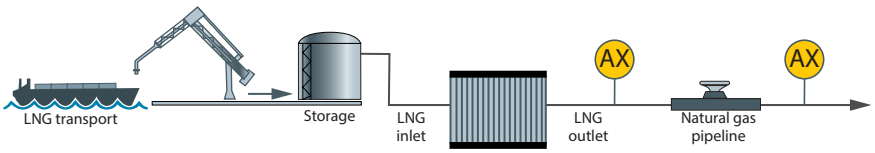
LNG: H_2O in LNG product terminal

Benefits at a glance

- Fast response to H_2O concentration changes
- Patented differential spectroscopy technique measures H_2O at sub-ppmv levels in vaporized LNG product
- Integrated permeation tube supports automated validation checks
- Laser-based measurement is highly selective and accurate for H_2O in vaporized LNG product



Open rack vaporizer

LNG vaporization

Liquefied natural gas (LNG) is shipped as a cryogenic liquid at a temperature of -160 °C. LNG received at an import terminal must be vaporized into a gas for custody transfer and pipeline distribution. Open rack vaporizers using seawater as a heat transfer medium are a common approach to regasification of LNG. Measuring H_2O in gasified LNG helps detect the presence of leaks in the vaporization heat exchanger that can compromise gas quality for custody transfer.

Measurement of H_2O to meet specifications

Natural gas is dehydrated to < 0.1 ppmv H_2O prior to cryogenic liquefaction, storage, transfer and export shipment as LNG. Shipments arriving at an import terminal are vaporized prior to custody transfer and distribution. Gasified LNG may be mixed with other fuels containing higher levels of H_2O, or a leak in the vaporizer heat exchanger may introduce H_2O. Monitoring the gasified LNG stream ensures specifications are met at custody transfer points in the distribution system.

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 H_2O concentration, an important performance characteristic for ensuring LNG vaporized for custody transfer and pipeline distribution meets specifications. An integrated permeation tube supports automated validation checks to verify the analyzer is operating properly during extended periods of time when H_2O is not present. 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.

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Application data	
Target component (Analyte)	H_2O in LNG product (regasification at import terminal)
Typical measurement range	0-10 ppmv*
Typical accuracy	±50 ppbv at 0.5 ppmv ±240 ppbv 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_2O dryer included)
Validation	Integrated permeation system

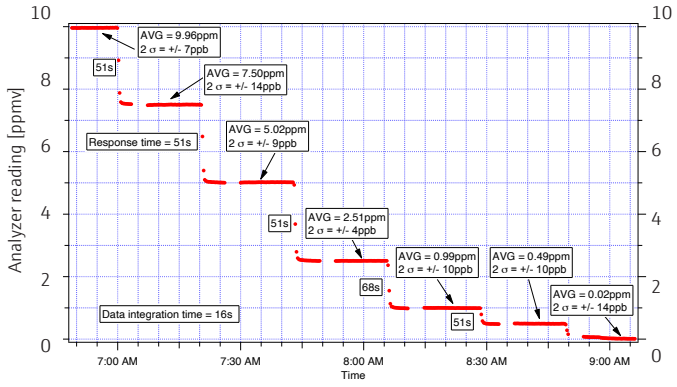
*Consult factory for alternate ranges.

Typical background stream composition			
Component	**Minimum (Mol%)**	**Typical (Mol%)**	**Maximum (Mol%)**
Water (H_2O)	0	<1 ppmv	10 ppmv
Nitrogen (N_2)	0	0.1	3
Oxygen (O_2)	0	0	1
Methane (C1)	90	95	100
Carbon dioxide (CO_2)	0	0	3
Ethane (C2)	0	3	7
Propane (C3)	0	1	2
Butanes (C4)	0	0.5	1
Pentanes and heavier (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 water, the measured component. Other stream compositions may be allowable with approval from Endress+Hauser.

Step test H_2O in natural gas

The accompanying graph shows results of a Step test in which the concentration of H_2O was decreased from 10 ppmv down to 0 ppmv. Measurement repeatability at all concentrations is well within specifications (± 30 ppbv).



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