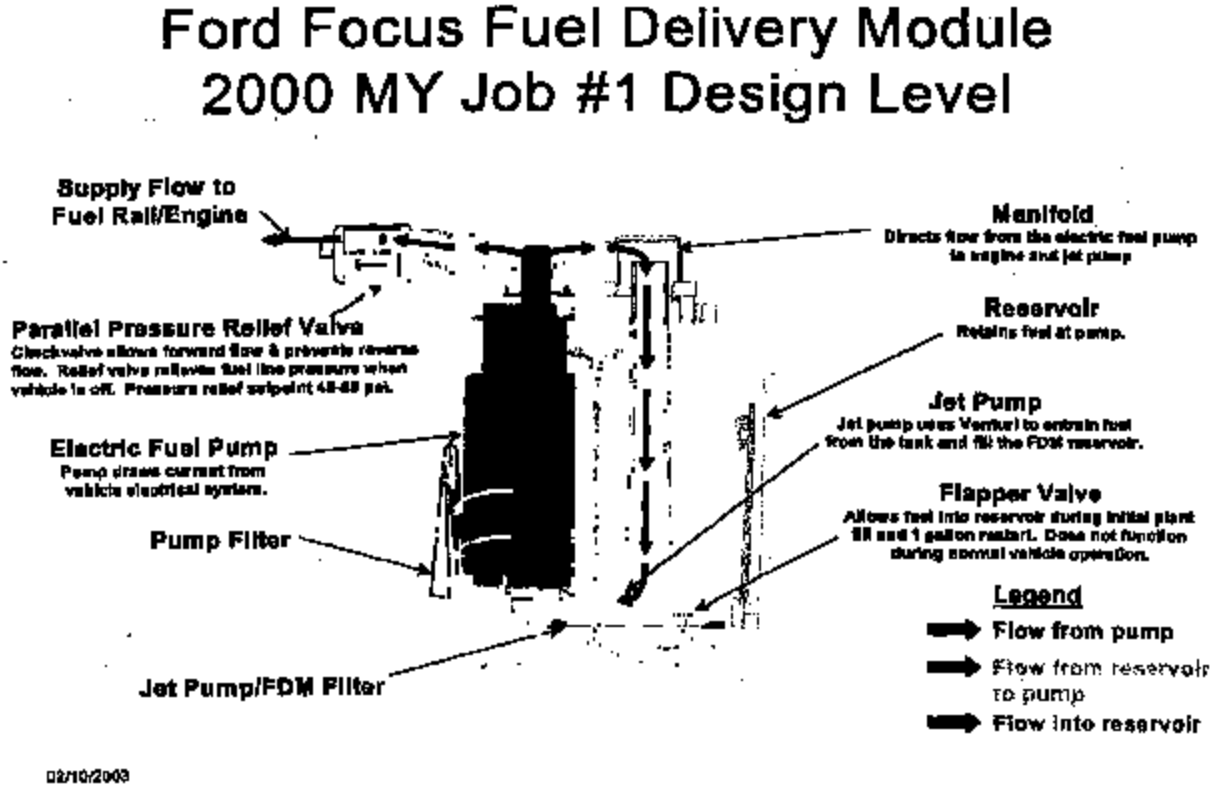
Source: ODI combined vehicle production data furnished by Ford Motor Company in (1) Attachment A to December 6, 2002, Response to ODI EA inquiry and (2) monthly production data supplied by Ford in response to ODI's April 4, 2003, verbal request.

(5) FDM Description

The Fuel Delivery Module (FDM) is mounted in the vehicle fuel tank and consists of an electric motor driven fuel pump, fuel level sensing device, and fuel filtering system.

Ford has manufactured (1) Original Design, (2) Interim Design, and (3) Current Design versions of the FDM for the subject vehicles.

Original Design –
Vehicles Manufactured From March 1999 ("Job 1") through June 13, 2001



Source: Ford Motor Company

The original design FDM pulled fuel into the bowl cavity of the FDM through a disk filter mounted in the base of the FDM, through a second filter mounted on the pump (called the "pump filter"), and delivered the filtered fuel to the fuel line that supplies this pressurized fuel to the engine.

