Reduced Bleaching Costs
Thanks to Rugged pH System

In the delignification of chemical pulps, overuse of bleaching agents is expensive and damages the fibers. For one of Russia’s largest P&P groups, selecting a pH measurement system from METTLER TOLEDO has resulted in reduced chemical costs, plus less maintenance.

Major Russian P&P holding
Ilim Pulp Group is one of the biggest pulp and paper holdings in Russia. Their Koryazhma plant in the Arkhangelsk Oblast region employs over 3,000 people and is one of the largest wood chemical mills in Europe, with production exceeding one million tons of pulp per year.

Treating brownstock
Delignification of brownstock via bleaching requires careful monitoring of pH to ensure sufficient quantities of chemicals are used to guarantee the pulp is properly bleached. But it is also important that the bleaching agents are not used excessively as this would not only be costly but can damage the fiber quality and hence strength of the final products. The mix of alkalinity, solid matter, sulfides and high temperature quickly take their toll on pH electrodes. Electrode diaphragms are particularly susceptible as they are poisoned by silver sulfide in the brownstock and become clogged by the fibers.

Requirements
Ilim required a reliable electrode that would withstand the process conditions for many weeks and would be easy to clean. They also wanted continuous data on how the electrode was being stressed so that they could predict when it might need replaced. Could METTLER TOLEDO meet the challenge?

After discussions with plant engineers, two measurement points were installed consisting of the following:
InPro 4260 i pH electrode

A number of features made this electrode the ideal choice for Ilim. Firstly, it uses Xerolyt Extra, a solid polymer electrolyte rather than a liquid one. This allows the diaphragm found on most electrodes to be replaced by a hole in the probe’s glass casing. This open junction means that the brownstock is in direct contact with the electrolyte material, allowing more precise measurement. The open junction also greatly reduces the risk of clogging. In addition, the Xerolyt polymer is free of silver ions, therefore preventing contamination from silver sulfide.

The InPro 4260 i is one of METTLER TOLEDO’s digital, intelligent sensors. Intelligent Sensor Management (ISM) technology reduces the maintenance cost of measurement points while increasing process safety and reliability. Sensors equipped with ISM monitor themselves for wear and send this information to the connected transmitter. The Adaptive Calibration Timer displayed on the M400 transmitter monitors the time to the next calibration, while the Dynamic Lifetime Indicator shows in real time the remaining lifetime of the electrode. These features meet Ilim Group’s requirement for knowing how the electrode is being stressed and when it might fail.

M400 transmitter

The M400 is a single-channel, multi-parameter transmitter for pH/ORP, oxygen or conductivity measurement. It accepts analog sensors or digital ISM ones such as the InPro 4260 i. ISM’s Plug and Measure function and Quick Setup routine enable quick and simple commissioning.

InTrac 777 retractable housing

The ability to extract the electrode without process interruption is one of the major advantages of this retractable housing. Its integral flushing chamber allows safe electrode cleaning or calibration. And should the electrode need to be removed for replacement, the Tri-Lock safety system prevents any release of brownstock via the housing.

Cost savings

Plant engineers are highly satisfied with the performance of the two installed systems. Not only that, chemical consumption and maintenance time on the bleaching process have both decreased. The combination of long sensor life, ISM technology, retractable housing and reduced operating costs have exceeded the plant’s requirements, and the purchase of four further systems is planned.

If you want to reduce operating costs at your mill, go to:

- [www.mt.com/InPro4260](http://www.mt.com/InPro4260)
- [www.mt.com/ISM](http://www.mt.com/ISM)
**Improve Process Yield and Product Quality with the InPro 7100i Conductivity Sensor**

The extremely fast response, precise measurement and instant availability of the InPro 7100i will enable you to improve your process control – leading to higher product yield and quality.

**Designed for demanding applications**
The quicker and more accurately you can measure conductivity, the faster you can respond to process changes. The new InPro 7100i has been designed to provide outstanding performance in the Pulp and Paper industry.

The PEEK shaft material offers high resistivity against aggressive solutions, and the WideRange technology feature allows the combination of compact design for ease of installation, with a very wide measuring range of 0.02 – 500 mS/cm.

Electrodes are available in Hastelloy C22, Titanium or 1.4435 stainless steel for use in harsh or non-harsh environments.

**Reliable signal, instant availability**
The InPro 7100i features METTLER TOLEDO’s Intelligent Sensor Management (ISM) technology, developed to reduce sensor configuration and maintenance, while increasing process uptime and safety.

