Chemical & Petrochemical

Perspectives in Liquid Process Analytics

22 News

INGOLD

Leading Process Analytics

Streamline Your Processes with the New iSense Software

Intelligent Sensor Management (ISM®) technology is helping chemical companies the world over to increase process reliability, reduce sensor lifecycle costs, and simplify sensor handling. With the new iSense software for ISM sensors, realizing the benefits of digital sensor technology is easier than ever.

Significant benefits

Analytical measurements are going digital. The advantages offered by the latest, cutting-edge in-line sensors and transmitters, such as greater process quality and yield, reduced sensor maintenance, and simplified sensor handling, are hard to ignore.

ISM, METTLER TOLEDO's digital sensor technology, has transformed the way analytical sensors are handled and maintained from first installation to end of life. ISM offers a level of performance and convenience that is not available with other systems.

Convenience is the key

Whether in production or in the lab, the greater the convenience provided by analytical equipment the more efficient will be your processes.

iSense, the accompanying software for ISM, streamlines all your sensor activities. It provides highly valuable features such as sensor calibration away from the process, electronic documentation, instant evaluation of a sensor's "health", and predictive information on when maintenance will be required. The latest version of iSense enables seamless management of ISM sensors and delivers exceptional usability.

It is easier with iSense

Spending hours learning new software is a costly use of operator time, so we have made iSense extremely intuitive to operate.

METTLER TOLEDO

For a new sensor, just connect the Bluetooth® communicator supplied with the software. iSense automatically recognizes the probe and displays a registration page where you can add any important information. The next time that particular sensor is connected, the iMonitor screen will provide an easy-to-read overview of the sensor's condition and, if maintenance is required, tell you what steps to follow.

Whether you want to calibrate a pH sensor, check how a sensor's performance has been affected by a process, or print sensor maintenance documentation iSense guides you through the steps.

For today's processes and tomorrow's

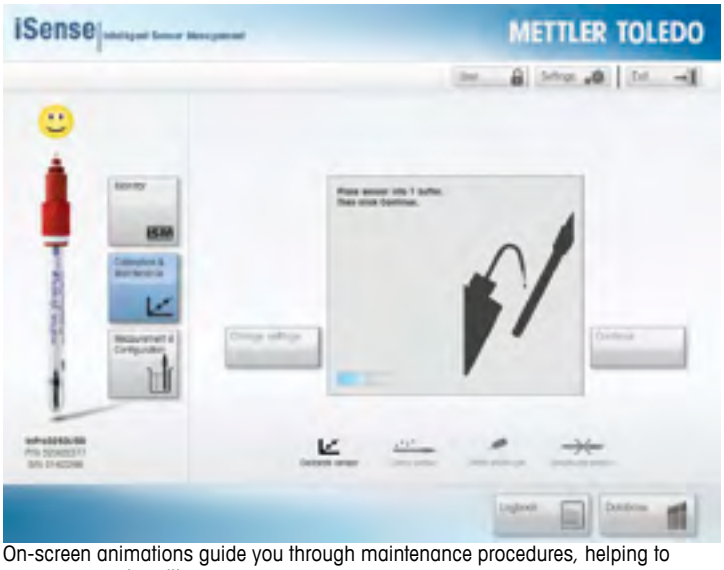
ISM and iSense have been designed to be adaptable to your current needs and your future ones. Planned developments, such as a mobile app that provides a quick sensor check on the go, mean that ISM will remain in the forefront of analytical measurement technologies.

Discover more at:

▶ **www.mt.com/ISM-chem**

The smiley provides at-a-glance notification of sensor "health". Diagnostics show that this sensor needs calibrated.

The Sensor History feature allows you to see how a sensor has been affected by process exposure over time, assisting with maintenance planning.



On-screen animations guide you through maintenance procedures, helping to ensure proper handling.

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Flexible, Intuitive, and Intelligent
New Transmitter for All Parameters

Our M800 transmitter series has now been extended. The new M800 1-Channel is a multi-parameter, single-channel device which combines a state-of-the-art user interface and advanced Intelligent Sensor Management (ISM®) technology with the broadest parameter coverage that has ever been available on a METTLER TOLEDO transmitter.

