Pulp & Paper
Perspectives in Liquid Process Analytics

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News

INGOLD
Leading Process Analytics

Eliminate Costly Problems
of Poor Liquor Filtration

Poorly filtered green liquor can cause expensive operational problems downstream. A large Japanese paper manufacturer turned to METTLER TOLEDO for a reliable solution. Now, not only is poorly filtered liquor no longer an issue, operating costs have been significantly reduced too.

Large Japanese paper producer

Japan is the second largest paper manufacturer and sixth largest pulp producer in the world. Our customer belongs to the largest single P&P producer in Japan, with approximately 4,800 employees and over 12 billion US dollars in annual sales.

Green liquor clarification

During processes for recovery of chemicals from the pulping stage, so-called green liquor is produced which has to be clarified before it can be treated further. The purpose of clarification is to remove solids from the liquor. The solids, or dregs, are primarily unburned carbon particles from the recovery furnace. Along with carbon the dregs contain other impurities such as silica, iron, chromium, aluminum and magnesium. If these impurities are not removed from the green liquor in the clarifier they can cause many fouling, clogging and corrosion problems downstream. Therefore, efficient clarification is critical.

The filtration process

To maintain filtration efficiency the customer backflushes the filter at certain intervals. However, immediately after backflushing, filter material often migrates through to the permeate side and therefore the turbidity in the permeate liquid immediately tends to rise.

Process control with turbidity measurement system

On the basis of the measurement provided by a turbidity sensor it is possible to control

METTLER TOLEDO

the return of high turbidity permeate liquid to the filter inlet side. If turbidity drops sufficiently, the permeate can be fed to the next step, causticization (Fig. 1). With this measuring principle it can be guaranteed that the degree of turbidity in the liquor never exceeds a level which might negatively impact the causticizer.

Turbidity sensor InPro 8400

METTLER TOLEDO solution

As the green liquor is strongly alkaline and the process temperature is high (70 °C), the turbidity measurement system has to be capable of tolerating extreme conditions. Prior to consulting METTLER TOLEDO the customer had difficulties in finding a reliable turbidity sensor for this application and doubted that an adequate solution could be found. METTLER TOLEDO recommended a system consisting of the InPro 8400 turbidity sensor and the Trb 8300 F/S transmitter. The sensor was mounted directly into the permeate pipe.

Functionality of the system

The decision to furnish the InPro 8400 with Kalrez seals was exactly right for this application. During the one-year test run the sensor needed no maintenance whatsoever, and even afterwards during actual production, the only work required was replacement of the lamp.

Low maintenance and reliable performance

After the many problems experienced prior to installation of the InPro 8400 sensor, the customer was extremely satisfied with our solution. The exceptionally low maintenance requirement of the sensor has reduced operating costs. But more importantly, the reliable data from the METTLER TOLEDO measurement point means that costs associated with poorly filtered green liquor are no longer a concern.

In-line measurement means optimized production and lower operating costs

The continuous stream of data that in-line measurement provides lets you know that your processes are working as they should, and informs you the instant that they are not helping you to maximize production and reduce operating costs.

Discover more at:
www.mt.com/PRO

To ensure the efficiency of your filtration processes, go to:
www.mt.com/InPro8400

Kalrez is a registered trademark of E. I. du Pont de Nemours and Company.

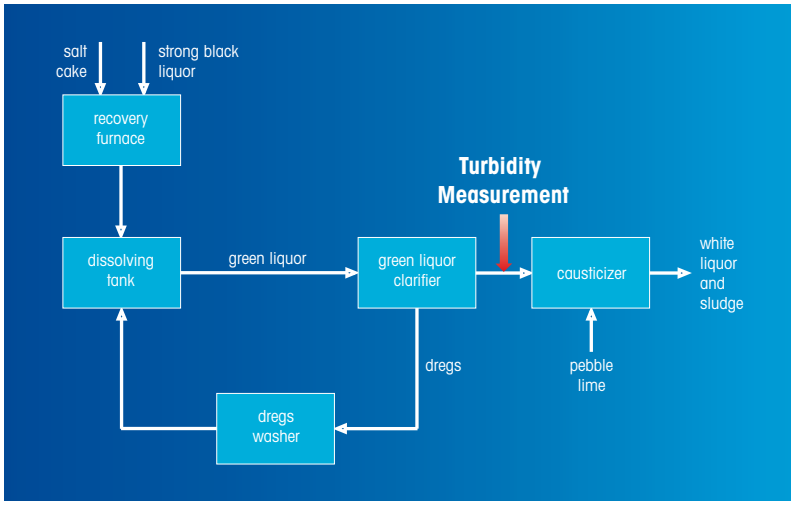

Figure 1: Extract of schematic flow chart of paper production.

