



Engineering Sciences Section - 2016

D21 Refueling Fire Caused by Defective Fuel Pump Nozzle, Electrostatic Discharge Ignition, and Violations of Safety Practices

Mark C. Pozzi, MS, Sandia Safety Sciences, 2 Marietta Court, Ste A, Edgewood, NM 87015*

After attending this presentation, attendees will be able to demonstrate how proper forensic investigation can determine, by using the scientific method, how to conclusively prove fire cause and origin, and how it relates to injury causation, property damage, violation of safety procedures, and related issues.

This presentation will impact the forensic science community by illustrating the methodology for investigating an emerging fire hazard, describing how to investigate a catastrophic refueling fire, and demonstrating how the source of fuel leakage and ignition was determined and how other sources of ignition were eliminated.

This presentation involves a forensic investigation of a gasoline refueling fire at a self-serve station. Multiple violations of safety practices before and during the fire caused or contributed to the fire. These violations caused a known defective fuel pump nozzle to remain in service with no warnings to consumers or lock-out/tag-out precautions. Documented failures of the nozzle earlier on the day of the incident were ignored by the operators of the refueling station. When utilized to fill a vehicle in the normal manner, the defective filler nozzle failed to shut off, spilling a large amount of gasoline from the filler neck onto the ground as the pump continued to operate. This falling fuel was capable of generating significant static electricity. No emergency shut-off switch was available near the gasoline pump. The vehicle passenger attempted to manually shut off the nozzle without success. The driver began to exit the vehicle to deal with the leaking fuel. When the driver rotated and slid off the seat and then touched the ground, an electrostatic discharge was generated sufficient to ignite the vapors spreading from the overflowing gasoline. A catastrophic fire resulted, which caused severe burns to the driver, destroyed the vehicle and refueling pump, and also destroyed much of the gas station. The station attendant failed to observe the refueling operation and failed to shut off the fuel pump even when aware of the fire. This caused the pump to continue to supply full-flow pressurized fuel to the fire for several minutes. Evidence of defects in the refueling nozzle were discovered; these defects caused the nozzle to malfunction, preventing proper shut-off. Claims that the fire had ignited because the driver had left the engine running were disproven via forensic inspection of the engine and components of the ignition system. There were no contributions to the fuel leak or fire by the vehicle or its occupants. Also, claims made that evidence spoliation had occurred as a result of the forensic investigation were disproven by the use of on-scene and subsequent photographs and other data. A previous similar incident at a different station operated by the same company was also uncovered, which had not been disclosed.

Refueling fires which were ignited by Electrostatic Discharge (ESD) ignition have been known for many decades. There have been approximately 200 reports of ESD ignition related to ground vehicle refueling fires in the United States since the late 1990s, with initial suspicion that cellular telephones were responsible; however, ESD was the actual cause. This has become a recognized significant hazard resulting in warnings being posted on many refueling pumps. ESD has caused fires in both ground vehicle and aircraft refueling, and it can occur with propane as well as liquid fuels.

Refueling, Defective, Electrostatic Discharge