

ENGINEERING ANALYSIS CLOSING REPORT

SUBJECT: Power Steering Failure

EA No.: EA17-004

DATE OPENED: 11/20/2017

DATE CLOSED: 2/8/2024

BASIS:

On September 28, 2016, the Office of Defects Investigation (ODI) opened a Preliminary Evaluation (PE16-011) to investigate claims of power steering assist loss on model year (MY) 2010 Ford Fusion vehicles. During the PE, ODI received 718 unique claims related to the alleged problem with 598 reports indicating the power steering assist failed while driving at various speeds with no warning. Ford Motor Company (Ford) provided 1,851 unique reports and 1,720 warranty claims related to the alleged problem. It should be noted that as the result of investigation PE14-030, Ford previously conducted a safety recall (15V-340) of the MY 2011-2012 Ford Fusion and other vehicles using the same electric power assist steering unit to rectify incidents of loss of power steering assist.

On November 20, 2017, PE16-011 was upgraded to this Engineering Analysis (EA17-004) to further assess the scope, frequency, and consequence of this failure. This was based on an analysis of the subject vehicle complaint data had indicated an increased likelihood of failure as the vehicles age. At the time, the rate of occurrence of this failure was comparable to previous investigations involving loss of power steering assist including the previously mentioned PE14-030.

SUBJECT VEHICLES: All MY 2010 Ford Fusion vehicles manufactured for sale or lease in the United States.

SUBJECT COMPONENT: All power assisted steering systems manufactured for use on the subject vehicle.

THE ALLEGED DEFECT: The alleged defect is the failure, malfunction, or other unsatisfactory performance of the power steering system.

DESCRIPTION OF COMPONENT OR VEHICLE SYSTEM: The Electric Power Assisted Steering (EPAS) system is comprised of a mechanical steering rack-and-pinion gear with a torque sensor, electric assist motor, motor position sensor and power steering control module (PSCM). The PSCM is self-monitoring and designed to detect faults within the system and can store diagnostic trouble codes (DTC) if a problem is detected.

CORRESPONDENCE:

NHTSA to MFR	MFR to NHTSA	NHTSA to MFR Supplement	Confidentiality		
			Date of Request	Date of NCC Response	Items Confidential
12/14/2017	2/16/2018	None	2/16/2018		Appendix I
4/28/2021	6/9/2021	None	6/9/2021		Appendix G

PROBLEM EXPERIENCE:

<u>Field Data</u>	<u>EA Opened</u>		<u>EA Closed</u>		<u>Total</u>
	<u>ODI</u>	<u>MFR</u>	<u>ODI</u>	<u>MFR</u>	
<u>Owner Reports</u>	718	1,110	1,233	1,503	2,895
<u>Field Reports</u>	0	741	0	770	770
<u>Lawsuits</u>	0	0	0	0	0
<u>Incidents</u>	13	12	44	15	59
<u>Injury Incidents</u>	5	1	11	2	13
<u>Injuries</u>	7	1	21	2	23
<u>Fatal Incidents</u>	0	0	0	0	0
<u>Fatalities</u>	0	0	0	0	0

VEHICLE POPULATION: 262,599 model year 2010 Ford Fusion

COMPLAINTS/FIELD REPORTS:

ODI has identified 1,233 complaints of alleged loss of power assisted steering in the model year (MY) 2010 Ford Fusion vehicles. In addition, Ford provided a total of 2,273 customers complaints and field reports related to the alleged defect in the subject vehicles. ODI's review of the field data indicated that the drivers generally experienced a sudden increase in steering effort while driving at various speeds. ODI found that a high friction condition in the Electric Power Assisted Steering (EPAS) system can set a diagnostic trouble code (DTC), provide a reduced assist for a short time, and then disable the power assist. Many drivers reported that a warning message appeared on the instrument panel when the failure occurred.

ODI has identified a total of 59 alleged crashes with 13 of those crashes resulting in injuries. Most of the crashes were low-speed, single-vehicle impacts with curbs and roadside objects, resulting in wheel and/or minor vehicle body damage. In addition, ODI has identified a total of 23 alleged injuries from the 13 injury-involved crashes. Most of the injuries were minor in nature.

WARRANTY CLAIMS: Ford provided approximately 2,170 warranty claims that may be related to the alleged defect in the subject vehicles.

SERVICE BULLETINS: In May 2023, Ford issued a Special Service Message (No. 51666) to its dealers stating a lower-cost remanufactured power steering gear is available for the owners of the subject vehicles.

