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Log R-466A

# NATIONAL TRANSPORTATION SAFETY BOARD
## WASHINGTON, D.C.

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Forwarded to:

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Research and Special Programs
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SAFETY RECOMMENDATION(S)

R-85-70

At 3:45 a.m., on July 30, 1983, vinyl chloride monomer (VCM) 1/ under pressure escaped from a railroad tank car at the loading facility within the Formosa Plastics Corporation (Formosa) chemical manufacturing plant at Baton Rouge, Louisiana. The released VCM was ignited by an undetermined source, and a large billowing fire ensued. An adjacent tank car containing VCM was involved in the fire but did not rupture violently. Two persons were injured seriously, two tank cars were destroyed, three tank cars were damaged moderately, and the loading facility was damaged extensively. Damage was estimated to be $1 million. 2/

The conduit which carried the electrical lines along the loading rack was designed to prevent electrical sparking from reaching an explosive gaseous atmosphere and was termed "explosion proof;" however, investigators found that some conduit coverplates under the racks were missing, which exposed the wiring and negated the explosion-proof feature of the installation. The speaker assembly on the intercom system at the loading rack was neither designed nor protected to prevent electrical sparking in an explosive, gaseous atmosphere. A grounding cable at the track level was rusted through and did not provide grounding protection. The flashlights used by the loaders were not approved for use in a VCM handling area. Although the radios used by the loaders were authorized for use in hazardous locations, the batteries being used in the radios were not because they supplied an amount of current that exceeded the level of current that precludes thermal or electrical ignition of flammable gas in an explosive atmosphere. The hand tools used by the loaders were of a ferrous material and could produce sparking in contact with other metals.

1/ Classified by the U.S. Department of Transportation as a flammable compressed gas, VCM is ignited easily in either liquid or vapor form, producing hazardous combustible gases largely composed of hydrogen chloride and carbon monoxide. It also is classified as carcinogenic.

2/ For more detailed information read Railroad Accident Report--"Vinyl Chloride Monomer Release from a Railroad Tank Car and Fire, Formosa Plastics Corporation Plant, Baton Rouge, Louisiana, July 30, 1983" (NTSB/RAR-85/08).

The quick-connect coupler from the end of the liquid loading hose at station No. 6-2 was examined after the accident, and investigators found that one of the two cam arms was broken and missing from the shank. This connection, with the cam lock fitting with the broken cam arm, had been made when the hoses were attached to the tank car by the previous shift sometime before 6 p.m. on July 29, 1983. Examination of the fracture area revealed that there was a series of parallel gouges made by pliers on the face of the fracture and on the sides of the shank. The face of the fracture and the gouges were covered with the same degree of oxidation/corrosion as the other areas of the coupler.

The oxidation/corrosion on the fractured surface of the cam arm being the same as on other areas of the coupler indicates that the missing shank was broken off before the accident. Therefore, since the hoses were connected to the tank cars on the previous shift, prior to 6 p.m. on July 29, 1983, the broken cam arm on the quick-connect coupler was not changed but was used to make the connection at least 10 hours before the accident occurred. The channel-lock pliers found on top of the tank car at station No. 6-2 next to the tank car connections suggest that loader-2 used the pliers to release the broken cam arm on the coupler and then laid them down while engaged in releasing the other cam arm by hand. The gouge marks on the broken surface of the cam arm could have been made by the pliers found on the tank car if they had been used to grip the cam arm to release it.

After the accident the tank cars at station Nos. 5-1 and 6-1 were found secured for shipment. Since loader-1 said that they were not secured when he left the loading rack, the Safety Board concludes that either loader-1 or loader-2 closed the liquid valves, and loader-2 completed securing the tank cars for shipment. The investigation did not determine if the nitrogen pressure came up to a level that allowed the hoses on those tank cars to be purged or whether the liquid loading hoses were released without purging. It is possible that the excess flow valves in the tank cars may have activated if the quick-connect couplers were removed before the liquid valves had been closed. If so, the VCM under pressure would not have sprayed from the tank car's liquid valve nipples, but the residual VCM in the liquid loading hoses would have spilled.

A cam-lock, quick-connect coupler is joined together when one half of the fitting is pushed onto the other half and held in place by the cam arm being forced closed, causing the cam section to engage only a grooved section of the other fitting. Therefore, a quick-connect coupler will disengage immediately if released under pressure. Because it cannot be reconnected easily, it should not be used on hoses and connections used to load or unload hazardous materials. However, there are no regulations that prohibit their use, and many chemical firms use them because that they are a labor-saving device. Other couplers are available that cannot be released while the connection is under pressure. The Safety Board believes that the use of quick-connect couplers should be prohibited in the transfer of hazardous materials and that the DOT should review the types of appliances used on hazardous materials loading racks and establish standards for the types of couplers that may be used. Since the accident, the Formosa plant has changed the type of rack hose couplers being used so that if the liquid loading hose is under pressure, the coupler will leak before it is fully disengaged and alert the loader so he can retighten the coupler quickly.

