Panametrics

Application note

Oxygen measurement in reactor feed gases

Summary

Oxygen is commonly measured in reactor feed gases or reactor head spaces. One such application is in the industrial production of formaldehyde.

Application

Formaldehyde is produced by mixing specific amounts of methanol vapor with oxygen in a reactor in the presence of a catalyst, most commonly metal oxides. This method keeps the methanol vapors below the explosive limit that would be surpassed in more traditional techniques using silver catalyst.

With 80% of the production cost of formaldehyde being compromised of the raw material used in the reaction, the oxygen content within the reactor must be controlled at an optimum level to produce a successful yield.

Challenge

The challenge in this application relates to the opportunity for liquid carryover to the oxygen analyser along with the reliability of the measurement. Traditional dumbbell type paramagnetic sensors have been used in the past for these applications however these required extensive maintenance. Liquid carryover is extremely damaging to these units and the challenge therefore is to use an oxygen analyser which has minimal maintenance requirements and the durability to recover from process upsets.

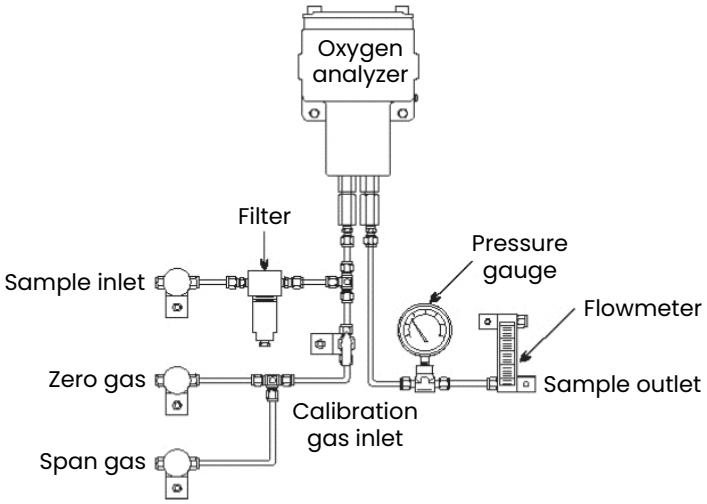
Benefits:

- No moving parts in the oxygen analyzer to get fouled by liquid carryover
- Sensor is not consumed as with galvanic fuel cells
- Simple field calibration
- Turnkey sample conditioning system

Solution

Air is used as the source of oxygen in the formaldehyde production process. The air and methanol vapor mixture is sampled on the inlet to the reactor. The XMO2pro thermoparamagnetic oxygen transmitter verifies that the optimal amount of oxygen, typically 9.8% is present to achieve a complete reaction with minimal waste. The sample system is mounted near the sample point to prevent measurement lag time.

A typical installation includes the thermoparamagnetic oxygen transmitter, a display/controller and a sample system. The sample system components including the inlet and calibration valves, a filter/coalescer assembly, pressure gauge and flowmeter are normally plate mounted.



Application specifications

Application	0% to 21% O_2 in N^2 saturated with methanol vapors
Temperature	Ambient
Pressure	5 psig

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