

Application Note

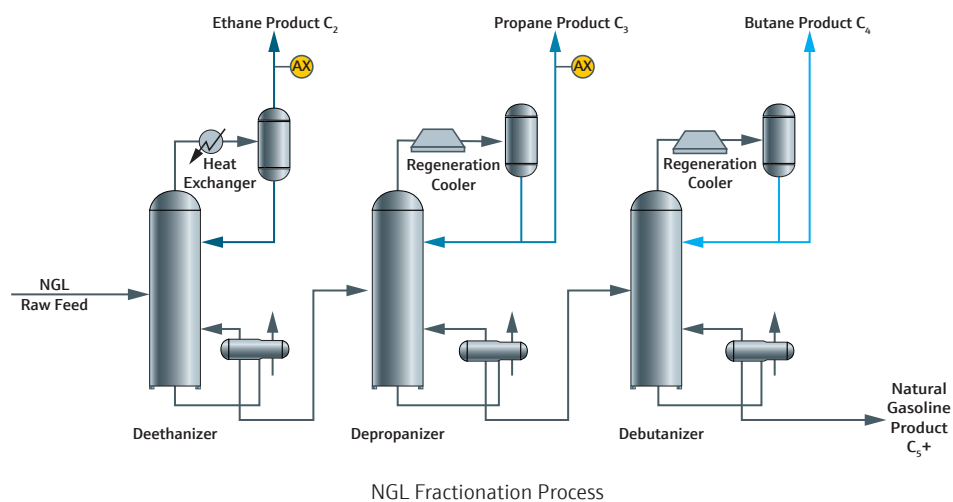
Water measurement in ethane/propane mix

Industry:
Natural Gas Processing
Application Note 35201

Key Points

- Fast response to H₂O concentration changes
- Patented* Differential Spectroscopy technique measures H₂O at low ppm levels in ethane/propane mix
- Laser-based measurement is highly selective and accurate for H₂O in ethane/propane mix
- Integrated permeation tube supports automated validation checks

Fractionation and recovery of NGLs Natural gas from some geological formations contains natural gas liquids (NGLs); ethane, propane, butane and a mix of C₅+ liquid condensates. These NGL compounds are commercially valuable as feedstocks for production of petrochemicals, octane-boosting gasoline additives, and for use as fuels. Cryogenic processing is used to separate and recover NGLs from natural gas using a series of fractionation columns. Ethane and propane are sometimes mixed to form an 80/20 hydrocarbon blend, termed E/P mix, which is used as a feedstock for ethylene plants.



Measurement of H₂O to meet purity specifications The purity specifications for E/P mix and other NGL fractionation products are based upon their intended use and downstream processing. Contaminants including H₂O, CO₂, and H₂S are measured in E/P mix to ensure purity specifications are met and documented as required in tariff and sales agreements between suppliers, carriers, and end users. Specifications and contracts typically state that E/P mix shall contain no free or entrained water.

SpectraSensors' solution SpectraSensors tunable diode laser absorption spectroscopy (TDLAS) analyzers have 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 levels in an NGL fractionation plant and at downstream custody transfer points. SpectraSensors' patented differential spectroscopy technique enables detection and measurement of low ppm levels of H₂O in E/P mix. 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 E/P mix product stream. Laser and detector components are isolated and protected from process gas and entrained contaminants avoiding fouling and corrosion, and ensuring stable long-term operation and accurate measurements.

*www.spectrasensors.com/patents

Application Data

Target Components (Analyte)	H ₂ O in Ethane/Propane Mix
Typical Measurement Ranges	0-10 ppm*
Typical Repeatability	±0.5 ppm or 2% of reading**
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.

** Repeatability is based on a single stream composition with minimal variation and which falls within the table below. If the stream composition varies, the factory should be consulted for specification.

Typical Background Stream Composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Methane (C ₁)	0	0.5	2
Ethane (C ₂)	65	85	90
Propane (C ₃)	0	15	30
C ₄ +	0	0	3
Carbon Dioxide (CO ₂)	0	100 ppm	1
Hydrogen Sulfide (H ₂ S)	0	10 ppm	1

The background stream composition must be specified for proper calibration and measurement performance. Specify the typical 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 SpectraSensors.