

METTLER TOLEDO APPLICATION NOTE

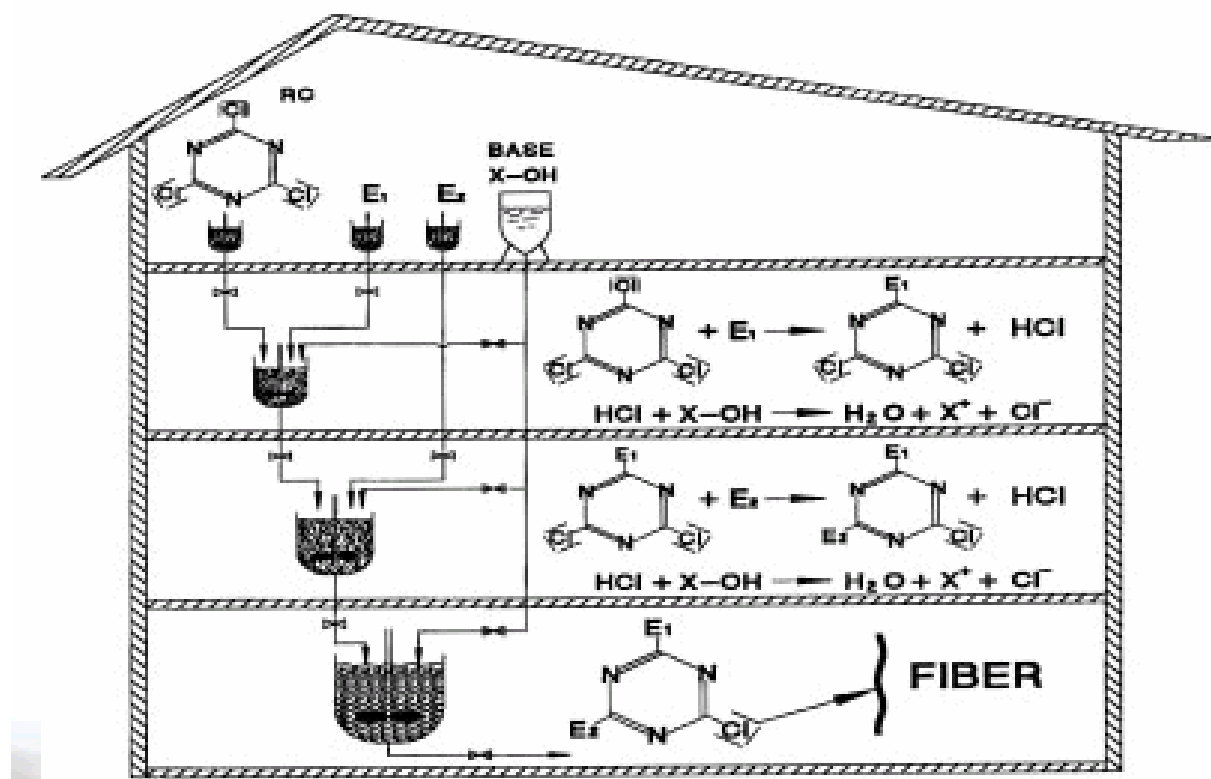
pH Measurement During Dyestuff Production

BACKGROUND

The production of dyestuffs is carried out predominantly in aqueous media. The quality and the efficacy of the dye depend on accurate pH and temperature control during the

manufacturing operation. Reliable and precise in-line measurement of these two parameters is therefore important in order to ensure optimum process control and maximum product yield.

Example of a process for the production of reactive dyestuff



THE PROCESS

A typical example of this process is in the production of a reactive dyestuff. Two condensation components (E1 and E2) are mixed in stages with a reactive component (RC), cyanuric chloride, to form a ready-to-use reactive dyestuff.

The three components are first made up separately in solution in stirred vessels and the

initial pH values adjusted. The raw solutions are cooled by ice before processing begins.

In the first process stage, RC is introduced into a blending vessel. A predetermined quantity of E1 is then added gradually by controlled dosing to ensure the right degree of reaction between the components as well as governing the heat generated by the reaction. Throughout, pH and temperature are measured and controlled continuously.

In the second stage, the reaction product (RC + E1) is fed to a blending vessel and, in the same manner as in the first stage, E2 added and reacted. As before, temperature and pH are again closely controlled.

The final reaction product, the finished dyestuff solution, is fed to a storage vat. During storage, the pH value is constantly monitored and, when necessary, adjusted to the set value. In addition to heat, HCl is also generated during the component re-actions, causing deviations in the specific process-dependent pH values. The necessary pH adjustments are carried out by the addition of a base solution.

Maintaining correct pH during the component reaction stages is imperative or the finished dyestuff will not possess the reactive properties necessary in the later dyeing process. During the addition of E1 and E2 to the RC, there must be controlled chemical reaction of the components to ensure that a residual reactive

fraction of exact valency is present in the final dyestuff which will allow the dye to react (bond) with the fiber substrate.

INSTRUMENTATION

The component media in which the measurements are taken are highly contaminating and corrosive. Since organic solvents may be present the processing plant must be designed to follow explosion proof regulations. A further problem is the need to measure the pH value over an extreme temperature range (23...212 °F). The equipment is often used for batch mode production of a range of different dyestuffs; accordingly, process conditions can vary widely. This calls for flexible measuring systems and especially robust, reliable and precise sensors. For the dyestuff producing industry, we recommend the InPro[®] 3200 pH electrode along with the InFit[®] 762 housing and the Model 2100-2X pH analyzer.

PRODUCTS

2100 pH Analyzer

- Detachable front panel and plug-in terminals for ease of installation
- All functions accessible through the keypad for increased ease of use
- Continuous sensor and transmitter diagnostics to monitor performance
- FM certification for Class I, Div 1 & 2 Environments and CSA General Purpose Approval
- 3 year warranty

InPro® 3200 pH Electrode

- Gel electrolyte eliminates fill requirements to reduce maintenance
- Steam-sterilizable & autoclavable for hygienic and CIP/ SIP applications
- Silver ion trap to minimize electrode contamination
- Integral RTD for higher measurement accuracy
- Rugged IP67 rated quick connect VarioPin connector

InFit® 762 Insertion Housing

- For vertical installation of pH and redox sensors in reactors
- Various insertion lengths and connection systems available
- Wide range of flanges available for flexibility of process installation
- In-situ sterilizable for hygienic applications