

Case study: West Coast, United States

Hydrogen sulfide scavenger helps refiner meet air quality regulations

Challenge

A small West Coast refinery was occasionally having trouble meeting local air quality regulations. If the hydrogen sulfide content of the flare gas line exceeds 160 ppm based on a rolling three hour average, the refinery must make a report to the local air pollution control district. Excessive violations can lead to increased site inspections, fines and negative publicity.

This refinery wanted to proactively reduce the H₂S content of the flare line as soon as their flare analyzer detected levels considered problematic. Baker Hughes, the industry leader in mitigating hydrogen sulfide related issues, was called to investigate.

Solution

Baker Hughes representatives conducted a thorough survey of the system and gathered critical operating parameters. This included information on the H₂S level reduction desired, the operating temperatures and pressures of the gas line, gas line diameters and flow rates, and residence time from the injection point to the H₂S monitor.

Using this information they were able to custom design a system to meet the needs of the refinery. The additive Baker Hughes chose to use was the water soluble additive SULFIX™ 9272

hydrogen sulfide scavenger. Baker Hughes proposed installing five injection points approximately 20 feet apart along the main flare line, plus two injection points along the flare line leading from the Scott tail gas unit (see Figure 1). These multiple injection sites were suggested to compensate for the poor mixing caused by the low gas velocity in the flare line.

A two-phase atomizer was also suggested in order to further distribute the additive into the flare gas. All of the injection points occurred upstream of a knockout pot available to scrub any liquid from the gas stream prior to flaring. The SULFIX 9272 hydrogen sulfide scavenger would be stored in a bulk tank and diluted with 20 parts of water at the discharge of the additive pump (see Figure 2).

Results and benefits

The refinery first installed one injection point using a cone-head nozzle along the main flare line and trialed the Baker Hughes proposal the next time the hydrogen sulfide content threatened to exceed the 160 ppm specification.

When the trial was a success, the refinery installed the rest of the injection points. They chose not to use the two phase atomizers to improve the mixing of the additive with the flare gas. The refinery now uses the SULFIX 9272

Challenges

- Trouble meeting local air quality regulations
- Flare gas line exceeds 160 ppm

Results

- Suggested multiple injection sites to compensate for the poor mixing caused by the low gas velocity in the flare line
- Recommended the SULFIX 9272 hydrogen sulfide scavenger
- Reducing the number of "out of compliance" reports made to the local air pollution control district

scavenger system on an as-needed rather than a continuous basis. If the H₂S content of the flare gas exceeds a predetermined level, the operators turn on the injection pumps to begin bringing down the H₂S level. Meanwhile, they are able to begin troubleshooting and correcting the root cause of the problem without the worry of violating air quality regulations.

This Baker Hughes program has been in place at this refinery for several years and has been instrumental

in reducing the number of "out of compliance" reports made to the local air pollution control district. The financial benefit of avoiding increased inspections, fines and negative publicity is difficult to measure but easy to appreciate. The refinery is so pleased with the program they have installed a second system in another area.

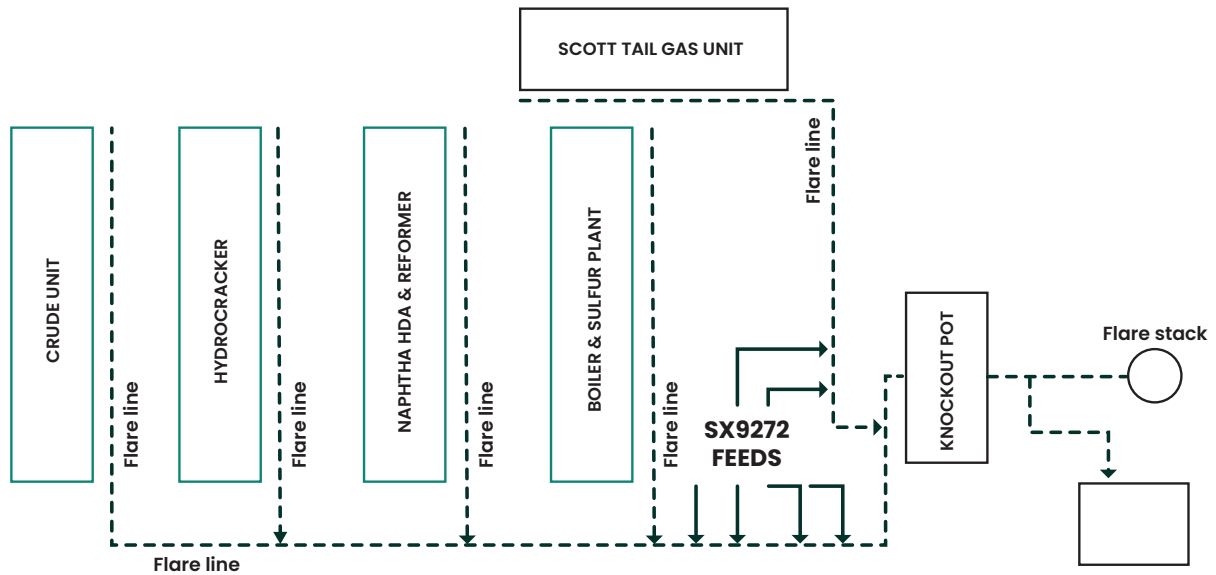


Figure 1. Illustration of Injection Locations for H₂S in Flare Gas Treatment System. In this figure SX927 refers to SULFIX™ 9272 hydrogen sulfide scavenger.

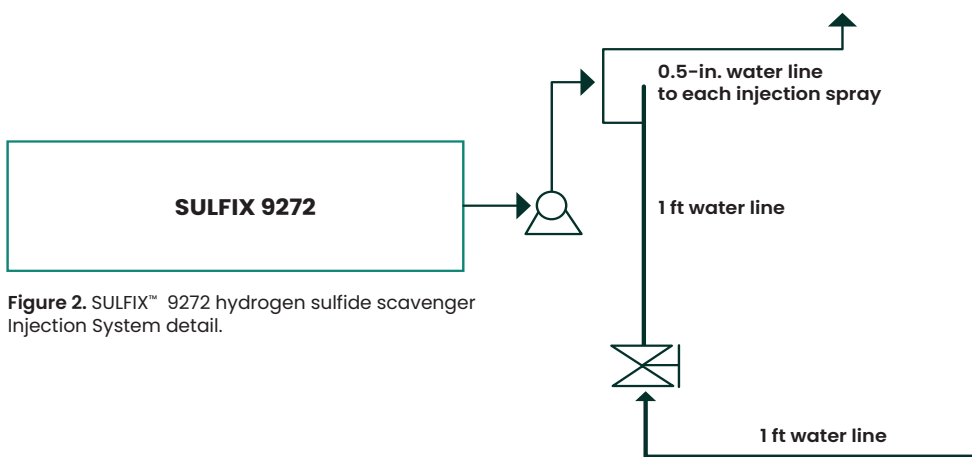


Figure 2. SULFIX™ 9272 hydrogen sulfide scavenger Injection System detail.