

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

Notice of Safety Advisory 2003-01

AGENCY: Federal Railroad Administration (FRA), DOT.

ACTION: Notice of Safety Advisory 2003-01

SUMMARY: FRA is issuing Safety Advisory 2003-01 addressing the importance of the hazardous materials offeror's requirement to verify the compatibility of all packaging components, such as valves and gaskets, in the event a change is made to the chemical constituents of a hazardous material in a railroad tank car. This action is being taken to improve the safety and reliability of hazardous material shipments in transportation.

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SUPPLEMENTARY INFORMATION:

Background:

On February 18, 1999, railroad tank car number UTLX 643593, spotted on an unloading rack at the Essroc Cement Corporation's Logansport cement plant near Clymers, Indiana, sustained a sudden and catastrophic rupture that propelled the tank an estimated 750 feet over a multistory storage tank. The 20,000-gallon tank car initially contained about 161,700 pounds (14,185 gallons) of a toxic and flammable hazardous waste being used as fuel for the plant's kilns. Fortunately, there were no injuries or fatalities. However, total damages, including property damage and costs from lost production, were estimated at nearly \$8.2 million. During the investigation of this incident, the safety relief device from this car and four other cars built to the same design were tested at a tank car repair facility to determine compliance with Federal regulations. Investigators determined that the gasket material in the safety relief devices exhibited varying degrees of brittleness, swelling, hardness, and cracking that

contributed to the failure of the pressure relief devices to comply with Federal and industry requirements.

Incidents such as the one near Clymers, Indiana, result from noncompliance with the requirements in the Hazardous Materials Regulations (HMR). Specifically, these incidents derive from improper material selection and consideration of all components. The safety and reliability of hazardous materials shipments in transportation depend on a disciplined approach to material selection and maintenance.

FRA is issuing Safety Advisory 2003-01 to further discuss the requirements concerning gasket material selection in the event a change is made in the chemical constituents of the hazardous material shipped. This document provides general guidance only. Shippers should not rely on this document as a substitute for sound engineering, material selection, and maintenance management.

Tank car UTLX 643593, a DOT specification 111J100W1 tank car built in early 1993, was one of 52 tank cars designed for toluene diisocyanate (TDI) transportation. The certificate of construction for UTLX 643593, and the other cars listed on the built certificate, indicates that these cars were approved for carriage of A Non-regulated commodities and commodities authorized in DOT Part 173 for which there are no other requirements and which are compatible with this design and class of car. @ [Emphasis Added] The service equipment from UTLX 643593 was on a 10-year maintenance and qualification cycle and was not due for requalification until 2003. The O-rings and gaskets for the pressure relief device were made of ethylene propylene rubber and Teflon⁷, respectively.

The hazardous material within the tank car, TDI waste matter, was loaded in October 1993 and stored until March 1998. It was transported to the Logansport facility for further storage until being moved for unloading in February 1999. On February 18, 1999, while spotted on an unloading rack, tank car UTLX 643593 sustained a sudden and catastrophic rupture that propelled the tank an estimated 750 feet over a multistory storage tank. Immediately after the incident, an investigation was conducted by the National Transportation Safety Board and FRA. Laboratory analysis obtained during the investigation revealed that two other constituents had been added to the material before shipping to the Logansport facility. A blending agent was added to the TDI to reduce its viscosity. The blending agents were HAN 9067 (a mixture of flammable petroleum hydrocarbons such as naphthalene and trimethylbenzene) and monochlorobenzene (MCB). Both blending agents are classified as hazardous materials when shipped individually.

The transportation of the solvent blend wastes and TDI matter wastes in UTLX 643593 and the other tank cars approved for the transport of pure TDI constituted a change in the compatibility status of the tank and service equipment. This change in compatibility status, which resulted in deterioration of the components, was a key contributor to the pressure relief devices failure to meet Federal requirements (See 49 CFR 173.24(e)).

After the Clymers accident, FRA mandated, in a letter to the tank car owner, that the pressure relief devices from four of the 24 tank cars containing the TDI matter wastes in storage at the Logansport rail yard be pressure-tested in accordance with the HMRs before any of the tank cars could be transported for unloading. The tear down and inspection of the pressure relief devices from these five tank cars (the four cars that FRA required to be tested and UTLX 643593) demonstrated that the devices were in a deteriorated condition. The ethylene propylene rubber AO-rings showed evidence of swelling, hardness, and brittleness, and the metallic components exhibited varying degrees of rust, scale, pitting, and grit. While the deteriorated AO-rings in the pressure relief devices did not cause the failure alone, the AO-rings clearly demonstrated improper material selection.

AA Chemical Resistance Guide to Elastomers provided to the investigators by the tank car manufacturer contained guidance about the resistance of available gasket, AO-ring, and sealing materials to degradation upon exposure to various chemicals. According to this guide, ethylene propylene rubber, the material that constituted the AO-rings in the pressure relief devices from the tank cars, offers good to excellent resistance to chemical attack from pure TDI at temperatures up to 70°F and should not exhibit more than minor swelling, softening, or surface deterioration. The guide also recommends against using ethylene propylene rubber with either MCB or naphthalene, one of the primary components of the HAN 9067 solvent. Investigators concluded that the swelling, hardness, and brittleness of the ethylene propylene rubber AO-rings in the pressure relief devices from the tank cars that were examined likely resulted from exposure to the MCB in the TDI matter waste.

