

Even Tanks Containing Mostly Water Can Explode

August 2021



▲ A foul condensate tank exploded at a mill and traveled 375 ft (yellow line) before landing on process equipment. Image courtesy of the U.S. Chemical Safety and Hazard Investigation Board.

On Feb. 8, 2017, an explosion occurred in a condensate tank at a mill in DeRidder, LA, that produced different grades of containerboard. According to the U.S. Chemical Safety and Hazard Investigation Board (CSB), the explosion launched the tank approximately 375 ft laterally and over a six-story building before it landed on process equipment. The incident caused three fatalities and seven injuries.

The foul condensate tank contained mostly water, a layer of flammable liquid turpentine on top of the water, and an explosive vapor space of air and turpentine vapor. Air likely entered the foul condensate tank through a vacuum relief device on the tank's roof. Turpentine, a solvent consisting of several hydrocarbons, is a byproduct of the paper manufacturing process.

The air and organic vapor formed an unanticipated flammable atmosphere. The source of the ignition was most likely hot work that was being performed near the tank. Read the CSB Report No. 2017-03-I-LA-1 for more information on this incident.

Did You Know?

- Combustible materials, such as fuel, can form an explosive atmosphere when dispersed in air. For liquids, this dispersion is usually caused by evaporation.
- An explosive atmosphere contains combustible material within a certain concentration range, called the explosive (or flammable) range. Below this range, there is not enough fuel to ignite, and above this range, there is not enough oxygen in the mixture to ignite. For most flammable liquids, a concentration of 20 g/m³ — equivalent to four tablespoons of liquid evaporated in a 100-ft³ enclosed space — can be sufficient.
- Liquids that are volatile enough to create an explosive atmosphere at room temperature are called flammable liquids and are labeled accordingly.
- A liquid can form an explosive atmosphere at high temperatures, even if the liquid is not labeled flammable.
- Organic liquids are usually less dense than water. If a process involves water and organic liquids, the organic liquids will most likely float on top of the water. In bulk tanks, the layer of flammable liquid can vaporize to create an explosive atmosphere in the tank's vapor space.
- Tanks typically have a breather vent to protect from overpressure or vacuum. A breather vent allows air to enter the tank during draining or vapor to escape during filling.
- Some companies store flammable liquids in inert bulk tanks to prevent ignition of the contents.

What Can You Do?

- Know the properties of the materials used in your area. Pay special attention to tanks that may contain two or more phases.
- A flammable phase may accumulate in wastewater tanks over time. These tanks may need to be treated as if they contain a flammable material.
- Inspect the inerting systems on your tanks and verify that they are operating properly.
- During hot work around tanks with flammable or combustible contents, be vigilant and follow your company's hot work procedures (August 2020 Beacon).

A small quantity of flammable liquid is no small hazard!