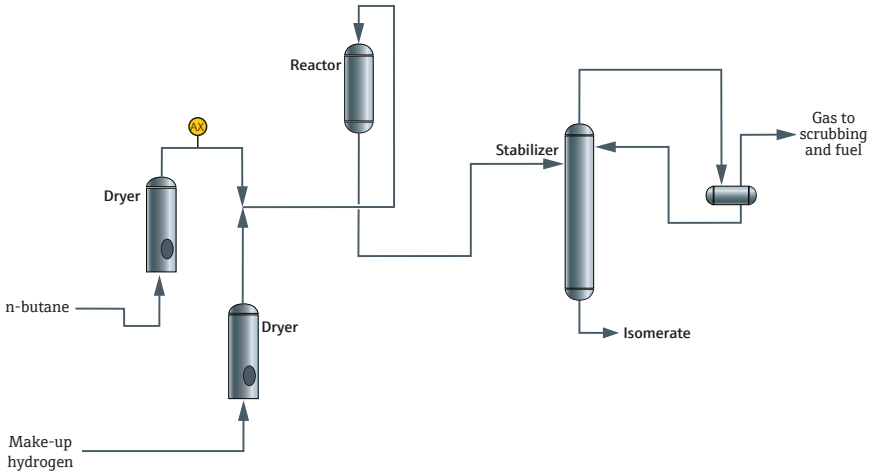
Refining: H_2O in n-butane feed gas to UOP Butamer™ process



The UOP Butamer™ isomerization process

Benefits at a glance

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

The UOP Butamer™ process

Isomerizes normal butane (n-C_4) to isobutane (i-C_4). Refineries use isobutane as a feedstock for their alkylation units to produce high octane motor fuel alkylate. The catalysts used in Butamer reactors are very sensitive to contaminants (water and sulfur) in the feed gases. The n-butane and hydrogen feed gases are passed through molecular sieve dryers to lower their moisture content to sub-ppmv levels

On-line H_2O monitoring

The Butamer™ process utilizes high-activity chloride-alumina catalysts. Exposure to excess levels of water will permanently deactivate the catalyst by the hydroxyl group (OH-) of water molecules displacing the chloride activated acid sites on the catalyst. On-line monitoring of H_2O in n-butane exiting molecular sieve dryer vessels prevents feed gas with 1 ppmv or more of H_2O from entering the Butamer™ reactor and deactivating the catalyst.

Endress+Hauser's solution

Tunable diode laser absorption spectroscopy (TDLAS) is a SpectraSensors technology proven effective in this critical measurement. TDLAS analyzers have an exceptionally fast response to changes in H_2O concentration, an important performance characteristic for detecting breakthrough in molecular sieve dryer beds and preventing n-butane with elevated levels of H_2O from entering a Butamer™ reactor. SpectraSensors patented differential spectroscopy technique enables detection and quantitation of sub-ppmv levels of H_2O in n-butane. 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 the n-butane feed gas.

Endress+Hauser

People for Process Automation

Application data	
Target component (Analyte)	H_2O in n-butane feed to Butamer™ reactors
Typical measurement range	0-5 ppmv
Typical repeatability	± 0.100 ppmv
Measurement response time	1 to ~60 seconds
Principle of measurement	Differential tunable diode laser absorption spectroscopy (TDLAS) (H_2O dryer included)
Validation	Integrated permeation system

Typical background stream composition

Component	Minimum (Mol%)	Typical (Mol%)	Maximum (Mol%)
n-butane	75	82	95
i-butane	5	15	25
i-butylene		0.1	
Neo-pentane		1.6	
i-pentane		1.2	
n-pentane		0.1	

The composition of n-butane feed gas to Butamer™ reactors may vary. The background stream composition must be specified for proper calibration and measurement performance.