L&R R-650C

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 2, 1995
In reply refer to: R-95-14

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On June 6, 1994, a conductor for the Norfolk Southern Railway Company detected product leaking from the bottom of tank car UTLX 79211 in the Norfolk Southern Harry deButts yard in Chattanooga, Tennessee. The tank car contained 12,184 gallons of a 75-percent concentration of arsenic acid, which is classified as a poisonous material and also designated as a marine pollutant under the Department of Transportation (DOT) Hazardous Materials Regulations.

A total of 3,079 gallons of arsenic acid was released from UTLX 79211. An undetermined amount of the arsenic acid entered the storm drain system for the yard. Although the sluice gate for the storm drain system was closed, arsenic-contaminated water from the storm drain system was discharged into Citico Creek about 1 1/2 miles upstream of the mouth of the creek into the Tennessee River. The intake pipes for the city's municipal water supply cross the mouth of the creek and extend about 175 feet into the Tennessee River. Cleanup, containment, and disposal costs were estimated at $8.77 million as of January 31, 1995. There was no evacuation, and no injuries were attributed to the release.[1]

The tank car involved in the release of arsenic acid was tank car UTLX 79211, a DOT specification 111A100W1 tank car, built by the Union Tank Car Company (Union) in March 1966. The tank car was owned by Union but was leased to Koppers Company, Inc., on March 31, 1988. The Hickson Corporation (Hickson) assumed operational control of the tank car in February 1989. Since that time, Hickson used UTLX 79211 to ship arsenic acid; prior to the accident on June 6, 1994, the tank car was used for shipments of arsenic acid in July and October 1993 and March and April 1994.

[1] National Transportation Safety Board. 1995. Tank car failure and release of arsenic acid in Chattanooga, Tennessee, on June 6, 1994. Hazardous Materials Accident Report NTSB/HZM-95/01. Washington, DC.

Although UTLX 79211 had a bottom outlet valve, Hickson transferred arsenic acid to and from the tank car through a 2-inch-inner-diameter (2.4-inch-outer-diameter) grade 316L stainless steel eduction pipe. In March 1988, Union, at the request of Koppers, modified the eduction system in UTLX 79211 by replacing the original 3-inch-diameter eduction pipe with the 2-inch-diameter eduction pipe. The original eduction pipe guide was also replaced. The sump and the housing at the top of the tank car were not replaced and were installed when the tank was constructed.

In April 1988, the Koppers Company had the tank car coated by the Tank Lining and Railcar Repair Company in Butler, Pennsylvania, with Plasite 3066, a baked-on phenolic resin coating. Plasite 3066 is a product of the Wisconsin Protective Coatings Corporation of Green Bay, Wisconsin.

Union indicated that although it may require a tank car to be lined or coated if the product to be transported could damage the tank car, Union does not specify the lining or coating to be used. Under the terms of the lease of UTLX 79211, Hickson, as the lessee, is responsible for the selection, evaluation of the coating's suitability for the intended product service, installation, maintenance, repair, and replacement of the lining or coating. Because the Plasite 3066 coating was applied in UTLX 79211 before Hickson's lease took effect, Hickson did not have any records or information regarding the selection of the coating and criteria, if any, used by the Koppers Company to evaluate the coating in arsenic acid service. Hickson had no discussions about the suitability of the Plasite 3066 coating with arsenic acid with Wisconsin Protective Coatings before the failure of UTLX 79211 in Chattanooga on June 6. Other than a technical bulletin from Wisconsin Protective Coatings, Hickson had no other evaluation of the suitability of the Plasite 3066 coating in arsenic acid service. However, Hickson has stated that the company has not had any failures with either the Plasite 3066 or 3070 coating.

Safety Board investigators first examined the tank car on July 23 at the deButts yard in Chattanooga.[2] When Safety Board investigators examined the tank car, the jacket and insulation on the bottom of the tank car had been removed along the length of the tank car inboard of the trucks to expose the tank shell, including the sump and bottom outlet valve. An oval-shaped hole was observed at the interface between the bowl-shaped sump and the bottom of the tank at the bottom centerline facing the A-end of the tank. The hole was about 1 inch long and 0.25 inch to 0.50 inch wide at its widest point.

[2] The Safety Board initiated an investigation after a Safety Board investigator learned of the circumstances of the accident on July 19, 1994, while attending a meeting of the Association of American Railroads' Tank Car Committee. Initial information indicated that the spill of arsenic acid had been contained within the yard. When the Safety Board was informed on July 22 that the spill extended outside the yard, investigators from headquarters in Washington, D.C., and the regional field office in Chicago, Illinois, were sent to Chattanooga.

UTLX 79211 was moved to Lynchburg, Virginia, where external and internal examinations of the tank car were performed on September 7, 1994. The internal examination of the tank car revealed discoloration of the coating about 21 inches below the top center of the tank and extending around the perimeter of the tank that marked the location of the liquid-vapor interface. Black stains in the coating could be seen throughout the tank. Pitting in the Plasite 3066 coating was also observed at random locations throughout the tank with the most severely pitted areas located at the liquid-vapor interface or in the vapor space of the tank. One of the more severe areas of pitting and corrosion was located at the top inside of the AR quadrant, where areas with general corrosion and group and random pitting were observed. The baffle for the safety relief valve was heavily pitted and corroded. Other areas where deterioration of the coating was observed included two random pits in the lower half of the AL side below the liquid-vapor interface, random pitting around the bottom outlet valve, and chips in coating covering the first circumferential girth weld inboard from the A-end.

