

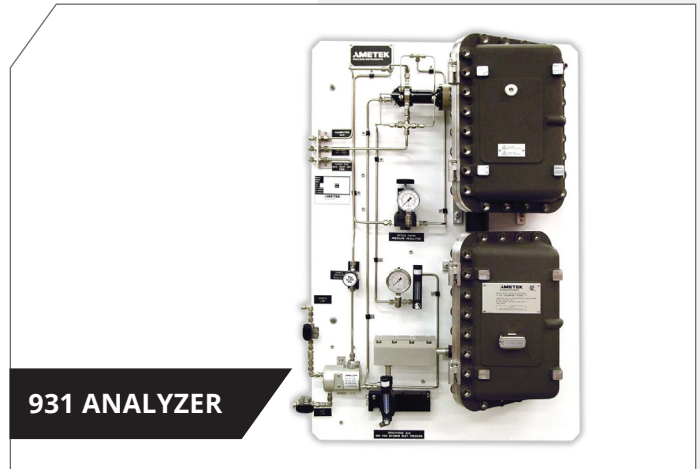
REDUCTION/AMINE TAIL GAS TREATERS

931 and 932 Analyzers

AMETEK's combined sulfur and hydrogen analyzers offer cost-effective analysis for optimal control of tail gas treaters, with high performance and reliability.

PROBLEM

To ensure the complete removal of hydrogen sulfide (H₂S), as well as efficient operations, measurement of H₂S and hydrogen (H₂) is required.



931 ANALYZER

PROCESS AND EQUIPMENT

The Claus sulfur recovery process is limited to 97 to 98% overall recovery efficiency because of the equilibrium nature of the reaction. To meet more stringent regulatory requirements, many sulfur recovery units (SRUs) are followed by a tail gas treater unit (TGTU) or tail gas clean-up unit (TGCU).

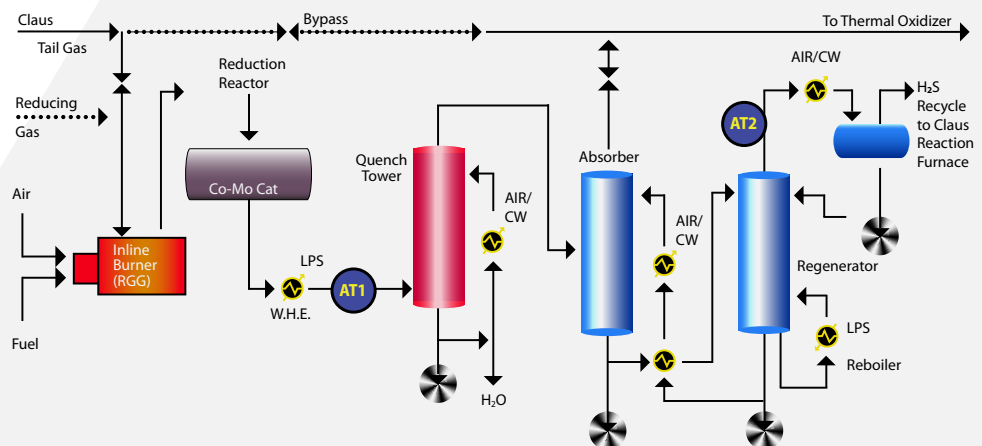
In the standard process, all unreduced sulfur components are catalytically converted to H₂S in a reduction reactor.

After cooling, the H₂S is selectively absorbed from the tail gas by means of an amine solvent or absorber. In the amine regenerator, the bulk of the H₂S is desorbed from the solvent and recycled back to the front end of the Claus SRU.

The off-gas from the top of the absorber is incinerated to sulfur dioxide (SO₂).

TAIL GAS TREATMENT UNIT

- AT1**
- Reduction Reactor Off-Gas**
- SO₂ (0 to 50 ppm) breakthrough
 - H₂ (2 to 4%) to ensure complete reduction
 - AMETEK 931 with H₂ option
- AT2**
- Regenerator Outlet**
- H₂ (2 to 4%) to ensure complete reduction
 - H₂S (0 to 50 ppm) for efficiency and compliance
 - COS (0 to 200 ppm) for amine protection or H₂S/COS ratios



MEASUREMENTS

Primary measurements

The basic analyzer requirements are to measure H₂ at the outlet of the reduction reactor and the H₂S at the top of the absorber. However, both measurements can be made at the top of the absorber as the H₂ content does not change after the reactor.

Secondary measurements

SO₂ breakthrough in the reduction reactor off-gas and the COS concentration in the absorber outlet are also important measurements for optimum control.

AMETEK ANALYZERS

The 931 and 932 analyzers are based on the 9xx series ultraviolet (UV) photometers used extensively in SRU tail gas, feed gas, and stack gas applications. A thermal conductivity (TC) detector is integrated into the UV sample cell for the continuous measurement of H₂. The non-moving-parts UV light bench is used for single gas measurement or the multi-wavelength analyzer for a combination of sulfur gases. The 931 analyzer can measure both H₂ and H₂S continuously, and can monitor both SO₂ and H₂ after the reduction reactor. The 932 can measure two or more sulfur gases, as well as H₂, from one sample point.

Possible combinations

H₂S: 0-50 ppm/0 to 500 ppm/0 to 5% (higher ranges available)

H₂S + H₂: H₂ 0 to 5%/0 to 10%

H₂S + COS or CS₂: COS or CS₂ 0 to 500 ppm minimum range

COS or CS₂: 0 to 200 ppm as primary measurement

H₂S + H₂ + COS or CS₂ or SO₂: SO₂ 0 to 50 ppm

H₂: H₂ 0 to 5% / 0 to 10%

H₂S + NH₃: for sour water stripper (SWS) feed gas

RESULTS

- Fast response – both detection principles (UV & TC) are continuous and instantaneous. Response time <30 seconds compared to three minutes or more for gas chromatographs
- No consumables, no carrier gas
- Single sample point and one sample system for multiple measurements
- Safety – the unique HAG (heated acid gas) probe containing the pipe-mounted sample system components, can be completely isolated from the process on both the sample and vent legs of the analyzer. This allows the entire sample system to be back-purged before maintenance
- Combined spares and maintenance with other series 9xx analyzers used in the sulfur recovery plant

SALES, SERVICE & MANUFACTURING

USA - Pennsylvania

150 Freeport Road
Pittsburgh PA 15238
Tel: +1 412 828 9040
Fax: +1 412 826 0399

USA - Delaware

455 Corporate Blvd.
Newark DE 19702
Tel: +1 302 456 4400
Fax: +1 302 456 4444

Canada - Alberta

2876 Sunridge Way NE
Calgary AB T1Y 7H9
Tel: +1 403 235 8400
Fax: +1 403 248 3550

WORLDWIDE SALES AND SERVICE LOCATIONS

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Germany

Tel: +49 2159 9136 0
Fax: +49 2159 9136 39

India

Tel: +91 80 6782 3200
Fax: +91 80 6780 3232

Singapore

Tel: +65 6484 2388
Fax: +65 6481 6588

China

Beijing
Tel: +86 10 8526 2111
Fax: +86 10 8526 2141
Chengdu
Tel: +86 28 8675 8111
Fax: +86 28 8675 8141
Shanghai
Tel: +86 21 5868 5111
Fax: +86 21 5866 0969



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