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Trouble-free Conductivity Measurement

A New Team of 2- and 4-Wire Transmitters

Monitoring conductivity is an excellent way of ensuring product quality, reducing product loss and optimizing processes. The latest editions to our conductivity transmitter line feature Intelligent Sensor Management (ISM) for even greater productivity.

Important measurement

Conductivity measurement with 2-e or 4-e sensors is common for monitoring water quality during water purification. For concentration determination through chemical processes, very often an inductive conductivity measuring approach is chosen.

M400 4-wire transmitter, a versatile solution for standard applications

Thanks to its multi-parameter capabilities, universal power supply, number of current output signals and relays, the M400 4-wire transmitter is a particularly versatile instrument. The Intelligent Sensor Management (ISM) Plug and Measure function and Quick Setup routine enables quick and simple commissioning; while the display provides measurement values from two sensors, and alarms for out-of-spec conditions, plus warnings of potential sensor failure.

Transmitter M400

M420 2-wire transmitter, a reliable solution for hazardous area applications

Designed for hazardous area operation, the M420 2-wire transmitter is the perfect solution for advanced process control. Key features include the IP 67 rated enclosure and options for additional functions e.g. for extended logbook or a second output signal. As the 2-wire transmitter with its 4 - 20 mA output signal provides HART communication as standard, the M420 represents a future-proof investment for integration into your process control system.

Transmitter M420

ISM – the leading sensor technology

METTLER TOLEDO's new transmitters all feature ISM technology for better process and maintenance control of measurement points, without compromising process reliability. The mixed mode input feature of the transmitters means that digital ISM sensors or traditional analog sensors can both be connected. The transmitters can be used in combination with 2- or 4-electrode sensors as well as inductive conductivity sensors. The large backlit display with its clearly structured menus ensures intuitive and easy operation.

The METTLER TOLEDO solution

METTLER TOLEDO is a total solution provider with many years' experience in conductivity measurement. Our portfolio covers various transmitter lines, analog and innovative ISM technology digital sensors, as well as housings for a wide range of applications.

Discover more at:

www.mt.com/M400
www.mt.com/M420

Reducing Maintenance Costs
in a Difficult Bleaching Application

Building on a successful low-maintenance pH measurement system installed more than five years ago, a major US pulp and paper mill reduces maintenance still further with the introduction of a combined pH and ORP sensor.

Continuous improvement

One of the world's leading suppliers of consumer tissue and paper towel products has been a satisfied user of METTLER TOLEDO DPA pH electrodes for over five years.

Following an extensive evaluation the DPA was deemed the best available sensor on the market, and the customer was pleased that the electrode would last approximately three months in an aggressive bleaching application. Over the years, METTLER TOLEDO has made further strides in pH technology innovation and recommended the customer try the more modern InPro 3250 i pH electrode in the same application.

Aggressive conditions

Bleaching is achieved in a four-stage process alternating between a chlorine dioxide stage and caustic extraction stage. The bleaching step in a pulp and paper mill is both aggressive and sensitive. With movement toward "elemental chlorine-free" (ECF) bleaching, chlorine dioxide is used to bleach the fibers to achieve the desired "whiteness". However, excessive dosing of chemicals attacks the fiber, ultimately resulting in loss of paper strength. Further, depending on the pH level, the chlorine dioxide is chemically converted into ineffective chlorate and chlorite. Therefore the bleaching power is directly related to both the chlorine dioxide concentration as well as pH, as illustrated below (Fig. 1).

Higher pH results in less efficient bleaching power, which requires the use of additional chlorine dioxide, adding to chemical costs. For that reason, acid is introduced to achieve optimal performance at a controlled pH of 3.5 – 4.0.

The bleached pulp is next reacted with caustic soda in the caustic extraction tower to remove the yellowing lignins from the fiber. In addition to measuring pH, the InPro 3250 i sensor has a built-in platinum oxidation-reduction potential (ORP) electrode. The ORP sensor is utilized to detect the presence of residual chlorine dioxide during preliminary rinsing of the fiber prior to caustic treatment.

In both bleaching and caustic extraction stages, the high oxidizing power, elevated caustic concentration and temperatures up to 80 °C can lead to a short life for conventional electrodes.

Technological advances

Over recent years the mill has invested heavily in upgrading to state-of-the-art technology throughout the facility. The InPro 3250 i offers numerous technical enhancements over DPA electrodes.

The "i" indicates that the electrode features METTLER TOLEDO's Intelligent Sensor Management (ISM) technology. ISM reduces the maintenance costs of measurement points, while increasing the safety of the production process.

