Chemical
Perspectives in Liquid Process Analytics

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News

INGOLD
Leading Process Analytics

A Small Footprint in Your Plant

A Leap Forward in Analytical Measurement

Compact, head mount temperature transmitters have been a common sight in chemical plants for decades. Calibration of analytical sensors requires a transmitter with keys and a display, which has prevented the head mount concept being used for pH/ORP, conductivity, and oxygen sensors – until now!

A world first

The average production facility contains hundreds or even thousands of field instruments, of which most are of the "fit and forget" type. They go unnoticed due to their inconspicuous design and absence of local human machine interface.

Analytical sensors, on the other hand, have not followed this trend and continue to require a transmitter large enough to include keys and a display due to their frequent need for calibration. METTLER TOLEDO has defied this convention. With the new M100, METTLER TOLEDO offers the world's first transmitter for analytical measurement based on a compact, head mount design.

Intelligence is the key

Thanks to METTLER TOLEDO's powerful Intelligent Sensor Management (ISM®) technology, the combined head mount transmitter/sensor concept has been applied to analytical parameters. This new approach enables METTLER TOLEDO to provide a solution for pH/ORP, conductivity, and oxygen measurement which has a very small footprint and is extremely easy to handle.

Plug and Measure means no local interface is required

This leap forward in field instrumentation is possible because ISM enables sensors to be calibrated away from the process in a convenient location such as a workshop. Calibrated sensors can then be swapped quickly in the field. This feature, called

METTLER TOLEDO

Plug and Measure, means measurement point start up is fast and error-free, and can be accomplished without complicated routines. Because of Plug and Measure, the M100 does not require a local operator interface.

Intrinsically safe

The new, 2-wire transmitter series is designed for use throughout the process industries and is certified intrinsically safe for installation in hazardous areas.

Online sensor diagnostics

The M100 can be easily configured over the HART® protocol. In addition, HART allows integration of ISM's advanced sensor diagnostics, such as the Dynamic Lifetime Indicator and Adaptive Calibration Timer, providing real-time data on sensor "health". These tools allow predictive maintenance, helping to ensure maximum plant uptime, measurement point reliability, and process efficiency and safety.

The support of all major asset management software such as AMS (Emerson), PDM (Siemens), and the open standard FDT/DTM ensures the widest compatibility, and remote access to sensor diagnostics.

Find out more about the M100 transmitter:
► **www.mt.com/M100**

Available October 2013

ISM

M100 transmitter mounted to InFit 761 e sensor housing

Key features

- Small footprint
- Aluminum head and stainless steel body
- Intrinsically safe
- Plug and Measure start up
- Predictive sensor diagnostics
- No display
- HART® communication

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Highly Durable pH Sensor
Delivers Critical Measurement

Production of neopentyl glycol requires tight control of pH in tough process conditions. For Sweden's Perstorp Group, a robust and intelligent pH measurement system is providing assurance of product quality.

Leading provider of specialty chemicals

Neopentyl glycol (NPG) is an organic chemical compound that is widely used in base resins in the manufacture of coatings and paints, and as an ingredient in synthetic lubricants.

One of the major producers of NPG is the Swedish Perstorp Group, a world leader in several sectors of the specialty chemicals market. Over its 130 year history, it has developed many innovative products and now has interests including polyols, biofuels, and feed additives.

pH control is critical in NPG production

NPG synthesis involves an aldol condensation of isobutyraldehyde and formaldehyde, followed by a hydrogenation step. The pH level during production greatly affects final product quality, and in one particular stage, Perstorp technicians found that pH must be maintained between pH 8 and 9 or else the product becomes unusable. The technicians were finding obtaining reliable pH measurements in this step to be very problematic.

The 120 °C temperature and oily process medium meant the lifetime of the various pH sensors they tried was no better than one week, despite regular cleaning. METTLER TOLEDO was asked to provide a better solution.

Robust sensor

We installed a system based on the InPro 4260 i sensor. This probe was selected for a number of reasons: It has a solid polymer electrolyte that provides excellent resistance to contaminating substances, and instead of having a diaphragm that would quickly become clogged, it has an open junction. These two features provide the extended sensor service life Perstorp were looking for. In addition, the InPro 4260 i includes Intelligent Sensor Management (ISM®) technology.

