CCPS CENTER FOR CHEMICAL PROCESS SAFETY
An AIChE Industry Technology Alliance

Process Safety Beacon

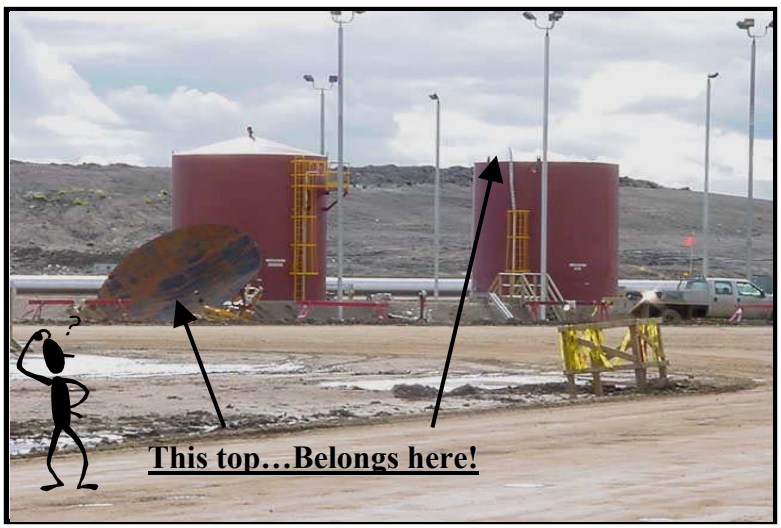
http: //www.aiche.org/ccps/safetybeacon.htm

Messages for Manufacturing Personnel

Sponsored by CCPS Supporters

October 2003

Don't pop your top…



Here's What Happened:

A very simple job—fill the tank with water. This is a common occurrence at a manufacturing plant and has minimal hazards. In this case, site personnel were being extra cautious. They started the water flow and confirmed that air was coming out of the vent on top of the tank. Everything seemed to be fine…***BUT***, the source of the water was the plant fire water system---and the flow was ***VERY*** high! The vent did not have enough capacity to relieve all of the displaced air, pressure built up in the tank, and **BOOM**—the top blew off when the roof seam failed.

How Did This Happen?

Tank vents are usually sized to handle normal processing activities, such as pumping in to or out of the tank during product transfers. Venting and vacuum break capacities are determined using formulas, or engineering calculations. These calculations are often called the "vent system design basis."

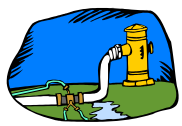
Problems occur when the inflow or outflow of liquid is greater than the capacity of the vent system. For inflow, it leads to an increase of pressure inside the tank because the vapor can't get out fast enough.

It doesn't take much pressure (in some cases just a few inches of water) to cause a lot of damage. Tanks usually have large surface areas, so when pounds per square inch is multiplied by a large number of square inches, the force can be huge! In this case, the roof seam was the weak point and failed first.

PSID Members look in Free Search—Tank Overpressure

Transferring Liquids: What You Can Do to be Safe !

- **Watch out for "Temporary" operations—this tank vent was probably sized for normal processing conditions, not for fire water addition. If uncertain---CHECK!**



- **Testing—SafeOut—Cleaning: there are many times that a vessel must be filled with water. Each time it is, make sure that the fill rate is slow enough for the vent system to handle the displaced vapor. And just to be sure, monitor the pressure in the vent space to make sure it is less than the vessel's pressure rating.**
- **When unsure, add water at "normal" processing rates.**

Liquid transfer can lead to major vessel damage.
"Transfer rate" must not exceed "vent capacity."

This edition is also available in German. Contact CCPS at ccps_beacon@aiche.org for information.