

IN-LINE PROCESS MONITORING FOR CHEMICAL CONCENTRATION

Monitoring concentrations of liquids, gases and powders is an indicator for product quality. Examples include: tank mixing, column/filter breakthrough, reaction end-point determination, by product/reactant concentrations, product purity, accountability tracking for sensitive materials, cleaning validation, waste reduction and reaction optimization. Real-time adjustments of the process parameters are therefore possible through immediate 'off-specification' detection.

INTRODUCTION

UV-vis measurement is a well-accepted technology to check the concentration of a chemical in the production process. Usually these measurements are performed 'off-line'.

The delay between sampling and obtaining the results from the laboratory can be time consuming. A significant disadvantage is that only a single measurement is generated in this time period and the concentration during, before and after the sampling point is unknown.

With the in-line chemical measurements taking place directly in the process, not only is complete documentation possible, but when variations occur, immediate intervention can take place.

INNOVATION

The Equispec™ Chemical Process Analyzer (CPA) is a high performance instrument designed for use in an industrial process. Its excellent sensitivity and flexibility make it useful for both process applications (tanks & pipes) and static (e.g. laboratory measurements). The CPA and process probes are designed to be used in high-temperature, high-pressure and corrosive environments. It can be used to analyze liquids, gases, solids or slurries.

Single wavelength or sophisticated chemometric models may be used for concentration predictions. The standard analyzer supports two probes with dedicated lamp compensation channels [all fiber-optic double-beam design]. An optional multiplexer allows for multiple sample positions, dedicated reference measurements and QC or check standards - that means you can correct on the fly and prevent waste in time and materials.



Photo 1 : Equitech's High-Volume Flow Cell

CHEMICAL CONCENTRATION MEASUREMENT

Equitech's fiber-optic probes allow for easy access into the process. Equitech offers probes for both reflection and transmission measurements almost every sample type. This includes insertion/immersion probes and flow cell designs (see Photo 1).

The spectrophotometer is integrated in a NEMA4 box with an industrial computer and touch-screen (see photo 2). The typical spectral range is 230-820 nm (resolution 1 nm). The NEMA4 box is made from stainless steel. It is designed and equipped specifically for use in the production environment where the ambient conditions can be dusty, vary in temperature, subject to vibration etc. The box also contains a thermoelectric cooling and heating device to eliminate the influences from ambient temperature by keeping the temperature inside the box at a constant level.



Photo 2: CPA stainless steel NEMA4 box with touch-screen

Results are calculated and displayed by EquiChem™ software (see Photo 3). Concentrations or wavelengths are tracked via trend charts and logged to a file. Multiple models may be applied to a single measured spectrum.

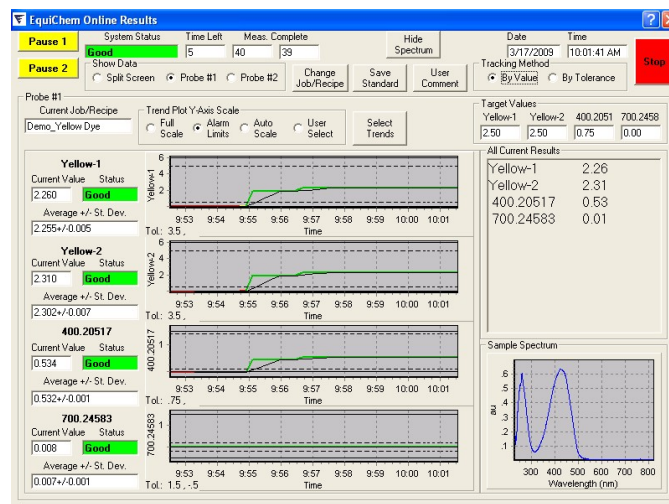


Photo 2: Trend charts of EquiChem™ Software

PROCESS MONITORING

Chemical production is a very complex process subject to influence by various factors including temperature, pressure and flow. In addition, raw material can influence the result, reflecting different lots, ratio of mixtures etc. All these factors, either singly or in combination result in modification to the concentration of the produced material. For continuous process monitoring, 10 to 60 seconds is recommended as the measurement interval. Intervals as fast as 1 to 2 seconds are possible.

INSTALLED APPLICATIONS INCLUDE

Ammonia, Dodecanedioic Acid,
 Hydrogen Cyanide, Monochlorobenzene,
 Nickel, Nitriles, Nitrite, Propanediol,
 Purified Terephthalic Acid, Titanium Dioxide,
 Titanium Tetrachloride, Toluene

For more information or to discuss your chemical measurement application in detail,

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