

Water Measurements in Desiccant Dryer Outlets

Desiccant Dryers

Molecular Sieves, Activated Alumina and Silica Gel desiccants are common drying techniques for Natural Gas Processing plants. Typically, two or three desiccant vessels are operated in parallel, using a piping system that allows a bed to be removed from the process for regeneration. As a bed becomes saturated, it is put into the regeneration circuit where hot, dry gas drives the absorbed moisture out. The freshly regenerated bed is then ready for service.

Critical Control of Moisture

Normally, when the inlet gas moisture concentration is constant or can be measured, the desiccant dryers have a predictable operational period between regenerations.

Due to aging, or overheating, or contamination in the circuit, the desiccant can lose capacity.

Desiccant beds can also channel, allowing small concentrations of wet gas to flow through the bed without being dried. Regardless, the effectiveness of the drying process must be confirmed to avoid potential problems in downstream processes.

Traditional Measurement Solutions

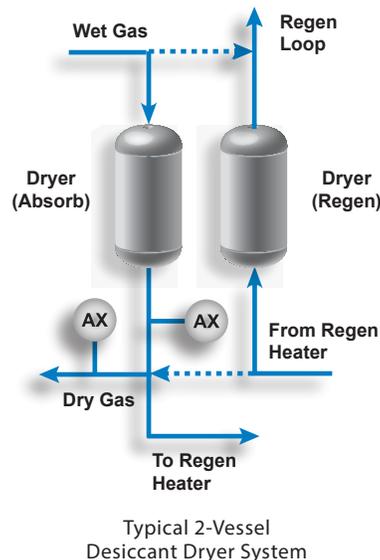
Electrochemical and vibrating quartz crystal moisture analyzers have been the traditional method for monitoring the levels of H₂O in Desiccant Dryer Outlets. Unfortunately, trace hydrocarbons and other contaminants present in the stream contaminate the electrochemical probes, resulting in high maintenance costs due to the need to be constantly replaced. It's not uncommon for moisture probes to be replaced multiple times a year. Quartz crystal moisture meters have slow wet-up and dry-down times that allow water downstream and prolong regeneration times.

SpectraSensors' Solution

SpectraSensors TDL analyzers are the ideal solution for this challenging application. The non-contact laser and detector is impervious to damage from contaminants. Tunable Diode Laser technology means that measurement interferences from other infrared absorbing compounds are avoided. There are no wet-up or dry-down delays, resulting in fast updates even when the concentration changes dramatically. Only SpectraSensors employs Differential Spectroscopy, which incorporates a dryer using metal getter technology to subtract the spectrum of the dry gas from the wet spectrum. This allows the analyzer to measure streams whose background gas compositions may change.

Validation

The pre-calibrated analyzer provides certified, sub-ppm measurements of H₂O. With the TDL technology, the calibration accuracy does not change over time. Periodic validation is performed with an integral, internal permeation system to verify that the factory calibration is maintained.



KEY POINTS

- Fast – No wet-up or dry-down times – Responds to changes in H₂O concentration in seconds
- Virtually maintenance free – No frequent change-out of sensor
- Avoids damage to sensor from contaminants in the process – Tunable Diode Laser and Detector are isolated from the process gas
- No interference from other compounds – Uses high resolution TDL technology

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Application Data

Target Components	H ₂ O in Desiccant Dryer Outlet
Typical Measurement Ranges	0-10 ppm*
Typical Repeatability	±0.05 ppm**
Measurement Response Time	1 to ~60 seconds**
Principle of Measurement	Differential Tunable Diode Laser Absorption Spectroscopy (H ₂ O scrubber included)
Validation	Integrated Permeation System

* Consult factory for alternate ranges.

** Measurement performance representation is based on a stable stream composition within the component ranges specified in the table below. These ranges do not indicate allowable variation in the composition of the sample stream.

Typical Background Stream Composition

Component	Minimum (Mole %)	Typical (Mole %)	Maximum (Mole %)
Water	0	< 1 ppm	10 ppm
Nitrogen	0	0.1	3
Oxygen	0	0	1
Methane	60	75	100
Carbon Dioxide	0	0	3
Ethane	0	15	20
Propane	0	6	13
Butanes +	0	4	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 water, the measured component. Other stream compositions may be allowable with approval from SpectraSensors.