FORD MOTOR COMPANY (FORD) RESPONSE TO RQ24-008 Request 15

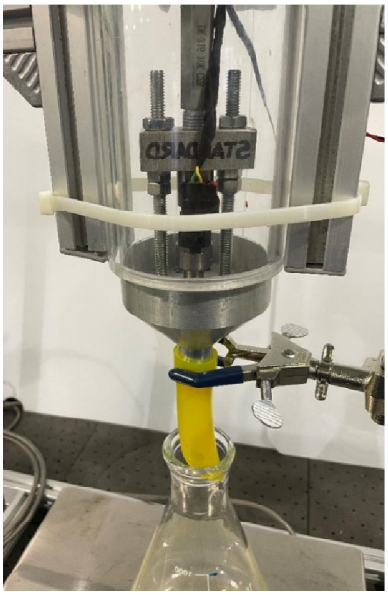
Request 15

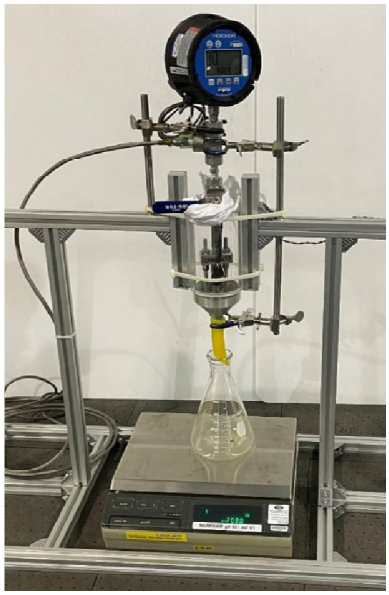
Please provide a detailed summary to each of the follow items regarding fuel leakage:

a) The testing programs Ford conducted to determine the fuel leak rate (19L/hour) as stated in the subject recall and the peer recall, and whether this rate represents a full or partial failure of the subject component;
b) Ford's estimation of the amount of fuel that has been, and will be, leaked onto the roadway due to the alleged defect from the subject vehicles and peer vehicles until the appropriate repairs have been, or will be, performed;
c) Ford's analysis of how the fuel leakage levels associated with the subject recall and the peer recall comply with any standards (NHTSA, EPA, or other);
d) Ford's knowledge of any corrective actions (recalls, TSBs, Customer Satisfaction Programs, or other) conducted by Ford, or any other automotive manufacturer, issued prior to the peer recall whereby the remedy for a defect involved knowingly leaking fuel onto the roadway; and e. Ford's perspective as to its obligations (legal, ethical, environmental, or other) to prevent and/or limit fuel leakage onto the roadway at any point during a vehicle's lifespan.

Answer

a) Ford completed the testing at Ford testing facilities. Ford performed testing on cracked injectors that were returned from the field. Ford personnel placed injectors in an enclosed container and pressurized the injector with n-Heptane. Ford performed pressure sweeps at various levels of pressure to inspect for evidence of fluid. All leaked fluid drained into a flask below the test setup. The mass of the fluid was measured by a scale. The volumetric leak flow rate was calculated based on the mass, collection time, and the density of heptane.





b) Based upon Ford's review of connected vehicle data, the median mileage traveled by vehicles with cracked injectors from the point of leak detection to point when that vehicle is serviced is 14 miles. Ford assumes the average vehicle speed is 30 mph, in part because vehicle speed is limited to 40 mph by Failure Mode Effects Management (FMEM). For vehicles that have received the 24S16 recall repair, Ford estimates an average vehicle leak rate of 4.78 L/hour based on analysis of returned parts. This leak rate is less than the leak rate described in 15a primarily due to the lower fuel pressure associated with the FMEM. Based on those assumptions, Ford estimates the total estimated fuel leakage is 2.2L for vehicles that have received the 24S16 recall repair and have experienced one or more cracked injectors.

c) Ford designs, builds, and tests its vehicles to ensure compliance with all applicable laws, including NHTSA, EPA, and CARB regulations.