A Louisiana State Police hazardous materials unit spokesman said that a State statute authorizes the State Police to enter and inspect any facility handling hazardous materials. Because of limited manpower and their highway-oriented operation, however, the State Police inspect only vehicles on the highway or highway vehicles at loading racks

and terminals. The spokesman said that the State Police recently had sent two officers to school for training in the inspection of railroad cars. The Louisiana State Fire Marshal's office advised investigators that, although the fire marshal had the jurisdiction to inspect loading facilities, the office lacked the resources, manpower, and expertise to inspect such facilities in a petrochemical plant. The fire marshal's office had no record that it had made any inspections at the Formosa plant.

The U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) has regulatory authority and jurisdiction to inspect the Formosa plant facilities. 3/ OSHA had made inspections of the plant as follows:

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| October 10, 1973 | General Schedule Inspection |
| November 27, 1973 | Follow-up Inspection |
| February 21, 1974 | Inspection Following an Accident |
| May 16, 1974 | General Schedule Inspection |
| Unknown, 1975 | General Schedule Inspection |
| December 10, 1976 | General Schedule Inspection |

Since 1976, OSHA has established priorities to perform general schedule inspections, and Formosa was not scheduled by OSHA for a general schedule inspection. Currently, OSHA is making unscheduled inspections only as the result of an employee complaint or a catastrophic accident.

Formosa has rebuilt the tank car loading rack between track Nos. 5 and 6. OSHA has not inspected the plant since the accident and has not examined the rebuilt rack. OSHA reviewed injury and illness reports for the Formosa plant on January 31, 1985. Because the injury/illness rate was lower than the national average, no inspection of the facilities was conducted or scheduled.

The Transportation Safety Act of 1974, Public Law 93-633, 88 Stat. 2156, Title I-Hazardous Materials, Section 102, states, "It is declared to be the policy of Congress in this title to improve the regulatory and enforcement authority of the Secretary of Transportation to protect the nation adequately against the risks to life and property which are inherent in the transportation of hazardous materials in commerce." The U.S. Department of Transportation's area of responsibility is further clarified in Section 103(6): "Transport or transportation means any movement of property by any mode, and any loading, unloading, or storage incidental thereto." The Federal Railroad Administration (FRA) has a hazardous materials inspector in New Orleans, Louisiana, 85 miles from Baton Rouge, but the railroad loading facility at the Formosa plant was last inspected by an FRA inspector in 1977 following a material handling accident.

OSHA and the FRA do not have an agreement of understanding for the safety inspections of railroad tank car loading and unloading facilities. OSHA has regulations for railroad tank car loading/unloading facilities, but the FRA does not.

3/ An OSHA inspector typically inspects such things as electrical lines, tools, and equipment and sometimes arrives at a facility unannounced.

The Coast Guard inspects the marine loading facility at the Formosa plant annually. The Coast Guard and OSHA have a working agreement, and both agencies have cooperated in the inspection of hazardous materials stored on docks and in the investigation of accidents and incidents on vessels involving hazardous materials.

The Formosa safety inspection program not only did not detect the generally unsafe working conditions that existed at the rail car loading racks but also did not result in the detection of defective loading equipment. Since safety inspections were not performed by Federal or State agencies, the fact that safety was not being addressed in an appropriate manner by Formosa went undetected.

The safety of petrochemical plant operations is only as good as each individual plant's safety program. While large-scale accidents may occur infrequently, they can cause large amounts of property damage, injuries, and social disruption. Toxic and/or flammable concentrations of chemicals can impact population exposures surrounding a petrochemical plant within minutes of the initial release. 4/ The potential for catastrophic accidents in an area such as Baton Rouge and surrounding communities with their extremely dense concentration of petrochemical plants is extremely high. If a BLEVE (a Boiling Liquid Expanding Vapor Explosion) had occurred in the accident, the explosion could have resulted in a chain-reaction of explosions throughout the Formosa plant and affected adjacent plants, escalating the accident to a catastrophe. Effective safety oversight is critical, and Federal and State agencies that have the responsibility and the authority to enforce safety standards in petrochemical plants should reevaluate their priorities in scheduling inspections and training inspectors to insure that a high level of safety is maintained at these chemical plants. The Safety Board believes that insufficient Federal and State oversight contributed to the lack of safety procedures, inadequate training of personnel, and poor maintenance of loading rack equipment at the Formosa plant.

Therefore, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

> Establish safety standards and inspection procedures for loading facilities at petrochemical plants. (Class II, Priority Action) (R-85-70)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in this recommendation.

By: Jim Burnett
Chairman

4/ The Safety Board discussed the issue of emergency preparedness plans for fixed-site hazardous materials handling facilities in its Special Investigation Report—"Railroad Yard Safety: Hazardous Materials and Emergency Preparedness" (NTSB/SIR-85/02).