

April 3, 2018

DEFECT INFORMATION REPORT

1. Vehicle Manufacturer Name:

Toyota Motor Manufacturing Canada Inc. ["TMMC"]
1055 Fountain Street North, Cambridge, Ontario, Canada N3H 5K2

Toyota Motor Manufacturing, Kentucky, Inc. ["TMMK"]
1001 Cherry Blossom Way, Georgetown, KY, 40324

Toyota Motor Manufacturing Indiana, Inc. ["TMMI"]
4000 Tulip Tree Drive, Princeton, IN 47670-4000

Toyota Motor Manufacturing de Baja California, S. de R. L. de C.V. ["TMMBC"]
Carretera Tijuana Tecate Kilometro 143 y 144
Tijuana, Baja California C. P. 22550

Toyota Motor Manufacturing, Texas, Inc. ["TMMTX"]
1 Lone Star Pass, San Antonio, Texas 78264

Affiliated U.S. Sales Company:

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

Manufacturer of Vacuum Pump

Magna Powertrain de México, S.A. de C.V., Plant Nuevo Leon
Boulevard Interamerican #220, Parque Industrial FINSA
Apodaca, Nuevo Leon 66600, Mexico
Phone: +52 811 156 1310

Country of Origin: Mexico

2. Identification of Involved Vehicles:

Make/Car Line	Model Year	Manufacturer	Production Period
Toyota / Camry	2018	TMMK	October 5, 2017 through November 3, 2017
Toyota/ Highlander	2018	TMMI	October 4, 2017 through November 3, 2017
Toyota / Sienna	2017	TMMI	October 6, 2017 through October 23, 2017
Toyota / Tacoma	2017	TMMBC	October 12, 2017 through October 17, 2017
Toyota / Tacoma	2017	TMMTX	October 5, 2017 through November 3, 2017
Lexus / RX350	2017	TMMC	October 2, 2017 through October 18, 2017

Applicability	Part Number	Part Name	Component Description
MY2018 Camry, MY2018 Highlander, MY2017 Sienna, MY2017 RX350	29300-0P011	Pump Assembly, Vacuum	Vacuum pump assembly
MY2017 Tacoma	29300-0P021		

- 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) Only vehicles equipped with vacuum pumps containing rotors manufactured during the suspected period described below are affected; other vacuum pumps are not affected.
- (3) No other Toyota or Lexus vehicles sold in the U.S. utilize the same vacuum pump.

3. Total Number of Vehicles Potentially Involved:

Toyota Camry : 441
 Toyota Highlander : 3,669
 Toyota Sienna : 1,007
 Toyota Tacoma : 769
 Lexus RX350 : 160
 Total : 6,046

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

Unknown. Toyota is unable to provide an estimate of the percentage of vehicles that actually contain the defect. Whether the manufacturing issue will lead to vane breakage in the vacuum pump, creating an unreasonable risk to safety, depends on each vehicle's operating conditions over time and actual drilling condition achieved at the time of manufacturing.

5. Description of Problem:

The subject vehicles are equipped with a vacuum pump assembly, which provides vacuum for the brake booster. The vacuum pump is supplied oil from the engine to seal and lubricate the movement of the pump vane. Engine oil is distributed to the vacuum pump housing through the rotor oil galley. There is a possibility that the oil galley in the rotor was not properly machined at the supplier. In this condition, oil may not be distributed throughout the vacuum pump. In some cases this may cause the vane to break, leading to the illumination of a warning light, a warning message, an audible tone, and resulting in the sudden loss of braking assist. A sudden loss of braking assist while driving could increase the risk of a crash.

6. Chronology of Principal Events:

October 2017 – January 2018

On October 11, 2017, during a quality drive test at a vehicle manufacturing facility (TMMTX), a worker experienced a hard brake pedal feeling, a brake warning light, and a warning message on the multifunctional display that was accompanied by an audible tone. The vehicle was inspected, and it was found that the vacuum pump assembly was not providing adequate vacuum. A further inspection revealed that the oil galley hole in the rotor was not drilled completely, preventing engine oil from entering the vacuum pump housing. Toyota requested the supplier to begin an investigation into the possible cause of the incomplete drilling of the oil galley hole.

At other Toyota vehicle manufacturing facilities vehicles were found to have a hard brake pedal feeling, a brake warning light, a warning message on the display, and an audible tone during a vehicle functional check process. Toyota inspected vehicles and engines and found that some vacuum pumps had been manufactured without oil galley holes or with smaller than specification oil galley holes.