InPro 4260 i pH sensor

Predictive diagnostics

One of ISM's main benefits is predictive diagnostics that provide real-time information on sensor condition: The Dynamic Lifetime Indicator (DLI) tool uses past and present process conditions to predict the remaining reliable lifetime of the sensor. This means that Perstorp technicians can see on the display of the connected transmitter when the sensor will need replaced. The Adaptive Calibration Timer (ACT) informs them when sensor calibration should next be performed.

Due to the DLI and ACT, technicians know well in advance when sensor maintenance or replacement will be required; therefore, they can plan maintenance accordingly.

Convenient calibration

Another valuable feature of ISM is sensor calibration away from the process. Using iSense software for ISM sensors running on a standard PC or laptop, the InPro 4260 i can be calibrated in any convenient location. Once calibrated, the sensors can be stored for quick exchange at the measurement point when required.

Retractable housing prevents process interruption

Testing of the system showed that reliable process control could be achieved if the sensor was installed in the medium for only five minutes out of every hour. Therefore, the sensor was fitted to an InTrac 777 retractable housing which allows removal of the sensor without process interruption or danger of the escape of medium. Once extracted, the sensor can be rinsed in hot water then reinstalled in the housing, ready for the next measurement.

High system performance

Perstorp are very pleased with the performance of the system and the technical support and service METTLER TOLEDO provided during the project. The combination of a process tolerant sensor, retractable housing, and ISM has given Perstorp the dependable, durable, pH measurement system they need to produce high quality NPG.

If you need a solution for a difficult pH measurement, visit:

► **www.mt.com/PRO-pH**

More Uptime, More Copper
Thanks to In-line Turbidity Systems

In-line turbidity measurements are invaluable for monitoring conditions in a wide range of mining processes. At a US copper mine, low maintenance turbidity systems confirm that solution extraction and wastewater treatment are in spec, and are also increasing production.

Arizona copper mine

A US-based mining concern operates several copper, gold, and cobalt extraction and processing facilities worldwide. At a mine in Arizona, they produce copper through solution extraction and electrowinning of crushed ore.

Pregnant leach solution

In solution extraction, weak sulfuric acid percolates through stockpiles of low-grade copper ore. The acid dissolves copper minerals in the rock and the copper-laden fluid (which also contains unwanted suspended solids), called pregnant leach solution, flows into collection ponds. From there it is pumped to a solution extraction plant where it is mixed with an organic diluent and allowed to settle.

The copper transfers to the diluent and floats to the top of the pond, then is sent on for electrowinning. The heavier, copper-depleted solution still contains sulfuric acid and is pumped back to the stockpiles to be reused as leach solution.

The exact make-up of the leach solution can affect the quantity of solids that exit the stockpile. Solids can be carried through the process and interfere with electrowinning, so the suspended solids content is closely monitored via turbidity measurements.

Off-line measurements were often too late

Mine technicians had been using grab samples for lab measurements, but sometimes increases in suspended solids were

being detected late, resulting in production delays. The technicians realized in-line measurements would prevent the issue and approached METTLER TOLEDO for a solution.

Real-time system safeguards the process

Due to the typical particle size found in the leach solution, we installed systems based-around our InPro 8400 forward-scattered light, turbidity sensor along with the Trb 8300 transmitter. Comparisons with lab measurements showed the in-line systems to be as accurate as the lab measurements. Mine engineers also appreciate the sensor's robust construction, low maintenance requirement, and scratch-resistant optics.

Now, thanks to the real-time data from the systems, the mine can accurately and continuously monitor the suspended solids content of the leach solution. Rapid corrective action of solution make up has led to greater production uptime.

Monitoring process waste

Turbidity is also an important measurement in waste management at the mine. Process waste is transferred to large pools called sludge thickeners where gravity separates the solid content, and clean water flows over a weir for further treatment before discharge. To monitor efficiency of the process, suspended solids are measured in the water flowing over the weir. If the turbidity of the overflow is more than 300 ppm, filter blocking can occur in downstream treatment, so early warning of a rise in solids level is important.

