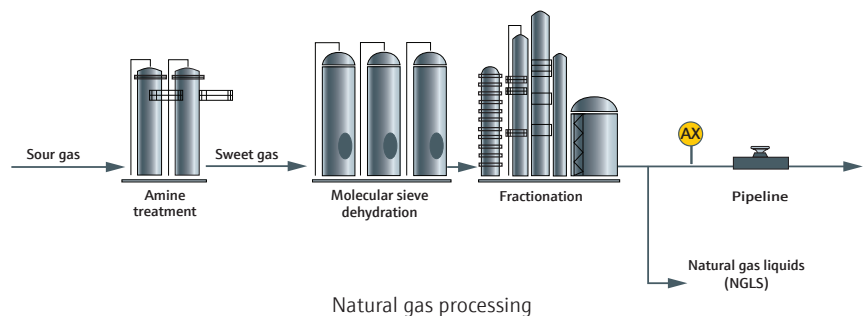


Natural gas processing: H₂O in natural gas product (product purity/residue gas)

Benefits at a glance

- Fast response to H₂O concentration changes
- Patented differential spectroscopy technique measures H₂O at sub-ppmv levels in natural gas
- Integrated permeation tube supports automated validation checks
- Laser-based measurement is highly selective and accurate for H₂O in natural gas



Natural gas processing

Natural gas from different geological formations contains varying amounts of contaminants and natural gas liquids (NGLs). Natural gas processing involves removal of H₂O, H₂S and CO₂ and cryogenic separation of NGLs from methane (CH₄) to produce a pipeline quality natural gas product commonly referred to as residue gas. After processing, residue gas is transported through pipelines to end users such as natural gas and electric utilities.

Measurement of H₂O to meet specifications

Molecular sieve dehydration is used to obtain the very low H₂O concentration (< 1 ppmv) required for cryogenic separation of NGLs from natural gas. Contaminants including H₂O, H₂S and CO₂ are measured in natural gas to ensure purity specifications are met and documented as required in tariff and sales agreements between suppliers, carriers, and end users.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology that has proven highly effective for this important measurement. TDLAS analyzers have an exceptionally fast response to changes in H₂O concentration, an important performance characteristic for monitoring H₂O in residue gas. Endress+Hauser's patented differential spectroscopy technique using SpectraSensors technology enables detection and measurement of sub-ppmv levels of H₂O in natural gas. An integrated permeation tube supports automated validation checks to verify the analyzer is operating properly during the extended periods of time when H₂O is not present in the gas. Laser and detector components are isolated and protected from process gas and contaminants avoiding fouling and corrosion, and ensuring stable long-term operation and accurate measurements in the field.

Application data

Target component (Analyte)	H ₂ O in natural gas product
Typical measurement range	0-10 ppmv*
Typical accuracy	±50 ppb at 0.5 ppmv ±240 ppb at 10 ppmv
Typical repeatability	±0.03 ppmv
Measurement response time	1 to ~60 seconds*
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (H ₂ O dryer included)
Validation	Integrated permeation system

* Consult factory for alternate ranges

Typical background stream composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Water (H ₂ O)	0	< 1 ppmv	10 ppmv
Nitrogen (N ₂)	0	0.1	3
Oxygen (O ₂)	0	0	1
Methane (CH ₄)	90	95	100
Carbon dioxide (CO ₂)	0	0	3
Ethane (C ₂ H ₆)	0	3	7
Propane (C ₃ H ₈)	0	1	2
Butanes (C ₄ H ₁₀)	0	0.5	1
Pentanes plus (C ₅ +)	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 H₂O, the measured component. Other stream compositions may be allowable with approval from Endress+Hauser.