



Oxygen Monitoring of VCM in PVC Production

Summary

PVC (Polyvinyl Chloride) is the world's third-most widely produced synthetic plastic polymer, after polyethylene and polypropylene. About 40 million tons are produced globally each year. PVC is used to make pipes, vinyl flooring and siding, hoses, cable coatings, medical devices, plumbing and automotive parts. In the production of PVC oxygen measurement is critical to product quality, yield and emissions.

Application

VCM (Vinyl Chloride Monomer) is an intermediate for the production of PVC. However, it is harmful to the environment and is desirable to minimize the VCM effluent. Stripping residual VCM from PVC product involves the careful measurement of Oxygen. During the stripping stage steam is used to collect the product. During this stage air can enter the process resulting in excess VCM thus reducing the yield. By monitoring the oxygen concentration of the VCM, gas operators can adjust the level of oxygen on demand. This level of control enables the oxygen concentration to be minimized by using the least amount of Nitrogen. Electrolysis of salt water produces chlorine, caustic soda and hydrogen. Ethylene and chlorine are combined to produce ethylene dichloride (EDC) which is further cracked to produce vinyl chloride; the basic building block of poly-vinyl chloride (PVC). The polymerization process links the VCM molecules to form long chains of PVC. The PVC produced by this process in the form a white powder known as "thomoplastic".

Benefits:

- Rugged and reliable with no moving parts
- Sensor is not consumed as with electrochemical cells
- Simple field calibration
- Turnkey sample conditioning system

Challenge

Attempts to measure the oxygen concentration with fuel cells have been problematic and inconsistent due to the high acidic content and condensate. Fuel cells degrade in a period of time that makes them uneconomical and maintenance intensive.

Solution

Panametrics XMO2pro thermoparamagnetic oxygen transmitter is well suited to this application. It has no moving parts, is stable and rugged enough to operate in the corrosive VCM gas. The XMO2pro is supplied with a sample system equipped with a liquid trap and either a vacuum pump or eductor. The turnkey system also allows for the automatic calibration of the transmitter by utilizing nitrogen for zero gas and instrument air for span gas (21% Oxygen).

Application specifications

- Application: 0–21% O₂
- Typically 2–4% O₂ in N₂/VCM Temperature: 40°C (Heated sample system)
- Pressure: Ambient
- Analog Output: 4–20mA
- Digital Interface: RS232
- Display/Controller equipped with programmable relays for “auto calibration”
- Sample system: Vacuum pump or Eductor, Liquid Trap, Hazardous area certification