Full parameter coverage

The M800 1-Channel extends METTLER TOLEDO's portfolio of high-performance transmitters with a single-channel instrument that covers all major measurement parameters. pH / ORP, dissolved and gas phase oxygen (amperometric and optical), conductivity, and turbidity measurement are all possible in conjunction with either ISM or analog sensors. The M800 1-Channel's multi-parameter ability means that most applications in process analytic applications, covered until now by different transmitters, can be equipped with just one instrument platform.

Cutting-edge user interface

Transmitters, as the interface between process analytical sensors and the user or control system, are central to successful and efficient production. With its 5.7" full-color, high-resolution touchscreen, simply structured menus, and user management functions, the M800 1-Channel sets a high standard in the market for convenient transmitter operation.

The freely-configurable display provides information on measurement values plus diagnostics data on a single screen. Logbook and user management features offer excellent traceability and operating security. Wizard set-up allows the user to reach any menu in only three touches, reducing training efforts and configuration failures to an absolute minimum.

At-a-glance diagnostics

Thanks to the iMonitor display the condition of each sensor is determined in an instant, allowing preventive action to be taken before processes are affected. The ISM predictive diagnostics tools shown on the iMonitor, such as the Dynamic Lifetime Indicator (DLI), Adaptive Calibration Timer (ACT), and Time to Maintenance (TTM) indicator are color coded and shown in a distinctive way. The sensitivity of the DLI can even be altered to match process conditions.

With the introduction of the M800 1-Channel METTLER TOLEDO offers an outstanding measurement solution for applications across all process industries at a very competitive price.

Find out more at:
► **www.mt.com/M800**

Fighting Corrosion, Scaling, and Fouling
in China's Largest Petrochemical Plant

It is estimated that the global cost of oil and petrochemical refinery corrosion and deposition exceeds US$ 15 billion annually. In cooling water systems a lot can be done to minimize it, with the help of dependable, intelligent measurement systems.

Massive petrochemical refinery

The China Petroleum & Chemical Corporation, more commonly known as Sinopec, is the world's second biggest chemical company by revenue. Saudi Basic Industries Corporation (Sabic) is the fifth. In 2009, these two giants established a joint-venture to create the Sinopec Sabic Tianjin Petrochemical Plant, a world-scale petrochemical facility located near Tianjin, China.

Built at a cost of US $ 2.7 billion, the vast facility's ethylene cracker and eight downstream units came on stream in 2010. The site has an annual output of 3.2 million tons of chemical products including ethylene, polypropylene, butadiene, and phenol.

Controlling recirculated water quality

Significant investment went into the plant's cooling water system, and to keep it in optimal condition corrosion, scaling, and fouling in the recirculated water has to be minimized. Plant technicians must tightly control water quality through treatment with caustic, acid, and biocides to achieve this. Controlling reagent dosing is realized via pH and ORP measurement, with the goal being to maintain the recirculation water within a pH range of 6.5 – 7.5 with a set-point for ORP of 550 mV.

Regardless of how well the water quality regime is maintained, the level of total dissolved solids will gradually increase until blowdown becomes necessary. Recognizing when to initiate blowdown is most often achieved through conductivity measurements. There are costs associated with conducting blowdown either too soon (more frequent treatment of feedwater) or too late (deposition in piping), so conductivity sensor accuracy is essential.

High performance sensors are key

The in-line pH, ORP, and conductivity sensors that were installed during plant commissioning proved problematic. Replacement parts were difficult to obtain, time spent on maintenance was excessive, and lab analyses of grab samples showed that measurements from the sensors were often incorrect. The low cost of these systems was quickly proven to be a false economy, and more dependable solutions were sought. METTLER TOLEDO was approached to supply in-line systems that would offer measurement accuracy, long sensor operating life, and low maintenance.