Toyota initiated an investigation into the cause of the incomplete drilling of the oil galley. Based on the serial numbers of the affected vacuum pumps identified from the inspected vehicles and engines, it was found that they had been drilled in August 2017. Toyota began investigating the supplier's production process and production history. It was found that the supplier experienced a power surge which stopped production on August 7, 2017 for a period of time. The investigation further identified that, if the zero-point calibration of the drilling machines, which must be performed when a drilling machine tool is changed, was not correctly performed, the drilling stroke could change and may become insufficient, leading to the potential for incomplete drilling of the oil galley of the vacuum pump.

In addition to the production process and history review, Toyota also reviewed the supplier's work procedures, process flow, repair, and maintenance history for the drilling machines. The work procedures instructed workers to perform a zero-point calibration of the drilling machines only when there is a tooling change. However, there were no work procedures instructing workers to perform zero-point calibration for abnormal conditions such as a power surge causing an equipment shutdown. Therefore, it was presumed that a zero-point calibration had not been performed after the power surge and the resumption of the production, and this resulted in the incomplete drilling of the vacuum pump oil galley. (However, machine tooling is replaced every 400 pieces; therefore, after production had resumed, the zero-point calibration would have been performed with the tooling change per the work procedure, and the correct drilling depth would have been achieved. This would have occurred by August 9th, 2017.)

As a result of the aforementioned process and procedure reviews, the supplier implemented a mandatory zero-point calibration measurement with log, updated their work procedures, and created an air test station at assembly to prevent the flow out of vacuum pumps with insufficiently drilled rotor oil galley holes.

Toyota and the supplier started vacuum pump performance and durability testing, using rotors with different oil galley hole sizes, to understand effects on vehicle performance. In parallel, Toyota also began identifying the vehicles potentially affected by improperly manufactured vacuum pumps based on the traceability of rotors, vacuum pumps, and engines.

February 2018- Mid-March 2018

During testing, it was confirmed that, if the oil galley hole in the rotor is partially drilled, allowing no oil to flow, or if the oil galley hole was not drilled properly, creating a smaller than specification hole, allowing only some oil to flow, oil may not be distributed throughout the vacuum pump. In this condition, the vacuum pump will initially provide the proper amount of vacuum to the brake booster. However, over time, the proper amount of oil may not be supplied to the vacuum pump, reducing the amount of generated vacuum. In some cases, the lack of proper oil flow could cause internal damage of the vacuum pump (breakage of the vane) resulting in loss of vacuum. If this were to occur, the existing vacuum reserve will deplete after one or two brake applications, depending on the amount of vacuum that had previously accumulated. Once the vacuum is depleted, the brake assist could be suddenly lost (no vacuum applied to the brake booster), and the brake pedal effort could increase (hard brake pedal feel); this would be accompanied by brake warning light illumination, a warning message on the multifunctional display, and an audible tone. Additionally, in some models with a different ECU design (RX350, Highlander, and Sienna) in the event of a loss of vacuum due to vacuum pump failure, the ECU contains logic for the brake actuator to continue to provide some brake assist under certain driving conditions. When the brake assist is operating in this manner, an over-sensitive brake feel can occur at low speeds.

March 28, 2018

Based on the above investigation, it was concluded that a sudden loss of braking assist while driving could increase the risk of a crash. As a result, Toyota decided to conduct a voluntary safety recall campaign.

As of March 21, 2018, based on a diligent review of records, Toyota's best engineering judgment is that there are no Toyota Field Technical Report and no warranty claims that have been received from U.S. sources that relate to this condition and which were considered in the decision to submit this report.

7. Description of Corrective Repair Action:

All known owners of the involved vehicles will be notified via first class mail to return their vehicles to a Toyota or Lexus dealer, as applicable. Dealers will replace the vacuum pump with a new one.

Reimbursement Plan for pre-notification remedies

As the owner notification letters will be mailed out well within the active period of the Toyota/Lexus New Vehicle Limited Warranty ("Warranty"), all involved vehicle owners for this recall would have been provided a repair at no cost under Toyota's Warranty.

8. Recall Schedule:

Notifications to owners of the affected vehicles will occur by the end of May, 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 April 3, 2018. Copies of dealer communications will be submitted as they are issued.

10. Manufacturer's Campaign Number:

Toyota: J0K

Lexus: JLD