Although Hickson was not involved with the evaluation or selection of the Plasite 3066 coating in UTLX 79211 (because Hickson did not assume control of the tank car until about 10 months after the coating had been applied), Hickson as the shipper of hazardous materials was responsible under the DOT hazardous materials regulations to ensure that the container, tank car UTLX 79211, was compatible with the lading with respect to several factors, including corrosivity. The investigation revealed that Hickson did not possess reliable corrosion data for the arsenic acid on carbon steel. Further, the Wisconsin Protective Coatings' technical bulletin that warned against the total and continuous immersion of the coating in chemicals with high corrosion rates should have prompted Hickson to question the suitability of the coating for arsenic acid service, to gather additional data for a more thorough evaluation of these coatings in arsenic acid service, and to assess how the immersion tests outlined in the technical bulletin related to the service environment in a railroad tank car. Rather, Hickson continued to have the phenolic Plasite coatings applied to its other tank cars without evaluating the performance of these coatings in arsenic acid service or determining an appropriate life-cycle of these coatings. Consequently, the Safety Board concludes that Hickson did not adequately evaluate the suitability of the Plasite 3066 and 3070 coatings with arsenic acid. Based on the deterioration of the coatings in tank cars UTLX 79211 and 75951, the Safety Board is concerned that the Plasite 3066 and 3070 phenolic coatings and other comparable baked phenolic coatings may not be suitable coatings for railroad tank cars in long-term arsenic acid service.

From the time Hickson assumed operational control of its leased tank cars in February 1989 to the failure of UTLX 79211, Hickson also had sufficient opportunities to monitor the condition of the coatings in its tank cars. Hickson officials stated that an employee entering the tank was to note any flaws or defects in the coating. However, tank car UTLX 79211 was inspected on June 1 prior to being loaded, and the corrosion damage in the sump area should have been observed

by the person conducting the inspection, but was not. Further, the failure of a sump through corrosion in one of Hickson's tank cars in May 1993 indicates that interior inspections of tank cars in general were inadequate. Had an effective procedure been in place to inspect the interior of tank cars and to ensure that the condition of the coatings were noted and reported and that action was taken to repair the coatings, the advanced deterioration of the coatings in UTLX 79211 and UTLX 75951 should not have occurred. Consequently, the Safety Board concludes that Hickson did not have an effective program for inspecting the interior of tank cars or for monitoring the condition of the coatings and replacing them before they reached an advanced stage of deterioration. The Safety Board believes, therefore, that Hickson should develop and implement procedures to evaluate, select, and monitor coatings and linings used in its tank cars in arsenic acid service to ensure that any coatings or linings are suitable for the protection of the tank. These procedures should, as a minimum, address the chemical and corrosive properties of the arsenic acid, its compatibility with the coatings or linings, and the performance of the coatings or linings in the service environment intended, periodic examinations of the coatings or linings, determination of the rate of deterioration, and an evaluation of the life-cycle of the coatings or linings.

The existing standards in the DOT hazardous materials regulations do not address the need to perform periodic tests and inspections of tank coatings and linings. The Federal Railroad Administration (FRA) and the Research and Special Programs Administration (RSPA) have proposed standards under docket HM-201 that would require the owner of a lined or coated tank car transporting materials corrosive to the tank to determine the periodic inspection interval and inspection technique of the material used and to maintain all supporting documentation, such as the manufacturers' recommended inspection interval and inspection technique for linings and coatings. The Safety Board believes that the deficiencies noted in this accident regarding the selection and evaluation of coatings and the subsequent monitoring of the performance of the coatings support the need for such standards.

However, Union has indicated that while it may require a tank car to be protected with a lining or coating, the selection, evaluation, and maintenance of the coating or lining is the responsibility of the lessee (usually the party with operational control of the tank car). Further, many tank car owners, including Union, consider the lessee (tank car user) to be the owner of the lining. The FRA also considers the selection, evaluation, and maintenance of the coating or lining to be the responsibility of the shipper (typically the party with operational control of the tank car). The shipper or party with operational control of the tank car would have the most knowledge about the physical and chemical properties of cargoes and has the responsibility to evaluate and select the coating or lining to protect a tank car. Consequently, the shipper or user of the tank car should be expected to be knowledgeable about the lining or coating in the tank car and to determine the periodic inspection interval or testing technique. Although it would be beneficial for the tank car owner to have this information, the party with operational control of the

tank car should determine the minimum inspection interval and testing technique for linings or coatings based upon the type of evaluation and selection process previously discussed. Therefore, the Safety Board is recommending that the FRA and RSPA require that the shipper or party using a tank car to transport materials corrosive to the tank determine the periodic inspection interval and testing technique for linings and coatings, and require that this information be provided to parties responsible for the inspection and testing of tank cars.

Therefore, as a result of its investigation of this accident, the National Transportation Safety Board recommends that the Hickson Corporation:

> Develop and implement procedures to evaluate, select, and monitor coatings and linings used in Hickson's tank cars in arsenic acid service to ensure that any coatings or linings are suitable for the protection of the tank. These procedures should, as a minimum, address the chemical and corrosive properties of the arsenic acid, its compatibility with the coatings or linings, the performance of the coatings or linings in the service environment intended, periodic examinations of the coatings or linings, determination of the rate of deterioration, and an evaluation of the life-cycle of the coatings or linings. (Class II, Priority Action) (R-95-14)

Also as a result of this accident investigation, the Safety Board issued safety recommendations to the Federal Railroad Administration, the Research and Special Programs Administration, the Union Tank Car Company, the Norfolk Southern Corporation, Hamilton County Emergency Services, the city of Chattanooga, the Association of American Railroads, and the Railway Progress Institute.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation R-95-14 in your reply.

Chairman HALL, Vice Chairman FRANCIS, and Member HAMMERSCHMIDT concurred in this recommendation.

By: Jim Hall
Chairman