For turbidity measurement, the mine had been using an optical absorbance sensor attached to a sample line; however, the system was proving problematic to maintain. In addition, the narrow sample line would frequently become clogged with sediment. METTLER TOLEDO was asked to supply a more dependable and lower maintenance system.

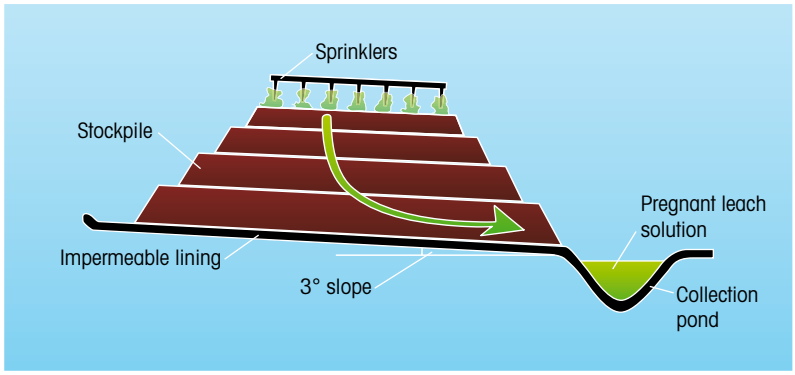
"Fit and forget" solution

The size of the suspended particles found in this process is greater than in the leach solution, so we installed our InPro 8200 back-scattered light sensor as this measurement technique is more accurate with larger particles. The robust, stainless steel sensor was installed in an InDip 508 immersion-style housing and the system was completed with a Trb 8300 transmitter.

The problem of clogged sample lines is removed, as the sensor is fitted in a housing which is installed in situ, and other than occasional cleaning, the system is maintenance-free. The continuous turbidity measurements are allowing mine technicians to better control sludge thickener efficiency, preventing blocked filters downstream.

If you need real-time turbidity measurements at your facility, go to:

▶ **www.mt.com/turb**



Solution extraction process


InPro 8400 turbidity sensor


Trb 8300 turbidity transmitter

Preventing Explosions
Demands In Situ, TDL Oxygen Sensors

At a Brazilian metal treatment plant, oxygen levels in a vapor extraction system must be continuously monitored to provide early warning of a potentially explosive gas mixture. A comparison of technologies shows that only an in situ, tunable diode laser sensor provides the required speed of response.

Metal treatment produces hazardous vapors

One of South America's major metal producers operates a facility in Brazil where they run a surface treatment procedure to harden steel. The process generates a great deal of organic vapors including benzene, toluene, naphthalene, ammonia, and phenol all of which pose a hazard to human health and the environment.

These gases are extracted from the production process equipment by fans and piped to a treatment plant. Typically, oxygen is not a component of the gas mixture itself, but enters in air through pipe connections and valves. To prevent the gas mixture posing a fire and explosion risk, the oxygen level in the piping must be continuously monitored.

Paramagnetic analyzer is far from ideal

Real-time measurements are required to allow for corrective action before the oxygen level exceeds safe limits. However, the paramagnetic analyzer the plant had been using gave engineers problems. The analyzer needed sample extraction and conditioning equipment to remove moisture and dust that would otherwise damage the analyzer's measurement cell. This equipment caused a delay in O_2 determination that, on occasion, led to an explosive gas mixture being present in the piping.

Further, the extraction and sampling equipment required regular maintenance, meaning it was often offline, leaving the plant without an oxygen measurement. In addition, the hydrocarbons in the gas mixture would sometimes interfere with the measurement, resulting in uncertainty as to the actual O_2 level.

Plant engineers began looking for a more reliable system that would also be low in maintenance. After becoming aware of our GPro 500 tunable diode laser (TDL) oxygen sensor, they contacted METTLER TOLEDO.

Tunable diode laser technology

TDL technology is a relatively new class of gas analyzer that is gaining acceptance across the process industries. TDLs work on the principle of laser absorption spectroscopy: A focused and tunable laser beam passes through the gas stream to a receiver. The laser scans a very narrow part of the electromagnetic spectrum where absorption lines that are characteristic of the gas species to be measured, exist. Analysis of the surface area of the absorption lines (or peaks), allows determination of the concentration of the target gas.