The base mounted disk filter screened particles that measured 62 microns in diameter and the pump filter screened particles that measured 95 microns in diameter.

Original Design FDM Filtering Specifications

	Disk Filter	Pump Filter
Mesh - microns	63	72
Area – cm^2	23	29

Source: Appendix K, Ford Response to EA Information Request- Dec 6, 2002

Interim Design –
Vehicles Manufactured From June 13, 2001 through December 12, 2001

ODI does not have an engineering assembly drawing of the interim FDM. The interim FDM is similar in appearance to the original design except that the pump filter (depicted on the left side of the FDM) is approximately six times larger in surface area.

The interim design FDM pulled fuel into the Bowl Cavity of FDM through a disk filter mounted in the base of the FDM and then through a second filter mounted on the pump (called the "pump filter") before being delivered to the fuel line that supplies the fuel to the engine.

The initial disk filter mesh was increased from 63 microns to 95 microns and the pump filter area was increased from 29 cubic centimeters to 123 cubic centimeters.

Based on ODI's inspections of a representative sample of the interim FDM furnished by Ford, the interim FDM also incorporates an O-ring that seals the cap of the FDM reservoir to the body of the FDM reservoir.

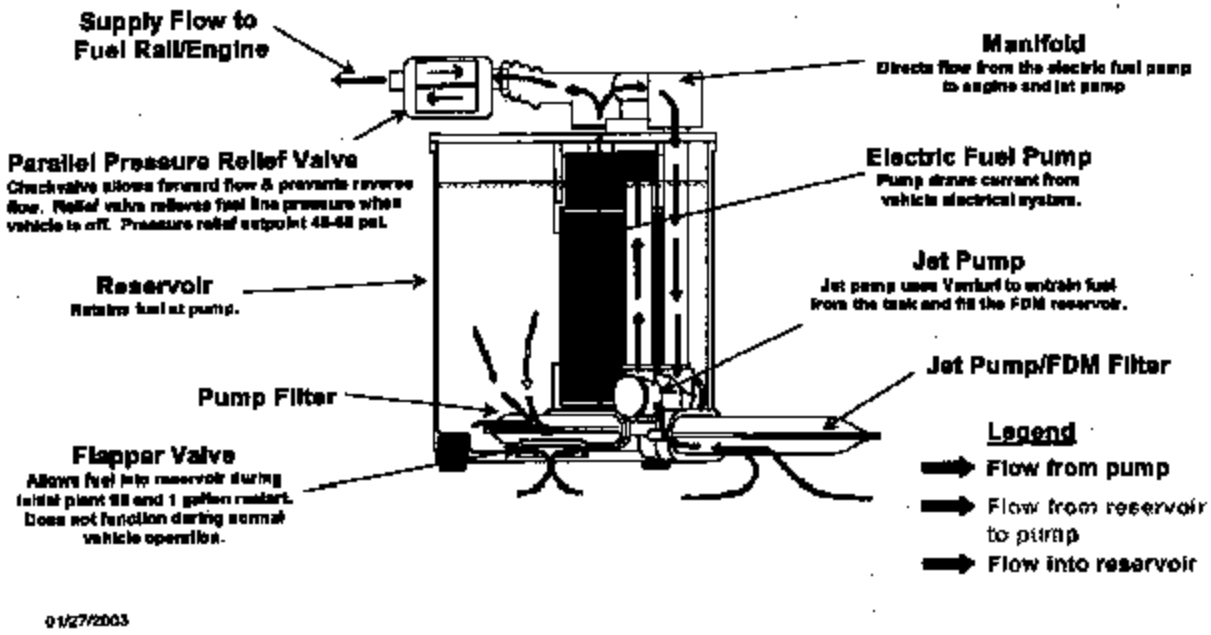
Interim Design FDM Filtering Specifications

	Disk Filter	Pump Filter
Mesh - microns	95	72
Area – cm^2	23	123

Source: Appendix K, Ford Response to EA Information Request- Dec 6, 2002

Current Design –
Vehicles Manufactured From December 13, 2001 through Present

Fuel Delivery Module
Electronic Returnless Fuel System



Source: Ford Motor Company

The current design of the Fuel Delivery Module consists of a basket weave "sock" filter mounted horizontally and externally to the FDM and a "jet filter" mounted in the inside of the FDM.

