CCPS 20 YEARS
CENTER FOR CHEMICAL PROCESS SAFETY
An AIChE Industry Technology Alliance

Process Safety Beacon

http: //www.aiche.org/ccps/safetybeacon.htm

Messages for Manufacturing Personnel

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April 2005

Pressure Explosion Results

This accident investigated by and picture provided by the U.S. Chemical Safety and Hazard Investigation Board. Visit their site at http://www.csb.gov

Here's What Happened

A tank in this 55 year old facility that produces caramel coloring exploded, killing one worker and heavily damaging other equipment. Vessel fragments were thrown as far as 150 yards/130 meters and the top head of the vessel was propelled 100 yards/90 meters. Shell fragments damaged adjacent structures and equipment including an aqua ammonia tank. This resulted in the release of 26,000 pounds/12,000 kgms of aqua ammonia, causing nearby residents to be evacuated or told to shelter in place.

Other major damage included collapsed concrete block walls, destruction of the spray dryer area as shown in the photograph, and the rupture of a 6 inch natural gas line. Fortunately, automatic shut-off valves in the gas line prevented a major gas release.

What You Can Do

This incident shows that pressure, by itself, can cause a major accident!

- Never completely block in a vessel. Some form of emergency or manual pressure relief (or vacuum break) system must be available.
- Vessels that are heated should be monitored closely—especially if there are no safety instrumented systems or interlocks to shut off the heat source if needed.
- Before connecting an air or nitrogen line to a vessel, make sure that the vessel can withstand the full supply pressure or that the vessel has a suitable relief system set low enough to protect the vessel.
- When doing jobs that distract you from your regular operations job, periodically check the equipment to confirm that it is still operating normally.
- Do not underestimate the power of over-pressurization and its ability to cause catastrophic failure. Metal fragments can travel long distances and do significant damage!

PSID Members see: Free Search--Overpressure

How Did This Happen?

The explosion was a simple case of over-pressurization.

The contents of the feed tank were overheated by steam coils, causing the vapor pressure to rise. There were no temperature alarms or interlocks to automatically stop the steam flow or notify operations that there was a problem. Because the operators were distracted by having to re-label a previously packaged order, they did not notice that the temperature in the tank had risen above specifications. At the same time the temperature was rising, the operators closed a vent line and opened an air pressurization line to the tank in an effort to "blow out" high viscous material. That act completely blocked in the vessel which had no emergency relief system. The result—catastrophic failure to relieve the pressure.

All Pressured Up and No Place to go = BOOM !

The Beacon is usually available in Arabic, Chinese, Dutch, English, French, German, Hebrew, Hindi, Portuguese, and Spanish.