Pressure Relief Valve Failures in Tank Cars  
Statistics and Assessment of Causes

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Abstract

In the last few years a number of failures of pressure relief valves (PRV) on tank cars carrying hydrocarbon liquids have been reported, with relatively short durations (months) in service. The failures mainly involve the breakage of the stem and parts of the valves falling into the tank car. Such failures pose serious safety issues in the transportation of hazardous materials on rail.

This paper discusses the statistics on PRV failures, by types and commodities. Data from full scale tests conducted to determine the accelerations to which various components of a tank car are subject during yard operations and in normal transit are indicated. Several different potential causes for PRV failures are discussed, including effect of pressure surge due to liquid sloshing, compression of vapors in nozzles and possible auto ignition of flammable vapors, electrochemical reactions involving dissimilar metals creating cracks in PRV stem and its subsequent fatigue failure due to bending forces, etc. Results from preliminary mathematical models are also presented. Recommendations for additional lab-scale and full scale testing are indicated.