Application Note
Formaldehyde / Methanol

Chemical composition:
Formaldehyde, Methanol, Water

Determination of the Formaldehyde and Methanol concentration

1. Introduction, goal of the measurement

Formaldehyde is an important industrial chemical and is employed in the manufacture of many industrial products and consumer articles.
More than 50 branches of industry now use formaldehyde, mainly in the form of aqueous solutions and formaldehyde containing resins.
World wide production of formaldehyde is approximately 3 x 10^6 tons/year.

Formaldehyde is industrially produced from methanol by oxidation using catalysts.

Operation:

The process consists of passing methanol through a reactor that produces formaldehyde in low concentrations. The resulting product is a combination of formaldehyde, water (a byproduct) and unreacted methanol. This mixture passes through a stripper that removes water and methanol until the product is 53 % formaldehyde and just under 2 % methanol and water. Formaldehyde with less alcohol is normally more desirable to the end user, but the stripping process is incapable of producing product with less than about 1.8 % methanol. To achieve higher quality, the product is then fed into a concentrator that boosts the 53 % formaldehyde to 56 % and reduces the methanol to approximately 1.08 % concentration. The concentration process requires closer monitoring than the stripping process and is therefore more labor intensive than the stripping process. The concentration process is controlled by the mPDS 2000V3 system. The mPDS 2000V3 system monitors the concentration of the formal-dehyde and the methanol simultaneously and automatically controls the process based upon those readings.

2. Process specifications

Temperature: 70 °C

Concentration: Formaldehyde: 56 %

Methanol: 0.8 - 2 %

3. Instrumentation

Measuring cell: DSRn427

Installation: Bypass with pump

Evaluation unit:

mPDS 2000V3

The measuring cell is installed in a temperature controlled instrumentation cabinet. The tubing to the instrumentation cabinet is wrapped in heat tape and insulated. This prevents the formation of solid paraform.

4. Description of the measurement, calibration, results

The method of concentration measurement is based on the determination of both the density and sound velocity.

Since the two components formaldehyde and methanol significantly affect the density and sound velocity, the concentrations of these components can be exactly determined.

According to a process consultant, the concentration data graphs are straight lines. The processing time has been shortened, resulting in high productivity and efficiency. Samples were taken every four to six hours to monitor the process. This resulted in frequent overshooting of targets by letting the process run too long.
With the mPDS 2000V3, the process is always on target with shorter runs. Better control results in a better quality product that can be directly blended from the tanks, without concentration verification before starting a blend. The methanol concentration is much lower, making a better quality formaldehyde that will yield increased revenues.

Reached accuracy: Formaldehyde: 0.02 %

Methanol: 0.04 %