M800 multi-parameter, multi-channel transmitter

Combined pH/ORP sensor reduces number of measurement points

For pH measurement we put forward our InPro 3250 i probe as being the most suitable. The InPro 3250 i is a pre-pressurized, liquid electrolyte sensor that delivers fast, accurate measurements. It features an auxiliary platinum electrode that offers a major benefit to Sinopec Sabic, the sensor can also measure ORP. Therefore, the number of measurement points in the recirculated water system could be reduced.

ISM® brings major gains

The InPro 3250 i is one of METTLER TOLEDO's Intelligent Sensor Management (ISM) family of sensors. ISM technology increases measurement uptime, simplifies sensor handling, and lowers operating costs. These benefits are possible due to the specially developed microchip embedded in ISM sensors. For the InPro 3250 i this circuitry allows pH calculation within the sensor itself. The pH value is then transferred to the connected transmitter via a highly stable digital signal. The microprocessor also contains advanced diagnostic algorithms that provide continuous data on sensor "health", so operators know when sensor calibration or replacement will be required.

The features of ISM likewise offer significant benefits for Sinopec Sabic in the measurement of conductivity.

One sensor type for many applications

METTLER TOLEDO Thornton specializes in water analytics. Typically, conductivity measurement for pure water, cooling system water, and chemical processes requires three different sensors due to the extreme differences in conductivity. To combat this, Thornton developed UniCond®, a digital conductivity sensor that can measure from pure water to wastewater to industrial process fluids.

UniCond is capable of this exceptional rangeability because, like ISM pH sensors, conductivity measurement and analog to digital conversion takes place in the sensor itself. This approach bypasses the problems of cable capacitance and resistance which are the reasons why analog sensors have a narrow measurement range. This restriction means many analog conductivity sensor types are required across a petrochemical facility. With UniCond only one sensor type is required for all these applications, resulting in reduced inventory and operator training.

Powerful and flexible transmitter

For use with the InPro 3250 i and UniCond sensors, Sinopec Sabic selected the multichannel version of our M800 ISM transmitter series. This is a multi-parameter unit designed to offer the highest installation flexibility and, with its color touchscreen, excellent ease of use. The M800's iMonitor diagnostics utility predicts sensor maintenance and details corrective actions before process measurements are affected.

Reliable solution and competent local service

Plant technicians are very satisfied, not just with the reliability and performance of the METTLER TOLEDO ISM solutions, but also the local support available from our service department. Sinopec Sabic is now running its cooling water treatment regime with confidence.

Find out more at:

- ▶ **www.mt.com/ISM-chem**
- ▶ **www.mt.com/UniCond**

Intelligent Sensor Management (ISM®) for Chemical Processes

ISM is METTLER TOLEDO's digital technology platform for process analytical measurement systems. With ISM solutions, maintenance becomes predictable, sensor handling is easy, and unplanned downtime is avoided.

The benefits of ISM translate into substantial gains for chemical companies in relation to process reliability, sensor lifecycle management, and cost of ownership.

Unlike analog probes, ISM sensors output a robust digital signal and retain their own calibration as well as process data. Thanks to diagnostics tailored to chemical applications, ISM sensors even predict when they will need maintained or replaced.

In pH, ORP, DO, gas phase oxygen, and conductivity measurement systems ISM gives you much more than just a measurement.

Greater process reliability

Increased operational uptime
ISM is more reliable by design and helps avoid unplanned downtimes by sustaining measurement performance.

Read the white paper on achieving greater process integrity:
▶ **www.mt.com/ISM-chem-wp**

Easy sensor handling

Convenient lifecycle management
Simplified sensor handling reduces time spent at measurement points.

Discover the new iSense software for ISM sensors:
▶ **www.mt.com/iSense**

Reduced maintenance

Low cost of ownership
ISM enables time-saving installation and drives down operating costs.

Find out how much time and money you can save by switching to ISM:
▶ **www.mt.com/ISM-cost-calculator**

A platform for plant-wide use …
From raw material storage to chemical synthesis, from process water preparation to wastewater treatment: whether in safe or hazardous areas your entire plant benefits from the unsurpassed reliability, simplified sensor handling, and low maintenance requirement of ISM solutions.

