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Wet Sulfuric Acid Process

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Abstract

In refineries, hydrogen sulfide (H_2S) is a by-product of processing sulfur-containing-crude-oils and is typically recovered as elemental sulfur. The Claus process is one of the most common methods for sulfur recovery and typically recovers 95–98% of the sulfur present in acid gas. With tightening regulations and sourer crudes, higher sulfur recovery levels (typically greater than 99%) are needed to meet the mandated emission limits. The wet sulfuric acid (WSA) technology, originally introduced in the 1980s by Haldor Topsoe, is an alternative to the Claus process for refinery sulfur management. It enables sulfur recovery in the form of valuable sulfuric acid, which is a key raw material for the fertilizer industry. While the technology can process a variety of sulfurous feeds originating from different processes, in this review, a generic wet sulfuric acid process is evaluated technically and economically for its capability to function as a sulfur recovery unit (SRU) in the refinery.

This review provides insight into a generic wet sulfuric acid process and covers its process chemistry, technology, and economics. The SRU configuration presented in this review produces 330 million lb/yr (150 ktpy) of commercial-grade sulfuric acid. The review can be used as a tool for the cost estimation for different plant capacities. It will be beneficial for planners, producers, and designers who are looking for independent data for conventional wet sulfuric acid process plants operating as refinery sulfur recovery units. This review includes the process flow diagrams, material balance, major equipment sizes, and specifications. Cost data, including the battery limit and offsite costs, variable costs, capex, opex, and overall production costs, is provided.

An interactive iPEP Navigator module of the process is included, which provides a snapshot of the process economics and allows the user to select the units and global region of interest.

The technological and economic assessment of the process is IHS Markit PEP's independent interpretation of a commercial process based on information presented in the open literature (such as patents or technical articles) or in-house generated data (e.g., simulation, equipment cost estimation). While this assessment may not reflect the actual plant data fully, IHS Markit PEP believes it to be sufficiently representative of the process and process economics within the range of accuracy necessary for economic evaluations of a chemical process design.

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