Valero

Texas City, Texas

August 19, 2022

Incident Summary

On August 19, 2022, at approximately 3:45 a.m., about 4,000 pounds of a hydrogen and hydrocarbon mixture was accidentally released into the firebox of a fired heater, where it ignited, creating a large fire at Valero Refining-Texas, L.P.'s ("Valero") refinery in Texas City, Texas (**Figure 1**). Valero estimated that the property damage from the incident was $10 million.

Figure 1. The Valero refinery in Texas City, Texas. (Credit: Google Maps)

On the morning of the incident, Valero restarted a fired heater that had been offline for approximately 12 hours due to a compressor shutdown caused by a malfunction of a pressure transmitter in the lube oil system. During the startup, it was essential to flow process feed through all four passes of the fired heater's tube system. However, only two of the four passes in the tube system had sufficient flow through them when the burners were ignited. Although the minimum flow was eventually established in another tube pass, there was no flow through the fourth pass.

Valero's investigation of the incident found that without the fluid flowing through the fourth pass to remove heat, the tube's metal wall temperature reached 1,500 degrees Fahrenheit (°F), which exceeded the design temperature limit. After the operations supervisor noticed the high temperature, field operators were sent to inspect the heater tubes. The field operators reported that some tubes were "glowing red hot," and consequently they manually turned off two of the fired heater's eight burners. The field operators then reduced the flow through the first three passes to help drive feed material into the fourth pass. Although operators reported hearing material flowing in the fourth pass, the meter indicated no flow. The Valero operations team concluded that the flow meter was malfunctioning.

Less than an hour later, a convection section tube in the fourth pass ruptured due to short-term overheating (**Figure 2**), releasing a flammable mixture of hydrogen and hydrocarbons into the firebox. Flames from the gas-fired burners ignited the mixture, resulting in a large fire.

Figure 2. Ruptured fired heater tubing. (Credit: Valero)

During its investigation, Valero discovered that the startup procedure for the fired heater, which required maintaining a steady flow through all four tube passes before lighting the burners, was not used. This procedure was "conditional," however, and was only necessary if the firebox temperature had cooled below 400°F. At the time when the burners were lit, this temperature was slightly below 400°F.

Additionally, Valero found that the fired heater lacked engineered safeguards to prevent the burners from being lit before establishing flow in each of the four passes. In response to the incident, Valero modified its automated burner controls to help ensure that the flow rate through every pass exceeds a predetermined minimum flow rate before operators can ignite a burner.

Probable Cause

Based on Valero's investigation, the CSB determined that the probable cause of the incident was a ruptured fired heater tube from short-term overheating. Flames from the fired heater's gas-fired burners ignited these flammable chemicals, resulting in the fire. The lack of automated safeguards that did not prevent the burners from being ignited before the minimum flow was established through each of the four tube passes contributed to the incident. Had Valero had such automated safeguards in place, this incident likely could have been prevented.