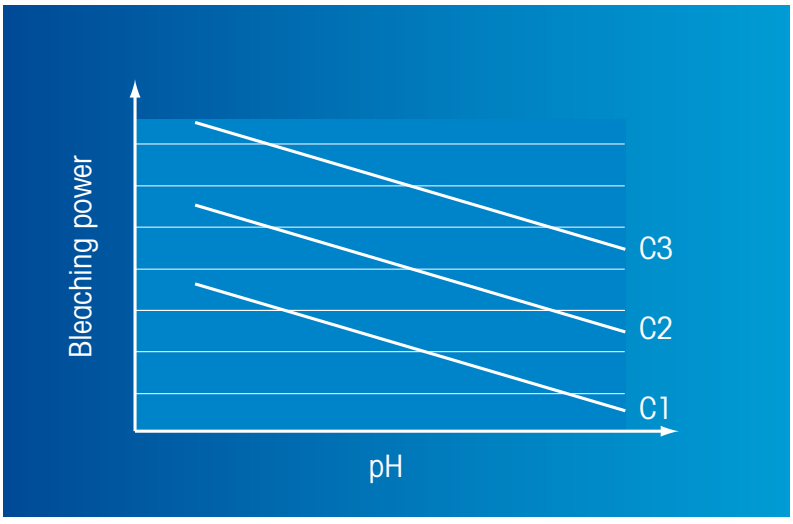


Figure 1: Regardless of chlorine dioxide concentration (C1, C2, C3), bleaching power decreases as pH increases.

Benefits of ISM include:

- Pre-calibration – ISM technology allows sensors to be pre-calibrated in the workshop, stored for future use, and installed when required, quickly and easily.
- Digital signal – unaffected by moisture or electrical noise; measurements are reliable and robust.
- Plug and Measure feature – for fast start-up.
- Dynamic Lifetime Indicator – tells you when sensor maintenance is required; chance of sensor failing during the process is almost eliminated, so process stability is greatly enhanced.
- ISM equipped systems mean simpler handling, higher process safety and increased productivity.

Additionally, the InPro 3250 i provides a temperature compensation capability not found in the DPA. This allows accurate pH readings regardless of process temperature fluctuations. Further, the pressurized liquid reference electrolyte continuously flushes the reference junction. This feature serves to prevent fouling of the junction and plays a significant role in extending sensor life, as well as providing optimum measurement accuracy.

Customer satisfaction

The customer's primary interest in extending the time between maintenance tasks has been achieved, resulting in significant cost savings. The digital aspects of the InPro 3250 i were an additional bonus which raises the measuring point's performance to a whole new level. In the bleach plant, four M700 transmitters with InPro 3250 i sensors are used. The modular design of the M700 permitted rapid upgrade to digital technology without the need for transmitter replacement. Also, the two-channel analog output of the M700 facilitated expansion to measure both pH and ORP.

Use of digital communication between the sensor and the transmitter eliminates electrical transmission problems common with high-impedance analog pH sensors in humid environments. Particularly in a mill environment, eliminating sensitivity to moisture presents a particular advantage.

To benefit from ISM at your mill, go to:
www.mt.com/InPro3250i
www.mt.com/ISM

Best Practice

Selecting the right system can greatly reduce your maintenance requirement

METTLER TOLEDO realizes that you want to keep maintenance time to a minimum while ensuring your pH measurement point is always operating optimally. We offer a range of pH electrodes, transmitters and housings for use in the Pulp and Paper industry. Our sales representatives will ensure you have the right systems for your processes.

Discover more at:
www.mt.com/PRO-pH

pH electrode InPro 3250 i

Tricky Sensor Installation Point?
Go Cableless!

Proper wiring between sensor and transmitter can be very costly, especially in locations with limited access or where moving parts can be a hazard. The cableless solution W100 gives you the option to solve expensive and challenging installation conditions at a very reasonable cost.

No more cables

With the W100, METTLER TOLEDO offers an innovative solution for cost-intensive measurement point installations. Based on reliable and industry-proven wireless technology (according to IEEE802.15.4), the W100 replaces the cable between METTLER TOLEDO Intelligent Sensor Management (ISM) sensors and the transmitter, and provides bi-directional digital data transfer with full calibration and diagnostics functionality.

Real-time monitoring of the measurement value as well as auto-recognition of the sensor is ensured. Additionally, the W100 convinces with its very simple one button operation, which is also the basis for the easy pairing between transmitter and sensor. Thanks to the LED display, the state of the W100 can be recognized at a glance. Installation at existing ISM measuring points is simple as there is no need to change any transmitter settings.

