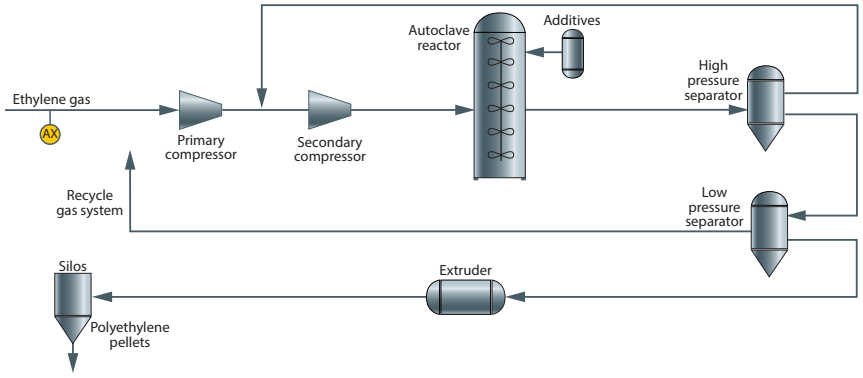
Petrochem: C_2H_2 in pure ethylene

Benefits at a glance

- Fast response to C_2H_2 concentration changes
- Laser-based measurement is highly selective and accurate for C_2H_2 in pure 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



Typical low density polyethylene production process

Ethylene purity

Ethylene is an important feedstock for production of polyethylene polymers and other petrochemicals. Catalysts used in LDPE, HDPE and LLDPE polymerization processes are highly sensitive to acetylene (C_2H_2) and other contaminants that poison and reduce catalyst activity. Purity specifications for polymer-grade ethylene are very stringent. The maximum allowable acetylene concentration for some polymerization processes is 1 ppmv.

Acetylene measurement

The acetylene concentration in ethylene is measured at the outlet of the acetylene converter in the production plant and at custody transfer points along pipelines transporting the gas or recovering it from storage in underground salt caverns. When ethylene from multiple sources is mixed, purity may be compromised and must be measured to ensure contaminant levels are within specifications. Out-of-spec ethylene may be rejected by polyethylene producers, or sent to flare incurring high costs.

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 in production plants and at custody transfer points in the feed streams to polymer plants. Laser and detector components are isolated and protected from process gas and contaminants avoiding fouling and corrosion and ensuring stable long-term operation.

Application data	
Target component (Analyte)	C_2H_2 in pure ethylene
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	Certified blend of C_2H_2 in nitrogen balance

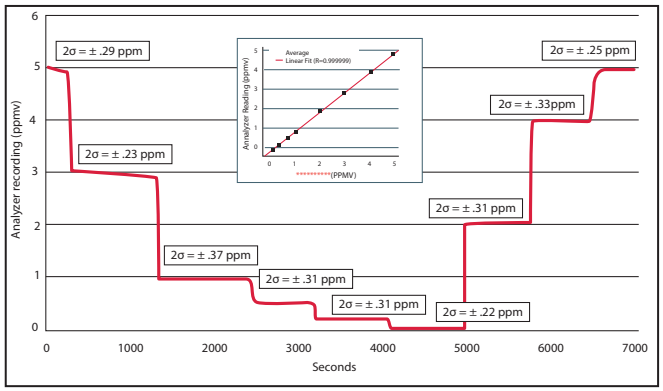
*Consult factory for alternate ranges

Typical background stream composition

Component	Unit	Typical concentration	Min for application	Max for application
Ethylene (C_2H_4)	mol%	99.95	99.9	100
Acetylene (C_2H_2)	ppmv	<1	0	5
Water (H_2O)	ppmv	<1	0	5
Carbon monoxide (CO)	ppmv	0.5	0	3
Carbon dioxide (CO_2)	ppmv	<1	0	5
Hydrogen (H_2)	ppmv	<1	0	5
"Light inerts" (C_1+C_2+N_2)	ppmv	100-200	0	1000
Propylene (C_3H_6)	ppmv	3000	0	10
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.

Typical performance



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AI01287C/66/EN/01.21

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