

APPLICATIONS

Selection of an appropriate and cost effective Tail Gas Treatment process to follow existing Claus plants is a challenge facing refiners and natural gas plant owners around the world. New emission regulations, interest in increasing sulfur recovery and processing of higher sulfur crudes are the main drivers.

The most common approach is to install an amine-based Tail Gas Treatment Unit (TGTU), however, lower investment costs and higher reliability can be achieved by combining two well established processes, Jacobs' SUPERCLAUS® process and caustic scrubber wet gas technology.

By combining these technologies investment costs are reduced, the process is less expensive to operate and to maintain, requires a smaller footprint, greatly simplifies overall operation and has a greater on-stream reliability when compared to an amine-based TGTU.

FEATURES

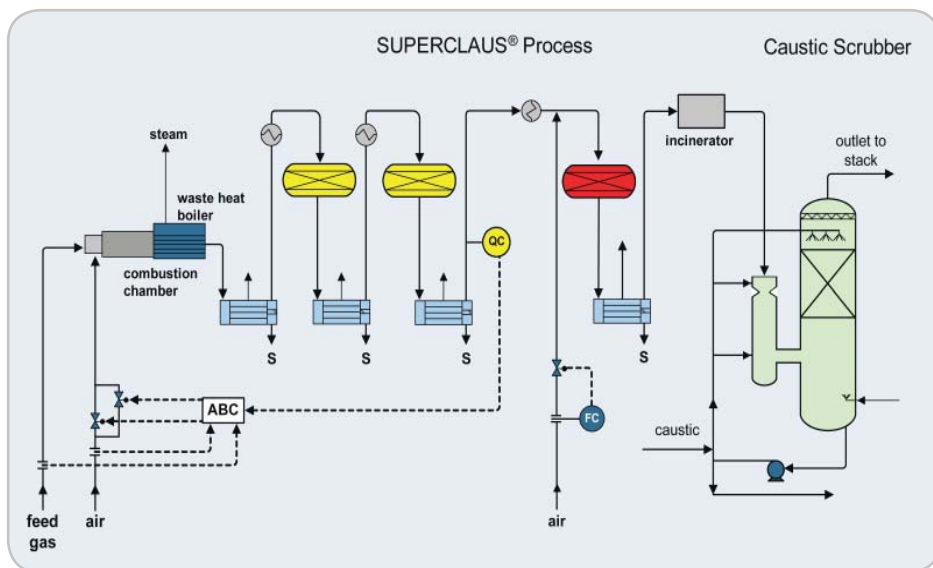
- » Application in both new and existing plants
- » Overall sulfur removal over 99.9%, also in case of bypassing the selective oxidation reactor stage
- » Long catalyst lifetime
- » Simple continuous operation
- » Low (additional) investment costs
- » NH₃ destruction
- » High turndown
- » High reliability - less than 1% unscheduled shutdown time
- » Small footprint, limited amount of equipment compared to amine based TGTU
- » In situ oxidation of the scrubbing effluent

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DESCRIPTION

By combining the SUPERCLAUS® and caustic scrubber technologies, the overall system can achieve greater than 99.9% sulfur removal at compelling capital and operating costs. Minimum 99.0% of the H₂S is captured and recovered as elemental sulfur by the SUPERCLAUS® process and the remaining sulfur is scrubbed and converted to Na₂SO₄ by the caustic scrubber. The residual SO₂ content in the flue gas is typically less than 50 ppmv.

The SUPERCLAUS® process consists of a thermal stage followed by minimum three catalytic reaction stages with sulfur removed between stages by condensers. The first two or three reactors are filled with standard Claus catalyst while the final reactor is filled with selective oxidation catalyst. In the thermal stage, the acid gas is burned with a substoichiometric amount of controlled combustion air such that the tail gas leaving the last Claus reactor contains typically 0.8 to 1.0 vol.% of H₂S. The selective oxidation catalyst in the final reactor oxidizes the H₂S to sulfur at an efficiency of more than 85%. Depending on feed gas conditions and unit layout, a sulfur recovery up to 99.2% can be achieved.

The resulting SUPERCLAUS® tail gas is routed to an incinerator, in which all sulfur compounds are converted to SO₂.

In the downstream caustic scrubber, scrubbing liquid is injected, countercurrent to the incinerator flue gas. Liquid collides with down flowing gas to create a region with extreme turbulence, with a high rate of mass transfer. Quenching of the incinerator flue gas and SO₂ removal from the gas occur in this region, therewith creating sulfite salts. The clean, water saturated gas is then passed on to atmosphere through mist removal devices, reducing the SO₂ content to < 50 ppmv.

The liquid reverses to the vessel sump for recycle back to the inlet. In the vessel sump, oxidation air is used to convert the sulfites to sulfates, that can be routed to waste water treatment.

LICENSOR

Jacobs Comprimo® Sulfur Solutions, and Jacobs Chemetics, both member of Jacobs Engineering Group Inc..

REFERENCES

More than 190 SUPERCLAUS® units and more than 100 caustic scrubber units.