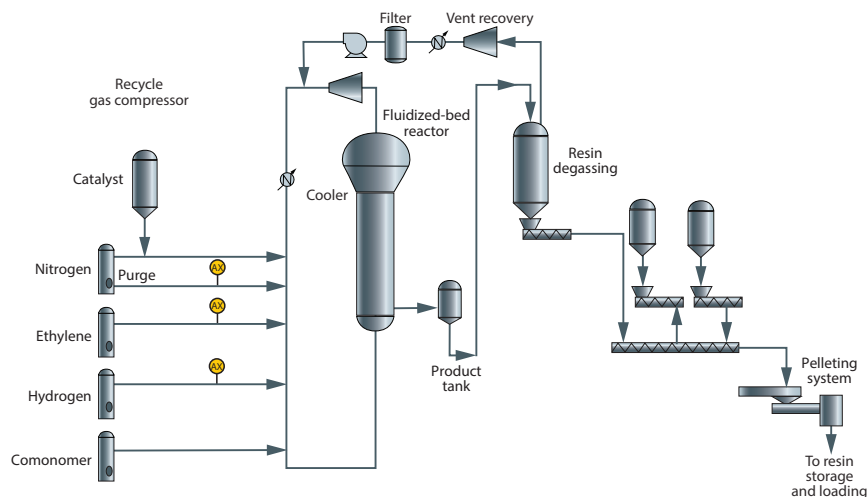


Petrochem: H₂O in UNIPOL™ PE process ethylene feed gas

Benefits at a glance

- Exceptionally fast response to H₂O concentration changes
- Patented differential spectroscopy technique measures H₂O at sub-ppmv levels in ethylene
- Integrated permeation tube supports automated validation checks
- Laser-based measurement is highly selective and accurate for H₂O in ethylene



UNIPOL™ gas phase polyethylene process

The UNIPOL™ polyethylene process

is a gas phase polymerization process that utilizes high activity metallocene catalyst in a fluidized bed reactor. Ethylene monomer contains residual impurities from the steam cracking process (C₂H₂, CO, O₂, and H₂O) that will poison metallocene catalysts. For this reason, polymer-grade ethylene is passed through a series of adsorbent beds before it is introduced into a UNIPOL™ fluidized bed reactor.

On-line H₂O measurement

Polymer-grade ethylene undergoes molecular sieve dehydration to reduce the moisture content to sub-ppmv levels. On-line monitoring of H₂O in the ethylene exiting molecular sieve dryer vessels prevents gas with elevated levels of H₂O from being introduced to the UNIPOL™ reactor and deactivating the catalyst. The H₂O concentration in the other reactor purge and feed gases (N₂, H₂, and co-monomer) must also be monitored and controlled to protect the catalyst.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology that has proven effective in this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in H₂O concentration, an important performance characteristic for detecting breakthrough in molecular sieve dryer beds and preventing ethylene with elevated levels of H₂O from entering a UNIPOL™ reactor. Endress+Hauser's patented differential spectroscopy technique enables detection and quantitation of sub-ppmv levels of H₂O in ethylene. 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 ethylene feed gas.

Application data

Target component (Analyte)	H ₂ O in UNIPOL™ PE process ethylene feed gas
Typical measurement range	0-10 ppmv
Typical repeatability	± 0.02 ppmv or 2% of reading
Measurement response time	1 to ~60 seconds
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (H ₂ O dryer included)
Validation	Integrated permeation system

Typical background stream composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
Ethylene (C ₂ H ₄)	99.95	99.9	100
Water (H ₂ O)	0	< 1 ppmv	1 ppmv
Acetylene (C ₂ H ₂)	0	0.5 ppmv	< 1 ppmv
Carbon monoxide (CO)	0	0.5 ppmv	< 1 ppmv