Current Design FDM Filtering Specifications

	Jet Pump Filter (replaced disk filter)	Pump Filter
Mesh - microns	32	32
Area – cm^2	64	32

Source: Appendix K, Ford Response to EA Information Request- Dec 6, 2002

(6) ODI Investigation

Following is a summary of ODI's investigative activities:

(A) ODI analyzed information provided by Ford on May 22, 2002; December 6, 2002; and August 18, 2003 in response to PE and EA Information Requests.

ODI reviewed this data to identify crashes previously unknown to ODI and to obtain information regarding consumer warranty repairs and complaints associated with the alleged defect.

(B) ODI requested NHTSA's Vehicle Research and Test Center (VRTC) (1) to obtain samples of contaminated FDMs for analysis and (2) to assess the affect on steering and braking efforts that would result if an engine stall were to occur on the subject vehicles.

VRTC issued a summary of its findings (VRTC-DCD2040) on May 13, 2003. Nine vehicles were evaluated. The fuel flow rate was severely restricted by the accumulation of debris in the FDMs installed in two of the vehicles inspected. The contamination material was inspected. Driving evaluations indicated that the vehicle retained full power steering and braking assist as long as the engine crankshaft rotated (approximately 30 MPH). Brakes power assist was maintained until the vacuum reservoir was depleted.

(C) ODI attempted to contact all vehicle owners of subject vehicles who had reported a vehicle crash allegedly due to stalling to either ODI or Ford.

The primary purpose of these calls was to confirm the details of the crash and to make an assessment as to whether stalling appeared to have been either a causal or contributing factor in the crash.

Attachment A summarizes the crashes that ODI has identified as incidents in which an engine stalling event had likely been a contributing factor.

Type 1 crashes include incidents that resulted in a collision with another moving vehicle; Type 2 crashes include incidents that resulted in contact with stationary objects along the roadway (e.g., curb or parked car).

(D) ODI also attempted to call all vehicle owners who filed a complaint with ODI about stalling in the subject vehicles between January 1, 2003 and March 31, 2003. The purpose of these calls was to assess the circumstances

of the reported stalling events (e.g., whether the stall events occurred randomly or predictably, the road speeds and conditions involved, whether there had been prior attempts to remedy the problem, the nature of any symptoms associated with the stall condition, and whether the stall event had placed the vehicle in an unsafe situation).

(E) ODI reviewed past investigations, recall campaigns, and customer service campaigns pertaining to engine stalling.

(F) ODI reviewed the "Analysis of Stalling Problems" report prepared by the Transportation Systems Center in June 1987.

(G) ODI reviewed data reported to NHTSA's Fatality Analysis Reporting System (FARS) to determine whether this data source would be useful for assessing the safety risk (as measured by fatalities) posed by engine stalling events.

FARS data enabled ODI to make broad comparisons of crashes associated with "vehicle stopped in the roadway" by state and by vehicle models. This data did not contain enough information to determine whether those vehicles had stopped in the roadway due to engine stalling or for other reasons.

(H) ODI conducted meetings with representatives from the Ford Safety Office on May 8, 2003; June 18, 2003; and August 21, 2003 to discuss aspects of the investigation.

(I) ODI conducted an evaluation drive of consumer vehicle VIN 1FAFP383X1W114744 (Lynchburg, VA) on July 15, 2003. Ford engineers (with an ODI engineer observing) drove this vehicle on July 16, 2003. After the evaluation drive, the fuel tank and FDM system were removed and returned to Ford. These components were inspected during the July 30-31, 2003 visit that ODI made to Ford in Dearborn, Michigan.

ODI also inspected and photographed crash vehicle VIN 3FAFP31322R186102 (Elwood City, PA) on July 29, 2003.

ODI conducted an evaluation drive of consumer vehicle VIN 3FAFP31391R124162 on August 20, 2003 (Falls Church, VA).

VRTC conducted an evaluation drive of consumer vehicle VIN 1FAFP3833YW134506 (Ansonia, OH).

