National Transportation Safety Board
Washington, D.C. 20594

Hazardous Materials Accident Brief

Accident No:	DCA99MZ003
Location:	Louisville, Kentucky
Date of Accident:	November 19, 1998
Time:	8:15 a.m. eastern standard time
Carrier:	Matlack, Inc.
Vehicles:	MC-307 Cargo Tank
Injured:	7 minor
Evacuated:	About 2,400 people were evacuated from the plant and surrounding business. About 600 local residents were told by authorities to remain inside their homes.
Property Damage:	In excess of $192,000
Materials Involved:	Nickel nitrate and phosphoric acid solution reacting with sodium nitrite solution
Type of Accident:	Chemical reaction during cargo transfer

The Accident

About 7:15 a.m. eastern standard time on November 19, 1998, a truckdriver driving a Matlack, Inc., cargo tank truck arrived at Ford Motor Company's Kentucky Truck Plant in Louisville, Kentucky, to deliver a liquid mixture of nickel nitrate and phosphoric acid (a solution designated CHEMFOS 700 by the shipper).

A plant employee told the truckdriver to park his vehicle next to the chemical transfer station outside the bulk storage building and wait for a pipefitter to assist him in unloading the chemical. According to testimony, a short time later, the pipefitter arrived at the transfer station and told the driver that he would assist him in unloading the cargo tank. The pipefitter opened an access panel containing six identical pipe connections. Each pipe connection served a different storage tank, and each connection was marked with the plant's designation for the chemical stored in that tank.

The driver told the pipefitter that he was delivering CHEMFOS 700 and then went to the driver's side of the cargo tank and took out a cargo transfer hose. The pipefitter connected one end of the hose to one of the transfer couplers, while the driver connected the other end of the hose to the cargo tank's discharge fitting. Unknown to the pipefitter or the truckdriver, the pipefitter had inadvertently attached the hose to the coupler marked "CHEMFOS LIQ. ADD" instead of to the adjacent coupler marked "CHEMFOS 700." The storage tank served by the coupler marked "CHEMFOS LIQ. ADD" contained sodium nitrite solution.

The driver climbed to the top of the cargo tank, connected a compressed air hose to a fitting, and pressurized the cargo tank. The driver and the pipefitter then reviewed the cargo manifest and bill of lading. The pipefitter signed three different certifications on the cargo manifest, one of which certified that the transfer hose was "connected to the proper receiving line." The pipefitter asked the driver how long it would take to unload the contents of the cargo tank, and the driver told him the transfer would take about 30 to 40 minutes. The pipefitter then left the loading area, leaving the driver to complete the unloading by himself.

About 8:15 a.m., after the air pressure was built up in the cargo tank, the truckdriver started the transfer. When the nickel nitrate and phosphoric acid solution from the truck mixed with the sodium nitrite solution in the storage tank, a chemical reaction occurred that produced toxic gases of nitric oxide[1] and nitrogen dioxide.[2] The driver stated that about 10 minutes after he started the transfer, he saw an orange cloud coming from the bulk storage building. (See figure 1.) He said he closed the internal valve of the cargo tank to stop the transfer of cargo and waited for someone to come out of the building. After several minutes, the pipefitter ran out of the building and gestured for the driver to stop the unloading process.

Figure 1. Postaccident view of the bulk storage building (center) with vapor cloud visible

As a result of the incident, about 2,400 people were evacuated from the plant and surrounding businesses, and another 600 local residents were told by authorities to remain

[1] Nitric oxide is toxic when inhaled and is a strong irritant to skin and mucous membranes.

[2] Nitrogen dioxide may be fatal if inhaled.

inside their homes. Three police officers, three Ford Motor Company employees, and the truckdriver were treated for minor inhalation injuries. Damages exceeded $192,000.

Chemical Transfer System

The chemical transfer station for unloading cargo tanks was on the outside of the bulk storage building. The system consisted of six 2-inch pipe connections enclosed in an access panel. (See figure 2.) The connections were identical stainless steel quick-connect couplers, and each had a shutoff valve. Each connection led to a different chemical storage tank. The couplings were not equipped with caps or locks, nor could the access panel be secured when the system was not in use.

