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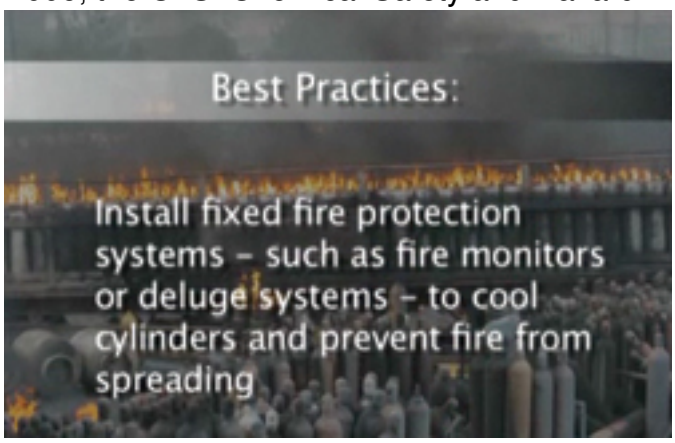
On June 24, 2005, serious trouble erupted at the Praxair gas-filling and distribution facility in St. Louis, MO. The site was storing about 30,000 compressed gas cylinders containing oxygen, nitrogen, propane, propylene, acetylene, carbon dioxide, helium and other specialty gases. That fateful summer day, a small fire from a propylene cylinder spread to other cylinders at the facility, causing some to explode and fly as far as 800 ft. In the process, they damaged property and started fires in the community. In June 2006, the U. S. Chemical Safety and Hazard Investigation Board (CSB) released a DV




D detailing its investigation and conclusions of the incident.

This DVD is excellent training material for anyone wanting to stress safe gas-cylinder handling within a facility. It shows the results of a leaking cylinder at the refilling plant and its effects on a whole community.  It also shows, through quality news footage, just how devastatingly powerful a gas cylinder can actually be.

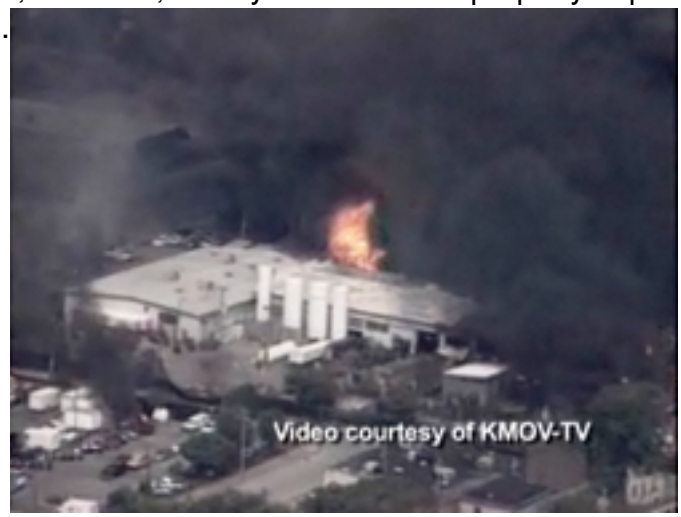
The typical gas cylinder stands 57'' tall, weighs 175 lbs., is 9" in diameter and has a wall thickness of ¼". Cylinders are often charged to 2000 to 2640 psi (with some as high as 6000 psi, depending on the type of gas). Their center of gravity makes cylinders easy to topple.

As the CSB DVD clearly shows, errant cylinders can penetrate brick walls, propel more than half a mile, spin and ricochet out of control, explode with tremendous force and become virtually unstoppable. Among other things, leaking cylinders also can displace extremely large areas, as well as immediately freeze exposed skin.

Not only are the gases in these cylinders under extreme pressure, they can be toxic, reactive, unstable or flammable. They also can be asphyxiating, radioactive or cryogenic. Depending on the type of gas, there is a potential for simultaneous exposure to both mechanical and chemical

hazards.

