IPPC (Integrated Pollution Prevention Control) authorization.

Application
During the sulfate process lignin is separated from cellulose. The byproduct black liquor is concentrated by evaporation and burned. Its inorganic portion is then used to regenerate the sodium hydroxide and sodium sulfide needed for pulping. In conifer pulping, a soap-like substance is collected from the liquor during evaporation. The soap is acidified with sulfuric acid to produce tall oil. Sulfuric acid initiates the chemical reaction that will transform the soap into tall oil. The temperature is 90 °C (194 °F) at atmospheric pressure. The pH measurement is conducted at this process step and the value has to be lowered to pH 3 to 3.5 in order to

The company
Billerud is a Swedish paper company supplying customers with efficient packaging paper. It has a world-leading position within several product segments such as packaging for medicines and the food industry, as well as transportation of demanding products. Billerud’s three pulp and paper mills in Sweden – Gruvön, Karlsborg and Skärblacka – and at the UK paper mill in Beetham, together have a capacity of 1.4 million tonnes. Altogether Billerud has 2,600 employees in 11 countries generating a sales turnover of around SEK 7 billion.

All of the mills have ISO 9001 quality assurance and ISO 14001 environmental certification. The Swedish mills are accredited with EMAS, and the one in the UK was the first paper mill in Europe to receive IPPC (Integrated Pollution Prevention Control) authorization.

Application
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start the chemical reaction. This application is measured in pipes and is not only hot but also very sticky.

**Situational particularities**

Billerud had clogging problems with their previous pH electrodes. Due to the presence of lignin and calcium sulfate, the electrodes continuously became clogged, and already had to be replaced after 1 to 2 days. The direct contact with sulfuric acid could also have had an influence on the short lifetime of these electrodes.

Billerud also had problems surrounding cleaning of the electrodes. For purging of the lines with sodium hydroxide solution, the process had to be halted. This was the moment when there was the opportunity to clean the electrodes at the same time. To be dependent on interruption of the process was very critical for planning electrode maintenance.

**Customer’s expectations**

Billerud expected to have more reliable and accurate measurements with the new measuring systems from METTLER TOLEDO, with a far longer lifetime than with the old electrodes. Because of the long distance to the site where the electrodes were located in the process, a reduction in maintenance intervals was considered to be a reduction in expense for labor. Billerud had earlier positive experience with METTLER TOLEDO products and were satisfied with the service offered. They had also received appropriate training.

**METTLER TOLEDO solution**

Due to the sticky media, a frequent cleaning and calibration cycle was indicated. METTLER TOLEDO proposed cleaning 3 times a day and calibration every 3 days. Process media water and rinse water were both 90 °C (194 °F).

Based on these factors, the following products were installed:
- pH electrode: InPro 2000
- Housing: InTrac 776e
- EasyClean: 350e with 10% HCl cleaning agent

**Impact of implemented measuring solution**

The benefits identified with the new system were, as expected, more reliable and accurate measurements. Accordingly, Billerud has obtained a higher quality of product due to the more accurate measurements. Cleaning of the electrodes, which had previously been a real problem, was now very satisfactory due to the automatic function of EasyClean. The suggested cleaning cycles of 10 minutes every hour were in the end not necessary. It turned out to be enough to clean the electrodes only at 8-hour intervals. Overall, the main benefits were the reduced replacement costs due to increased electrode lifetime (up to four times longer) and reduced labor costs for maintenance.

**Customer Satisfaction**

Billerud is satisfied with both the new measuring solution and the cooperation with the METTLER TOLEDO representatives. In the meantime, Billerud has ordered six further loops incorporating EC 350e systems.

**Key benefits of pH electrode InPro 2000**
- Works very well at high temperatures (90 to 100 °C/194 °F to 212 °F)
- Reference system was very reliable because no clogging problems

**EasyClean 350e**
- Reduced maintenance effort
- Electrode kept clean a much longer
- Automatic cleaning and calibration

**Housing InTrac 776e**
- No interruption of the process. Maintenance is independent from the process

www.mt.com/cleaning
MgO slurry control with the new Xerolyt® EXTRA pH-Electrode

Pulp manufacturing processes are highly demanding because of their harsh conditions. The new pH-electrode InPro 4260 with the Xerolyt EXTRA from METTLER TOLEDO has been developed for difficult applications such as slurry control.

One goal, two results
The recovery of cooking liquor chemicals in pulp manufacture results both in a reduction of environmental loads and lower operational costs. Chemical recovery plants work on the basis of a wet process during which the SO2 and MgO contained in the flue gas from the recovery boiler are converted into magnesium bisulfite.

Reaction steps where Mg(HSO3)2 is produced
There are several stages to achieve this, one of which is SO2 absorption.
In the wet process, ash separation and flue gas saturation occur together in a wet scrubber. Absorbent preparation begins with the suspension of the separated ash. The magnesium oxide reacts with water to form magnesium hydroxide and serves as an SO2 absorbent.

In the alkaline sulfite stages, crystalline magnesium sulfite is formed which is converted into magnesium bisulfite through further contact with SO2. This results in raw acid which is drawn off and passed on for acid preparation. After clarification, insoluble impurities can be discharged by means of sedimentation. With further fortification, cooking acid is produced for reuse in the process.

How to overcome a challenging situation
In order to obtain a reliable in-line pH signal for use as a control parameter for the recovery of chemicals in the spent pulp liquor, proper electrode and housing selection is critical. Problems of this process include product characteristics, requirements for acid flushing, temperature range and reliability of the measurement.

