

Protect Vulnerable Piping and Equipment

A forklift truck was a factor in an explosion and fire at a Texas olefins plant in October 2005. The truck was towing a trailer of compressed air cylinders through a process unit (Image 1), when the trailer struck a protruding drain valve on a strainer in a liquid propylene pipe (Image 2). The drain line, operating at 216 psig (15 barg), was severed (Image 3), creating a 1.9-in. (4.8 cm) opening. Propylene, which boils at -54°F (-48°C), was released (Image 4) and rapidly created a flammable vapor cloud (Image 5).

The truck driver and other workers in the area noticed the release and fled. The control room was informed and operators immediately began to shut down the unit and activate emergency response procedures. However, they were not able to isolate the leak and stop the release. The vapor cloud ignited about 2 min after the release began (Image 6). Several workers were knocked over by the explosion, and two were burned — one seriously. Fourteen other workers received minor injuries.

The explosion ignited a pool fire, which exposed structural supports for piping, vessels, heat exchangers, and other process equipment to the flames. About 30 min after the fire started, support columns that had not been fireproofed failed. Their collapse caused additional damage and the loss of containment of flammable materials. The plant and a school were evacuated and neighbors were told to shelter in place. The fire burned for five days, and the manufacturing unit was shut down for five months.



What can you do?

- Seek out piping, valves, and other equipment that might be vulnerable to damage due to factors such as accidental collision or somebody standing on it. Report potential problems to management to ensure the risk is reduced by taking the appropriate action, such as modifying the piping or adding a protective barrier. Follow your plant's management of change (MOC) procedure when making changes.

- Consider plugging or capping open-ended vents, drains, sample lines, or other pipes to prevent leaks. A quarter-turn valve does not have to be broken off to leak. It can be opened accidentally by a person or a vehicle.

- If you are required to drive forklifts, cars, trucks, golf carts, or any other type of vehicle, stay on approved routes when

traveling through the plant. Always drive carefully and follow the plant's driving rules.

- If you are involved in maintenance, construction, or other activities that require vehicles in areas of the plant they do not normally travel, ensure the job safety analysis considers vehicle hazards such as collision, damage to piping, equipment, and structures, as well as the vehicle as a potential ignition source.

- Watch the U.S. Chemical Safety Board (CSB) video that describes this incident to learn more (www.csb.gov/formosa-plastics-propylene-explosion).

- Read the January 2003 and May 2010 Beacons, which describe inadequate clearance for tall equipment and fireproofing structural steel.

Protect your plant from collisions!

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