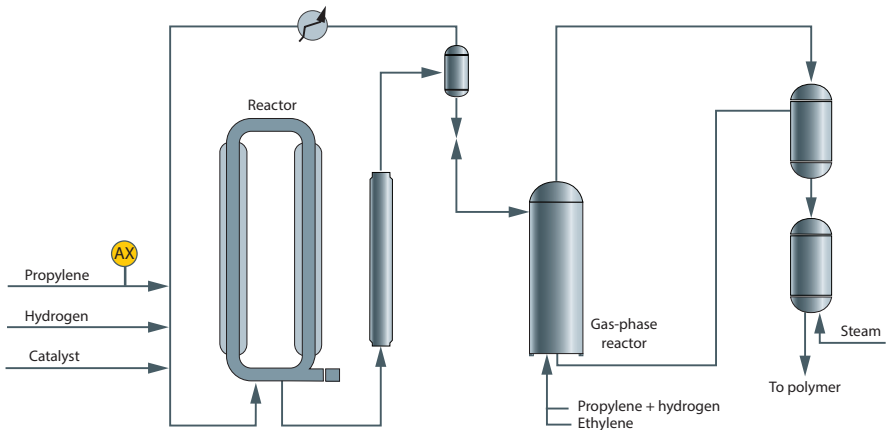
Petrochem: H_2O in pure propylene (steam cracker)

Benefits at a glance

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



Propylene production process

Propylene purity

Catalysts used in polypropylene polymerization process are highly sensitive to H_2O and other contaminants that poison and reduce catalyst activity. Purity specifications for polymer-grade propylene are very stringent. The maximum allowable H_2O concentration for some polymerization process is 1 ppmv.

On-line H_2O measurement

Propylene comes from three majors sources; refinery FCC units, ethylene cracking furnaces, and propane dehydrogenation units. The propylene product stream from these sources can pick up traces of water during transportation in pipelines or storage in salt caverns. On-line monitoring ensures the H_2O 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 H_2O 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-ppm levels of H_2O in propylene. An integrated permeation tube supports automated validation checks to verify the analyzer is operating properly during the extended periods of time when H_2O 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.

Endress+Hauser

People for Process Automation

Application data	
Target component (Analyte)	Water in pure propylene
Typical measurement range	0-10 ppmv*
Typical repeatability	±0.050 ppmv or 2% of reading
Measurement response time	1 to ~60 seconds
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (H_2O scrubber included)
Validation	Integrated H_2O 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
Water (H_2O)	ppmv	<2	0	100
Ethylene (C_2H_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
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 water, the measured component. Other stream compositions may be allowable with approval from Endress+Hauser.