

Application Note

Water measurement in regasified LNG product

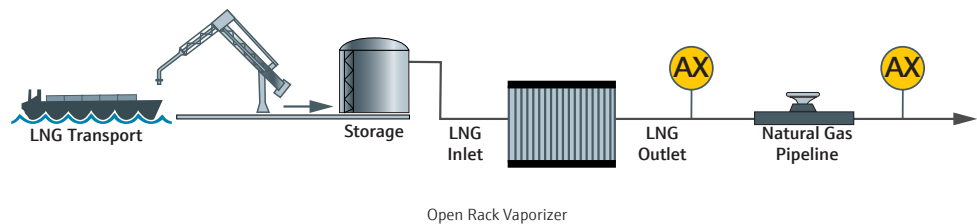
Industry:
Liquefied Natural Gas (LNG)
Application Note 44401

Key Points

- Fast response to H₂O concentration changes
- Patented* Differential Spectroscopy technique measures H₂O at sub-ppm levels in vaporized LNG product
- Integrated permeation tube supports automated validation checks
- Laser-based measurement is highly selective and accurate for H₂O in vaporized LNG product

*www.spectrasensors.com/patents

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 H₂O in gasified LNG helps detect the presence of leaks in the vaporization heat exchanger that can compromise gas quality for custody transfer.



Measurement of H₂O to meet specifications Natural gas is dehydrated to < 0.1 ppm_v H₂O 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 H₂O, or a leak in the vaporizer heat exchanger may introduce H₂O. Monitoring the gasified LNG stream ensures specifications are met at custody transfer points in the distribution system

SpectraSensors' solution SpectraSensors tunable diode laser absorption spectroscopy (TDLAS) analyzers have proven highly effective for this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in H₂O 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 H₂O 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.

Application Data

Target Component (Analyte)	H ₂ O in LNG Product (Regasification at Import Terminal)
Typical Measurement Range	0-10 ppm*
Typical Accuracy	±50 ppb at 0.5 ppm ±240 ppb at 10 ppm
Typical Repeatability	±0.03 ppm
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Differential Tunable Diode Laser Absorption Spectroscopy (H ₂ O dryer included)
Validation	Integrated Permeation System

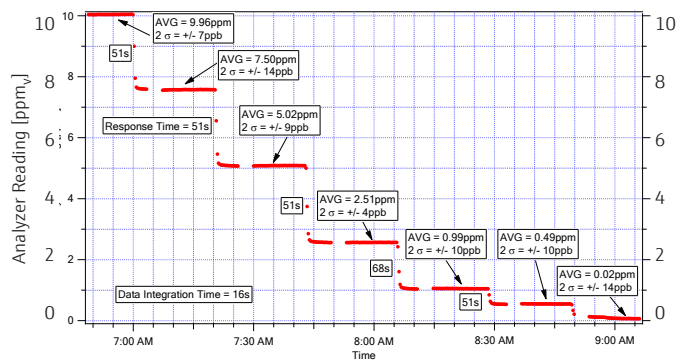
*Consult factory for alternate ranges.

Typical Background Stream Composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Water (H ₂ O)	0	<1 ppm	10 ppm
Nitrogen (N ₂)	0	0.1	3
Oxygen (O ₂)	0	0	1
Methane (C ₁)	90	95	100
Carbon Dioxide (CO ₂)	0	0	3
Ethane (C ₂)	0	3	7
Propane (C ₃)	0	1	2
Butanes (C ₄)	0	0.5	1
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 SpectraSensors.

Step test H₂O in natural gas The accompanying graph shows results of a Step test in which the concentration of H₂O was decreased from 10 ppm down to 0 ppm. Measurement repeatability at all concentrations is well within specifications (± 30 ppb).



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