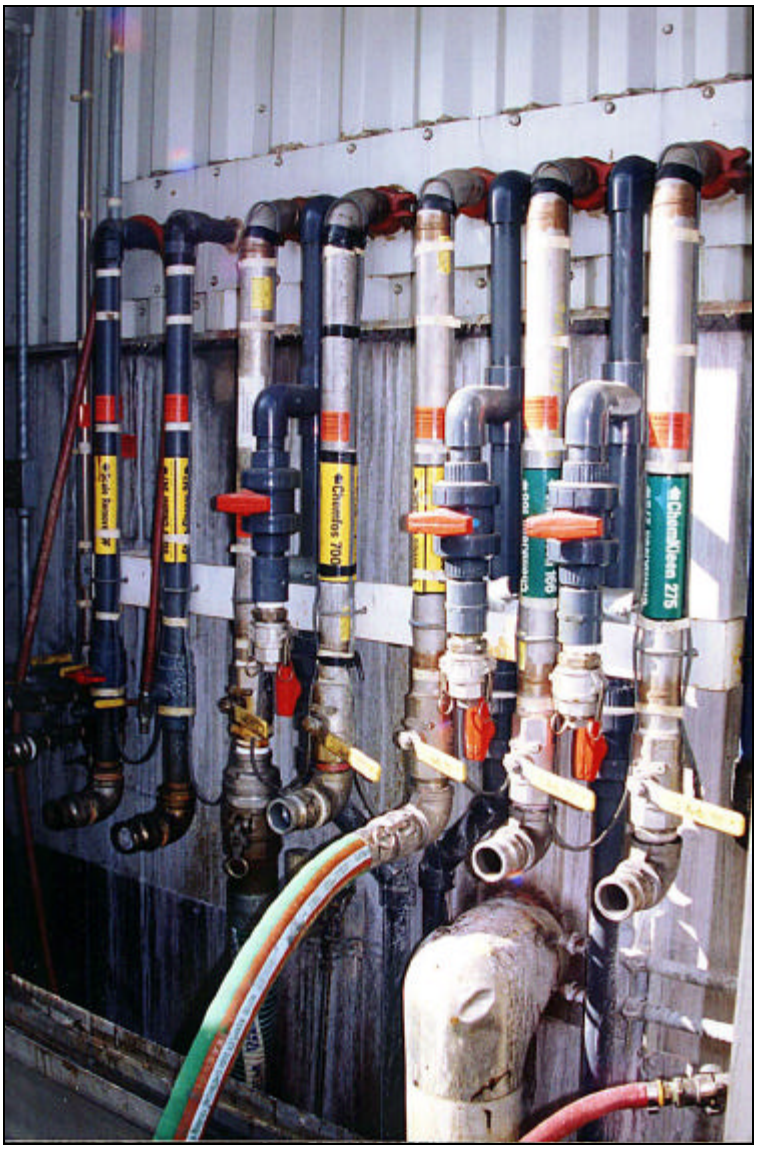

Figure 2. Transfer coupler access panel with transfer hose attached

The connection for the nickel nitrate and phosphoric acid solution was labeled "CHEMFOS 700" in black print on a yellow background. An identical adjacent pipe had similar labeling, but the wording on the label was "CHEMFOS LIQ. ADD," which was partially obscured by tape. (See figure 3.)

Figure 3. Close-up view of the correct transfer coupler (left) and the coupler to which the transfer hose was inadvertently attached (right)

Training for Unloading Operations

At the time of the accident, Ford Motor Company had written procedures for unloading cargo tanks at its Louisville truck facility and a training program for employees involved in unloading bulk chemicals. On June 26, 1998, the pipefitter involved in this accident received training covering *Local Work Instruction No. EI100-3*, dated May 26, 1998. This work instruction had been revised on June 23, 1998, and certain requirements had been added that were to be met during the unloading process. These new requirements included covering storm drains in the unloading area, verifying that sufficient capacity is available in the holding tank, and remaining with the truckdriver to observe the

unloading process. The pipefitter did not receive training on the revised local work instruction or its new requirements before the accident.

