

# 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.

## Measurement Requirement

The measurement of water in acetic acid is important for controlling the distillation and drying columns in the acetic acid process. The measurement of low ppm water in the glacial acetic acid product ensures that product specifications are met.

## AMETEK Solution

AMETEK Process Instruments has developed the IPS-4 NDIR Spectrophotometer that is based on the field proven IPS-4 UV-Vis platform. The IPS-4 NDIR is an optical filter spectrophotometer that operates in both of the NIR and IR spectral regions. Water measurements are susceptible to changes in sample temperature. The IPS-4 has a temperature compensation algorithm to compensate for 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.

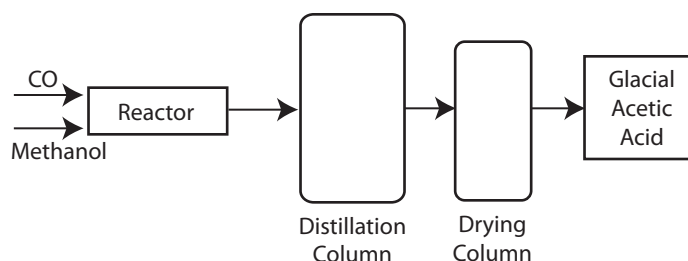
***The use of multiple optical filters in the IPS-4 NDIR allows for the capability to measure multiple components and provide reference wavelengths. Unlike traditional dual beam infrared analyzers, this single beam device does not require reflective cells and the use of measuring and reference filters minimizes any source variation or signal loss errors to enable a very robust process measurement.***

## Application Discussion

A common synthesis route for the production of acetic acid is the carbonylation of methanol. Glacial acetic acid ( $\text{CH}_3\text{COOH}$ ) is produced in a three-step process. One of these processes uses dual catalysts of hydrogen iodide

and a rhodium carbonyl catalyst. Methyl iodide ( $\text{CH}_3\text{I}$ ) is used as an intermediate in this process. The following schematic is typical for acetic acid plants:

### Acetic Acid Process Schematic



The continuous measurement of water with the IPS-4 NDIR analyzer in the inlet and outlet of the distillation column and drying column 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 the Table below:

### Water Measurements in Acetic Acid

Measurement Range	Sample Point	Benefit
0-20%	Reactor Outlet	Ensure Reactor efficiency
0-10%	Distillation Column Outlet	Ensure that Distillation Column is efficient
0-2000 ppm	Drying Column Outlet	Ensure that product meets specifications



## AMETEK IPS-4 Features

- ▶ Robust multiwave/single beam technique
- ▶ Fast optical response time
- ▶ Modular integrated spectrophotometer system for NDIR applications
- ▶ Easy to use multi-language vacuum fluorescent display
- ▶ Auto zero and auto calibration capability
- ▶ Optional heated sample cell enclosure available for operation up to 150°C
- ▶ MODBUS RTU communications protocol
- ▶ Ethernet communications
- ▶ Pressure and temperature compensation available
- ▶ NEMA 4X, IP65 indoor/outdoor housing

## Process Instruments Expertise

The IPS-4 NDIR is backed by AMETEK Process Instruments well-established international sales and service networks. AMETEK's application expertise in chemical processes and handling of toxic and corrosive samples is your assurance that the IPS-4 NDIR will meet your water measurement needs in acetic acid plants. Contact your local AMETEK office or representative for more information.

## IPS-4 NDIR Applications

The IPS-4 NDIR can be used for both liquid and gas phase measurements. Additional applications that can be measured with the IPS-4 NDIR are presented in the table below:

Measured Components	Sample Phase
Sodium hydroxide in acid gas scrubber	liquid
Water vapor	vapor
Methane, CO, CO <sub>2</sub>	vapor
Acetylene in ethylene	vapor
Methanol in water	liquid
Ethylene in vinyl chloride	vapor



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One of a family of innovative process analyzer solutions from AMETEK Process Instruments.  
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