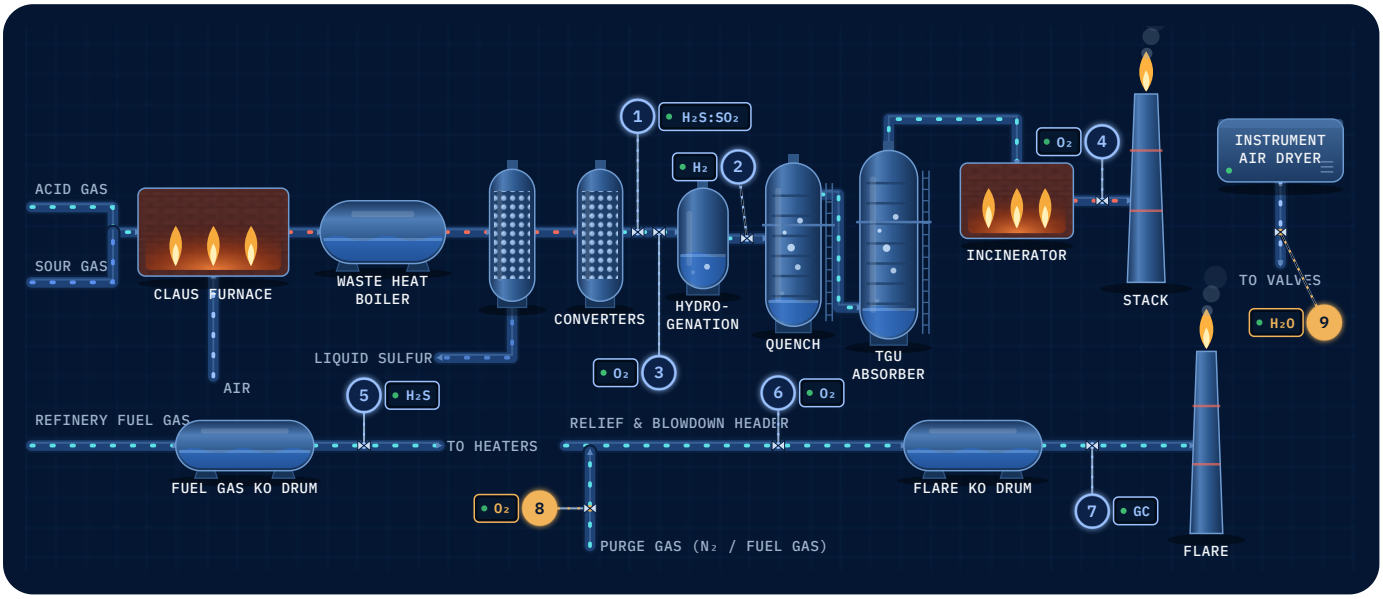
Sulfur recovery, fuel gas and flare: where to measure

Most analyzers in a sulfur recovery unit are specialised sulfur and combustion analyzers that YORK supplies as integrated systems. YORK instruments cover the flare header oxygen, the purge nitrogen and the instrument air.



● YORK instrument ○ Integrated system (supplied through YORK)

How the process works

The sulfur recovery unit turns H_2S from the amine regenerator and sour water stripper into liquid sulfur, and the tail gas unit cleans up what is left. Here the key analyses are sulfur ratios and combustion control, which need specialised analyzers. YORK supplies them as integrated systems, alongside its own instruments for oxygen and dew point.

1. **Claus furnace.** Part of the H_2S burns with air to SO_2; the air rate is trimmed from the tail gas H_2S:SO_2 ratio.
2. **Waste heat boiler and converters.** The gas is cooled and passes catalytic converters, where H_2S and SO_2 react to sulfur that condenses as a liquid.
3. **Tail gas unit.** A reducing-gas burner and hydrogenation reactor turn the remaining sulfur compounds into H_2S, which a quench column and amine absorber remove.
4. **Incinerator.** Residual H_2S is burned before the gas leaves the stack.
5. **Fuel gas and flare.** The fuel gas header feeds the heaters; the flare header collects relief and blowdown gas and is kept free of air by purge gas.

Interactive version with animation:
https://www.yorkinstrument.ae/guides/sulfur-recovery-flare-measurement-points/

Measurement points

#	POINT	MEASURES	TYPICAL VALUE / LIMIT	RECOMMENDED SOLUTION
1	Claus tail gas	H_2S to SO_2 ratio	2:1 is the stoichiometric reference; operators often target 2:1 to 4:1	Integrated system: UV air-demand analyzer
2	Tail gas unit, after hydrogenation	Excess hydrogen	About 2.1 % at 10 % excess air (simulated example)	Integrated system: thermal-conductivity H_2 analyzer
3	Tail gas unit, reducing-gas burner	Oxygen ingress	Firing above about 90 % of stoichiometric air risks oxygen reaching the hydrogenation catalyst	Integrated system: zirconia O_2 analyzer
4	Incinerator stack	Excess oxygen	Plant-specific: set to keep destruction efficiency and permit compliance	POA3500; Integrated system: in-situ zirconia O_2 analyzer
5	Refinery fuel gas header	H_2S	Set by the emission permit for the heaters (limit not reproduced here)	Integrated system: H_2S analyzer
6	Flare header	Oxygen (air ingress)	No single published limit; an O_2 signal can trigger purge or make-up gas injection	Integrated system: O_2 analyzer qualified for wet sour gas in Zone 1/2
7	Flare vent gas	Heating value and composition	Set by local flare regulations (limit not reproduced here)	Integrated system: process GC or calorimeter
8	Purge and blanket nitrogen	Oxygen (%)	Keep oxygen below the limiting oxygen concentration with margin (NFPA 69), e.g. about ≤ 10 % for methane	PGA500-EX
9	Instrument air header	Pressure dew point	At least 10 °C below the lowest ambient temperature, and never above 4 °C at line pressure (ISA-7.0.01)	DPT810, DM9200, DPT-600 Plus-EX

Typical values from published standards, regulations and technical literature. Your contract, licensor or plant specification always governs. Integrated systems are supplied by YORK through its partner integration factory.

Key references

1. Hatcher et al., SO_2 breakthrough under the microscope — Digital Refining
2. Q&A Q27 (2017): sulfur block best practices — AFPM
3. Dynamic simulation modeling to protect flare headers from air ingress (AIChE 2016) — AIChE
4. Inerting, purging, discharge location and containment (NFPA 69 summary) — Open Exam Prep
5. Understanding ISA-7.0.01-1996 Instrument Air Standard — Compressed Air Best Practices