According to the company's manufacturing process engineer, another written company instruction included a step-by-step procedure for unloading bulk tankers. This procedure was developed to meet the company's ISO[3] 9000 certification process in May 1997. This unloading procedure was not disseminated to Ford Motor Company pipefitters responsible for the unloading of cargo tanks; it was placed in the company's phosphate process manual, and the process engineer said he advised the pipefitters to review it. The procedure was also posted on a bulletin board inside the bulk storage building. According to interviews, the company did not train the pipefitters on the written unloading procedure, which included the requirement to double-check connections to verify the proper connection.

The pipefitter stated that he was unaware of any written instructions or procedures covering the unloading of a cargo tank. Training records did indicate that the pipefitter had been given a copy of *Local Work Instruction No. EI100-3*, dated May 26, 1998. He further stated that if he had double-checked the connection before he left the transfer area, he probably would have noticed that the transfer hose was connected to the wrong coupling.

Regulatory Requirements

Title 49 *Code of Federal Regulations* (CFR) Section 172.702 requires hazmat employers to train and test their hazmat employees. Under Section 172.704, hazmat employers are required to provide general-awareness, function-specific, and safety training to employees who perform functions related to the transportation of hazardous materials.

The term "hazmat employee," as defined in 49 CFR §171.8, includes all persons who in the course of employment perform functions that directly affect hazardous materials transportation safety. According to the interpretation of the U.S Department of Transportation's (DOT's) Research and Special Programs Administration (RSPA), the employee's functional relationship to hazardous materials transportation safety, rather than incidental contact with hazardous materials in the work place, is the primary factor in determining whether an individual is a "hazmat employee."

The Safety Board contacted the acting director for the DOT's Office of Motor Carrier Safety (OMC)[4] to determine the scope of its enforcement of the hazardous materials regulations (HMR) by OMC's investigators at facilities that receive hazardous materials shipments. The OMC official replied that "OMC has no jurisdiction to perform

[3] International Standards Organization.

[4] On January 1, 2000, the Office of Motor Carrier Safety was redesignated the Federal Motor Carrier Safety Administration.

investigations of facilities that receive hazardous materials." Neither the OMC nor RSPA had conducted compliance reviews at the Louisville, Kentucky, truck plant.

As a result of its investigation of a 1986 marine accident in Deer Park, Texas, which involved a transfer of hazardous materials between a marine vessel and a transfer terminal, the Safety Board pointed out the need for the DOT to establish uniform general requirements that would provide adequate and equal levels of safety for the public and for employees of all segments of a hazardous materials transportation system. As a result of the Deer Park accident investigation, the Safety Board issued intermodal Safety Recommendations I-88-1 and -2, asking the DOT to establish safety requirements for the movement and temporary storage of hazardous materials at intermodal transportation facilities and to strengthen the minimum safety requirements for loading and unloading hazardous materials in all modes of transportation. In issuing these safety recommendations, the Safety Board noted that in the Transportation Act of 1974 (Hazardous Materials Transportation Act), Congress defined transportation as "any movement of property by any mode, and any loading, unloading, or storage incidental thereto."

According to Safety Board records, the Board has not received any correspondence from the DOT regarding Safety Recommendation I-88-1 since January 14, 1994, and regarding Safety Recommendation I-88-2 since September 30, 1988. In response to Safety Recommendation I-88-1, the DOT indicated that RSPA had initiated a review of jurisdictional authority that was to have been completed by December 31, 1988. In response to Safety Recommendation I-88-2, the DOT indicated that loading and unloading operations were being addressed in several regulatory projects by the different DOT modal administrations. According to Safety Board records, no information has been received to indicate that the review of jurisdictional authority by RSPA or the other regulatory projects cited by the DOT were completed. Safety Recommendations I-88-1 and -2 remain classified "Open—Unacceptable Response."

On July 29, 1996, RSPA published an advance notice of proposed rulemaking (ANPRM) titled "Applicability of Hazardous Materials Regulations (HMR) to Loading, Unloading, and Storage," Docket No. HM-223. The ANPRM announced three public meetings at which RSPA would "seek ideas, proposals and recommendations regarding the applicability of the HMR to particular hazardous materials transportation activities." This information would "help the agency to consolidate, clarify, revise and update existing agency interpretations, rulings and decisions regarding the applicability of the HMR and determine whether there is a need to amend the HMR." On April 27, 1999, RSPA published a supplemental ANPRM for Docket No. HM-223 to "highlight comments received" in response to the ANPRM and to invite additional comments on the applicability of the HMR to the loading, unloading, and storage of hazardous materials. RSPA has indicated that it will issue a notice of proposed rulemaking later in 2000 that addresses the loading, unloading, and storage of hazardous materials.