(J) ODI visited Ford's Dearborn Proving Ground on July 30-31, 2003. ODI engineers conducted evaluation drives of three Ford Focus vehicles equipped with five different FDMs. After each evaluation drive, the FDM was removed, disassembled, inspected and tested in the presence of ODI engineers.

(7) Ford's Actions

Ford will notify all owners of MY 2000-2001 Focus vehicles equipped with the "original design" FDM that a stalling condition may develop in these vehicles and that Ford will replace the FDM with a new FDM designed specifically for this upgrade program whenever the owner states that he or she has experienced any symptoms of stalling. The notification will alert owners to the potential for the stalling conditions to occur, provide recommendations for short term actions to mitigate the risk of stalling until the vehicle can be serviced, and offer an upgraded FDM replacement free of charge to owners who experience any stalling symptoms.

(8) ODI Assessment

The FDM installed in MY 2000-2002 Ford Focus vehicles clogs gradually due to the progressive accumulation of debris in the mesh of the FDM filters. Consumer complaints provide confirming evidence that the symptoms are progressive. Consumers (particularly those with "original design" FDMs) have typically reported that the symptoms had been evident for some period of time and, when not corrected, increased in frequency and severity.

The "interim design" and "current design" FDM have significantly lower complaint and warranty claim rates than the "original design" FDM after an equivalent time in service. Although ODI is closing this investigation with respect to vehicles equipped with those FDMs, it will monitor future complaint activity and may re-open the investigation.

ODI does not agree with Ford's assertions with respect to the safety consequences associated with stalling and related symptoms in the subject vehicles. While ODI recognizes that, over a decade ago, it closed some stalling investigations without seeking a recall, the position of the Office has evolved. As discussed earlier, vehicle stalling problems can vary in the frequency and severity of their nature, their effect on vehicle control, and the extent that prior warnings or symptoms are provided. In recognition of this, the facts and circumstances of each investigation must be considered in evaluating the safety risks. Simplistic determinations and comparisons

provide a useful perspective but this perspective must be evaluated in the context of other factors. ODI is aware that if the agency pursued this matter, Ford would attempt to rely on past ODI actions, and the resolution of this investigation would be delayed. Further, ODI is cognizant of and has considered the uncertainties of litigation.

(9) Conclusion

ODI has concluded that it is in the best interest of the public to bring this matter to a timely conclusion in a manner that will assure that all owners of Ford Focus vehicles equipped with the "initial design" FDMs that experience any symptoms of FDM clogging will get a new improved FDM at no charge.

Under the circumstances, ODI has concluded that expenditure of resources to pursue this issue at this time is not warranted. ODI reserves the right to take further action if warranted by the circumstances.

G. T. Bowman, Safety Defects Engineer — Date 1/16/04

I Concur: Richard Boyd

Chief, Medium & Heavy Duty Truck Division — Date 1/16/04

Director, Office of Defects Investigation — Date 1/16/04

Appendix A

List of Crashes Caused or Contributed to by Engine Stalling in Ford Focus Vehicles (as of August 2003)

CRASH AND INJURY:

ODI's investigation has identified incidents in which an engine stall in the subject vehicles appears to have caused or contributed to a vehicle crash.

Eight of these crashes involved a collision with another vehicle under dynamic conditions. ODI has classified these at Type 1 crashes.

Eleven of the reported crashes have involved collision with stationary objects along the roadway [e.g. curb or parked car]. ODI has classified these at Type 2 crashes.

Nine of these crashes have resulted in personal injury. ODI has not identified any reports of a fatality associated with engine stalling in the subject vehicles.

Summary of Crashes – Ford Focus Stalling as of August 2003

	Injury Incidents (*)	Non-Injury Incidents	Total
Type 1 crashes- Vehicle into Dynamic (moving) Vehicle Collisions	4	4	8
Type 2 crashes- Vehicle into Stationary Object Collisions	5 (**) (***)	6	11
Total	9	10	19

(*) No injury incidents resulted in fatalities. (**) One of these crashes resulted in two injuries. (***) One injury was caused by air bag deployment.