

August 10, 2023**DET-23-101**

ISUZU Campaign: V2305

Chronology of Defect Determination**573.6(c)(6)**

Describe the chronology of events leading up to the defect determination decision.

On December 27, 2022, Isuzu North America Corporation (INAC) QA was made aware of a Technical Assistance (TAL) Case from Isuzu Commercial Truck of America (ICTA) in which a technician reported corrosion on one of the externally mounted ignition coil pack fuses on a 2023MY NPRHD gasoline vehicle. The field report indicated that the vehicle exhibited a Check Engine MIL and reduced engine power. INAC QA was unable to recover any parts from this case.

Between December 27, 2022 and January 8, 2023, INAC QA received 2 additional reports of corroded fuses. One case stated that the driver experienced a crank no start condition while the other stated that the driver experienced a Check Engine MIL and engine misfire.

On January 11, 2023, Isuzu Technical Center of America (ITCA) and Isuzu North America Corporation (INAC) QA, together with Isuzu Motors Limited (IML) and Isuzu Technical Center of America (ITCA), Inc. (collectively, Isuzu), promptly launched an investigation.

On February 16, 2023, INAC QA, after receiving returned warranty ignition coil pack fuse holders from the field, contacted American Furukawa (the vehicle chassis harness supplier) and requested them to study the returned warranty parts in order to determine the water leak path.

On March 8, 2023, American Furukawa reported to INAC QA that it was unable to determine the exact water intrusion entry point.

On March 23, 2023, ITCA completed its preliminary analysis and discovered that the incorrect seal part number was used on both ignition coil pack fuse holders. This incorrect seal did not create a proper interference fit on the smaller of the two wires at the rear of the fuse holder, resulting in a potential water intrusion path into the fuse holder cavity and fuse.

On March 24, 2023, INAC QA reviewed the current field cases and confirmed that the rate of reported cases from the field was low (Incident Rate Per Thousand Vehicles was 3.75). Moreover, the rate of incoming claims from the field decreased month over month from the peak in January 2023. Of the reported cases, most reported a Check Engine MIL with either engine misfire or an engine derate (reduction to about 5 mph acceleration). Notwithstanding the low rate and declining number of field incidents, INAC QA requested ITCA to perform a risk assessment study and confirm the potential failure modes in the event the ignition coil pack fuse(s) becomes corroded or fails.

Between March 24 and May 25, 2023, ITCA also studied other potential leak paths into the fuse holder, and on May 25, 2023, ITCA confirmed that the only leak path was from the rear wire seal. During this period, the field incident rate of engine performance issues remained low.

In the meantime, on April 23, 2023, based on ITCA's findings, ITCA submitted an Engineering Change Request (ECR) to the supplier to correct the ignition coil pack fuse holder seal/wire combination by increasing the smaller wire size from 2.1mm to 2.9mm.

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Between May 31, 2023, and July 12, 2023, IML in conjunction with ITCA began studying an interim countermeasure.

- Throughout this period, Isuzu continued to monitor field incidents and confirmed that they remained low. ITCA completed the interim countermeasure study and confirmed that the application of Cemedaine Super X 8008 silicone sealant to the rear of the fuse holder plug will provide sufficient sealing performance for the connection.
- On July 12, 2023, the Charlotte production team began to apply silicone sealant to the rear of the ignition coil pack fuse holder plugs on production vehicles. All vehicles produced after this date have silicone applied.

On July 5, 2023, ITCA completed the risk assessment and concluded that corroded fuses could lead to a Check Engine MIL and an engine derate, and an engine stall while trying to start it.

On July 19, 2023, INAC QA obtained a vehicle and testing equipment in order to perform a duplication test to validate ITCA's risk assessment.

On July 20, 2023, to July 31, 2023, after receiving ITCA's risk assessment, INAC QA studied the consequences of a corroded ignition coil pack fuse on the functioning of an actual vehicle to validate ITCA's risk assessment and to understand the warning signs to the driver as fuse corrosion progresses from light corrosion to a later stage of heavy corrosion. During this study INAC QA confirmed:

- When one fuse becomes lightly corroded (50 to 1000 ohm resistance), the vehicle illuminates the Check Engine MIL and an audible misfire is heard from the engine. These are accompanied by a very noticeable shake or vibration due to the engine misfire.
- The vehicle also exhibits reduced power with no engine derate, which was observed as slower than normal acceleration (roughly 30% increased acceleration times). In addition, drivers will notice a fuel smell from the exhaust.
- Drivers would be given multiple indications (sight, sound, smell, feel) that the engine was not operating properly.
- To evaluate the consequences should a driver ignore these warning signs, INAC QA tested this possibility by inducing a higher resistance (>1000 ohms) in one ignition coil pack circuit. This resulted in a flashing Check Engine MIL, engine derate, and a speed reduction to 5 MPH; however, power steering and power brake assist were still retained since the engine remained running.
- Based on this test, Isuzu concluded that if a driver had ignored the prior warnings, the vehicle could still be controlled with power assist brakes and power assist steering, but that accelerator function would be greatly reduced and the vehicle would be limited to a maximum speed of 5 MPH.
- To further evaluate the consequences of disregarding these warnings, INAC QA then induced resistance in both circuits, resulting in an engine stall and an inability to restart the engine.

On August 1, 2023, Isuzu reviewed the work done to date, the details of the field cases, and risk assessment findings.

Although Isuzu is not aware of any crashes, property damage claims, injuries or deaths associated with this issue, in an abundance of caution, on August 4, 2023, Isuzu decided to conduct a safety-related defect recall to address this concern.