Like all other ISM equipped sensors, the InPro 7100i contains a microchip in the sensor head that converts the analog measurement signal into a digital one which is sent to the transmitter. As digital signals are almost unaffected by moisture or cable length, measurements at the transmitter are always reliable.

**Installation is simple with the InPro 7100i**.
ISM’s Plug and Measure feature means that no configuration at the transmitter is required. Simply install the sensor in the process, connect it to the transmitter and begin measuring.

**Easy process integration**
The InPro 7100i is compatible with a broad range of METTLER TOLEDO static and retractable housings, opening a wide variety of integration options. In conjunction with the InFit 761 housing, process insertion in the Pulp and Paper industry is safe and reliable.

**Benefits of the InPro 7100i**
- Fast response:
  - Improves process control
  - Increases yield
  - Lowers costs

- Reliable digital signal:
  - Unaffected by moisture
  - No degradation over long cables

- Suitable for a wide variety of applications:
  - Extensive measuring range
  - Choice of sensor pin material

- Low maintenance:
  - Resists aggressive solutions

- Easy installation:
  - Compact design
  - Compatible with many housings

To find out more about the InPro 7100i, go to:
- [www.mt.com/InPro7100](http://www.mt.com/InPro7100)
- [www.mt.com/ISM](http://www.mt.com/ISM)
How Can ORP Analysis Improve Your Bottom-line?

Controlling oxidant levels in your mill by measuring oxidation reduction potential (ORP) in-line may not seem an obvious cost cutting process. But for a paper mill in the US it reduced chemical costs, production downtime and improved product quality.

CFS manufacturer
One of our customers in the USA produces over 1,000 tons per day of coated free sheet (CFS) paper on three paper machines. Their CFS grade lines have diverse furnishers, some of which include bleached chemical thermo-mechanical pulp (BCTMP) and varying levels of machine and recycled broke. Subsequently, maintaining levels of oxidants in the system sufficient to maintain microbiological control without adversely affecting product quality, has been a challenge.

ORP measurement
Mill engineers recognized that ORP measurement would be extremely useful in monitoring oxidant levels throughout the mill and so installed a number of METTLER TOLEDO ORP measurement systems. The first ORP system was installed to monitor the water leaving the upflow filters and gravitating into the 750,000 gallon clearwell storage container. The second ORP system was installed to check the water leaving the clearwell for the mill’s distribution system. In the following year a third ORP measurement point was installed at the end of the filtered water distribution system to ensure full disinfection throughout the entire system.

The obvious next step was to take ORP technology to the paper machine. Over the following five years, in-line ORP measurement on various machine water loops encountered problems, primarily due to sensor fouling caused by the level of material present. Then the mill decided to install a METTLER TOLEDO redox probe in the cleaner tank very close to the headbox on the #1 paper machine. The velocity of the stock furnish in this area was very effective at preventing the sensor from fouling. As an added precaution, a retractable housing was installed to allow operators to clean the probe when necessary, without interrupting the process.

ORP technology from METTLER TOLEDO
The installed in-line ORP measurement system consisted of:
- InPro 3250 SG pre-pressurized, liquid-electrolyte ORP electrode with platinum contact near the tip (solution ground) allowing measurements of the redox potential
- InTrac 777 retractable housing with Tri-Lock safety system and an integral flushing chamber for regular cleaning without process shut down
- pH 2100 transmitter with diagnostic functions and PID controller.

Operational and experimental observations
Several cause and effect ORP relationships were observed during normal mill operations. In addition, deliberate “upset” testing has been performed to demonstrate further interactions, as summarized below.

Cause and effect ORP relationships
- Impact of paper break: The most significant process change to impact ORP values is a paper break. It was standard procedure on a break to shut off the dyes, ash and broke. The ORP spiked substantially on every break because the flow of all the reducers in the system was shut off, but the oxidant continued to flow. The excess oxidant in the system was causing bleaching and loss of color control when the sheet was back on the rolls.
- Filler material: Another significant finding was the unexpected reductive potential of the filler materials, granulated calcium carbonate and precipitated calcium carbonate. Increasing flow of either of these fillers caused a lowering of ORP value. With this information the mill was able to stabilize the dramatic changes in oxidant demand observed above, by reducing rather than completely shutting off some of the fillers on machine breaks.
- Introduction of process water: During machine breaks, additional fresh process water is drawn into the machine system. This water...
contains a high chlorine residual. An increase in the ORP value was seen each time a large amount of process water entered the system.

- Grade shift: Changing between various grades of product in some cases resulted in an increase in ORP while other grades caused a decrease in ORP.
- Post-consumer waste: Use of post-consumer waste acts as a reducer and was shown to cause a moderate decrease in ORP.

