



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 1, 2004

In reply refer to: H-04-24

Mr. Thomas Leiting
Chief Executive Officer
River Valley Cooperative
619 Lombard Street
Clarence, Iowa 52216

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The Safety Board is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses the adequacy of River Valley Cooperative's (River Valley's) emergency procedures for anhydrous ammonia nurse tank loaders. The recommendation is derived from the Safety Board's investigation of the hazardous materials accident that took place when a nurse tank failed and released anhydrous ammonia near Calamus, Iowa, on April 15, 2003, and is consistent with the evidence we found and the analysis we performed.¹ As a result of this investigation, the Safety Board has issued two safety recommendations, one of which is addressed to River Valley. Information supporting this recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

About 11:50 a.m. central daylight time on April 15, 2003, a nonspecification cargo tank used by River Valley exclusively for agricultural purposes as a nurse tank split open after being filled with anhydrous ammonia at River Valley's nurse tank filling facility near Calamus. About 1,300 gallons of the poisonous and corrosive gas escaped, seriously injuring two nurse tank loaders, one of whom died from his injuries 9 days after the accident. Both loaders suffered more than 50 percent body surface area chemical burns, eye injuries, and inhalation injuries. The Safety Board determined that the probable cause of the accident was inadequate welding and insufficient radiographic inspection during the tank's manufacture and lack of periodic testing during its service life.

¹ For additional information, see National Transportation Safety Board, *Nurse Tank Failure With Release of Hazardous Materials Near Calamus, Iowa, on April 15, 2003*, Hazardous Materials Accident Report NTSB/HZB-04/01 (Washington, DC: NTSB, 2004).

The two nurse tank loaders, who were the only people at the facility at the time of the accident, had been filling nurse tanks from the storage tank, which was their usual task. In the late morning, they finished filling the accident nurse tank and disconnected the loading hoses and fittings. One loader was standing on the loading platform, while the other had backed a pickup truck up to the full nurse tank and was standing at the back of the pickup truck hooking the nurse tank to the truck. Suddenly, the nurse tank shell split open at the bottom of its front half. The force of the event threw the loader who had been standing by the pickup truck against the back of the truck. He could recall nothing after this until he woke to find emergency responders treating him. The second loader, who had been on the loading platform and later died, could not be interviewed by investigators because of the severity of his injuries.

At 11:50 a.m., a woman who used this filling facility to provide anhydrous ammonia for her farm was driving by the Calamus facility when she saw a large, white vapor cloud emanating from the loading platform area. She pulled into the facility. She saw one tank loader lying in the emergency water immersion tub on the platform and a second loader standing outside the tub assisting the one in the water. She notified emergency responders, who arrived on the scene a few minutes later. At some time during the emergency response, the second loader joined the first loader in the immersion tub.

During its investigation, the Safety Board examined the emergency procedures the nurse tank loaders had been told to follow. When the nurse tank split open, it quickly lost the bulk of its liquid contents. The spilled anhydrous ammonia rapidly vaporized, and for some minutes the vapor cloud probably enveloped the platform, the immersion tub, and the two loaders. When an anhydrous ammonia release occurs, it puts those in the vicinity at risk of two types of exposure—inhalation and skin/soft tissue exposure. The loaders evidently tried to follow the procedure that River Valley had told them to use in case of an anhydrous ammonia release—they tried to immerse themselves in the nearest water-filled immersion tub, which was on the loading platform. Immersion tubs enable workers to wash corrosive liquid from their skin and soft tissues. They are not designed to provide protection from or treatment for inhalation of chemical vapor. Although the loader immersed in the tub received some protection from skin/tissue exposure, both loaders were unable to avoid inhaling the ammonia vapor. The loader who was not initially immersed in the tub (and who subsequently died from his injuries) remained at risk not only to the inhalation hazards but also to the damaging effect of the gas on his skin.

Hazardous materials authorities have indicated that evacuation is the appropriate response to minimize inhalation exposure from significant anhydrous ammonia releases. The material safety data sheet used by CF Industries, Inc., which was the Calamus facility's anhydrous ammonia supplier, states that when an inhalation exposure to anhydrous ammonia occurs, the victim should immediately be moved away from the exposure site and into fresh air. According to the National Institute for Occupational Safety and Health (NIOSH),² in its study *HAZOP of Anhydrous Ammonia Use in Agriculture*,³ workers should “immediately vacate the area by heading upwind” when an anhydrous ammonia release occurs. The *2000 Emergency Response*

² NIOSH is a Federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. It is part of the Centers for Disease Control and Prevention within the U.S. Department of Health and Human Services.

³ Thomas McKelvey, *HAZOP of Anhydrous Ammonia Use in Agriculture*, prepared for NIOSH by Technica, Inc., Columbus, Ohio, May 1991.

*Guidebook*⁴ recommends that when a large spill of anhydrous ammonia takes place, people should move at least 200 feet away from the source. By contrast, the only procedure that River Valley told its loading employees to follow in the event of an anhydrous ammonia release directed immersion in the nearest water-filled tub, which was in the immediate proximity of the release from the nurse tank, leaving the loaders at risk of inhalation exposure. This was contrary to the guidance in the material safety data sheet, the NIOSH study, and the *2000 Emergency Response Guidebook*. On this basis, River Valley's instruction was ineffective as a response to a significant release, such as can result from the failure of either a nurse or storage tank. Instead, River Valley should have directed its loaders, when faced with such a significant release, to evacuate the release area before taking steps to flush affected skin and tissue with water.

The Safety Board concluded that River Valley's emergency procedures were ineffective because they did not direct the nurse tank loaders to evacuate the area when an anhydrous ammonia release posed an inhalation hazard. To date, River Valley has not developed new procedures for its employees to follow in the event of a significant anhydrous ammonia release.

Therefore, the National Transportation Safety Board makes the following safety recommendation to the River Valley Cooperative:

Review manufacturers' material safety data sheets for anhydrous ammonia, the National Institute for Occupational Safety and Health's *HAZOP of Anhydrous Ammonia Use in Agriculture*, and the *Emergency Response Guidebook* and establish written emergency procedures for employees to follow when an anhydrous ammonia release poses an inhalation hazard. (H-04-24)

The Safety Board also issued a safety recommendation to the Research and Special Programs Administration. In your response to the recommendation in this letter, please refer to Safety Recommendation H-04-24. If you need additional information, you may call (202) 314-6177.

Chairman ENGLEMAN CONNERS, Vice Chairman ROSENKER, and Members CARMODY, HEALING, and HERSMAN concurred in this recommendation.

By: Ellen Engleman Connors
Chairman

⁴ The *Emergency Response Guidebook* was developed jointly by the U.S. Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico for use by firefighters, police, and other emergency services personnel who may be the first to arrive at the scene of a transportation incident involving a hazardous material. It is primarily a guide to assist first responders in (1) quickly identifying the specific or generic classification of the material(s) involved in the incident and (2) protecting themselves and the public during this initial response phase. The guidebook is updated every 3 to 4 years to accommodate new products and technology. The next update is scheduled for 2004.