FORD MOTOR COMPANY (FORD) RESPONSE TO PE24-027

Request 10

Furnish Ford's assessment of the alleged defect in the subject vehicles, including:

a. The causal or contributory factor(s);
b. The failure mechanism(s);
c. The failure mode(s);
d. The risk to motor vehicle safety that it poses;
e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring, or subject component was malfunctioning; and
f. The reports included with this inquiry.

Answer

Ford's investigation did not identify any specific or common root causes contributing to the Edge and MKX rear brake hose leaks that are the subject of NHTSA's Information Request. Brake hoses can fail for many reasons potentially related to contact with road debris, improper service (allowing the caliper to hang while brake pads are replaced), or fatigue. Ford continues to monitor reports of rear brake hose leaks; however, due to the age of these vehicles there were no warranty parts available from the field for analysis at the time of this NHTSA Information Request.

In 20V-469 (20S42), Ford approved a recall for the front brake hose based on a projected failure rate of 70 R/1000 over 10 years/150,000 miles. Analysis of brake hoses during that investigation determined that the rupture in the brake jounce hose occurs from a consistent localized failure of the internal reinforcement braid caused by cyclic fatigue via tensile/bending and torsional inputs during suspension and steering articulations. The rate of failure is proportional to the amount of steering and suspension inputs to the hose ("work" done by the hose). The brake hose construction consists of 5 layers: 2 layers of yarn braiding sandwiched between 3 layers of EPDM rubber. The Edge and MKX brake hose internal reinforcement braid material was changed from Poly vinyl alcohol (PVA) to Polyethylene terephthalate (PET) as a containment action and remedy. The front and rear brake hoses utilize the same construction and materials, so Ford compared the hose bend radius of the front and rear hoses:

CD4.2 Edge Front Hose Bend Radius
Design Position = 22 mm
Full Jounce = 14.56 mm with 3.83 mm elongation.
Full Rebound = 14.82 mm with elongation 5.97mm

CD4.2 Edge Rear Hose Bend Radius
Design Position = 38.8 mm. **76% larger radius**
Full Jounce = 20.30 mm with elongation -1.11mm. **40% larger radius**
Full Rebound = 17.14 mm with elongation of 1.14 mm. **16% larger radius**

Rear brake hoses are not subject to steering articulations, and this combined with the larger bend radius results in less cyclic fatigue over the life of the brake hose.

If a rear brake hose develops a leak, the driver may experience an increase in pedal travel, but the driver will be able to bring the vehicle to a stop. If the customer continues to drive the vehicle, a leaking brake hose will cause the brake fluid level in the master cylinder reservoir to decrease. When the level reaches the “Low” mark on the reservoir, the red brake warning indicator light will illuminate, providing overt notification to the driver that there is a problem with the braking system. If the customer continues to drive the vehicle with brake warning lamp illuminated, the brake fluid in the affected circuit of the master cylinder may become empty which will result in a reduction in the rate of deceleration. The brake system is split diagonally, and one circuit in the master cylinder is isolated (protected) and will always have fluid, so two of the vehicle’s four brakes will always work if a hose is leaking. This allows the vehicle to be stopped safely even if one circuit is leaking. The Subject and Peer vehicles meet FMVSS 135 S7.10 Hydraulic circuit failure performance requirements.

Ford’s assessment of the alleged defect in the subject vehicles is guided by data we have received related to the concern. Ford has identified 71 warranty claims and 21 field reports and consumer reports on the subject and peer vehicles defined in this information request. Ford has not identified any lawsuits or legal claims relating to the alleged defect on these vehicles and Ford has not identified any accidents or injuries. In August 2020, after continued monitoring of rates over time related to front brake jounce hose leaks, Ford approved FSA 20S42 on Edge and MKX vehicles in the North America due to a projected repair rate of 70 - 98 R/1000 at 10 years in service. Ongoing analysis of Edge and MKX rear brake hoses has identified significantly lower 10-year projections than front hoses (1.2 R/1000 for rear hoses).

Based on Ford’s assessment of the failure rate and warranty claims Ford does not believe that the alleged defect presents an unreasonable risk to motor vehicle safety because (1) the risk of a partial loss of braking performance while driving is low and progressive in nature, and (2) the alleged defect will not cause a total loss of braking. Although a progressive leak in a rear brake jounce hose may increase brake pedal travel, these vehicles are equipped with two isolated brake circuits allowing the vehicle to be stopped safely if one circuit is leaking. Ford has not identified any reports of accident or injury, on a population of over 732,000 subject and peer vehicles that are up to ten years old.