Petrochem: NH₃ in pure propylene



Propylene production process

Polymer-grade propylene

Catalysts used in polypropylene polymerization process are highly sensitive to NH_3 and other contaminants that poison and reduce catalyst activity. Purity specifications for polymer-grade propylene are very stringent. The maximum allowable NH_3 concentration for some polymerization processes is <1 ppmv.

On-line NH₃ measurement

On-line monitoring ensures the NH_3 content of polymer-grade propylene is within specifications for its intended use. Out-of-spec propylene may be rejected by polypropylene plants, require additional treatment steps, or sent to flare incurring high costs.

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 NH₃ concentration, an important performance characteristic for monitoring propylene purity in product plants and at custody transfer points in feed streams to polymer plants. Endress+Hauser's patented differential spectroscopy technique enables detection and quantitation of sub-ppmv levels of NH_3 in propylene. An integrated permeation tube supports automated validation checks to verify the analyzer is operating properly during the extended periods of time when NH₃ is not present in a propylene stream. Laser and detector components are isolated and protected from process gas and contaminants avoiding fouling and corrosion and ensuring stable long term operation.



Benefits at a glance

- Fast response to NH₃ concentration changes
- Patented differential spectroscopy technique measures NH₃ at sub-ppmv levels in propylene
- Integrated permeation tube supports automated validation checks
- Laser-based measurement is highly selective and accurate for NH₃ in propylene

Application data	
Target component (Analyte)	Ammonia in pure propylene
Typical measurement range	0-5 ppmv*
Typical repeatability	±0.04 ppmv
Measurement response time	1 to ~60 seconds
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (NH3 scrubber included)
Validation	Integrated permeation system

*Consult factory for alternate ranges.

Typical background stream composition					
Component	Unit	Typical concentration	Min for application	Max for application	
Propylene (C_3H_6)	Wt. %	99.75	99.5	100	
Ammonia (NH ₃)	ppmv	<1	0	0.5	
Ethylene (C ₂ H ₄)	ppmv	50	0	100	
Ethane + propane ($C_2H_6 + C_3H_8$)	Wt. %	0.25	0	0.5	
Diolefins + acetylenes	ppmv	<10	0	25	
Carbon monoxide (CO)	ppmv	<10	0	30	
Carbon dioxide (CO ₂)	ppmv	<1.0	0	2	
Oxygen (O ₂)	ppmv	<1	0	2	
Water (H ₂ O)	ppmv	<2	0	2	
Total	Mol. %	100			

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 ammonia, the measured component. Other stream compositions may be allowable with approval from Endress+Hauser.

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