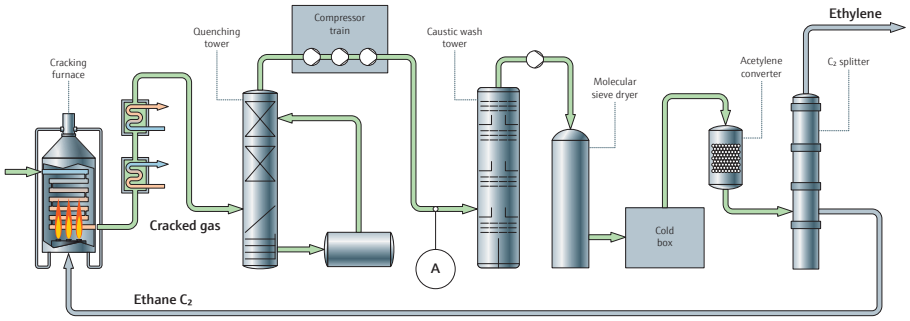
Petrochem: H_2S in caustic wash tower inlets



H_2S measurement point at caustic wash tower inlet

Benefits at a glance

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

Hydrogen sulfide in cracked gas

During steam cracking of hydrocarbon feed stocks sulfur compounds present in the feed gas are converted to H_2S. Sulfiding agents added to the feed gas to passivate heating coils inside the cracking furnace to reduce coke formation also add to the amount of H_2S in cracked gas. H_2S must be removed because it is corrosive to process equipment and will poison and deactivate catalysts. Inside a caustic wash tower, cracked gas is contacted with a countercurrent stream of aqueous sodium hydroxide (NaOH) which reacts with H_2S forming sodium sulfide (Na_2S) and sodium hydrosulfide (NaHS) which are absorbed in the liquid phase. Fresh NaOH solution must be added to maintain efficiency of the H_2S scavenging reaction within the caustic wash tower.

Hydrogen sulfide measurement

All cracked gas passes through the caustic wash tower, so maintaining H_2S scavenging efficiency directly affects plant operation. Monitoring the H_2S concentration in cracked gas entering a caustic wash tower provides information needed to control NaOH concentration and compensate for changes in H_2S loading and NaOH depletion.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology that has proven highly effective in this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in H_2S concentration, an important performance characteristic for monitoring and controlling H_2S removal in caustic wash tower units. Endress+Hauser's patented differential spectroscopy technique enables detection and quantitation of ppmv levels of H_2S in cracked gas. Laser and detector components are isolated and protected from process gas and contaminants avoiding fouling and corrosion and ensuring stable long-term operation.

Endress+Hauser
People for Process Automation

Application data	
Target component (Analyte)	Hydrogen sulfide in caustic wash tower inlets
Typical measurement range	0-500 ppmv*
Repeatability for JT33	Consult factory
Repeatability for SS2100, SS2100a, SS2100i	± 2% of full scale**
Measurement response time	1 to ~60 seconds*
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (H_2S scrubber included)
Validation	Certified blend of H_2S in nitrogen balance

*Consult your local Endress+Hauser sales center for alternate ranges

**Typical repeatability listed. Based on a single stream composition having minimal variation and falling within the table below. Consult your local Endress+Hauser sales center when stream composition is expected to vary.

Typical background stream composition

Component	Unit	Min	Typical	Max
Hydrogen sulfide (H_2S)	ppmv	0	500	1000
Carbon dioxide (CO_2)	ppmv	10	200	500
Hydrogen (H_2)	mol%	15	25	30
Methane (CH_4)	mol%	10	20	30
Ethane (C_2H_6)	mol%	10	15	30
Ethylene (C_2H_4)	mol%	20	25	40
Acetylene (C_2H_2)	mol%	0	0.3	0.5
Propylene (C_3H_6)	mol%	0	7.5	15
Propane (C_3H_8)	mol%	0	7.5	150
Methyl acetylene propyne (C_3H_4)	mol%	0	0.03	0.1
Propadiene (C_3H_4)	mol%	0	0.02	0.1
Carbon monoxide (CO)	mol%	0	0.05	0.1
Butanes (C_4H_{10})	mol%	0	0.05	0.1
Butenes (C_4H_8)	mol%	0	0.3	0.5
1,3-Butadiene	mol%	0	0.5	1
C5+	mol%	0	0.1	0.5
Total	mol%		100	

The background stream composition must be specified for proper calibration and measurement performance. Specify the typical 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.