Chevron Phillips

Sweeny, Texas

February 15, 2021

Incident Summary

On February 15, 2021, at 3:05 p.m., a hydrogen and hydrocarbon gas mixture was accidentally released into the firebox of a fired heater, where it ignited and exploded at the Chevron Phillips Chemical Company ("Chevron Phillips") facility in Sweeny, Texas (**Figure 1**). Chevron Phillips estimated the incident resulted in $2.5 million in property damage.

Figure 1. The Chevron Phillips facility in Sweeny, Texas. (Credit: Google Maps)

Chevron Phillips' investigation found that the facility shut down multiple fired heaters when extreme cold weather from Winter Storm Uri caused several freeze-related operational issues. Due to emergency conditions that included utility losses and supplier-driven gas shortages, Chevron Phillips shut down its fired heaters without removing the solidified carbon deposits on the interior walls of the heater tubes (decoking).

Chevron Phillips' investigation revealed that further utility upsets caused the facility to stop all fuel gas supply and fully shut down the remaining fired heaters. During the shutdown, a valve between one of the ethylene unit's fired heaters and downstream equipment remained open. The open valve allowed downstream flammable hydrogen and hydrocarbon gas to flow backward into the fired heater tubes. Approximately 30 minutes after this happened, a tube within the fired heater ruptured, allowing the flammable gas to enter the firebox. The gas accumulated, ignited, and exploded, causing extensive damage to the fired heater (**Figure 2**).

Figure 2. Fired heater explosion damage. The left image shows the broken tube and walls, and the right image shows a fan. (Credit: Chevron Phillips)

Chevron Phillips' investigation determined that the tube failure likely occurred because the fired heater tubes were shut down without decoking. Coke fouling can insulate the tube surface, resulting in local hotspots and increasing the risk of thermal shock and tube failure in fired heaters. These conditions stressed the tube's walls when the metal cooled faster than the internal coke, breaking the tube. Chevron Phillips' investigation concluded that hot insulation inside the firebox likely ignited the gas (autoignition).

Probable Cause

Based on Chevron Phillips's investigation, the CSB determined that the probable cause of the incident was a fired heater tube failure from thermal stress due to the rapid shutdown. When the tube broke, a hydrogen and hydrocarbon gas mixture from downstream equipment flowed into the firebox. Hot insulation within the firebox likely ignited the flammable gas, resulting in an explosion. Inadequate winterization of multiple valves, instruments, and control systems contributed to the incident.