



# Steam and condensate handling in sulfur recovery

QMax Industries

Steam and condensate handling is a critical part of the sulfur recovery unit (SRU). While attention often centers on Claus reaction kinetics and catalyst performance, thermal management via steam systems ensures the entire process remains stable, efficient and safe. Poorly managed condensate in an SRU steam system can cause corrosion, water hammer and process disruptions.

## Steam considerations

Steam is used across an SRU for heating process gas, preventing sulfur solidification, and supporting phase changes. It maintains reheat temperatures between catalytic reactors and keeps rundown lines above sulfur's freezing point, ensuring stable operation.

Steam quality is essential. Dry, saturated steam delivers consistent heat, while wet steam lowers efficiency and increases the risk of water hammer and corrosion. Condensate can form carbonic acid, accelerating carbon steel degradation. Strategies like sloped tracer lines, proper drainage, effective steam traps and corrosion-resistant materials help mitigate these risks and protect system integrity.

Steam traps discharge condensate while

retaining steam, and a well-chosen, properly installed trap is essential for thermal efficiency and system longevity. The main types include thermostatic traps, which are suited for tracing systems and startup venting; bimetallic traps, valued for their durability in high-pressure systems; thermodynamic disc traps, which are rugged and compact; inverted bucket traps, commonly used with tracing systems; and float and thermostatic traps, which are ideal for broad loads such as heat exchangers.

Proper trap selection depends on pressure, load, reliability and space. The wrong trap can lead to steam loss, condensate buildup or freezing.

## Steam equipment in SRUs

The two main outputs of a Claus SRU are steam and sulfur, with steam generally considered more valuable, as most of it is exported to other refinery units. Key equipment that generates steam includes the waste heat boiler (WHB), which recovers intense thermal energy from Claus gas streams to produce high-pressure steam, maximizing energy efficiency and protecting downstream

equipment from thermal overload. Sulfur condensers also play a critical role, condensing sulfur while generating medium- or low-pressure steam to help maintain SRU balance and support catalytic reactions.

Steam plays a vital role across SRU equipment, serving both process heating and freeze protection functions. Process gas reheaters use steam to elevate temperatures and maintain optimal reactions, while combustion air pre-heaters rely on it to improve efficiency and flame stability. Acid gas strippers and knockout drums depend on tracing or jacketing for freeze protection, and sulfur rundown lines require similar measures to prevent blockages from solidification. Sulfur seals and pits utilize jacketing or coils for thermal control, and tail gas lines and analyzers need tracing and insulation to remain above the dew point.

## Thermal maintenance

Several types of thermal maintenance strategies are deployed in SRUs to ensure proper operation and reliability. Jacketed pipe provides uniform heating for sulfur,

while steam tracing, including aluminum-based conductive systems such as QMax FTS, offers cost-effective flexibility. Electric tracing is used when steam is unavailable, and equipment jacketing, such as the QMax FHJ, protects valves, pumps, and vessels. For larger applications, tank heating can be achieved through internal steam coils or external tracing.

Proper installation requires effective condensate drainage, accessible trap stations, expansion allowances and a good fit. Design should account for heat loss, steam pressure, circuit layout, insulation and maintenance access.

Strong steam and condensate management is essential for reliable SRU performance. From process stability and safety to energy efficiency and asset protection, thermal systems are central to SRU operations. Investing in solid steam and condensate design and upkeep ensures reliable, high-performing SRUs for years to come.

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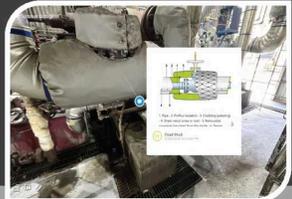
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