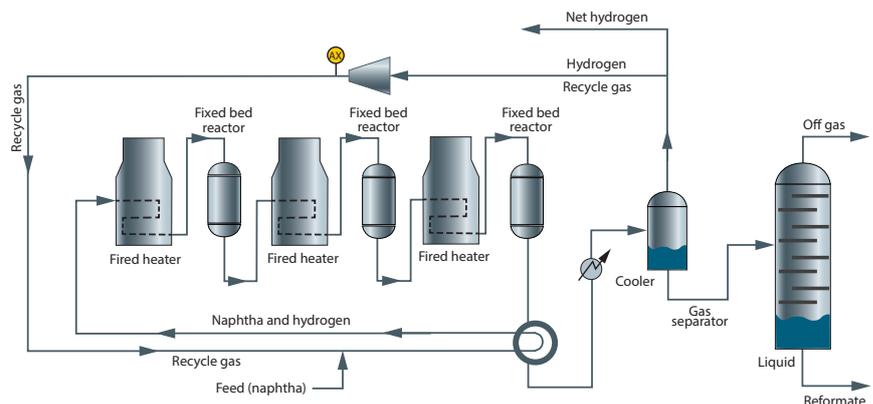


Refining: H₂S in hydrogen recycle for catalytic reformer

Benefits at a glance

- Fast response to H₂S concentration changes
- Patented differential spectroscopy technique measures H₂S at low ppmv levels in catalytic reformer hydrogen recycle gas
- Laser-based measurement is highly selective and accurate for H₂S in catalytic reformer hydrogen recycle gas
- Low maintenance and OPEX costs – no cylinders of carrier or combustion gases, or lead acetate tape



Semi-regenerative catalytic reformer

Catalytic reformings

A catalytic reformer unit converts naphtha into high-octane aromatic compounds termed reformates used in gasoline blending and yields large quantities of hydrogen that is recycled and used in other processes. A semi-regenerative catalytic reformer (SRR) unit has three fixed bed catalytic reactors employing a platinum/rhenium (Pt/Re) catalyst on a chloride alumina support. H₂S and other sulfur compounds poison the Pt/Re catalyst increasing coking, and decreasing hydrogen production and reformate yield. For this reason the naphtha feed to an SSR undergoes treatment in a hydrotreater unit to remove H₂S and other sulfur compounds.

On-line H₂S monitoring

On-line monitoring of the H₂S concentration in SRR hydrogen recycle streams enables refineries to control H₂S contamination in SRR reactors at the low levels required for optimum catalyst activity and reformate yield. Catalyst activity in an SRR gradually decreases over time as coke is deposited on the catalyst. The

SRR must be shut down periodically to burn off coke deposits which halts production of reformate and hydrogen. Monitoring and controlling the H₂S level in hydrogen recycle gas helps extend the time period between SRR shut downs for catalyst regeneration.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology proven highly effective in this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in H₂S concentration, an important performance characteristic for monitoring and controlling H₂S levels in an SRR unit. Endress+Hauser's patented differential spectroscopy technique enables detection and quantitation of low ppm levels of H₂S in SRR hydrogen recycle gas. Laser and detector components are isolated and protected from process gas and entrained contaminants avoiding fouling and corrosion, and ensuring stable long-term operation and accurate measurements.

Application data

Target component (Analyte)	H ₂ S in semi-regenerative reformer hydrogen recycle gas
Typical measurement ranges	0-50 through 0-300 ppmv*
Typical repeatability	±2% of full scale*
Measurement response time	1 to ~60 seconds*
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (H ₂ S scrubber included)
Validation	Certified blend of H ₂ S in nitrogen balance

*Consult factory for alternate ranges.

Typical stream composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Hydrogen (H ₂)	70	80	90
Methane (C1)	8	12	20
Ethane (C2)	3	5	10
Propane (C3)	0	2	5
i-butane i-C4	0	1	2
n-butane n-C4	0	<1	2
Pentanes (C5)	0	0	1

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 H₂S, the measured component. Other stream compositions may be allowable with approval from Endress+Hauser.