

June 26, 2018

## DEFECT INFORMATION REPORT

1. Vehicle Manufacturer Name:

Toyota Motor Corporation [“TMC”]  
1, Toyota-cho, Toyota-city, Aichi-pref., 471-8571, Japan

Affiliated U.S. Sales Company:

Toyota Motor North America, Inc. [“TMNA”]  
6565 Headquarters Drive, Plano, TX 75024

Manufacturer of Fuel Pulsation Damper

Maruyasu Industries Co., Ltd.  
2-7-11 Shirakane, Showa-ku, Nagoya-shi, Aichi 466-0058, Japan  
Phone: +81-52-871-3232

Country of Origin: Japan

2. Identification of Involved Vehicles:

Make/Car Line	Model Year	Manufacturer	Production Period
Lexus / GS350	2007-2011	TMC	June 19, 2006 through August 28, 2011
Lexus / GS450h	2007-2011	TMC	September 26, 2005 through August 23, 2011
Lexus / IS350	2006-2013	TMC	May 27, 2005 through March 19, 2013
Lexus / IS350C	2010-2014	TMC	November 25, 2008 through August 5, 2014

Applicability	Part Number	Part Name	Component Description
MY2007-2011 GS MY2006-2014 IS	23270-31020	Damper Assy, Fuel Pressure Pulsation	Fuel Pulsation Damper

NOTE: (1) Although the involved vehicles are within the above production period, not all vehicles in this range were sold in the U.S.

(2) The involved vehicles are equipped with 3.5L V6 2GR-FSE gasoline engine with a fuel injection system containing two fuel pulsation dampers with a certain diaphragm material. Some Toyota or Lexus vehicles are equipped with pulsation dampers containing the same diaphragm material, however the material in those vehicles is exposed to lower temperatures during engine operation than in the involved vehicles due to different engine designs. Other Toyota or Lexus vehicles sold in the U.S. are not equipped with pulsation dampers or the diaphragm material in the dampers are made of different materials.

3. Total Number of Vehicles Potentially Involved:

Lexus GS350/450h	:	64,620
Lexus IS350/350C	:	50,378
Total	:	114,998

4. Percentage of Vehicles Estimated to Actually Contain the Defect:

Unknown. Toyota is unable to provide an estimate of the percentage of vehicles to actually contain the defect. Whether the issue in each case will lead to damage of the diaphragm material in fuel pulsation damper, creating an unreasonable risk to safety, depends on each vehicle's operating conditions.

5. Description of Problem:

The subject vehicles are equipped with a 3.5L V6 2GR-FSE gasoline engine with an intake port injection system containing a fuel delivery pipe and two fuel pulsation dampers. The diaphragm material in the fuel pulsation dampers may harden over time due to a chemical process involving amine in the fuel, higher ethanol content in fuels used in countries such as the U.S., Canada, and China, and high temperatures. If this were to occur, cracks could develop on the diaphragm, causing fuel to leak. A fuel leak in the presence of an ignition source can increase the risk of a vehicle fire.

6. Chronology of Principal Events:

March 2014

In March 2014, Toyota received a dealer report from the U.S. market indicating fuel smell and fuel leakage from a pulsation damper on the fuel delivery pipe of the intake port injection system on a 2007MY Lexus GS350. Toyota was unable to recover the part for investigation, so Toyota monitored the field.

#### January 2015 - December 2015

In January 2015, Toyota began to receive additional field technical reports from the U.S. market indicating fuel smell or fuel leakage from the pulsation damper. Toyota investigated recovered fuel pulsation dampers and found that the diaphragms had become harder. Cracks were observed on the diaphragms causing fuel to leak.

The diaphragm material is amine cross-linked fluorine rubber, Toyota theorized that amine in fuel additives could cross-link the rubber, causing the diaphragm to become harder, and potentially leading to the diaphragm cracking. Based on this theory, Toyota began an investigation.

Toyota had received reports from the U.S. market. However, no reports were received from the Japan market. Therefore, Toyota compared fuel in the U.S. with fuel in Japan and found that amine content in U.S. fuel is higher than the amine content in the fuel from Japan.

#### January 2016 - December 2016

To investigate the difference of the level of amine cross-linking of the rubber diaphragm between the U.S. and Japan markets, Toyota conducted random parts recovery in the U.S. and in Japan.