TDLs for monitoring oxygen, carbon monoxide, and other gases are growing in use in many industrial processes because they measure in situ and therefore do not require sample extraction or conditioning equipment. They are also largely immune to the presence of dust, moisture, and background gases in the gas stream.

Cross-stack TDLs require tricky alignment

Most TDLs are of a cross-stack design comprising separate sender and receiver units. Such TDLs require a pipe diameter that is wide enough to allow the laser to pass through a sufficient quantity of gas in order that a reliable measurement is obtained. The pipe diameter of the metal treatment plant's vapor extraction system prevented the use of such a configuration. Even if the diameter had been sufficient, installation of such TDLs demands precise

GPro 500 oxygen sensor

alignment of the two units, and time consuming and costly realignment may be periodically required.

No alignment worries with probe-design TDL

METTLER TOLEDO developed the GPro 500 TDL oxygen sensor to surmount the path length and alignment issues. The GPro 500 has both laser source and receiver in the same unit. The laser passes down a probe, at the end of which a corner cube directs the beam back to the receiver. Not only does this means that there is no alignment necessary, it also provides a more accurate oxygen measurement because the laser crosses the gas stream twice.

Two other features of the GPro 500 also appealed to the treatment plant's engineers: When the unit needs calibrated (approximately once per year) the sensor head can be removed while the probe is left in situ, so there is no danger of gas escaping from the vapor extraction system. Intelligent Sensor Management (ISM®) predictive diagnostics in the unit provide constant assurance of the sensor's condition, so engineers can be confident in the sensor's measurements.

Robust, reliable, and precise

A GPro 500 was duly installed in the extraction system piping. Since its commissioning, the GPro 500 has required no maintenance and suffered no failures, and is providing accurate oxygen measurements for safeguarding organic vapor extraction. Due to the plant owners' satisfaction with the sensor, they now are planning on installing GPro 500s in their other Brazilian facilities.

Find out more about reliable, low-maintenance oxygen monitoring, at:

▶ **www.mt.com/O2-gas**

Remote Access to Sensor Diagnostics
New FF Transmitter

The M400FF transmitter with Intelligent Sensor Management (ISM®) technology provides the highest reliability and easiest handling in hazardous and non-hazardous area applications. Advanced sensor diagnostics data available over FOUNDATION fieldbus™ leads to reduced operating costs and helps improve productivity.

Outstanding reliability

With its rugged design and approvals for hazardous area use, the M400FF 2-wire transmitter provides operating assurance even in the most challenging conditions. In combination with METTLER TOLEDO's advanced Intelligent Sensor Management (ISM) technology, the M400FF offers greater process reliability in applications across the chemical industry.

Flexible and future-oriented

The M400FF transmitter is a multi-parameter, single-channel unit for pH / ORP, amperometric and optical oxygen, conductivity, and dissolved carbon dioxide sensors. Thanks to the mixed-mode input, which accepts traditional analog or ISM sensors, the M400FF offers a unique and smooth technology transition from analog to digital sensors and provides a future-oriented investment in your plant.

Compatible with your asset management system

Because of the implemented standardized FOUNDATION fieldbus (FF) interface, the M400FF supports corresponding asset management tools, such as AMS (Emerson) and PRM (Yokogawa), and field communication tools, including HH475. This ensures maximum compatibility with your asset management system.

Quick set-up and simplified sensor handling

Thanks to the M400FF's advanced ISM functionality, the transmitter offers additional, valuable benefits:

- Using our iSense software for ISM sensors, probes can be accurately calibrated in any convenient location and stored for later use.
- When a calibrated sensor is connected to the M400FF, the calibration data is automatically uploaded and the system is ready to measure in a few moments.
- This Plug and Measure feature minimizes the risk of installation troubles and simplifies sensor commissioning and replacement.

Improved process control thanks to sensor diagnostics

Measurement data and ISM sensor diagnostics tools, such as the Dynamic Lifetime Indicator (DLI), Adaptive Calibration Timer (ACT) and Time to Maintenance (TTM), can be integrated into the process control system. Due to the M400FF's communication capability, system integration is easily achieved, enabling more efficient maintenance of the measurement system. Unplanned shutdowns due to unforeseen sensor failure no longer occur, and the resulting increase in process availability and reduced maintenance lead to improved productivity and lower operating costs.

