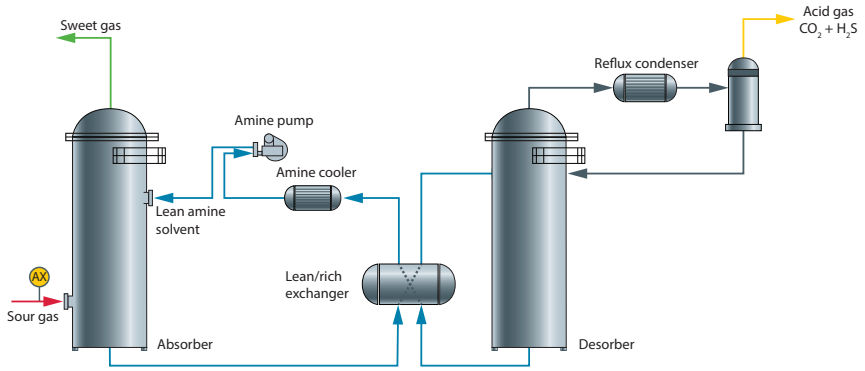
Natural gas processing: CO_2 in raw natural gas feed



Amine treatment unit

Benefits at a glance

- Fast response to CO_2 concentration changes
- Laser based measurement is highly selective and accurate
- for CO_2 in natural gas
- Non-contact laser measurement avoids fouling and corrosion for reliable long-term operation
- Low maintenance and OPEX costs – no carrier gases or consumable items

Amine treatment and gas sweetening

Raw natural gas extracted from different geological formations contains varying amounts of acid gases (CO_2 and H_2S). Natural gas containing CO_2 at concentrations in excess of 2% and H_2S concentrations in the ppmv range is highly corrosive. Natural gas sweetening processes remove acid gases from sour gas to meet specifications for gas transmission pipelines. The CO_2 concentration in gas intended for cryogenic liquefaction into LNG must be reduced below 50 ppmv to avoid solidification and damage to plant equipment. Amine treatment units are commonly used in gas processing plants to remove CO_2 from natural gas.

Process control and optimization

In operation, sour gas is contacted with an aqueous amine solution which removes CO_2 by chemical reaction and absorption. Measuring the CO_2 in sour gas at the inlet and sweet gas at the outlet of an amine treatment is important for control and optimization of the treatment process.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology proven highly effective for this critical gas processing measurement. TDLAS analyzers have an exceptionally fast response to changes in CO_2 concentration, an important performance characteristic for monitoring the efficiency of the amine treatment process and quality of the resulting natural gas product. Laser and detector components are isolated and protected from the process gas and entrained contaminants avoiding fouling and corrosion and ensuring stable long-term operation and accurate measurement in the field.

Endress+Hauser

People for Process Automation

Application data	
Target components (Analyte)	CO_2 in raw natural gas
Typical measurement range	0-100 ppmv
Typical repeatability	±2 ppmv
Measurement response time	1 to ~60 seconds*
Principle of measurement	Non-differential tunable diode laser absorption spectroscopy (TDLAS)
Validation	Certified blend of CO_2 in a balance of nitrogen or methane

*Application specific; consult factory.

Typical background stream composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Hydrogen sulfide (H_2S)	0	<2 ppmv	10 ppmv
Water (H_2O)	0	<1 ppmv	1
Nitrogen (N_2)	0	0.1	3
Oxygen (O_2)	0	0	1
Methane (C1)	75	95	100
Carbon dioxide (CO_2)	0	0	3
Ethane (C2)	0	3	10
Propane (C3)	0	1	5
Butanes(C4)	0	0.5	2
Pentanes and heavier (C5+)	0	0.4	0.5

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