For many applications

Since there is no cable to be laid, the system offers great advantages in applications where high installation costs due to physical barriers or contamination risks, exist. Also, in applications where the measuring point is needed only temporarily, where the installation of the sensor has to be changed several times, or where the sensor is mounted on a moving part, the W100 is a highly cost-efficient solution. It is also the perfect answer for remote monitoring tasks.

The W100 supports ISM sensors for pH, DO as well as 4-E conductivity, which are compatible with the advanced transmitter line M400 or the value transmitter line M300.

Additional benefits of the cableless solution include the long battery lifetime of up to 6 months, and the communication range of up to 150 meters.

Discover more at:
www.mt.com/W100

Best Practice

Stay one step ahead of maintenance with ISM

A METTLER TOLEDO ISM measuring system with the W100 will not just save on installation costs; ISM also reduces the maintenance and calibration effort to a mimimum. This considerably improves process reliability, productivity and system availability.

Find out how ISM can help you, at:
www.mt.com/ISM

Magnesium Oxide Slurry Control with Rugged pH Electrode

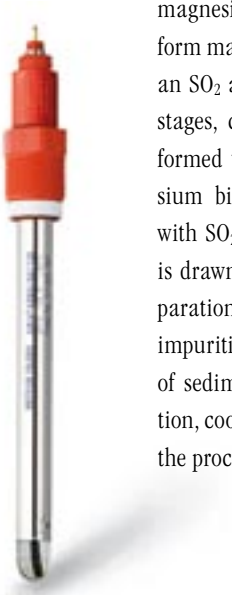
Pulp manufacturing processes are highly demanding because of their harsh conditions. The new InPro 4260 i pH solid polymer electrode has been developed for difficult applications such as slurry control.

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 sulfur dioxide (SO_2) and magnesium oxide (MgO) contained in the flue gas from the recovery boiler are converted into magnesium bisulfite.

Reaction steps where $Mg(HSO_3)_2$ is produced

There are several stages to achieve this, one of which is SO_2 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 SO_2 absorbent. In the alkaline sulfite stages, crystalline magnesium sulfite is formed which is converted into magnesium bisulfite through further contact with SO_2. 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.



pH electrode InPro 4260 i

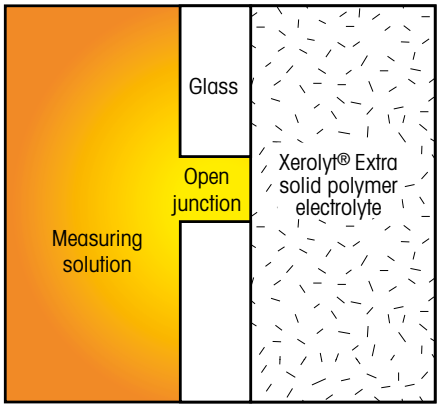
How to overcome a challenging situation

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 above conditions, use of the new InPro 4260 i electrode is recommended. The electrode features Xerolyt EXTRA solid polymer electrolyte for precise pH measurement and longer lifetime, even in the most difficult high particle concentration industrial environments. This diaphragm-less sensor features an open junction, allowing direct contact between process media and electrolyte. As there is no diaphragm, the possibility of clogging is greatly reduced, and hence the need for frequent cleaning. Further, the "i" suffix indicates that the electrode is part of METTLER TOLEDO's Intelligent Sensor Management (ISM) range of sensors. Microchips in the head of the electrodes monitor the sensors for signs of stress or degradation and transfer the information to the transmitters. The advanced diagnostics features of ISM systems interpret the sensor data to inform the user when electrode cleaning or calibration is required. Thus maintenance can take place when it is needed, rather than waiting until measurement performance from the sensor is reduced, or conducting regular maintenance when it may not be necessary.

