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Ice ruptures unused pipe and causes fire!

A section of piping in a refinery unit was taken out of service during a process modification. The unused piping was not physically removed, nor was it isolated from the active piping with slip blinds. Instead, it was isolated from the connected piping by closed isolation valves. The active piping contained liquid propane under high pressure, and the propane contained a small amount of liquid water entrained as a separate water phase. Debris jammed in the seat prevented one of the isolation valves from closing fully. This allowed wet liquid propane to leak from the active piping into the unused piping. The water, which is heavier than propane, accumulated at a low point in the unused piping. During the winter, the water which had accumulated in the unused piping froze. When water freezes it expands, and this expansion caused a crack in the unused pipe. When the weather warmed, the ice melted and propane leaked from the active piping through the leaking isolation valve, and then out through the cracked pipe. A large flammable vapor cloud formed and ignited. The resulting fire caused four injuries, the refinery had to be evacuated, and it was shut down for nearly two months. The fire caused major damage to other equipment and piping, resulting in additional release of flammable materials and escalation of the fire. More than two tons of chlorine was also released from containers impacted by the fire.



Do you know?

- It is easy to forget about “unused” equipment and piping, particularly when it has been out of service for many years. This equipment may not be inspected, and it may be left out of operating procedures such as draining condensate out of low points, and freeze protection programs.
- Valves can leak, and cannot be relied upon to provide positive isolation of piping and equipment.
- Water, unlike most materials, expands when it freezes. If the water is isolated in a closed piece of equipment or an isolated section of pipe, the ice formed by the freezing water causes enormous pressure and is capable of rupturing pipe and equipment.
- Branch connections of process piping with little or no flow may create the same hazard of water accumulation at low points.

PSID Members use Free Search for "Isolated."

What can you do?

- Make sure that all process modifications, including removal of equipment or piping from service, have a management of change review.
- Make sure that all equipment in your plant which is not in routine use is either physically disconnected from active equipment and piping, or positively isolated using slip blinds or other reliable isolation systems.
- Consider potential hazards of accumulation of material in pipe branches which are not routinely used, or which have low flow rates.
- Be prepared for cold weather in winter. Make sure that you follow procedures to prepare the plant for winter, to prevent freezing of critical equipment.



Is your unused piping and equipment disconnected or positively isolated?

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