The offeror of tank car UTLX 643593 apparently did not consider that the presence of MCB and HAN 9067 solvent in the TDI waste mixtures might adversely affect the AO-rings in the pressure relief devices and other gaskets on the tank cars used to store and transport these wastes. Consequently, the offeror did not find that the presence of these chemicals changed the compatibility status from the transport of pure TDI. The investigation, however, showed that the presence of MCB and HAN 9067 solvent in the TDI waste mixtures was sufficient to chemically attack the AO-rings in the pressure relief devices on tank cars carrying TDI waste mixtures. Therefore, the transportation of the solvent-blend wastes and TDI-matter wastes in the tank cars approved for the transport of pure TDI constituted a change in product compatibility.

Federal Requirements:

The HMR, 49 CFR Parts 171-180, set forth requirements for the safe transportation of hazardous materials in commerce by railcar, aircraft, vessel, and motor vehicle. In general, the HMR apply to each person who performs, or causes to be performed, functions related to the transportation of hazardous materials in commerce. The HMR prescribe requirements for classification, packaging, hazard communication, shipping papers, incident reporting, handling, loading, unloading, segregation, and movement of hazardous materials.

Material selection and use of an appropriate packaging for a hazardous material are essential to ensuring the safety and reliability of the shipment while in transportation. Only packagings compatible with the hazardous material may be used to ship hazardous materials in transportation. Persons must ensure that a packaging will retain its contents during temperature variances, changes in atmospheric pressure, vibration, or other conditions that may be encountered during normal conditions of transport. These requirements also apply to tank cars containing only a residue of a hazardous material.

The HMR place the responsibility for ensuring that a package is appropriate for transportation on the offeror (typically the shipper) of the material. The selection should be made with input from the tank car owner and the component/gasket manufacturer to ensure that the configuration is appropriate for the device and that other entities having similar responsibilities in relation to the tank car's maintenance are aware of the requirements and can modify inspection and maintenance cycles as necessary. In addition, the tank car manufacturer and tank car repair facilities each have a responsibility to ensure that the approved materials are used during the assembly of the tank car and for repairs or replacement. The HMR require the offeror to ensure that the components on the tank car are correct before offering the tank car for transportation.

Even when appropriate test intervals are established and followed, carriage of cargos that chemically attack gaskets and AO@-rings in valves and fittings can undermine the integrity of the valves and fittings. The addition of a new chemical constituent to a commodity approved for transportation in a tank car changes the chemical composition of that commodity and results in the exposure of gaskets and seals on the tank car to a new mixture. The concentration of a newly added chemical constituent may be sufficiently diluted so as to present little or no risk of chemical attack to gaskets and seals, but the risk level can best be ascertained by tests or verification through technical literature that the new chemical constituent is compatible with the gaskets and seals on the tank car.

While no information or guidance regarding gasket and fitting compatibility in conjunction with changes in product service has yet been issued by FRA, the topic continues to be addressed through various programs. For example, on

September 21, 1995, the Research and Special Programs Administration amended the performance standards for the gaskets used on tank cars. The regulations require that each tank car used in anhydrous ammonia, division 2.1 or division 2.3, service have gaskets designed according to temperature, application, media, pressure, and size, so that a positive seal is created and the safety and reliability of the shipment will be maintained.

Recommended Action:

In recognition of the need to assure safety, FRA strongly urges all persons involved in the packaging and offering of hazardous materials to carefully examine all of their internal procedures and processes to ensure proper compliance. In addition, FRA reminds offerors of hazardous materials of their responsibility to verify the compatibility of all tank car components, such as valves and gaskets, to resist corrosion, permeability, premature aging, pitting, or embrittlement. In making these determinations, offerors should combine their knowledge of the materials to be shipped with component compatibility information available from the component and gasket manufacturers and communicate their requirements to the tank car owner. Technical organizations such as the National Association of Corrosion Engineers (<http://www.nace.org>), the American Society of Mechanical Engineers (<http://www.asme.org>), the American Chemistry Council (<http://americanchemistry.com>), the Fluid Sealing Association (<http://www.fluidsealing.com>), and the Gasket Fabricators Association (<http://gasketfab.org>) provide additional sources of information. Tank car owners are required to use the information received from offerors to develop appropriate maintenance and inspection cycles based on the information.

Additional Information:

Interested parties can obtain additional information through several methods. You may request an informal written interpretation, a regulatory clarification, or a response to a question, or offer an opinion concerning hazardous materials transportation by sending a written submission to the Office of Safety Assurance and Compliance (RRS-12), Federal Railroad Administration, U.S. Department of Transportation, 1120 Vermont Avenue, N.W., Washington, D.C. 20590-0001 or to our E-Mail address at hmassist@fra.dot.gov. Additional information, including accident/incident information, guidance, and telephone contact numbers, is also available on our web site at <http://www.fra.dot.gov>.

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George A. Gavalla
Associate Administrator for Safety