DESIGN, MATERIAL, AND/OR PRODUCTION MODIFICATIONS: None identified. However, Ford identified a manufacturing quality issue affecting the steering gear in MY 2011-2012 Ford Fusion and certain other Ford models built between September 2010 and February 2012. It should be noted that ODI investigated this issue under PE14-030 resulting in Recall 15V-340.

TESTING:

NHTSA's Vehicle Research and Test Center (VRTC) conducted a variety of tests and evaluations in support of several ODI investigations of power steering failures from around 2010 to 2017. VRTC measured the steering effort with and without power assist in a subject vehicle and several other peer vehicle models investigated by ODI. The tests were performed at 0.25g turn at 25 mph and at 0.40g turn at 30 mph. The subject vehicle (MY 2010 Ford Fusion) had the lowest "percent increase or change" in steering effort (hand-wheel force) from assist to no assist among nine vehicle models tested. Also, when tested at parking speeds, the subject vehicle was among the lowest in percent increase when compared to its peers.

VRTC did not identify any root cause of the EPAS failures in the subject vehicles. VRTC also attempted but could not replicate the ramp-down assist feature of the EPAS in a subject vehicle. There were no visual warning messages or chime from the vehicle's message center during the tests.

FAILURE/MALFUNCTION MODES: If the friction in the steering system exceeds a preset or allowable threshold, a friction related DTC will be set, and the system will "ramp down" the steering power assist for up to five seconds during the ignition cycle. The EPAS is then disabled on subsequent ignition cycles.

WARNING SYMPTOMS: No warning symptoms related to the alleged defect in the subject vehicles have been identified.

CONTRIBUTING FACTORS: No contributing factors related to the alleged defect in the subject vehicles have been identified.

MANUFACTURER'S EVALUATION OF ALLEGED DEFECT:

Ford has consistently stated that it does not believe the reports alleging loss of power steering assist indicate a defect trend or an unreasonable risk to safety in the subject vehicles that have been in service for more than ten years. This assessment was based on factors such as a low rate of reports, low severity of symptoms related to the loss of assist, no defect identified in the steering system, and the ramp-down/reduced assist strategy while driving and is accompanied by audible and visual warnings.

Ford stated that the customer complaint rate for allegations of loss of power steering assist in the subject vehicles is at a low two complaints per 1,000 vehicles per year in service. The rate for the subject vehicles is lower than the recalled MY 2011-2012 Fusion vehicles that had a specific manufacturing issue (Recall 15V-340 mentioned earlier). Higher friction is expected as the steering and suspension system age and components experience natural wear. By design, steering efforts are greater at lower speeds and tighter turning radiuses as compared to higher speeds and larger turning radiuses. Even with reduced power steering assist, braking functionality is maintained, affording the driver adequate opportunity to stop the vehicle in a safe manner. These factors contribute to the low number and the low severity of crash and injury allegations due to the alleged loss of power steering assist.

According to Ford, the Power Steering Control Module (PSCM) can detect internal and external mechanical issues with the power steering system by monitoring the assist required for moving the gear. If the amount of friction in the steering system exceeds an allowable threshold, a friction related DTC will be set, and the system will implement a failure management mode. During the ignition cycle when the DTC is set, the message center will chime and display "SERVICE POWER STEERING" and the steering assist will ramp down to a lower calibration level. The transition from full to reduced assist can take up

to five seconds depending on the vehicle speed. The increase in steering wheel torque input needed by the driver at reduced assist can range from approximately zero to 15 percent depending on the initial effort required for the desired turn. During subsequent ignition cycles after the DTC sets, the message center will chime and display “SERVICE POWER STEERING NOW” and the PSCM removes the steering assist. Ford believes the vehicle remains controllable during the period of reduced assist based on the driver’s comments in the reports and its engineering vehicle evaluations.

During PE14-030, Ford’s analysis projected 10-year failure rates of approximately 13-22 percent for the recalled Fusion vehicles (compared to approximately 8-14 percent projected by NHTSA) and approximately 2.2 percent for the subject vehicles that were not recalled (compared to approximately one percent projected by NHTSA). Ford believes that combining all of the data identified on the subject vehicles to date (which was in about June 2021), the failure rate is approximately 1.7 percent, which is below the previously projected estimate of 2.2 percent at ten years in service. If the count of VOQs is included in the analysis, Ford believes the failure rate to be approximately two percent, which compares well to the projected failures for the population conducted in 2015. The performance of the subject vehicles has been consistent and predictable since PE14-030 was closed. Reports alleging a crash or injury remain at a very low rate of less than 0.01 percent of the population.