Although RSPA has not published a final rule for HM-223, the policy of the Federal Railroad Administration (FRA) is to inspect and enforce the HMR at all facilities

that receive hazardous materials shipments by rail. These facilities include shipping (loading), carrier (railroad operator), and unloading (consignee) facilities. According to documentation provided to the Safety Board by the FRA, that agency has issued hazardous materials bulletins that specify FRA policy and guidance for industry in specific areas. These bulletins have been included in FRA inspectors' *Hazardous Materials Enforcement Manual*. Examples of some bulletin topics are tank car unloading, attendance requirements, and hazardous materials training requirements. Each of these bulletins suggests specific procedures to be followed in the topical area. Further, the FRA has published guidance documents for industry's use in developing effective railroad tank car loading and unloading training programs. The FRA conducts "cursory reviews of the training received by hazmat employees after completion of their training to ensure that each hazmat employee is trained, tested, and certified on the employee's appropriate area of responsibility."

Actions Taken Since The Accident

According to Ford officials, the company now requires that before a cargo tank can be unloaded, the proper connection of the transfer hose must be verified by specially trained company personnel, the truckdriver, and an on-site chemical supplier employee (if available). The company has also upgraded the signs at transfer stations, installed color-coded key locks on pipe end caps, installed locks on the access panel, and posted unloading instructions at the transfer station.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was inadequate training of Ford Motor Company's employees on the company's procedures for unloading bulk hazardous materials. Contributing to the accident was the similar labeling of adjacent pipe connections, which made it possible for the pipefitter to confuse the two connections. Further contributing to the accident was the failure of the U.S. Department of Transportation to establish, and oversee compliance with, adequate safety requirements for unloading hazardous materials from highway cargo tanks.

Adopted: June 20, 2000

Recommendations

As a result of its investigation of the November 19, 1998, accident in Louisville, Kentucky, and the June 4, 1999, accident in Whitehall, Michigan,[5] the Safety Board issues the following safety recommendations:

To the Research and Special Programs Administration:

Within 1 year of the issuance of this safety recommendation, complete rulemaking on Docket HM-223 "Applicability of the Hazardous Materials Regulations to Loading, Unloading and Storage," to establish, for all modes of transportation, safety requirements for loading and unloading hazardous materials. (I-00-6)

To the Occupational Safety and Health Administration:

Require that facilities where bulk hazardous materials are transferred be equipped with a means of emergency communications. (I-00-7)

To Ford Motor Company:

Distribute written safety-critical procedures for unloading bulk shipments of hazardous materials to all Ford Motor Company employees who are engaged in cargo transfer operations, and conduct initial and recurrent training on the procedures. (I-00-8)

To the American Chemistry Council:

Revise, in cooperation with National Tank Truck Carriers, Inc., the *Manual of Operating Recommendations* to include specific recommended practices that can be implemented to prevent the unloading of hazardous materials into the wrong storage tank. For example, drivers should personally verify or question all transfer connections before beginning delivery of product. (I-00-9)

[5] National Transportation Safety Board. 2000. Chemical Reaction During Cargo Transfer. Hazardous Materials Accident Brief HZB/00/03. Washington, D.C.

Inform your members of the facts and circumstances of the June 4, 1999, accident in Whitehall, Michigan, and the November 19, 1998, accident in Louisville, Kentucky, and emphasize the importance of implementing specific safety-critical hazardous materials cargo transfer procedures and training employees in those procedures. (I-00-10)

To National Tank Truck Carriers, Inc.:

Revise, in cooperation with the American Chemistry Council, the *Manual of Operating Recommendations* to include specific recommended practices that can be implemented to prevent the unloading of hazardous materials into the wrong storage tank. For example, drivers should personally verify or question all transfer connections before beginning delivery of product. (I-00-11)

Inform your members of the facts and circumstances of the June 4, 1999, accident in Whitehall, Michigan, and the November 19, 1998, accident in Louisville, Kentucky, and emphasize the importance of implementing specific safety-critical hazardous materials cargo transfer procedures and training employees in those procedures. (I-00-12)