

Application Note

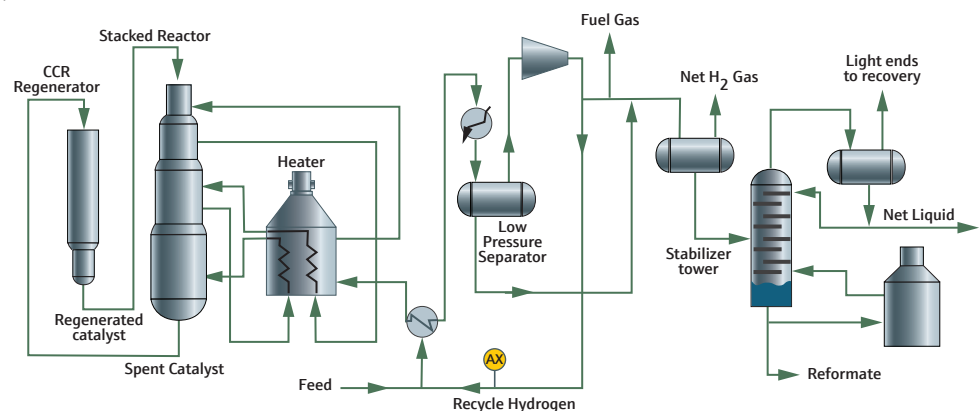
H₂S in continuous catalytic reformer hydrogen recycle streams

Industry:
Refining
Application Note 26002

Key Points

- Fast response to H₂S concentration changes for process monitoring and control
- Non-contact laser measurement avoids detector contact, corrosion and damage from H₂S, HCl and other contaminants
- Laser-based measurement is highly selective and accurate for H₂S in catalytic reformer hydrogen recycle streams

Catalytic reforming A catalytic reformer unit converts naphtha into high-octane compounds termed reformates used in gasoline blending, and yields large quantities of hydrogen, which is recycled and used in other processes. Sulfur compounds in the naphtha feed are converted to H₂S. A continuous catalytic reformer (CCR) unit has a three-stage stacked reactor 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 undergoes treatment in a hydrotreater unit to remove H₂S and other sulfur compounds.



Continuous Catalytic Reformer

On-line H₂S monitoring On-line monitoring of the H₂S concentration in CCR hydrogen recycle gas streams enables refineries to control H₂S contamination at the low levels required for optimum catalyst activity and reformate yield.

SpectraSensors' solution SpectraSensors tunable diode laser absorption spectroscopy (TDLAS) analyzers have proven highly effective for this important measurement. TDLAS analyzers have an exceptionally fast response to changes in H₂S concentration, an important performance characteristic for monitoring and controlling H₂S levels in refinery CCR units. Laser and detector components of a TDLAS analyzer 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 Continuous Catalytic Reformer Hydrogen Recycle Gas
Typical Measurement Ranges	0-50 ppm*
Typical Repeatability	±1 ppm
Measurement Response Time	1 to ~60 seconds
Principle of Measurement	Tunable Diode Laser Absorption Spectroscopy
Validation	Certified blend of H ₂ S in pure N ₂

*Consult factory for alternate ranges.

Typical Stream Composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Hydrogen (H ₂)	70	80	90
Methane (C ₁)	8	12	20
Ethane (C ₂)	3	5	10
Propane (C ₃)	0	2	5
i-Butane (C ₄ H ₁₀)	0	1	2
n-Butane (C ₄ H ₁₀)	0	<1	2
C ₅ +	+0	0	1

The background stream composition must be specified for proper assessment, calibration and measurement performance. Specify the normal composition, along with the minimum expected values for each component, especially H₂S, the measured component. Other stream components may be allowable with approval from SpectraSensors.

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