



Engineering Sciences Section – 2008

C14 Laboratory Impact Evaluation of Fuel Tank Filler Anti-Spill Valves

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After attending this presentation, attendees will understand how fuel can escape from a vehicle fuel tank if the fuel filler assembly is compromised and how the installation of anti-spill valves (check valves) on the fuel tank filler inlet will substantially mitigate the loss of fuel under the conditions evaluated.

This presentation will impact the forensic community/or humanity by demonstrating through laboratory testing that the loss of liquid such as gasoline and its vapors from a compromised fuel filler assembly is substantially mitigated by the installation of anti-spill valves on fuel tank filler inlets. As a result the probability of post-collision fuel fed fires is reduced.

A severe fire can result from the escape of gasoline and gasoline vapors during and after a collision and/or rollover due to a compromise in the fuel tank filler assembly. The fuel tank filler inlet (spud) is the opening in the fuel tank where the fuel filler pipe/hose assembly attaches and fuel enters the fuel tank. The fuel filler assembly is the hose, pipe, or hose/pipe combination which attaches to the fuel tank filler inlet (spud) on one end and to the body of the vehicle on the other end. The fuel cap closes the fuel filler opening to prevent fuel from escaping.

History has shown the fuel filler assembly may be compromised during a collision. The fuel filler hose and/or tube can be cut, the fuel filler pipe or hose may separate from the fuel filler inlet, or the fuel filler cap may be loose, not installed or improperly installed. If one of these failures occurs, gasoline and gasoline vapors can escape from the fuel tank.

The use of fuel filler anti-spill valves to prevent the loss of fuel from the fuel tank filler should the filler system be compromised was discussed and recommended as early as the mid-1960s. These valves function as "one-way" type valves. They open under the force of the fuel during refueling and close when refueling stops. Automobile manufacturers use some of these anti-spill valves as part of their emission system to prevent the escape or "spit-back" of fuel and fuel vapors.

Six different anti-spill valves were installed on the fuel tank filler inlet (spud) in OEM (original equipment manufacturer) polymer fuel tanks which were not originally equipped with anti-spill valves. The fuel tanks were filled to 90% of their capacity with colored water. The fuel filler assembly was compromised or removed from the fuel tank filler inlet. Using a pendulum, laboratory impact testing was performed to evaluate the effectiveness of these valves in preventing the loss of liquid when the fuel tank is exposed to impact loading. The anti-spill valves were not directly impacted. Following the impact, the fuel tanks were placed on a tilt table to evaluate the effectiveness of the valves while the tank was rotated 360 degrees. Additionally three different polymer fuel tanks equipped with OEM installed fuel filler anti-spill valves were tested.

The results of the testing reveal that for the circumstances evaluated, anti-spill valves installed on the fuel tank filler inlet are effective in substantially mitigating the loss of fluid from the fuel filler inlet spud when the fuel tank is subjected to impact loading. The results also indicated that some anti-spill designs are more effective in preventing the loss of fluid when the fuel tank is rotated.

Fuel, Filler, Valve