

Millard Refrigerated Services Ammonia Release

By Christina Meyer

<http://www.csb.gov/millard-refrigerated-services-ammonia-release/>

In Theodore, Alabama sits Millard Refrigerated Services Inc., which serves as a warehouse and distribution center for different companies. This company uses anhydrous ammonia with their bulk refrigeration operations. On the morning of August 23, 2010, employees were loading two international ships.

When using anhydrous ammonia, the hazard of hydraulic shock comes along with it. Hydraulic shock is the sudden, localized pressure surge in piping or equipment resulting from a rapid change in the velocity of a flowing liquid. The highest pressures often happen when vapor and liquid ammonia are present in a single line and are distributed by a sudden change in volume. This rapid change in pressure increase can result in the catastrophic failure of piping, valves, and other components.



The facility lost power the day before which caused the refrigeration system to be shut down. When they regained power the next day, they brought the system live. Operators cleared the alarms while troubleshooting, which reset the refrigeration system. The control system got reset causing the freezer evaporator to switch directly from a step in the defrost cycle into refrigeration mode while the evaporator coil still contained hot, high-pressure gas. This reset triggered a valve to open causing low temperature liquid ammonia to be fed back into all four evaporator coils before removing the hot ammonia gas. This resulted in both hot, high-pressure gas and extremely low temperature liquid ammonia to be present in the coils and related piping at the same time. This caused the hot high-pressure ammonia gas to rapidly condense into a liquid. Liquid ammonia takes up less volume than ammonia gas, which created a vacuum where the gas had been. The void sent a wave of liquid ammonia through the piping. In the end hydraulic shock resulted. A roof-mounted 12-inch suction pipe catastrophically failed, which causes the release of more than 32,000 pounds of anhydrous ammonia. A Millard employee was injured due to falling while trying to exit the crane when the released ammonia cloud engulfed it. The large ammonia cloud traveled a quarter mile from the facility towards an area where 800 members reported symptomatic illnesses from ammonia exposure. Thirty-two of offsite workers ended up requiring



hospitalization, and four of them ended up in an intensive care unit. A key lesson taken away from this incident is avoid the manual interruption of evaporators in defrost and ensure control systems are equipped with password protection to ensure only trained and authorized personnel have the authority to override systems. Also design ammonia refrigeration systems where each evaporator coil

should be controlled by a separate set of valves rather than multiple coils connected to a valve group. The final lesson is that if there is a release of ammonia and a leak cannot be promptly isolated and controlled, an emergency shutdown should be activated in order to reduce the amount released.