pH Measurement in Paper Mill Headbox

Process

Paper mills convert wood pulp to paper products such as printer paper, paper towels, cardboard, and many others. There are three primary stages in the paper making process: pulp preparation, paper making, and finishing.

Pulp preparation is required because raw fiber from the pulp mill has poor cohesion, low bursting and tensile strengths, and a tendency to flocculate. Therefore, the fiber is unsuitable for paper manufacturing and must undergo further processing in refineries, cleaners, and chests prior to delivery to the headbox. During this processing, additives such as resins, dyes, fillers, sizers, and chelating agents are blended with the fiber to provide better fiber binding, strength, smoothness, color, and opacity.

The headbox receives the processed pulp and serves to smooth out any outstanding variability in the pulp flow. Figure 1 illustrates the role of the headbox in this part of the process. Uniform flow velocity and composition are required for the paper machine to smoothly produce good quality paper. The head pressure in the headbox determines how quickly the headbox discharges onto the forming wire. Pressure is varied depending on the speed of the wire (throughput) and the type of paper being produced.

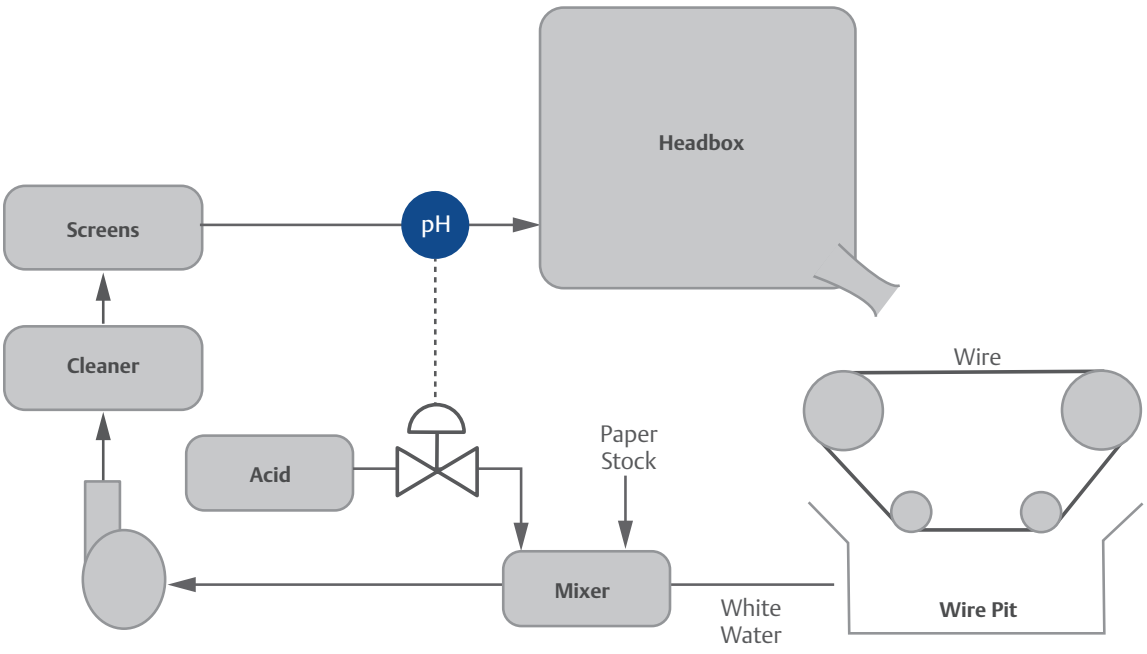
After the treated pulp is discharged from the headbox it is formed and dried and then transferred to the finishing portion of the paper mill where it is cut and packaged into rolls or sheets.

pH Measurement

Raw pulp typically has a higher pH than is desirable for paper making. Therefore, it is adjusted to the target level of approximately 4.5 pH by adding alum or sulfuric acid either to the recycled white-water feed or to the stock upstream of the fan pump. This lower pH level promotes binding of the fibers into the paper sheet.

pH measurement in the headbox is difficult because of the high degree of suspended solids present in the pulp which makes sensors prone to clogging and fouling. As a result, pH sensors in this application often require frequent cleaning and replacement. Despite these problems, however, the benefit that pH control conveys in strength and other paper properties are so great that headbox pH measurement cannot be ignored.

Figure 1 - pH Measurement Process in Paper Mill Headbox Applications



EMERSON

The Emerson Solution

The Rosemount™ 396P pH/ORP Sensor was designed specifically for harsh, high suspended solids applications like paper making. The reference junction in the 396P has a high resistance to coating due to its large surface area and small pore size. Therefore, the maintenance costs and downtimes typically associated with frequent sensor cleaning and replacement are greatly reduced.

For applications with harsh chemicals that may poisoning the pH sensor reference junction the Rosemount RBI pH Sensor may be preferred. Multiple isolation chambers behind the reference junction in this sensor act as barriers to protect the inner reference from contact with the harsh chemicals, while the high surface area of the reference junction resists plugging and maintains the electrolyte flow needed for a stable pH signal.

Both the 396P and the RBI are available in threaded or retractable mounting configurations and are compatible with all Rosemount liquid analysis transmitters, including the Rosemount 56 Dual Channel Transmitter which offers dual sensor inputs, a large full color display, and built in measurement and troubleshooting tips.

Rosemount 396P pH/ORP Sensor

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