… adaptable to your requirements
Our ISM transmitter portfolio covers single-parameter, single-channel units for maximum process safety, to multi-parameter, multi-channel devices for greater convenience and flexibility.

Incorporating ISM solutions into your asset management or plant control system via transmitters or converters allows seamless integration of sensor diagnostics information for remote monitoring.

Discover how ISM can help you at:
► **www.mt.com/ISM-chem**

M800 transmitter showing iMonitor sensor diagnostics utility.

Greater Productivity and Safety
Thanks to In Situ Oxygen Measurement

To minimize explosion risk, oxygen levels during formaldehyde production must be kept very low. A US producer selects a METTLER TOLEDO in situ sensor to increase throughput and safety. Since installation, sensor performance has been "flawless".

Ubiquitous compound

Formaldehyde is one of the most widely used industrial chemicals. It is a common precursor to numerous complex compounds and materials, is a key ingredient in many resins and building products, is used as a preservative in paints and cosmetics, and is also a highly effective disinfectant.

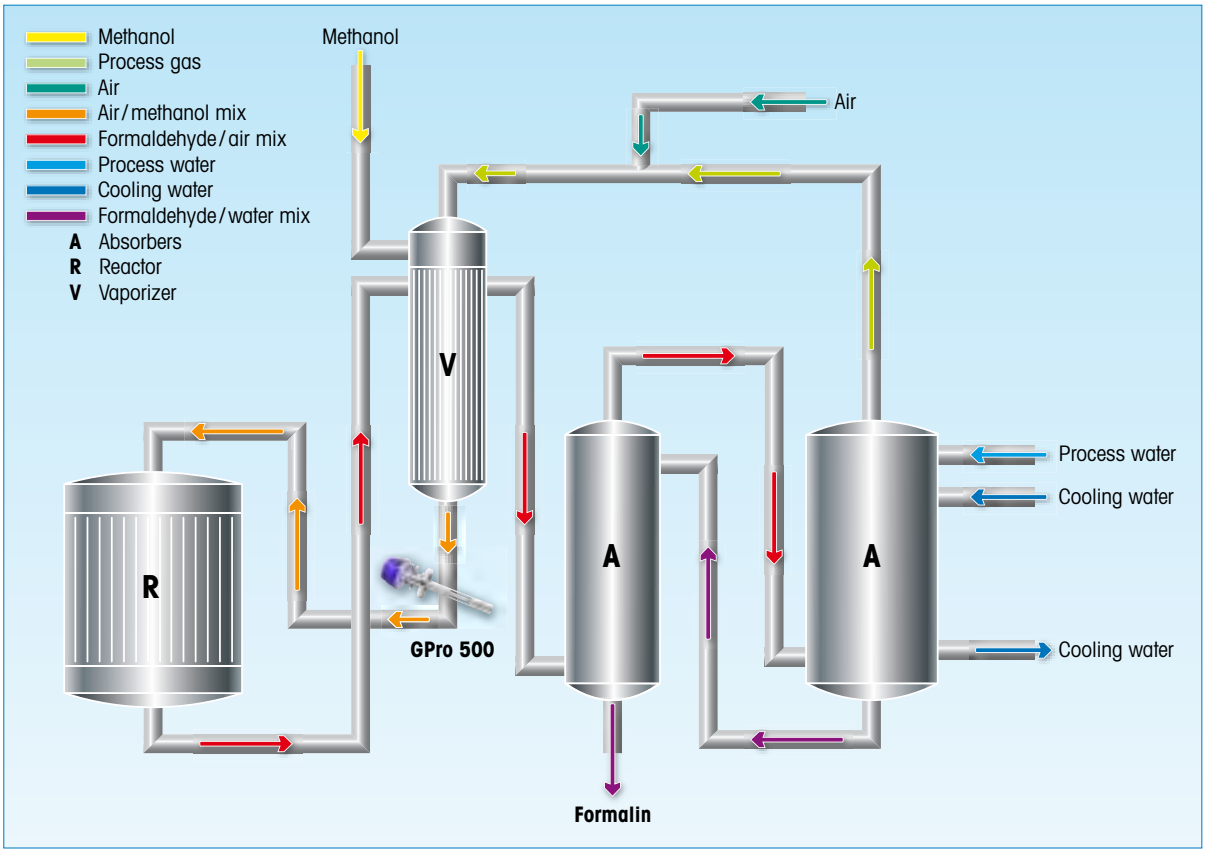
Production methods

There are two main production routes: the direct oxidation of methanol to formaldehyde using metal oxide catalysts; and oxidative dehydrogenation of methanol using a silver catalyst.

