

Lessons Learned from Accident Investigations

Farm Cooperatives Urged to Review Emergency Procedures

The deadly release of anhydrous ammonia following a nurse tank rupture in Iowa has prompted safety officials to urge farm cooperatives to review their emergency procedures to avoid deaths and injuries.

The National Transportation Safety Board (NTSB) became concerned about emergency preparedness during its investigation into an April 2003 accident in Calamus, Iowa, which occurred at the River Valley Cooperative. Two loaders filled a nurse tank with anhydrous ammonia at a tank filling facility. As the loaders were preparing to connect the tank to a pickup truck, a long split opened near the right center at the tank bottom. Approximately 1,300 gallons of poisonous and corrosive gas escaped, injuring two loaders. Nine days after the accident, one of the injured loaders died.

The Safety Board said the accident was the result of inadequate welding and insufficient radiographic inspection during the tank's manufacture, and lack of periodic testing during its service life. The NTSB's report also focused on the cooperative's emergency preparedness and concluded that its 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. The Board determined that the cooperative should have directed its loaders, when faced with a significant release, to evacuate the release area before taking steps to flush affected skin and tissue with water.

When the nurse tank split open at the Calamus facility, it quickly lost the bulk of its liquid contents, investigators said. 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.

Hazardous materials authorities have indicated that evacuation is the appropriate response to minimize inhalation exposure from significant anhydrous ammonia releases, the Safety Board said. The material for anhydrous ammonia provided by River Valley'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), in its study *HAZOP of Anhydrous Ammonia Use in Agriculture*, workers should "immediately vacate the area by heading upwind" when an anhydrous ammonia release occurs. The *2000 Emergency Response Guidebook* recommends that when a large spill of anhydrous ammonia takes place, people should move at least 200 feet away from the source.

By contrast, River Valley told its loading employees that in the event of an anhydrous ammonia release to immerse themselves 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.

The loaders evidently 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 and tissue exposure, neither loader was able 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, investigators concluded.

According to The Fertilizer Institute, the estimated 200,000 nurse tanks in service apply between 1 million and 1.5 million loads of anhydrous ammonia to fields annually.

For the complete accident report, visit the NTSB Web site at this address:
<http://www.nts.gov/publictn/2004/HZM0401.pdf>