Gases with low-temperature flash-points and high rates of diffusion present a danger of fire or explosion. High concentrations of even a “harmless” gas such as nitrogen can create reactivity, toxicity or asphyxiation hazards. Because the gases are contained in heavy, highly pressurized metal containers, the large amount of potential energy resulting from gas compression makes the cylinder a potential rocket or fragmentation bomb when improperly handled or exposed to fire. Many argue that gas cylinders with broken valve stems will only spin and not have enough thrust to become airborne. The CSB DVD, however, clearly shows that improperly exposed cylinders can be hurdled great distances.




According to the CSB’s conclusions, the cause of the catastrophe at the St. Louis Praxair operations was the result of relief-valve settings that, although meeting specifications, were too low for containerized gases stored in direct sunlight. Some gas containers should always be shaded from the sun. A Safety Bulletin released by the CSB in June 2006, painted quite a picture of the community impact:

*“Dozens of cylinders and cylinder parts were propelled into the community and were found on sidewalks, front yards, backyards, courtyards, parking lots, and under cars. Damage included a burned-out empty commercial building, fire-damaged cars, a three-foot hole in the wall of one residential building, broken windows, and other destruction to residential and commercial buildings. Cylinder parts traveled as far as 800 feet from the area of the explosions. The fire plume spread asbestos from ruptured acetylene cylinders over a 1/3-mile-wide and 1-mile long area. The St. Louis Chief Medical Examiner attributed the death of one St. Louis resident to an asthma attack triggered by noxious smoke and fumes from the incident.”*

While this incident represents the extreme in the hazard continuum, it can teach important lessons about how to handle gas cylinders in the average-sized facility.

**Never forget**
Be sure to visually inspect a gas cylinder before placing it into service. Look for dents, crevice corrosion, bulges and arc or torch burns that may weaken the cylinder wall, or cuts, gouges, digs, corrosion or pitting that may decrease wall thickness. Also, check for neck and valve defects. Never handle cylinders roughly or roll or drag a cylinder.

Misuse can weaken a cylinder and make it unfit for future use. Strap large cylinders to a wheeled cart to ensure stability when moving, and only move one cylinder at a time.

**According to OSHA Standard 29 CFR 1910.101(a): Inspection of compressed gas cylinders.**
*"Each employer shall determine that compressed gas cylinders under his control are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections shall be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR parts 171-179 and 14 CFR part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962, which is incorporated by reference as specified in Sec. 1910.6."*

Keep the cylinder valve closed when it doesn't need to be open. This is important for both full and empty cylinders. Keeping the valve closed on empty cylinders prevents corrosion and contamination caused by air and moisture that could enter the cylinder after it is empty. Mark cylinders as being empty and segregate them from full cylinders. Inspect all cylinders for damage before storing. Make sure that all cylinders are stored on a dry surface.


Inside buildings, store cylinders in a well-protected, well-ventilated, dry location, at least 20 ft. (6.1 m) from highly combustible materials such as oil or excelsior. Store them in definitely

assigned places, away from elevators, stairs or gangways. Locate storage places where cylinders will not be knocked over or damaged by passing or falling objects—*or subject to tampering by unauthorized persons*. Do not store cylinders in unventilated enclosures. The in-plant handling, storage and utilization of all compressed gases in cylinders, portable tanks, rail-tank cars or motor-vehicle cargo tanks shall be in accordance with *Compressed Gas Association Pamphlet P-1-1965*.

It is always a good idea to write a detailed inspection policy and to document each inspection. Developing a “Compressed-Gas Cylinder” audit sheet and performing periodic audits can also be beneficial. Consider the effects of storing cylinders for long periods and immediately remove damaged ones from service.

The St. Louis incident should teach all of us to be aware of the potential dangers that lurk within mishandled or improperly stored compressed-gas cylinders. This compelling DVD is an excellent safety training resource. To download or request a free copy, visit the Chemical Safety and Hazard Investigation Board Video Room at www.csb.gov MT

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