

Rail Flatcar Chemical Fire Investigation

Minneapolis, Minnesota
Major Transportation Company
Contract Amount: \$30,000

PROBLEM

Three 28-foot trailers on a three-car articulated rail flatcar were destroyed by fire. The State Fire Marshal indicated that the most probable cause of the fire was a load shift on a LTL and autoignition of chemicals. The LTL was being held responsible for a loss of \$300,000 by an LTL carrier on an adjacent flatcar.

SOLUTION

Remtech engineers was engaged (four months after the incident) to conduct an independent fire investigation. The chemicals involved were dilute janitorial and metal cleaning products and oil based paints. Dental cleaning materials contained 15% sulfamic acid and 10% sodium hydroxide solutions. An aluminum cleaner contained 10 to 30% phosphoric acid.

Paints contained solvents, powdered metals (aluminum, titanium), and propellants. Other potential metal catalysts included the aluminum trailer, copper, brass, aluminum and zinc electrical fittings. Potential combustible reactants included paper, cardboard, and cloth medical dressings.

Janitorial cleaning chemicals contained glycols, surfactants, and ammonia compounds.

Samples of chemicals involved in the fire were obtained from product manufacturers. Potential reaction consequences were determined using A Method for Determining the Compatibility of Hazardous Wastes. Reactions with the greatest potential to produce heat or fire were selected for testing. Potential binary, tertiary, and synergistic heat of reaction tests were conducted.

Induction reaction periods were determined to ensure that adequate reaction times were employed. The order or sequence of chemical reactants was also varied to determine maximum heat generation. Initial tests were conducted in one liter glass reactors with a digital thermocouple equipped with an immersion probe. Reactions yielding the highest reaction temperatures were scaled up (8 liter glass reactors) to determine if heats of reaction were mass limiting. Results indicated that insufficient heats of reaction were produced to elevate temperatures above threshold autoignition temperatures (for wood and cardboard 400 to 500 oF).

The cause of the fire was determined not to be due to the autoignition of chemicals on the trailer. The most probable cause of the fire was the crushing of pressurized paint spay cans during a load shift and the release of propellants and ignition by an open flame such as sparks from railcar wheels.

A video tape of typical flatcar braking and spark generation was provided to Remtech for determination of spark temperature and projection distances. Still frame capture indicated that molten sparks released during braking had sufficient mass and projection to enter the nose of the trailer where propellants could be ignited.

COSTS/BENEFITS

Remtech's investigation and accident reconstruction shifted the responsibility of the fire cause away from the LTL and saved them an estimated \$300,000.



Articulated Rail Flatcar Fire



Burn Residues Following the Fire