METTLER TOLEDO solution
Due to the afore-mentioned conditions the METTLER TOLEDO Xerolyt EXTRA electrode is recommended in conjunction with the InTrac 777 e retractable housing. The new InPro 4260 electrodes feature the new Xerolyt EXTRA reference polymer for precise pH measurement and longer lifetime, even in the most difficult industrial environments. The Xerolyt EXTRA pH electrode should be installed in an InTrac 777 e retractable housing which allows users to remove the electrode from the process without process interruption. The retractable housing permits routine electrode maintenance throughout the process to further extend the electrode life. In particularly harsh processes, users may also use the automatic (pneumatic) housing version to set timed insertion/retraction intervals to limit sensor contact with the process which may also extend sensor life. Additional safety features include position indicator and interlock which prevent misuse of the retractable housing, making it a safe, practical housing for magnesium oxide slurry control. This system is compatible with the transmitter pH 2100e.
Open junction
The open polymer surface at the junction with the process media accounts for a substantial decrease of clogging through the process solution, eliminating the need for frequent cleaning or unscheduled electrode replacement.

Retractable housing
InTrac 777 e
- Rugged 316L SS and PVDF construction for maximum chemical resistance.
- Flushing chamber for automatic cleaning and calibration reduces overall system downtime.
- Patented immersion tube design isolates the sensor on retraction and guarantees complete separation of the process from the outside environment.
- Safety interlocks prevent sensor removal from housing while in measuring position.
- Manual or pneumatic operation

pH-electrode
InPro 4260
- New Xerolyt EXTRA polymer
  The latest development of the pioneering Xerolyt polymer reference electrolyte, successfully used over many years. Its patented composition minimizes measurement errors in almost all process media, leading to tighter process control.
- Fast and accurate temperature compensation
  The integrated temperature sensor right behind the pH glass membrane allows for a precise and fast automatic compensation of the temperature effect on the probe signal, for correct pH control when the process temperature changes.
- VP Connector
  The VarioPin™ connector is the industry standard. The VP has an IP68 waterproof rating and ensures a robust connection.

Transmitter pH 2100 e
- Operational safety and reliability due to continuous sensor and transmitter diagnostics.
- Easy installation and self-explanatory operation through pictographic user-interface and Sensorface®.
- Loop autonomy and maintenance-free pH measurement due to integrated PID controller.
- Flexibility with 4 wire installation or alternatively 2-wire execution with HART® and/or Proibus® and/or FF communication and EEx applications.

www.mt.com/pro-pH
**Accurate, Reliable pH Control at the Headbox of a Paper Machine**

**pH stability at the headbox improves paper quality**
Practically at every process stage in the manufacture of paper, correct pH value plays a vital role. As an example METTLER TOLEDO quotes the problematic and importance of pH measurement at the headbox.

Variations in pH value at the headbox of a paper machine have a negative effect on the mechanical strength of the paper web and can result in tearing, apart from influencing other important properties. Problems at the wet end of a paper machine can rarely, if ever, be corrected downstream. Therefore, continuous accurate and reliable pH measurement at this point is a critical factor.

**pH controls CO₂ gas concentration**
Normally, the incoming stock has a higher pH value than is actually wished for, so that the value has to be lowered accordingly through the addition, upstream of the headbox, of “neutralization” agents such as aluminum sulfate, sulfuric or other acid, or, on an ever increasing scale, CO₂ gas. Carbon dioxide dissolved in water acts as a weak acid and therefore able to effect gentle neutralization.

**High demands on pH measurement**
The appropriate pH-value of the pulp slurry at the headbox is a critical and determining factor. Efficient process control at the headbox places high demands on inline/online pH measurement electrodes due to the presence of moisture, pressure surges, vibration, abrasion and contaminating media. The process medium itself has a high proportion of suspended solids and the temperature is in the region of 50 °C (120 °F).

**InPro 2000 – the problem-solving pH-electrode**
METTLER TOLEDO recommends for such harsh environments the InPro 2000 pH-electrode. Main benefits of InPro 2000 are:
- Robust design for long-term stability
- No diaphragm clogging due to silver-ion trap
- Precise and fast measurements due to flowing liquid junction
- Ease-of-maintenance in respect of cleaning
- Fast response, resistance temperature detector (RTD)

**Suitable housings**
Depending on the required electrode shaft length, two different housings are recommended:
- **InFit 764-50** (120 mm)
  This side or vertically mounted housing is equipped with a protective cage to shield the electrode against abrasive solids in the process medium.
- **InTrac 776e** (250 mm)
  This retractable housing offers the TRI-LOCK™ safety system. The electrode can be calibrated and cleaned without interrupting the process, which extends the electrode life and reduces maintenance effort.

www.mt.com/pro-pH
Original INGOLD Accessories
Keep your Measuring Systems Running

METTLER TOLEDO not only provides complete measuring systems to control parameters such as pH/ORP, dissolved and gaseous oxygen, CO₂, conductivity and turbidity, it also offers you a comprehensive and well-balanced package of accessories.

pH and ORP Accessories
METTLER TOLEDO offers a wide selection of pH buffers, electrolytes, cleaning and storage solutions to facilitate operation and maintenance of its high-accuracy pH measurement systems.

Oxygen Accessories and Maintenance
To maintain the membrane integrity of oxygen sensors, kits of multiple membrane types, including membrane body, electrolytes and O-rings are offered.

Continued Support
Many customers still rely on our previous generations of products. We are committed to continue to provide maintenance materials, service and technical support for all of these products.

For more information, we invite you to visit:

www.mt.com/pro-service