Schlumberger

THIOPAQ O&G Technology Reaps Rewards from Sour Casinghead Gas Stream

Pioneering application yields environmental benefits while achieving economics critical to project success

CHALLENGE

Design new gas processing plant to economically reduce hydrogen sulfide (H_2S) concentration (from 40,000 ppm to <10 ppm) in casinghead gas stream gathered from 234 production wells in the midwestern US.

SOLUTION

Employ THIOPAQ O&G technology, a patented biodesulfurization process that scrubs H_2S from gas streams and uses *Thiobacillus* bacteria to oxidize it to elemental sulfur.

RESULTS

- Achieved target economics.
- Minimized capex and opex cost of sulfur-removal process.
- Recovered up to 200-bbl/d high-quality (<4-ppm H_2S) saleable gas product.
- Provided 200-Mcf/d [5,663 m^3/d] residue gas for sale to gas distribution system.
- Improved air quality proactively.
- Showcased first use of process in US for casinghead gas.

Economically reducing H_2S concentration in product gas

An independent operator of a mature oil field in the midwestern US determined that the sour condensate-rich casinghead gas, which for more than 68 years had been flared from the field's 234 producing wells, had potential economic value in the improving energy market. Seven field compressors and 38 miles [61 km] of gathering pipeline would be installed to provide 700 Mcf/d [20 Mm^3/d] of gas to a proposed gas processing plant. However, the total cost of gas collection, treatment, and processing needed to be minimized against the recoverable LPG value to make the project economically favorable. The gas, with a heating value of over 2,000 Btu/cf [75 MJ/m^3], contained 4-mol% [40,000-ppm] H_2S. The critical challenge was efficiently reducing the H_2S concentration to <10 ppm to yield a high-quality LPG product for sale.

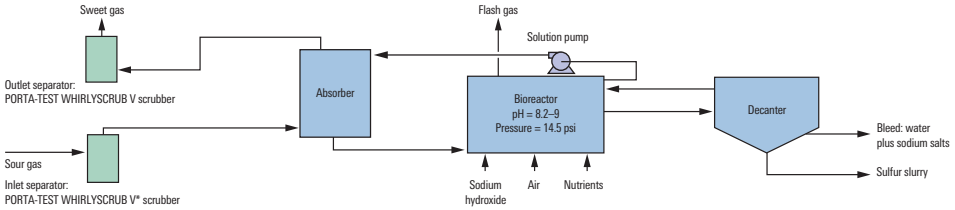
Efficiently removing H_2S to produce saleable LPG and elemental sulfur

In consideration of capital cost, operating expense, and H_2S handling safety, the operator contracted with Schlumberger to design and install the THIOPAQ O&G biodesulfurization system with a mechanical refrigeration unit (MRU) to chill the sweetened gas. To ensure a sulfur-free product and command a higher price than sour LPG, the THIOPAQ O&G system removes H_2S from the gas stream prior to the MRU and oxidizes it to elemental sulfur by biological processing with *Thiobacillus* bacteria. The field-proven process has much lower operational costs than a conventional scavenger system, high H_2S removal efficiency, wide operational pressure range (2–1,300 psi [14–9,000 kPa]), no sulfide-containing waste stream, no use of chemical chelating agents, and no hazardous bleed streams. The elemental sulfur by-product is saleable for beneficial use in agriculture.

Schlumberger has a global license to engineer, design, fabricate, commission, start up, and operate plants with THIOPAQ O&G technology, which has been implemented in more than 250 applications worldwide in units processing from 1,000-lbm/d [453 kg/d] sulfur to more than 67 tonUS/d [60.9 t]. Previously proved for high-pressure natural gas, the process installed in the Illinois gas plant is the first in the US to treat low-pressure casinghead gas.

Achieving environmental air quality improvement target

The gas gathering system and gas plant are performing well, with more than 99% availability since startup in 2006. The 150-bbl/d [0.16-m^3/d] LPG product meets specification for sulfur content and Reid vapor pressure, with the H_2S concentration in the treated gas consistently at <4 ppm. Following installation of a 5-mile [8-km] pipeline, the remaining 200 Mcf/d of residue gas from the MRU has been sold to the local distribution system for household heating and cooking. The operator proactively improved environmental air quality conditions in the area—recovery of the previously wasted casinghead gas reduced annual CO_2 emissions by 55,114 tonUS [50,000 t] and annual SO_2 emissions by 1,323 tonUS [1,200 t].



Schlumberger paired THIOPAQ O&G technology with the PORTA-TEST WHIRLYSCRUB V single-stage gas scrubber for further separation efficiencies.*

slb.com/gas-treatment

Gas Processing