**METTLER TOLEDO solution**

In the months that followed the initial trial of the METTLER TOLEDO system on the #1 paper machine, ORP measurement was extended to the other two machines, and the oxidant addition programs adjusted based on the ORP results. The mill then took the process one step further and fed the signal from the transmitter to the mill’s DCS process control system to provide real-time, in-line measurements at the control center.

**Quick return on investment**

In all the applications, the installation of ORP measurement provided a return on investment within one month.

Many “reducers” have been identified as contributors to oxidant demand competing directly with added oxidant, thereby lessening disinfection action. Knowledge of these interactions permits implementation of corrective actions to minimize the ORP upset and keep concentrations within the target control range, as illustrated in Fig. 1. This results in shorter times of out of spec product color and minimizes corrosion while maintaining sufficient disinfection action.

The most significant economic outcome of ORP monitoring has been the ability to run increased levels of machine broke and CFS broke, without the typical loss in microbiological control and subsequent deposits/holes in the sheet. By maintaining a target ORP setting and adjusting the oxidant feed, optimal running conditions are maintained.

METTLER TOLEDO systems demonstrated that dependable, accurate in-line measurement of ORP at the paper machine can be achieved. Required maintenance is minimal, particularly due to the use of InTrac 777 retractable housings.

Monitoring and control of oxidant addition based on ORP has proven effective for microbiological disinfection in several application points throughout the mill. Cases where the oxidant demand varies based upon product changes or process upsets particularly benefit from ORP control. The result for our customer has been a significant decrease in oxidant costs and production downtime plus, more importantly, improved paper quality; benefits that have brought the mill substantial financial gains.

If you want to reduce production downtime and improve product quality at your mill, go to: www.mt.com/InPro3250

---

**Fig. 1: Effect of corrective action**

*ORP electrode InPro 3250SG*
Boost Lifetime of Your pH Electrodes by up to 30% and Reduce Maintenance Costs

Conditions in pulp and paper mills can be very hard on measurement equipment. Keeping pH electrodes clean not only helps ensure they are operating correctly, but by using an automated cleaning system you will increase electrode life and reduce maintenance.

The need for electrode cleaning
Depending on the type of application and actual operating conditions, sensors used in pH measurement may require more or less frequent maintenance attention. Particularly in processes which produce a coating on pH electrodes and block the diaphragm it is necessary to clean the sensor at regular intervals.

Automation of these tasks results in a significant increase in measurement accuracy and service life of electrodes. And thanks to the improved accuracy and increased lifespan of up to 30%, the manpower requirement for sensor maintenance work will be substantially reduced.

Benefits of EasyClean 100
The EasyClean 100 is a specially designed module within the EasyClean family for automated cleaning tasks, and provides many benefits:
- Reduced maintenance costs
- Higher productivity
- Increased process reliability
- Reduced downtimes
- Longer operational life of the electrode
- More precise process control

The EasyClean 100 carries out sensor rinsing automatically. The timing for the cleaning procedure is triggered via signals from the transmitter which can set the unit for cleaning interval and cleaning time period. A specially designed spray head directs a jet of water (or compressed air) at the sensing end of the electrode and ensures effective cleaning. It is therefore completely unnecessary to remove the sensor from its measurement position. The spray head is directly mounted in the lower end of an InDip 550 immersion housing.

The EasyClean product family
With the EasyClean systems, METTLER TOLEDO offers solutions for a diverse range of application requirements. EasyClean 100 and 150 are both suitable for the regular rinsing of sensors subject to light/medium contamination. For heavily contaminated electrodes the EasyClean 200 provides regular rinsing plus additional cleansing with a cleaning agent. The EasyClean 350 and 400 are fully automated calibration systems and reduce the maintenance costs of pH measuring points to an absolute minimum. In addition, the EasyClean 400 provides easy system integration and with the 400X METTLER TOLEDO offers a solution for hazardous area applications.

If you want to reduce maintenance costs at your mill, go to:
www.mt.com/EasyClean
Better Process Safety, More Uptime with Retractable Housings

If you have processes that run over extended periods or where sensor contamination is a concern, retractable housings allow easy and safe sensor access – without process interruption. That means process safety is ensured and uptime increased.

Concept
The idea behind InTrac retractable housings is to offer enhanced reliability and operational safety and increased process uptime, plus significantly reducing measuring point operating costs. InTrac housings have been designed for use in demanding applications in the Pulp and Paper industry where the use of pH/ORP, DO, conductivity and turbidity sensors is necessary to control and monitor process conditions.

