Panametrics

Application note

Moisture and oxygen measurement in ethylene production

Summary

Ethylene is a key building block in the petrochemical industry and a large percentage of global ethylene production goes toward the production of polyethylene, where ethylene gas is the main feedstock. The presence of high levels of moisture and oxygen (>1 ppm) in the ethylene and polyethylene production processes can damage catalysts, cause premature reactions to take place and reduce overall process yield and product quality.

Application

Ethylene is produced by the steam cracking of naphtha or ethane in a furnace at high temperature. The resultant cracked gas is compressed and dried before being cryogenically cooled to separate out the ethylene product. The ethylene product gas is the main feedstock in polyethylene production, where it is mixed with co-feeds like butene, hexane and inert gases and converted to polyethylene in a reactor containing special catalysts. Moisture must be removed from the process gas feeds using molecular sieve dryers to ensure the moisture level remains below the alarm point for the process, which is typically <1 ppm.

Oxygen levels are also a concern and so must be controlled throughout the process. The oxygen levels in the various feed gas streams need to be monitored continuously to ensure oxygen levels remain low, typically <1ppm.

Benefits:

Multiple measurements on a single electronics platform offer a lower cost per measurement point, both for moisture and oxygen measurements. Aluminium oxide sensors can measure at process pressure so no need of expensive pressure reduction equipment in the sample conditioning system. Non depleting electrochemical oxygen sensors lower maintenance costs.

Application specifications:

- Typical Moisture range: 0 - 5 ppmV
- Typical Oxygen range: 0 - 5 ppmV
- Typical Operating Pressure: 400 - 600 psig

Challenge

There are multiple feed gas streams in ethylene and polyethylene processes, most if not all requiring online moisture and oxygen measurements to ensure high product quality and efficient operation of the plant. Other moisture and oxygen measurement technologies are typically configured as single channel instruments, requiring a large number of analyzers to meet the measurement requirements of the plant. This leads to high operating costs in supporting a large installed base of different instruments with associated spare parts and requirement of operator expertise on different instrument platforms.

Solution

The Panametrics multichannel moisture.IQ offers the perfect solution as up to six moisture measurements and six oxygen measurements can be carried out simultaneously on a single analyzer platform. The aluminum oxide sensor can work up to 5000psig so measurements can be made at process pressure while the wide dynamic range of the sensor allows measurement down to ppb levels. For the oxygen measurement, the Delta F non depleting sensor provides stable and accurate readings, down to ppb levels. Both the moisture and oxygen sensors can be installed in their own Panametrics designed and built sample conditioning systems or in one combined system, if measuring on the same stream. For customers that prefer transmitter type solutions, the HygroPro and oxy.IQ are great options for the moisture and oxygen measurements respectively.

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