Discover more at:
www.mt.com/InPro4260i



Open reference junction of the InPro 4260 i

The Information you Want
is at www.mt.com/pro

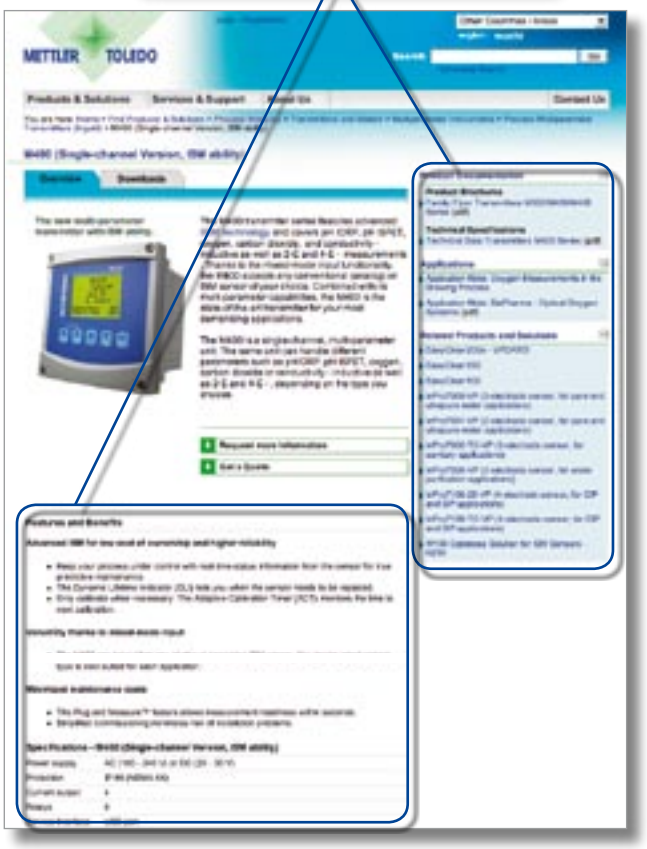
The METTLER TOLEDO Process Analytics website contains a vast amount of up-to-date information on all our products and services.

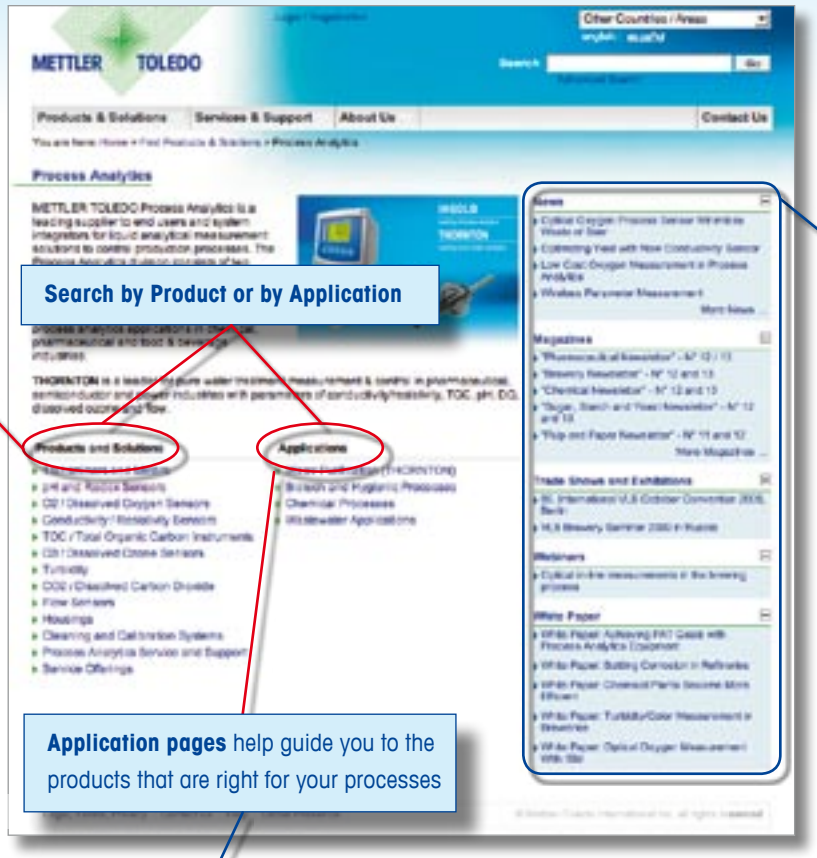
Content is localized for your country and tailored to suit your selections.

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...

A typical Product page: with Features and Benefits and quick access to relevant application information, related products and downloads





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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 O_2
- conductivity
- turbidity

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

Get in-line with METTLER TOLEDO

The versatile M400
now for inductive conductivity

In critical applications (e.g. in acidic, sticky or oily solutions) conductivity sensors are often based on the inductive principle. With our newest transmitter, M400 Type 1 Cond Ind, METTLER TOLEDO combine the benefits of the proven inductive conductivity sensors of the InPro 7250 series with the successful transmitter line M400. The new transmitter features mixed mode input capability, where either a digital or analog sensor can be used. Supported parameters are conductivity as well as pH/ORP. With METTLER TOLEDO's new ISM technology the transmitter provides advanced diagnostic tools such as the Dynamic Lifetime Indicator for reducing maintenance costs, achieving higher reliability and better yield of the process as well as improving the lifetime of sensors.

www.mt.com/M400

ISM

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