

Application Note

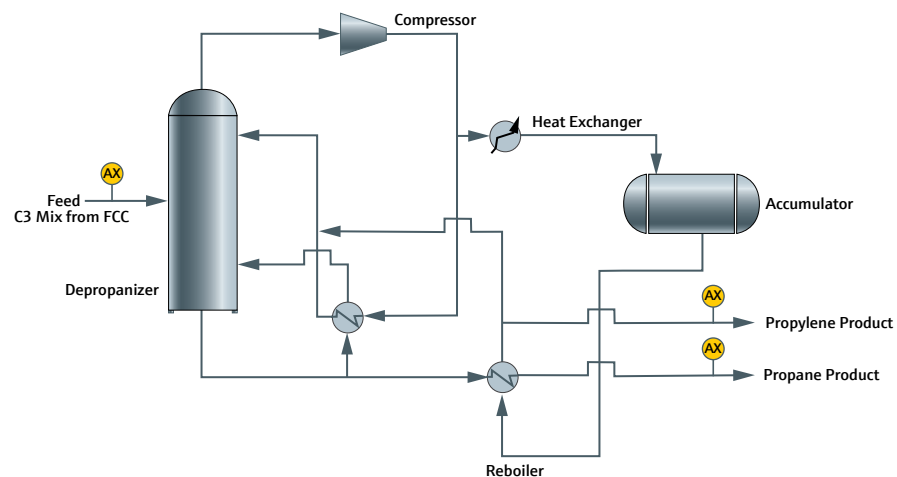
Water in propane/propylene mix

Industry:
Refining
Application Note 23501

Key Points

- Fast response to H₂O concentration changes
- Patented* Differential Spectroscopy technique measures H₂O at low ppm levels
- Laser-based measurement is highly selective and accurate for H₂O in C₃ mixtures
- Integrated permeation tube supports automated validation checks

FCCU propylene production Refinery Fluidized Catalytic Cracking Units (FCCU) are a major source of the propylene feedstock used in petrochemical plants. The yield of propylene from an FCCU varies with feedstock and operating conditions. Refineries operate FCCUs to achieve a balance of gasoline and propylene production, maximizing the production of one decreases the yield of the other. The gas plant associated with an FCCU separates fuel gas from C₃ and C₄ gases and gasoline, and contains treatment equipment to remove H₂O and other contaminants from these products.



Fractionation and Recovery of Propane and Propylene from an FCCU

On-line H₂O monitoring Many downstream petrochemical processes employ catalysts that are highly sensitive to H₂O and other contaminants. H₂O must be removed from C₃ propane/propylene mixtures to avoid carryover into the separated propane and propylene product streams. On-line monitoring of H₂O concentration in C₃ mix, and the separated propane and propylene products streams ensures purity specifications are met for downstream petrochemical production processes.

SpectraSensors' solution SpectraSensors tunable diode laser absorption spectroscopy (TDLAS) analyzers have proven highly effective in this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in H₂O concentration, an important performance characteristic for monitoring and controlling H₂O levels in propane and propylene streams. SpectraSensors' patented* differential spectroscopy technique enables detection and quantitation of low ppm levels of H₂O in propane/propylene mixtures. 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 measurements.

*www.spectrasensors.com/patents

Application Data

Target Component (Analyte)	Water in Propane/Propylene Mix
Typical Measurement Range	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 stream composition with minimal variation. If the stream composition varies, the factory should be consulted for specifications.

Typical Background Stream Composition

Background 1 - Propane

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Ethane (C ₂ H ₆)	0	1	2
Propane (C ₃ H ₈)	65	90	100
Propylene (C ₃ H ₆)	0	8	35
C ₄ +	0	1	2.5

Background 2 - 35/65 Propane/Propylene Mix

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Ethane (C ₂ H ₆)	0	1	2
Propane (C ₃ H ₈)	0	34	50
Propylene (C ₃ H ₆)	50	64	100
C ₄ +	0	1	2

Background 3 - 65/35 Propane/Propylene Mix

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Ethane (C ₂ H ₆)	0	1	2
Propane (C ₃ H ₈)	50	64	80
Propylene (C ₃ H ₆)	20	34	50
C ₄ +	0	1	2.5

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 SpectraSensors.

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