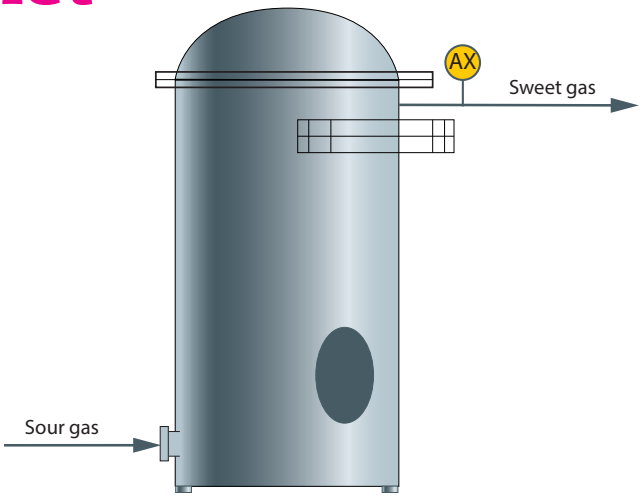
Natural gas processing: H_2S in solid scavenger outlet

Benefits at a glance

- Fast response to H_2S concentration changes
- Laser-based measurement is highly selective and accurate for H_2S in natural gas
- Patented differential spectroscopy technique measures H_2S at low ppmv
- levels in natural gas
- Low maintenance and OPEX costs – no cylinders of carrier and combustion gases, or lead acetate tape



Solid scavenger vessel for H_2S removal

Gas sweetening using a solid scavenger

Raw natural gas extracted from different geological formations contains varying amounts of acid gases (H_2S and CO_2). While amine treatment is the most widely used gas sweetening process, a solid scavenger is sometimes used to remove low to medium concentrations of H_2S and mercaptans. Iron oxide (Fe_2O_3) is one type of solid scavenger which reacts with H_2S in the gas stream to form Fe_2S_3. This process is used remove H_2S to meet specifications for gas transmission pipelines. The maximum allowable concentration of H_2S in natural gas is typically < 5 ppm.

On-line measurement of H_2S

The solid scavenger material in the vessel must be changed out or regenerated periodically. An iron oxide scavenger bed may be regenerated using air. Monitoring the H_2S concentration in gas exiting the scavenger vessel ensures the gas meets specifications for pipeline transmission and provides an indication of scavenger condition.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology proven highly effective for this important measurement. WITH Tunable diode laser absorption spectroscopy (TDLAS), a SpectraSensors technology, has proven highly effective for this important measurement. TDLAS analyzers have an exceptionally fast response to changes in H_2S concentration, an important performance characteristic for monitoring the efficiency of the scrubbing process and quality of the resulting natural gas product. Endress+Hauser's patented differential spectroscopy technique enables detection and quantitation of low ppm levels of H_2S in the outlet of a solid scavenger vessel. Laser and detector components are isolated and protected from the process gas and entrained contaminants avoiding fouling and corrosion, and ensuring stable long-term operation and accurate measurements.

Endress+Hauser

People for Process Automation

Application data	
Target component (Analyte)	H_2S in solid scavenger vessel outlet
Typical measurement ranges*	0-10, 0-20, 0-50, 0-100 ppmv
Typical repeatability	SS2100, SS2100a, SS2100i: ± 250 ppbv or ± 2% of reading JT33: ± 100 ppbv or ± 1% of reading
Typical accuracy	SS2100, SS2100a, SS2100i: ±500 ppbv at 4 ppmv or 16 ppmv JT33: ± 200 ppbv @ 4ppmv and ± 500 ppbv @ 16 ppmv
Measurement response time	<5 seconds
Principle of measurement	Tunable diode laser absorption spectroscopy
Validation	Binary cal gas bottle with methane or nitrogen background (Nitrogen is optional with auto-validation)

* These low ppm measurements are performed by differential TDLAS.

Typical background stream composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Hydrogen sulfide (H_2S)	0	<2 ppmv	10 ppmv
Water (H_2O)	0	50 ppmv	5,000 ppmv
Nitrogen (N_2)	0	0.1	3
Oxygen (O_2)	0	0	1
Carbon dioxide (CO_2)	0	1	3
Methane (C_1)	50	95	100
Ethane (C_2)	0	3	20
Propane (C_3)	0	1	15
Butanes(C_4)	0	0.5	5
Pentanes and heavier (C_5+)	0	0.4	2

The background stream composition must be specified for proper calibration and measurement performance. Specify the normal composition, along with the minimum and maximum expected values for each component, especially H_2S, the measured component. Other stream compositions may be allowable with approval from Endress+Hauser.