The latter process is used by one of the largest formaldehyde producers in the US. During production a mixture of methanol and water is mixed with air and recycled gas from the process. This mixture is vaporized by heat exchange against hot reactor effluent. The vaporized feed mixture is then fed to the silver catalytic reactor to form formaldehyde.

Oxygen levels are critical

The methanol/air mixture in the vaporizer is highly flammable and the oxygen level must be maintained below the lower explosive limit (LEL). For oxygen measurement the facility was using an extractive system for drawing a sample that was then conditioned before it could be measured. The inherent time delay in the system compromised safety, so to compensate the process was run at less than its optimal throughput. In addition, the many components in the extraction and



Schematic of oxidative dehydrogenation process for formaldehyde production

GPro 500 TDL analyzers showing the range of process adaptions

New – GPro 500 for Carbon Monoxide Measurement

The GPro 500 TDL analyzer series has been extended: a new spectrometer is available for ppm level measurement of carbon monoxide (CO) in combustion applications such as process heaters, boilers, and thermal oxidizers. With reliable and fast measurement of CO along with O_2, it becomes possible to operate combustion processes with trim control instead of % excess oxygen control only. With trim control, significant fuel cost savings can be realized by adapting to any changes in combustion load, environment, or fuel quality factors.

New – Unique range of process adaptions

Additionally, the GPro 500's standard purged (SP) probe design, which provides alignment-free installation, has been complemented with other process adaptions to enable maximum flexibility when selecting the installation point for O_2 or CO measurement. The new non-purged (NP) probe also does not require alignment and works without process-side purging. It can be installed with a filter option when dust is present, such as in coal-fired heaters, or directly into tank headspaces if the gas matrix is dry and dust free. The wafer-type process adaption is particularly suitable for measurement in small pipes (DN50 or 2") and does not cause any flow restriction.

conditioning equipment were increasing the risk of the toxic process gas escaping.

In situ measurement increases safety

METTLER TOLEDO was asked to provide a solution that would provide a fast response and allow production to be safely increased.

Our GPro 500 oxygen sensor is highly suited to this application. Its tunable diode laser (TDL) technology allows it to measure directly in the vaporizer's outlet, so measurements are almost instantaneous. Single-flange installation means there is no danger of process gas escaping. It is also immune to the corrosive process gas.

Whereas other available TDLs have a high purge gas demand, the GPro 500's unique probe design means that purge gas consumption is very low. And as there are no moving parts, maintenance is reduced to occasional cleaning of the optics and annual inspection.

"Flawless" performance

Our customer reports that since commissioning they have been gratified with the sensor's performance, which they describe as "flawless". They particularly appreciate the lack of servicing required which means maintenance technicians have more time for critical tasks. Thanks to the GPro 500 formaldehyde production at the plant is now safer and throughput has been increased.

Find out more about the GPro 500 at:
▶ **www.mt.com/O2-gas**

Download the GPro 500 Gas Applications guide:
▶ **www.mt.com/gas-guide**

Solid Benefits

Digital Sensors Help Turn CO_2 into Cement!

The dramatic rise in recent decades of atmospheric carbon dioxide is driving technology companies to develop innovations that can help reduce the increase. In the US, one company is using a ground-breaking technique to convert flue gas CO_2 into building material. To help them achieve it they use an intelligent, self-cleaning pH measurement system.