Ford determined that a leaking fuel injector may impact a vehicle's compliance to the 2-day and 3-day diurnal evaporative emissions standards as well as running loss. Relying on engineering judgment, Ford concluded that depending on the severity of the injector damage, there could be a compromised combustion event, which would result in misfire events detected by the On-Board Diagnostics (OBD) system and illuminate the Malfunction Indicator Light (MIL). Note, Ford filed an EPA Emission Defect Information Report with U.S. EPA on April 23, 2024. Ford's report stated that "based on engineering judgment, there may be an impact to evaporative emissions compliance with this concern.

If the vehicle exceeds evaporative or tailpipe emissions standards due to an unexpected hardware failure, the vehicle's OBD system will detect the failed hardware and provide the vehicle operator with an instrument cluster notification to seek service. Ford provides customers with warranty coverage for labor and material cost of any defective emissions part replacement. Here, vehicle service returns the vehicle to a state of compliance with all Federal and State regulations.

The evaporative emissions system of these vehicles complied and complies with EPA requirements and test specifications for the full useful life of the vehicle. It is possible for fuel injectors to leak in the field; however, the projected failure for the cracked fuel injector in the field is less than 1% at full useful life (15 years / 150,000 miles). When this occurs, it is overt to customers and they generally seek service quickly. Ford is able to return those vehicles to a state of compliance once the fuel injector is replaced.

d) Ford has not identified other technical service bulletins, internal service messages, or emissions, safety, safety compliance, or customer satisfaction field service actions where the remedy includes a drain tube that can redirect already-leaked fuel away from hot surfaces and onto the roadway in the event of a failure to prevent the risk of fire.

However, manufacturers incorporate design features to help ensure safety in the event of an unintentional fuel spill or leak. For example, Ford and other manufacturers utilize drain holes in fuel filler hardware that direct any spilled fuel to the ground in the event customers overfill their vehicles at gas stations. Fuel spillage during refueling is not expected to be a regular occurrence, just as fuel leakage from cracked injectors is not expected to be a regular occurrence, but in both cases, Ford is designing the product to help ensure safety.

e) Ford designs the liquid fuel handling system to be leak free for the full useful life (15 years / 150,000 miles) of the vehicle. Ford also designs the evaporative emissions systems to be compliant with test specifications for the full useful life of the vehicle.

Once the vehicle leaves Ford's control, Ford provides customers with specific legal rights under its New Vehicle Limited Warranty. If a part fails and fuel is released into the environment, Ford provides the New Vehicle Limited Warranty to remedy vehicles by repairing, replacing, or adjusting the defective parts.

When Ford becomes aware of a safety concern, Ford always acts in the best interest of protecting our valued customers. Ford considered two possible remedies associated with the fuel injector: a hardware replacement option and a software algorithm option. The hardware replacement option posed significant challenges to providing a timely remedy to owners. This was due to the volume of injectors required and the lead time associated with designing revised injector hardware, getting the new hardware into production, and calibrating the new design for proper operation in vehicles. The peer (22S73) and subject (24S16) recalls involve approximately 700,000 vehicles and 2.1 million fuel injectors. Because of the significant lead time involved with manufacturing 2.1 million injectors, Ford also considered and ultimately implemented the FMEM software algorithm and drain tube. A software solution could be made available to all customers very quickly, and the drain tube had a very short lead time for production. This option was the fastest way for Ford to protect the most customers.

If a fuel injector does crack and releases fuel, Ford's recall repair seeks to mitigates any safety risk to the customer and to reduce the amount of fuel that actually can leak from the vehicle. The recall repair software is designed to immediately deactivate the high-pressure fuel pump and limit the torque capacity of the engine. This significantly limits fuel leakage. The software also notifies the driver to seek service so that the driver can seek repairs before there is further fuel leakage. The drain tube ensures that if there is a fuel leak, it is redirected from hot surfaces to further mitigate the risk of a fire.

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