AMETEK®
PROCESS INSTRUMENTS

APPLICATION NOTE

CONTINUOUS MONITORING OF WATER IN ACETIC ACID PLANTS

Acetic acid is an important chemical reagent and industrial chemical. Vinyl acetate adhesives and cellulose acetate fibers are produced from acetic acid. Acetic acid is used in the production of polyethylene terephthalate used in plastic bottle manufacturing. Dilute acetic acid is used in the food industry to manufacture vinegar.

It is important to measure water to control the distillation and drying columns in the acetic acid process. The measurement of low parts per million (ppm) water in the glacial acetic acid product ensures that product specifications are met. Figure 1 depicts a typical schematic for acetic acid plants.

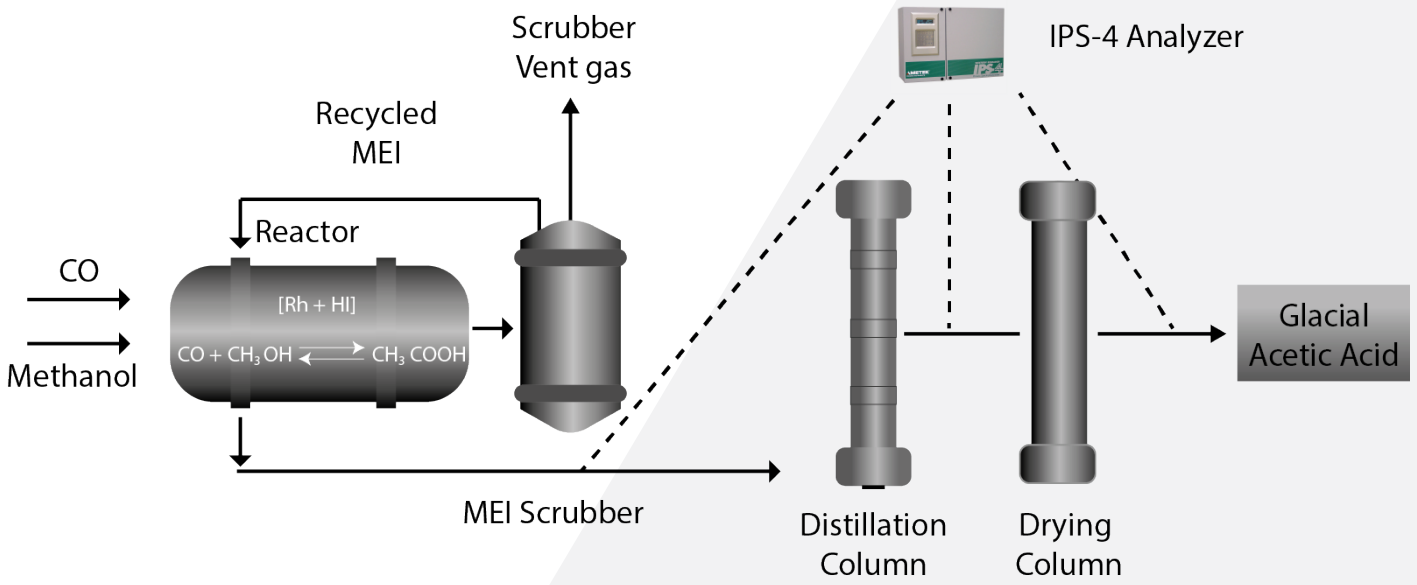

Figure 1. Schematic of the acetic acid process

EQUIPMENT

The IPS-4 NDIR spectrophotometer is an optical filter spectrophotometer that operates in both the near-infrared (NIR) and infrared (IR) spectral regions. The IPS-4 also has a temperature compensation algorithm to account for changes in sample temperature, as water measurements are susceptible to changes in sample temperature. The IPS-4 NDIR analyzer features an integrated sample conditioning system that simplifies installation and allows for easy maintenance of the analyzer. The IPS-4 is easy to use and can be installed in wash down conditions and harsh environments.

The use of multiple optical filters in the IPS-4 NDIR enables the measurement of multiple components and provides reference wavelengths that ensure reliable optical system performance. Unlike traditional dual-beam infrared analyzers, this single-beam device does not require reflective cells, and the use of measuring and reference filters minimizes any source variation or signal loss errors to enable a very robust process measurement.

PROCEDURE

A common synthesis method for producing acetic acid is the carbonylation of methanol. Glacial acetic acid is produced in a three-step process. One of these processes uses dual catalysts of hydrogen iodide and a rhodium carbonyl catalyst. Methyl iodide is used as an intermediate in this process, and can be continuously measured using the IPS-4, in the outlet of the scrubber vent gas in the acetic acid plant to ensure the safe operation of methyl iodide scrubber (please refer to AMETEK application note F-0304 for details).

The continuous measurement of water with the IPS-4 NDIR analyzer in the inlet and outlet of the distillation and drying columns ensures the efficiency of the acetic acid process. The fast response time of the IPS-4 allows for quick remedial action when the water concentration is out of specification. The measurement of 0-2000 ppm water in the final glacial acetic acid ensures that the product meets quality specifications. Three measurement points for water in acetic acid plants are summarized in Table 1.

Measurement range	Sample point	Benefit
0-20%	Reactor outlet	Ensures reactor efficiency
0-10%	Distillation column outlet	Ensures distillation column efficiency
0-2000 ppmv	Drying column outlet	Ensures that the product meets specifications

Table 1. Water measurements in acetic acid

IPS-4 NDIR SPECTROPHOTOMETER

Key benefits

- Robust multi-wave/single-beam technique
- Analog and digital connectivity – Modbus, Ethernet and web browser-based interface
- NEMA 4 enclosure houses all components – designed for outdoor installation; no exposed components
- Fully integrated sample conditioning; no need for site integration

IPS-4 ANALYZER

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