

Refineries: Application Focus

Sour Water Stripping (SWS)

Process Description

Sour water stripping is used to remove ammonia (NH₃) and hydrogen sulfide (H₂S) from sour water streams coming from many unit operations to condition it for discharge or reuse within the refinery. In a complex refinery, most of the sour water comes from distillation, fluid catalytic cracking, catalytic reforming, coker and acid gas removal units, with many other operations contributing to the balance. The different streams are collected in a surge tank for centralized processing via a heat exchanger and a single stripper column, or two in series. A combination of pH control and heat, from direct injection steam or reboiler drives off the ammonia and hydrogen sulfide. The presence of solids and hydrocarbons ('oils') are major contaminants that cause heat exchanger, stripper column, and reboiler fouling. The impact is loss of SWS capacity that may bottleneck refinery production rates, drive the need for unscheduled SWS shutdowns and cleanouts leading to additional production losses, high maintenance costs and increased worker safety issues from exposure to the highly volatile H₂S in the sour water system. Oil contamination of the stripper also leads to a range of problems downstream. One is oil carryover in the acid gas stream heading to the sulfur plant, leading to sulfur plant reliability issues and increased risk of fires from oil coking of the reactor beds. Another is excess oil in the stripped water to the water treatment plant creating an overload

Ensure your sour water stripping reliably supports your unit production quotas and your water quality requirements.



condition resulting in environmental risk and/or the need to reduce refinery capacity.

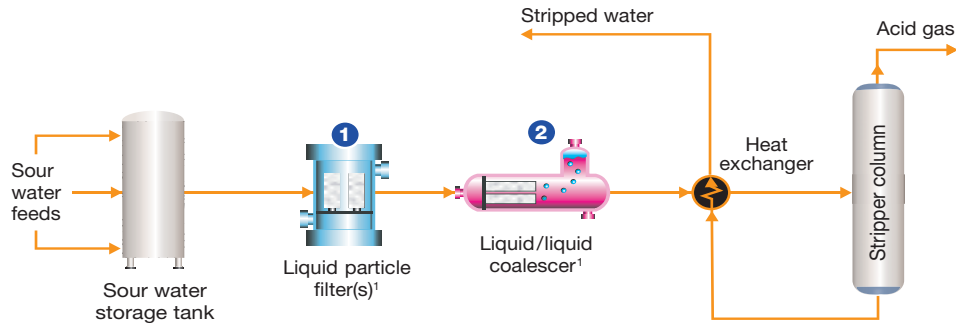
Refinery Needs

- Achieve refinery unit production quotas via reliable treatment of the sour water in the SWS
- Meet water quality specifications for discharge, further treatment or re-use in the refinery
- Minimize maintenance costs and worker exposure issues due to SWS fouling
- Ensure sulfur plant reliability by minimizing oil carryover in the SWS acid gas stream

Production Challenge/Pall Solution

| Challenge | Solution |
|--|---|
| <p>Meet daily refinery unit production targets by meeting SWS H₂S, NH₃ and capacity treatment targets</p> | <p>Improve refinery productivity targets and sulfur plant reliability and SWS cost control by effective removal of particulate and oil contaminants that are fouling the SWS reboiler and column trays and the acid gas stream affecting SWS and sulfur plant capacity and reliability that back up refinery unit operations.</p> <p>Cyclonic separators will not effectively remove the oils:</p> <ul style="list-style-type: none"> • especially on stable emulsions, due to the fine oil droplet size resisting separation. • under varying sour water flow conditions that cause loss of inertial separation efficiency. Use of recycle loops to main inertial efficiency greatly increase initial capex and system complexity, leading to high maintenance and poor reliability of oil removal. <p>High efficiency prefilters and AquaSep® EL liquid/liquid coalescers reliably remove particulate and oils from stable sour water emulsions, with 0% to 100% turndown, ensuring maintained SWS capacity and reliability.</p> |
| <p>Ensure sulfur plant and water treatment plant reliability through reliable removal of oils from the acid gas and stripped sour water streams</p> | |
| <p>Reduce SWS labor and maintenance costs from particulate and oil fouling</p> | |

Process Flow Diagram



¹ Consider placement of the particle filter and coalescer upstream of the storage tank if oil fouling of the tank is a labor and maintenance issue, or if one incoming stream is identified as problematic.

Key Applications/Filter Recommendations

| Application | Pall Product | Advantages | Customer Benefits |
|--|---|---|--|
| 1 Prefiltration prior to liquid/liquid coalescer | Vector™ High Flow filters, Ultipleat® High Flow filters, coreless filters, and/or a range of FSI™ filter bags | Efficient removal of solids from the coalescer and SWS | Improves the efficiency and life of the liquid/liquid coalescer Improves SWS production, reliability, safety and opex by controlling particulate fouling of the heat exchanger and stripper reboiler and trays |
| 2 Hydrocarbon removal | AquaSep® EL ² liquid/liquid coalescer in horizontal configuration | Removes hydrocarbon carryover into the heat exchanger and stripper column | Improves SWS reliability, safety and opex challenges by controlling oil fouling of the heat exchanger and stripper reboiler and trays Improves sulfur plant reliability and safety by removing oil carryover into the reactor beds Freedom from oil overload to the water treatment plant that can create an environmental hazard and/or a refinery capacity limitation. |

² Based on sour water pH between 4 and 8.5 at point of filtration. Consult Pall for pH outside of this range.



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