

devices were in a deteriorated condition. The ethylene propylene rubber "O"-rings showed evidence of swelling, hardness, and brittleness, and the metallic components exhibited varying degrees of rust, scale, pitting, and grit. While the deteriorated "O"-rings in the pressure relief devices did not cause the failure alone, the "O"-rings clearly demonstrated improper material selection.

"A Chemical Resistance Guide to Elastomers" provided to the investigators by the tank car manufacturer contained guidance about the resistance of available gasket, "O"-ring, and sealing materials to degradation upon exposure to various chemicals. According to this guide, ethylene propylene rubber, the material that constituted the "O"-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 906® solvent. Investigators concluded that the swelling, hardness, and brittleness of the ethylene propylene rubber "O"-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 906® solvent in the TDI waste mixtures might adversely affect the "O"-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 906® solvent in the TDI waste mixtures was sufficient to chemically attack the "O"-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 "O"-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