Financial savings and improved pH control of salt cake solution at a North American Mill

A successful installation of the InPro 4250 pH-electrode to control the salt cake solution allowed the reduction of calibration frequency on a monthly schedule. The electrodes which now last for months provide financial savings in time and equipment. The Mill can further regulate the amount of H₂S being charged into the atmosphere by operating more efficiently saving even more financial resources.

The Pulp & Paper Industry

In North America, the Pulp & Paper industry is considered to be very fragmented with ongoing consolidations still the norm in the industry. Coupled with the fact that the North American Pulp & Paper industry is very capital intensive with small profit margins and strict federal, state and provincial safety and environmental regulations the industry is tending toward specialization and in some cases seeking to mitigate risks through globalization. This economic environment has created a Mill culture that places a premium on operational efficiencies within the plant environment. Today’s competitive Mills understand that controlling production processes is paramount in creating a safe and profitable operation.

The Application

The object is to control the pH of the “salt cake solution” before it is sent to the chemical recovery system. This is to prevent the formation of H₂S gas. The formation of H₂S gas can be extremely dangerous in the Mill environment. Further, H₂S is routinely monitored in pulp & paper mills to comply with federal, state and provincial regulations. In this particular application, the pH measurement is mainly for safety. However, according to Kelli Re, METTLER TOLEDO Regional Sales Manager “the measurement of pH in the pulp manufacturing process is normally to control the balance between effective washing liquor concentration’s for the downstream recovery in the brown stock washer. What this Mill is doing is further ensuring that enough
Further compounded by temperature or mechanical shock. Because Mill workers have to “dress out” in protective clothing to pull an electrode from the process, a buffer calibration would take about an hour if everything went right. If they had to replace the probe, which was normally the case, it would take about two hours. Since the Mill didn’t use VP connectors, Mill Technicians ran new sensor wire through conduit and landed the wires to the transmitter every time they replaced the electrode. The VP Connectors allowed for a very quick replacement.

The Outlook

So what is the upside of using the METTLER TOLEDO InPro 4250 pH-electrode with VP connector cables?

● The INGOLD sensors are tolerant to going dry for short periods of time to a much larger degree than the sensors we had been using.

● We now calibrate the METTLER TOLEDO InPro 4250 pH sensor on a monthly schedule not weekly.

● Moreover, the InPro 4250 pH probes are lasting months.

● More importantly, financial savings in time and equipment are accountable to this change.

Compared to the competition METTLER TOLEDO offers longer lifetime pH-electrodes through our advanced sensor technology.

www.mtpro.com/pH
Inductive conductivity in brownstock washing

Cost savings in the brown stock area require long-term control of the dilution factor. Conductivity is a very good way to determine the dilution factor on-line. Inductive conductivity is the best solution in applications with contamination and chemicals. Inductive conductivity gives reliable readings to control the process and thereby assure quality in the most economical fashion.

Process

Brown stock, the “dirty” pulp coming out of the digester is washed in several stages with increasing cleanliness. The goal is to achieve clean stock with the minimum amount of fresh water used and to avoid unnecessary dilution of the chemicals that are washed out. These chemicals are recovered in the recovery boiler, and a high concentration of water makes this process inefficient or even impossible. The concentration of chemicals in the solution coming out of the last stage washer determines the cleanliness of the stock as well as the dilution factor. At this stage fresh water is added to the system. The amount determines the cleanliness of the stock, and the concentration of chemicals in the solution going to the recovery boiler. There is a fine balance between effective washing and conservation of the liquor concentration for downstream necessary. Even though it is called dilution factor, we are still looking at fairly high concentrations, with conductivity in the range of 50 to 100 mS/cm, depending on the individual plant, process, and stock. That corresponds to concentrations in the low one digit percent range. Dilution in that sense is relative to the two digit concentrations in the digester area.

Additional information

pH is another important parameter in the brown stock washing process, having to do with the different behavior of fibers in solutions of different pH. Accurate measurement of pH and conductivity is vital to execute the optimal control strategy.

METTLER TOLEDO Solution

Inductive conductivity

InPro 7250 sensor series

The best solution for this application is an inductive conductivity sensor. With this type of sensor no electrodes are directly in contact with the process, and are therefore not directly affected by contamination. The sensor is constructed of PEEK which is a very good material for this application because it is resistant against the chemicals used. The sensor should be installed in the washer or in the drain line, where it would see a representative sample of the washing solution. Placing the sensor near the fresh water inlet is therefore not recommended.
As far as the transmitter is concerned, the Cond Ind 7100e series is the best choice. Simple operation, precise and reliable measurements as well as low cost of ownership reduce effort and expense. With its unique user interface (pictographs) and continuous transmitter and sensor diagnostics, this transmitter unit can be employed in all process applications.

www.mtpro.com/cond

Key features of the InPro 7250

- 0 to 2,000 mS/cm
- -20 to +180 °C (−4 to +356 °F)
- 0 to 20 bar (0 to 290 psi)
- highest measuring accuracy
- integrated temperature sensor
- approved for use in hazardous areas
**pH measurement in pulp production/ chlorine-free bleaching**

More and more pulping plants are switching over to the use of environmentally friendly bleaching chemicals such as hydrogen peroxide or ozone. pH is measured in this application to improve the quality of the pulp and to decrease chemical costs by increasing effective usage.

**Process**

Chlorine and hypochlorite, the materials originally used to oxidize and destroy the dyes and tannins of the wood, leave chloride residues in the wash water and harm the cellulose fibers.

Typical parameters for the bleaching process are:
- Pulp stock concentration: 12 % or greater
- Process temperature: > 100 °C (212 °F)
- Process pressure: > 12 bar (174 psi)

pH electrodes tend to have a very short lifetime in this environment due to harsh process conditions and the need for daily maintenance, cleaning, and recalibration.

**METTLER TOLEDO Solution**

The 465-SC pH electrode mounted in an InFit 764-50 housing in an InFlow 764-20 flow-through assembly is recommended for this application. Installation of the pH electrode in a bypass line decreases process temperatures and pressures and increases the lifetime of the electrodes. This rugged electrode has a silver-ion barrier to minimize reference poisoning or contamination problems. Pressurization of the housing prevents hydrogen peroxide from entering into the reference system of the electrode and reduces its susceptibility to diaphragm clogging from the high pulp stock concentration. Maintenance is reduced since recalibration is needed only once a month, and sensor life was extended to an average of one year.

**465-50-SC combination pH electrode**

- Accurate pH measurements.
- Silver ion barrier eliminates diaphragm contamination.
- Accurate and reproducible results in harsh processes
- Choice of electrolyte solution ensures chemical compatibility.

**InPro 2000 pH electrode**

- Refillable for increased electrode lifetime.
- Liquid-fill design ensures fast response, highest accuracy and reliability. Silver ion trap to minimize electrode contamination.
- Ex-certificated.

**InTrac 776 e retractable housing**

- 316L SS or PVD provides maximum chemical resistance.
- Automatic cleaning and calibration.
- Safety interlocks prevent sensor removal from housing while in measuring position.
- Manual or pneumatic operation.

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