High safety
Central to the design of InTrac housings are the Tri-Lock safety features: sensor detector, safety immersion tube and positive position locks. All of which have been designed to avoid unintentional release of process fluids. The sensor detector prevents the housing from being inserted without a sensor being installed. The patented immersion tube seals the housing from the process at all times during operation, and the positive position locks always keep the sensor in an optimal measuring position. Complete separation of the sealing and bearing functions improves operation and reliability even in highly contaminating applications.

In combination with an EasyClean cleaning and calibration system, a fully automated measuring system is available, bringing about a substantial reduction in operating costs.

Compliance
The InTrac housings are fully compliant with ATEX guideline 94/9/EC and are suitable for installation in Zone 0 and 1 hazardous areas. A wide selection of process fittings enables unrivalled flexibility for any installation purpose.

New length
The InTrac 777 line is now available with an extended insertion length of 295 mm to cover more applications.

If process safety and increased uptime is important to you, go to: www.mt.com/InTrac
The Information you Want
is at www.mt.com/pro

The new-look METTLER TOLEDO Process Analytics website contains a vast amount of up-to-date information on all our products and services.

Content is localized for your country and tailored to suit your selections.

Simple layout allows you to quickly find the information and features you are looking for.

- Learn about our most recent product developments
- Register for free webinars
- Request further information on products and services
- Obtain a quote quickly and easily
- Download our latest white papers
- Read case studies relevant to your industry
- Access buffer and electrolyte solution certificates
- and more...

The home page has been designed to get you quickly to the products and news you are interested in.
Product pages provide a product overview and quick access to all important details and documentation.

Application pages help guide you to the products that are right for your processes.

- Read the latest product news
- Access our newsletter archive
- Find out when our next trade show or exhibition is in your area
- Register for free webinars presented by our industry experts
- Download our white papers
Intelligent Sensor Management
Reduces Life Cycle Costs and Improves Process Safety

Intelligent Sensor Management (ISM)
ISM reduces the installation, maintenance and calibration effort for METTLER TOLEDO’s digital sensors to a minimum. This considerably improves process reliability, productivity and system availability.

Reliable installation
Digital communication between sensor and transmitter means signal is always reliable and unaffected by moisture.

Intelligence – starts in the head
ISM sensors are equipped with integrated electronics in the sensor head that store all relevant sensor parameters and includes algorithms for enhanced sensor diagnostics.

Predictive maintenance
Intelligent diagnostics information is calculated and displayed on the sensor’s transmitter and tells you if the sensor needs maintenance or replacement – no more downtimes due to sensor failure!

System integration
Key ISM parameters can be fully integrated in a process control system via PROFIBUS® PA or FOUNDATION Fieldbus™.

Plug and Measure

- Sensors are immediately recognized when connected to the transmitter – eliminating difficult configuration procedures.
- Operational availability of measurement point within seconds.
- Wireless module available for transmission from sensor to transmitter – no need for costly cable installation.
- Sensors can be pre-calibrated in the lab and stored for later use, saving time and increasing operational availability.

METTLER TOLEDO’s ISM product range includes…
…a wide range of sensors for
- pH
- dissolved and gaseous O₂
- conductivity
- turbidity
Intelligent Sensor Management Reduces Life Cycle Costs and Improves Process Safety

Diagnostics

- Any sensor maintenance requirement is recognized at an early stage, reducing downtimes and minimizing plant operation costs.
- Dynamic Lifetime Indicator estimates in real time the remaining lifetime of the sensor.
- CIP/SIP cycles counted automatically.
- Sensor spider diagram for fast troubleshooting.

Maximum Performance

- iSense Asset Suite software offers you a unique means of optimizing the performance of ISM sensors for enhanced reliability and process safety.
- Key Performance Table enables you to evaluate the condition of an ISM sensor at a glance, without the need of a transmitter.
- Documentation of every calibration as well as the entire sensor history – documentation requirements to regulatory standards are easily met.

…advanced single- and multi-channel transmitters
- 4-wire
- 2-wire
- wireless module

… software applications
- iSense Asset Suite
- pH data logger

Intelligence starts in the head

www.mt.com/ISM
Plug and Measure Sensors for Immediate Measurement

Intelligent Sensor Management (ISM) technology helps you to install and maintain pH and conductivity measurement systems for use in pulp and paper mills. A microchip in the sensor provides parameter measurements and sensor status information in real time to the control room. Now maintenance can be effectively planned in advance. ISM sensors can be accurately pre-calibrated and adjusted using a standard PC and METTLER TOLEDO’s iSense software, then stored for later use. Plug and Measure functionality means sensors are easily installed and start measuring immediately.

www.mt.com/ISM