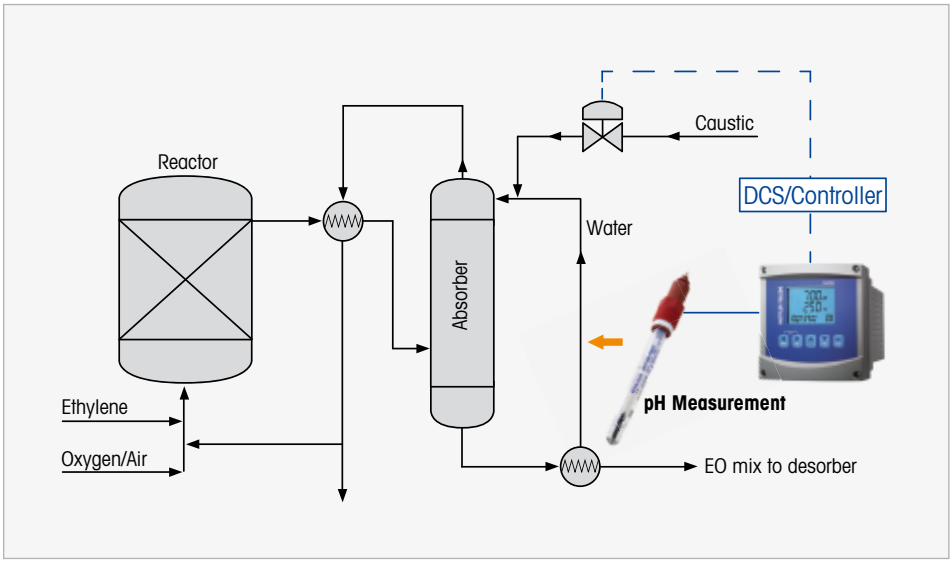
Application Note

INGOLD
Leading Process Analytics

pH Control
in Ethylene Oxide Production



Background

Ethylene oxide (EO – C_2H_4O) is a large volume intermediate chemical. It is used as a precursor in the manufacture of different chemicals varying from ethylene glycol, which is used in automotive antifreeze, to the production of polyester. Other derivatives include surfactants, solvents and amines. EO also has direct use as a disinfectant for wool, textile and spices.

Process

Ethylene oxide is produced through direct oxidation of ethylene by oxygen or air over a silver catalyst at 200 – 300 °C and 10 – 30 bar. The reactor effluent contains 75 – 90 % EO which is absorbed by cold water quenching and consecutively stripped off and further purified.

Challenges

Preventing complete oxidation of ethylene to water and CO_2 has long been one of the biggest hurdles in maximizing EO output. Thanks to developments in catalyst technology, these problems have been significantly reduced. Nevertheless, byproducts are formed: besides CO_2 these may include aldehydes, and acetic and formic acid. Also, NO_x formation can occur which can lead to the formation of explosive

METTLER TOLEDO

compounds. To neutralize acidic and acid-forming compounds, and as aqueous EO is easily hydrolyzed into ethylene glycol at both low and high pH, it is highly recommended to control quench water pH around neutral (pH 6 – 9), typically by adding base.

METTLER TOLEDO Solution

The InPro® 3250i pH sensor, with its pre-pressurized electrolyte and ceramic reference diaphragm, is especially designed for these types of application. It deals particularly well with the hydrocarbons specific to the EO production process, ensuring fast response time and high accuracy, and enabling trouble-free process control. Thanks to Intelligent Sensor Management (ISM®) technology, the sensor provides sophisticated performance diagnostics and Plug and Measure installation for easy sensor handling and low maintenance.

The M400 2-wire transmitter is the ideal instrument to complete the measurement point. Certified for hazardous area use and offering full ISM functionality, the M400 offers a best-in-class solution for critical pH measurements. ISM sensor diagnostics are accessible through the transmitter's MMI or remotely via the HART protocol with the help of a communicator or asset management software.

InPro 3250i pH sensor

- Long operational probe lifetime and high accuracy
- Predictive diagnostics
- Plug and Measure startup
- Can also measure ORP

M400 2-wire transmitter

- Multi-parameter ability
- 4 to 20 mA (with HART) or Foundation Fieldbus or Profibus communications
- NEPSI Ex / ATEX / FM approved for hazardous areas
- Full ISM diagnostics

▶ **www.mt.com/InPro3250**
▶ **www.mt.com/M400-2wire**
▶ **www.mt.com/pro-pHguide**

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