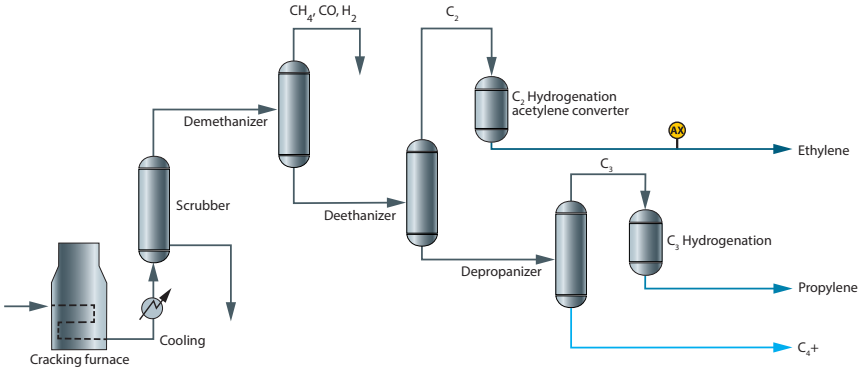
Petrochem: C_2H_2 in outlet of back end acetylene converters

Benefits at a glance

- Extremely fast response to C_2H_2 concentration changes
- Laser-based measurement is highly selective and accurate for C_2H_2 in ethylene
- Non-contact laser measurement avoids fouling and corrosion for reliable long-term operation
- Low maintenance and OPEX costs – no cylinders of carrier gas or other consumables



Back end acetylene converter

Ethylene purity

Separating acetylene (C_2H_2) from ethylene (C_2H_4) is difficult due to the similar volatility of these gases. A catalytic hydrogenation reaction step is typically employed to convert acetylene into ethylene. The concentration of C_2H_2 is reduced from thousands of ppmv at the inlet of an acetylene converter to hundreds of ppmv at the mid-bed down to low ppmv or ppbv levels at the outlet of the converter.

Acetylene measurement

Monitoring the acetylene concentration in ethylene exiting an acetylene converter ensures the conversion process is operating efficiently and ethylene purity specifications are being met. The typical measurement range for C_2H_2 at the outlet of an acetylene converter is 0-5 ppmv. Out-of-spec ethylene may be sent to flare to avoid contamination and shutdown of downstream equipment and the high cost of such incidents.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology that has proven highly effective for this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in acetylene concentration, an important performance characteristic for monitoring ethylene purity exiting an acetylene converter. Laser and detector components are isolated and protected from process gas and contaminants avoiding fouling and corrosions and ensuring stable long-term operation.

Endress+Hauser

People for Process Automation

Application data

Target component (Analyte)	C_2H_2 outlet of back end acetylene converter
Typical measurement range	0-5 ppmv*
Typical repeatability	±0.1 ppmv*
Measurement response time	1 to ~60 seconds*
Principle of measurement	Non-differential tunable diode laser absorption spectroscopy (TDLAS)
Validation	A certified blend of C_2H_2 in a balance that matches the sample

*Application specific; consult factory.

Typical background stream composition

Component	Unit	Typical concentration	Min for application	Max for application
Acetylene (C_2H_2)	ppmv	0-5	0	10
Ethylene (C_2H_4)	mol%	65	60	90
Ethane (C_2H_6)	mol%	33	0	40
Hydrogen (H_2)	ppmv	0-50	0	1000
Carbon monoxide (CO)	ppmv	0.5	0	1000
Carbon dioxide (CO_2)	ppmv	<1.0	0	1000
Methane (CH_4)	ppmv	50 - 100	0	1000
Propylene (C_3H_6)	ppmv	3000	0	5000
Total	mol%	100		

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