

CASE STUDY 6 – STORAGE TANK FIRE

Organization context: The organization in focus manages a bulk liquid storage terminal.

Describe the event: On the day of the incident, a large fire erupted at the facility, starting in the vicinity of one above-ground atmospheric storage tank holding a flammable liquid. Once the fire erupted, the organization was unable to isolate or stop the release. As a result, the fire burned, intensified, and spread to the other tanks located in the same containment area before it was finally extinguished after three days.

Explain the consequence: The fire caused substantial property damage at the facility, including the destruction of many above-ground atmospheric storage tanks and their contents.

The incident also significantly impacted the environment from a breached containment wall around the tanks and released a large quantity of flammable material, firefighting foam, and contaminated water into the neighbourhood.

Further, the released materials flowed from there into the water bodies leading to the closure of a long stretch of the ship channel adjacent to the facility and several waterfront parks in the neighbouring areas due to the contamination.

While there were no injuries or fatalities as a result of the incident, the local community experienced serious disruptions because of chemical-related air quality concerns. At one point, shelter-in-place orders were issued for the entire City, affecting the normal operation of local schools and businesses. A portion of a major highway in the area was also closed.

What were the root causes: The cause of the incident was determined to be the release of flammable hydrocarbon vapour from the failed tank circulation pump, which accumulated in the area and ignited, resulting in a fire. Other contributing factors that led to the severity of the incident were the absence of a flammable gas detection system and the absence of remotely operated emergency isolation valves to safely secure the flammable liquids in the tanks at the facility.

Elements of the tank farm design also contributed to the severity of the incident by allowing the fire to spread to other tanks within the tank farm. The resulting accumulation of hydrocarbon and other fluids in the secondary containment area ultimately contributed to a breach of the containment wall and a release of materials to the local waterways.

Finally, the investigation determined that certain exemptions in the regulations for atmospheric storage tanks had allowed the facility not to develop and implement a formal Process Safety Management (PSM) program for the tank involved in the incident and its associated equipment, which also contributed to this incident.

What can be learned from this case study (good and bad): Development and implementation of PSM for the facility applicable to all atmospheric storage tanks and associated equipment in highly hazardous chemical service is desirable under some circumstances. Development and implementation of a performance monitoring program for all pumps in highly hazardous chemical service at the facility with the necessary control limits and alerts for the measured parameters.

Installation of flammable gas detection systems with associated alarm functions at the areas of facility where flammable substance releases could occur.

Development and implementation of a response plan and operator training for necessary actions to take when an alarm sounds.

Installation of remotely operated emergency isolation valves for all atmospheric storage tanks that contain highly hazardous chemicals or liquids with a certain flammability rating and above at the facility.

Conducting an evaluation of the design of all new and existing tank farms at the facility against the applicable sections of the prescribed Codes and Standards.