Find out more at:

► **www.mt.com/M400-2wire**

M400 FF transmitter

Chemical Synthesis
Beyond the Round Bottom Flask

Researchers in synthetic organic chemistry are under increasing pressure to discover and develop new and improved chemical reactions and processes as quickly as possible. While analytical technologies have changed dramatically, chemical synthesis itself has remained largely unchanged for over fifty years. A new type of approach is now helping chemists to redefine the way that chemical syntheses are researched and performed.

New experimental techniques for organic synthesis.

Historically, the round bottom flask has been the work-horse in the synthesis lab but it has its drawbacks. Heating and cooling of the reaction mass is difficult and imprecise, and maintaining temperature over several hours is challenging. In many cases, synthesis steps are impossible to perform unless a scientist is present to supervise the reaction, and repeating a synthesis is not always straightforward.

A new technology has been developed that helps scientists develop a greater understanding of the reactions they study and has redefined the way organic syntheses are researched and performed while maintaining their current workflow.

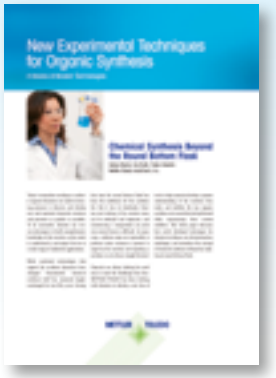
Replacing the round bottom flask

EasyMax® and OptiMax™ synthesis workstations eliminate the need to use heating mantles, oil and ice baths, and cryostats. With no training requirement, EasyMax is fast and easy to set-up, making users immediately productive. The touch-screen is used to change conditions and program a few steps ahead. Reactions can be run safely unattended day or night and the workstation captures experimental data to deliver an enhanced understanding of the reaction under investigation – leading to faster reaction optimization. Every reaction event is captured and experiments are easily compared and repeated.

Text: Urs Groth,
Head of Communications Reaction Engineering

Gain more insight into chemical synthesis

A white paper is now available that discusses how newly developed methodologies for chemical synthesis are eliminating key challenges, and introduces the concept of chemical synthesis without the traditional round bottom flask.



Download here:
► **www.mt.com/organicsynthesis**

EasyMax®

► **www.mt.com/synthesis-workstations**

No Clogging, No Maintenance
Just Accurate Conductivity Measurement

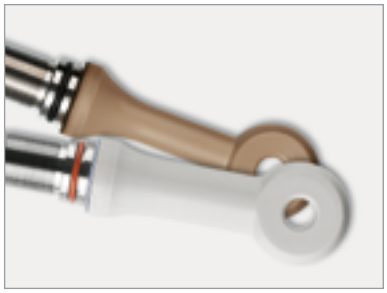
METTLER TOLEDO's inductive conductivity sensors combine high performance with low maintenance. The electrodeless design provides very accurate measurement in medium to highly conducting process fluids – no matter how harsh the conditions.

Conductivity sensors are invaluable in monitoring industrial wastewater, and acid and caustic concentrations in chemical processes. However, standard designs can easily become clogged, necessitating regular cleaning.

METTLER TOLEDO's InPro 7250 inductive conductivity sensors never clog and are highly resistant to coating. Their robust design ensures maintenance- and trouble-free operation.

Find out more at:
▶ **www.mt.com/cond**

Your benefits



Choice of body materials
Available in PEEK for very aggressive chemical environments or in PFA where strong acids are present.

Easy installation
A variety of process adapters allows simple installation into almost every type of process.

Wide measurement range
High linearity from 0 to 2000 mS/cm for process control across a wide range of applications.

InPro 7250 inductive conductivity sensors

Get in-line with METTLER TOLEDO

Intelligent Sensor Management
for the Chemical Industry

ISM® is METTLER TOLEDO's digital technology platform for process analytical measurement systems. With ISM solutions, maintenance becomes predictable, sensor handling is simple, and process uptime is increased.

See the complimentary brochure, white papers, and software on our website for the chemical industry and discover how ISM delivers:

Greater process reliability
Easy sensor handling
Reduced maintenance

▶ **www.mt.com/ISM-chem**

ISM

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