Confronting atmospheric CO_2 with new technology

The atmospheric concentration of carbon dioxide has risen from approximately 315 ppmv in 1960 to approximately 395 ppmv in 2013. With the rate of increase predicted to continue, technology companies are looking at methods to convert CO_2 into more benign and useful forms. One such US company has developed a technique for converting CO_2 in flue gas into a calcium carbonate cement for use in the production of concrete.

The company is proving the viability of the technology in a pilot facility located next to a large coal-fired power plant in California. CO_2 that has been stripped in a scrubber from the power plant's flue gas is passed to a process vessel where a highly alkaline calcium-containing solution reacts with the CO_2 to produce calcium carbonate. This is further processed and used as the integral constituent of cement. Manufacturing high purity calcium carbonate relies on tight control of pH in the scrubber.

Process conditions make pH measurement difficult

Periodic lab measurements of pH from grab samples would not be timely enough to allow adequate process control. However, use of in-line sensors means that they are constantly exposed to the process fluid. This quickly leads to a build-up of precipitate on a sensor's glass membrane and diaphragm, resulting in measurement drift that would ultimately impact product quality. In addition, staff resources at the plant are low, so regular sensor maintenance to uphold sensor performance is a great inconvenience.

Durable, low maintenance pH system

METTLER TOLEDO was asked to supply a low maintenance solution that would secure pH measurement reliability. We installed a system comprising our

InPro 4260 i pH sensor, InTrac 777 e retractable housing, M700 transmitter, and EasyClean 400 automated cleaning / calibration system. This solution gives the facility engineers the measurement stability and reduced maintenance they require.

Robust InPro 4260 i pH sensor

- Xerolyt polymer reference electrolyte for precise measurements and long sensor lifetime.
- Open junction eliminates clogging.
- Resistant to strong alkalis and acids.

Automatic EasyClean 400 system

- Completely unattended sensor cleaning and calibration.
- Freely programmable sequences provides high flexibility.
- Profibus® PA and FOUNDATION fieldbus™ compatible.

Retractable InTrac 777 e housing

- Internal chamber for sensor cleaning / calibration or replacement without process interruption.
- Tri-Lock safety system prevents escape of process medium when sensor is retracted or being replaced.
- Available with stainless steel or PVDF wetted parts.

Multi-parameter M700 transmitter

- Measures two parameters plus temperature.
- Modular design allows simple configuration.
- Choice of communication protocols for easy system configuration.

Intelligent Sensor Management

The system features METTLER TOLEDO's unique Intelligent Sensor Management (ISM®) technology platform, including digital sensor-transmitter communication. The digital signal is highly robust and immune to degradation caused by cable capacitance and interference from surrounding equipment. This further secures the reliability of the measurement received at the M700 transmitter.

ISM's predictive sensor diagnostics, displayed on the M700 and asset management system, means that facility engineers are constantly aware of sensor "health" and know well in advance when sensor replacement will be required.

pH sensors with ISM retain their own calibration data. This allows them to be calibrated away from the process in a more convenient location. They can then be stored until required. When a failing sensor is exchanged for a pre-calibrated probe, the M700 transmitter automatically recognizes the sensor and configures itself appropriately.

Consistently reliable

Technicians at the facility are very pleased with the system. They are convinced that ISM's features give them a level of process reliability that they could not achieve with analog sensors. ISM's predictive diagnostics tools allow them to schedule sensor replacement for when it will be required, rather than conducting it too early or too late. The InPro 4260 i, with its robust digital signal, gives them high confidence in the accuracy of pH measurements.

The ISM sensor and transmitter coupled with the EasyClean unit means that apart from occasional sensor replacement, and replenishing cleaning and calibration fluids, the system takes care of itself.

For more information on ISM, go to:
▶ **www.mt.com/ISM-chem**

Get in-line with METTLER TOLEDO

Heads – I use the sensor again, tails – I don't.

Don't leave it to chance!

ISM – True Predictive Diagnostics

No more guessing if a sensor will survive through the next production run. Intelligent Sensor Management's predictive diagnostics analyze process conditions and sensor health to provide you with accurate information on when sensor replacement will be needed.

ISM Intelligent Sensor Management from METTLER TOLEDO

► **www.mt.com/ISM**

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