Toyota measured the volume of fluorine in the diaphragm from pulsation dampers on recovered fuel delivery pipes, because fluorine in the rubber decreases when the rubber is cross-linked by amine. As a result of the recovered parts investigation, Toyota found that the fluorine volume in parts recovered from the Japan market have no correlation with vehicle mileage and are similar to new parts. However, the fluorine volume in parts from the U.S. market decreased as the vehicle mileage increased. Based on this parts recovery activity, Toyota believed that the level of amine cross-linking of the rubber is related to the amine concentration in fuel. However, Toyota had not determined whether a sufficient amount of cross-linking could occur in the field so as to produce a crack in the diaphragm.

To further investigate the rate at which the diaphragm material could harden, Toyota conducted immersion testing under various amine concentration levels using sample pieces of rubber and testing fuels. As a result of the testing, Toyota found that the rate at which the rubber hardens increased as the amine concentration was increased. Toyota also conducted immersion testing under various temperature conditions, because, in general, cross-linking is accelerated under high temperature. As a result of the testing, Toyota found that the hardening of the diaphragm was also accelerated by higher temperatures.

To determine whether hardening as a result of these two factors could then lead to cracks on the diaphragm and fuel leakage, Toyota conducted endurance testing in Japan of the fuel pulsation damper. A large amount of fuel is necessary for testing so Toyota conducted the testing using Japan fuel and added the same level of amine as the U.S. fuel. The testing continued for

approximately 150,000km of field usage. However, cracks on the diaphragm and fuel leakage were not duplicated.

#### January 2017 - June 2018

Because cracks on the diaphragm and fuel leakage were not duplicated by the aforementioned testing, Toyota continued the investigation—focusing on other factors that could accelerate amine cross-linking sufficiently to potentially produce a diaphragm crack in the field. Toyota began investigating the influence of ethanol in fuel, because the ethanol content in U.S. fuel is higher than the ethanol content in fuel from Japan. Toyota conducted immersion testing and found that fuel with 10% ethanol content further accelerated the rate at which the rubber hardens.

To determine whether this higher rate of hardening from all three factors (higher temperature, higher amine content, and higher ethanol content) could lead to cracks on the diaphragm in the field, Toyota conducted additional endurance testing in Japan. Toyota sent fuel from the U.S. market to Japan and conducted the testing. As a result of the testing, fuel leakage was duplicated at approximately 95,000km of field usage. The tested part was investigated and cracks on the diaphragm, similar to failed parts in the field, were found. Toyota also found that the amount of fluorine in the diaphragm had decreased. Endurance testing was also conducted concurrently using fuel from Japan. The testing had continued for approximately 150,000km of field usage, but cracks on the diaphragm and fuel leakage did not occur.

Toyota concluded that the diaphragm material could be cross-linked by influence of amine, higher ethanol content in U.S. fuel, and higher temperatures causing the diaphragm to harden over time. If this were to occur at a sufficient rate, cracks could develop on the diaphragm resulting in fuel leakage from the pulsation damper.

#### June 20, 2018

Based on the results of the above investigation, Toyota decided to conduct a voluntary safety recall campaign.

As of June 7, 2018, based on a diligent review of records, Toyota's best engineering judgment is that there are 9 Toyota Field Technical Reports and 22 warranty claims that have been received from U.S. sources that relate to or may relate to the fuel pulsation damper failure described above.

#### 7. Description of Corrective Repair Action:

All known owners of the subject vehicles will be notified by first class mail to return their vehicles to a Lexus dealer. The dealers will replace the fuel delivery pipe with a new one containing improved pulsation dampers.

#### Reimbursement Plan for pre-notification remedies

The owner letter will instruct vehicle owners who have paid to have this condition remedied prior to this campaign to seek reimbursement pursuant to Lexus's General Reimbursement Plan.

8. Recall Schedule:

Notifications to owners of the affected vehicles will occur by early August, 2018. A copy of the draft owner notification letter will be submitted as soon as available.

9. Distributor/Dealer Notification Schedule:

Notifications to distributors/dealers will be sent on June 26, 2018. Copies of dealer communications will be submitted as they are issued.

10. Manufacturer's Campaign Number:

JLF