

## Application Note

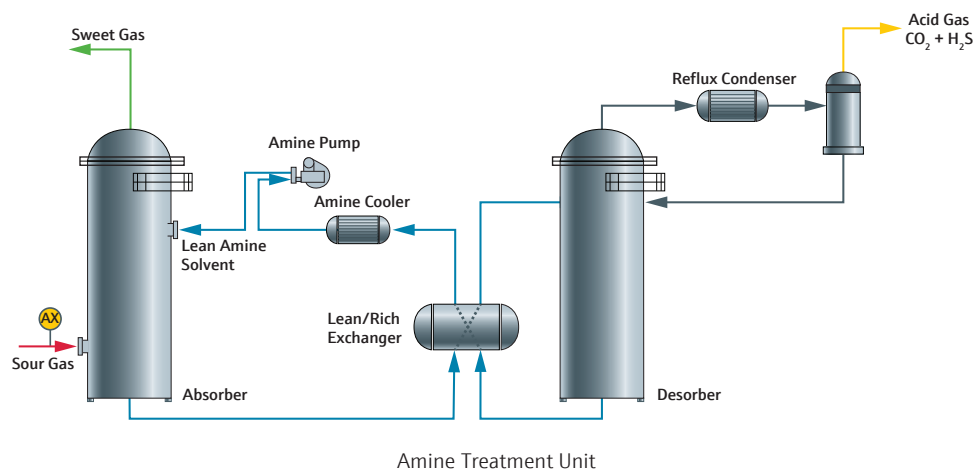
# Carbon dioxide in raw natural gas

**Industry:**  
Natural Gas Processing  
Application Note 34103

### Key Points

- Fast response to CO<sub>2</sub> concentration changes
- Laser based measurement is highly selective and accurate for CO<sub>2</sub> 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<sub>2</sub> and H<sub>2</sub>S). Natural gas containing CO<sub>2</sub> at concentrations in excess of 2% and H<sub>2</sub>S concentrations in the ppm range is highly corrosive. Natural gas sweetening processes remove acid gases from sour gas to meet specifications for gas transmission pipelines. The CO<sub>2</sub> concentration in gas intended for cryogenic liquefaction into LNG must be reduced below 50 ppm to avoid solidification and damage to plant equipment. Amine treatment units are commonly used in gas processing plants to remove CO<sub>2</sub> from natural gas.



**Process control and optimization** In operation, sour gas is contacted with an aqueous amine solution which removes CO<sub>2</sub> by chemical reaction and absorption. Measuring the CO<sub>2</sub> 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.

**SpectraSensors' solution** SpectraSensors tunable diode laser absorption spectroscopy (TDLAS) analyzers have proven highly effective for this critical gas processing measurement. TDLAS analyzers have an exceptionally fast response to changes in CO<sub>2</sub> 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.

## Application Data

Target Components (Analyte)	CO <sub>2</sub> in Raw Natural Gas
Typical Measurement Range	0-100 ppm
Typical Repeatability	±2 ppm
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Non-differential Tunable Diode Laser Absorption Spectroscopy
Validation	Certified blend of CO <sub>2</sub> in a balance that matches the sample

\*Application specific; consult factory.

## Typical Background Stream Composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Hydrogen Sulfide (H <sub>2</sub> S)	0	<2 ppm	10 ppm
Water (H <sub>2</sub> O)	0	<1 ppm	1
Nitrogen (N <sub>2</sub> )	0	0.1	3
Oxygen (O <sub>2</sub> )	0	0	1
Methane (C <sub>1</sub> )	75	95	100
Carbon Dioxide (CO <sub>2</sub> )	0	0	3
Ethane (C <sub>2</sub> )	0	3	10
Propane (C <sub>4</sub> )	0	1	5
Butanes (C <sub>4</sub> H <sub>10</sub> )	0	0.5	2
C <sub>5</sub> +	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, especially CO<sub>2</sub>, the measured component. Other stream compositions may be allowable with approval from SpectraSensors.

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