ODI ANALYSIS:

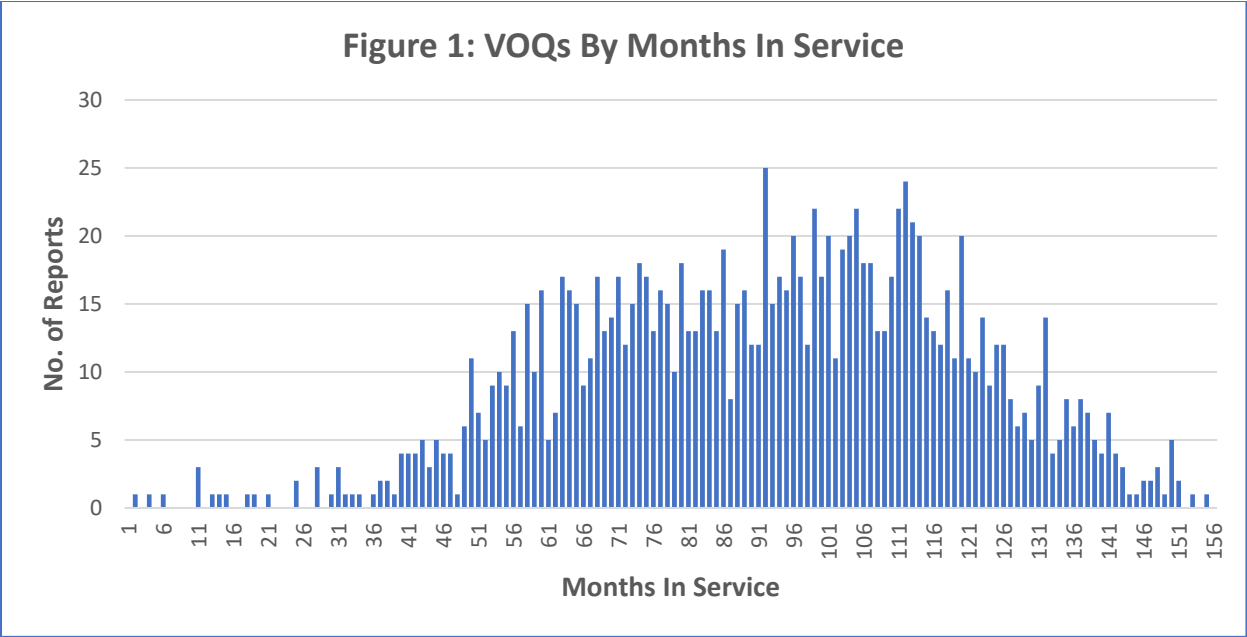
Neither Ford nor NHTSA has identified a root cause for the alleged defect in the subject vehicles. Ford has stated that although the designs of the steering systems are similar for the subject vehicles and the recalled MY 2011-2012 Fusion vehicles (Recall 15V-340), the steering gears produced for the subject vehicles were not affected the manufacturing quality issue identified in the recall.

As shown in Table 1, reporting of the 1,236 VOQs on the subject vehicles peaked around 2017-2019 and has been declining since then. Also, as shown in Figure 1, the failures by months-in-service peaked at around 85-120 months (or 7-10 years). It should be noted that the subject vehicles are currently about 13 years old. Some of the more recent VOQs and Ford’s customer complaints indicated a concern about the high repair cost (approximately \$1,500 or more for a new steering gear), and not necessarily a safety concern.

Table 1: VOQs By Received Date (thru end of CY 2023)

Year Received	Before 2014	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
No. of VOQs	62	105	154	141	174	199	193	93	50	44	18

During PE14-030, statistical modeling of the failure data by NHTSA's National Center for Statistics and Analysis projected 10-year failure rates of approximately 8-14 percent for the recalled Fusion vehicles and approximately one percent for the subject vehicles. In addition, Ford in 2015 projected a 10-year failure rate of approximately 2.2 percent for the subject vehicles. Ford recently stated that as of about June 2021 the actual overall failure rate to be approximately two percent.



REASON FOR CLOSING: ODI’s analysis of the alleged defect in the subject vehicles identified the following: testing showed minor steering effort changes between “assist” and “no assist”, no root cause identified, a declining failure trend, the ramp-down or reduced assist provided when a DTC is set, a lower failure rate than the recalled Fusion vehicles, and the high age of the vehicles. A safety-related defect trend has not been identified. Accordingly, this Engineering Analysis is closed. The closing of this investigation does not constitute a finding by NHTSA that a safety defect does not exist, and ODI will take further actions if warranted by future circumstances.

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2/7/2024

 Date

I Concur:
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2/8/2024

 Date

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2/8/2024

 Date