

# Brewery

Perspectives in Liquid Process Analytics



# 17 News

**INGOLD**

Leading Process Analytics

## Better Beer, More Beer Improved Productivity at Tsingtao Brewery

**For China's largest brewer, controlling dissolved oxygen levels in beer is vital for ensuring product quality and production volume. Optical measurement technology has not only delivered excellent results, it has also reduced maintenance.**

### China's largest brewer

Founded in 1903 by German settlers, the Tsingtao Brewery is the largest and most prestigious of the approximately 600 breweries currently operating in China.

One of Tsingtao's key production units out of its 48 facilities is located in Qingdao, in the province of Shandong. In operation since 1991, the recent introduction of modern production equipment from Germany and France means the unit is now highly automated, operates with advanced control methods, and has the capacity to produce up to 450 million liters of beer annually.

### DO detection

To a great extent, the quality of beer is associated with the quantity of dissolved

oxygen (DO) it contains. Oxygen reacts with proteins and polyphenols in the beer which leads to non-biological instability resulting in reduced shelf life and adversely affected flavor. Consequently, control of DO levels during beer production is always a quality target that Tsingtao focuses on. During production, a significant proportion of dissolved oxygen comes from the filtering process. Therefore, before product enters bright beer tanks, in-line detection of DO prevents out-of-spec beer reaching the filling line.

Since 2003, the brewery has employed METTLER TOLEDO in-line DO measuring equipment at fermentation tanks and filters as well as on other brewery processes. As production at the brewery has



**METTLER TOLEDO**





Bottling line  
at Tsingtao Brewery

Advanced sensor diagnostic tools displayed on the connected transmitter provide real-time data on the probe's condition. The remaining lifetime of the sensor and when calibration will next be required, as shown by the Dynamic Lifetime Indicator and Adaptive Calibration Timer, mean that maintenance planning is easy and the risk of sensor failure during production is greatly reduced.

increased, clean-in-place (CIP) cycles have become a significant daily operation. To prevent damage to DO sensor membranes from chemicals and high temperatures, the probes have to be withdrawn from the process pipes during CIP and subsequently reinserted. All of which is time consuming for operators. Could METTLER TOLEDO provide a solution?

### Optical technology

We suggested a switch from an amperometric measuring system to one based on optical technology. Our InPro 6970 i optical DO sensor exploits the phenomenon of fluorescence quenching to determine trace oxygen levels. No membrane is involved and the sensor is largely unaffected by CIP processes.

But resistance to CIP is not the only benefit of the InPro 6970 i. Amperometric sensors are liable to incorrectly report high DO levels if flow velocity is too low. The InPro 6970 i has a negligible flow velocity requirement, so false DO level alarms are eliminated. Fluorescence quenching technology determines oxygen in liquids very quickly, therefore the response time of the sensor is extremely fast. Additionally, the InPro 6970 i detects DO levels down to 2 ppb. Combined, this means the sensor is an excellent tool for reducing out-of-spec production.

### Less maintenance

Tsingtao Brewery also appreciates the reduced maintenance benefits the InPro 6970 i brings. Firstly, sensor drift is very low so calibration is required less frequently than for amperometric probes. Secondly, whereas maintenance on amperometric sensors involves changing membrane and electrolyte, with the InPro 6970 i the only part that requires periodic replacement is the OptoCap sensing element. OptoCap exchange is simple and can be completed in under a minute.

The "i" in InPro 6970 i denotes that the probe features METTLER TOLEDO's Intelligent Sensor Management (ISM) technology. ISM brings additional, maintenance benefits that help sustain Tsingtao's round-the-clock production.

### Productivity

According to Du Shuhai, engineer at the brewery, "On the basis of production exceeding 430 million liters in 2009, the successful application of the InPro 6970 i meant that the dissolved oxygen index of all filtered beer was maintained below 50 ppb, and both beer quality and output were improved."

If you want to improve beer quality and output at your brewery, go to:

- ▶ [www.mt.com/InPro6970i](http://www.mt.com/InPro6970i)
- ▶ [www.mt.com/ISM](http://www.mt.com/ISM)



Dissolved oxygen sensor  
InPro 6970 i

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## Increase Yield with a New Transmitter!

**Improved process monitoring and sensor management will increase the yield of your brewery. The M800 transmitter is the key to more process and sensor information for better process control.**

### One instrument

When our customers speak, we listen. Two years of development work have gone in to making our latest transmitter not only the finest in our portfolio, but possibly the most user-friendly analyzer on the market. The ability to display up to eight measurement values on a single screen provides simple monitoring of multiple sensors. Advanced on-screen diagnostics provide real-time monitoring of sensor condition for proactive maintenance. Touchscreen technology and the intuitive user interface offer incomparable ease of use.

### The M800 transmitter platform

METTLER TOLEDO offers a highly versatile family of sensors for applications in process analytics and water treatment. The new M800 transmitter platform covers major measurement parameters in one instrument: pH/ORP, oxygen (amperometric and optical), conductivity and flow monitoring are all possible in conjunction with our Intelligent Sensor Management

(ISM) sensors, and other parameters will follow.

Up to four analytical sensors plus two flow inputs can be connected to one M800. With this multi-channel multi-parameter ability, most applications in the chemical industry that are today covered by different transmitters can now be equipped with the same instrument platform.

### iMonitor

Precise management of your processes through analytical measurements allows improvements to production yield. In addition, knowledge of the condition of your analytical sensors further improves yield by preventing unscheduled downtime due to sensor failure. The M800 features iMonitor, a tool for displaying sensor diagnostics and optimizing sensor maintenance. At a glance, the current performance of each connected sensor can be ascertained. Color-coded bars for all ISM diagnostic data provide real-time

determination of measuring result quality. Alerting operators proactively to maintenance requirements helps prevent unanticipated, costly process downtime and ensures easy and efficient maintenance management.

### Complete control at a touch

The M800's large, high-resolution, color touchscreen simplifies all transmitter operations. The freely programmable display of up to eight measurement values or diagnostics data provides all vital information on one screen, or up to eight screens, to suit your requirements.

Fully tailorable wizard set-up allows you to reach any menu function in only three touches. This concept helps reduce training effort and configuration failures to an absolute minimum.

### M800 transmitter – quick overview

- Intelligent Sensor Management
- Color touchscreen/iMonitor
- Measures pH/ORP, conductivity, DO (amperometric and optical), DO<sub>3</sub>, O<sub>2</sub> gas, flow
- 2- and 4- channel versions
- Logbook
- User management

Find out more about the M800, at:

► [www.mt.com/M800](http://www.mt.com/M800)



## Turbidity Measurement at the Lauter Tun Improves Productivity and Quality

**In-line turbidity measurement provides a reliable way of verifying the performance of the separation of the wort/solids. After years of successfully using METTLER TOLEDO's InPro 8400 turbidity sensor in the lauter tun, the InPro 8600 has surpassed our customer's expectations in providing reliable measurement values as well as being simple to install and maintain.**

### Brazilian brewer

Our customer, one of Brazil's biggest players in the brewery market, produces a beer known the world over and must meet the brand's owner's international quality standards. The brewery has always acknowledged METTLER TOLEDO as a supplier of state-of-the-art technology, and has successfully used the InPro 8400 turbidity sensor for many years. Due to that sensor's performance and our post-selling services, METTLER TOLEDO was contacted to supply another turbidity system for another lauter tun in which the same beer would be

produced. We were able to offer the InPro 8600 with ISM technology, a sensor with improved performance and enhanced features to meet the customer's demanding needs.

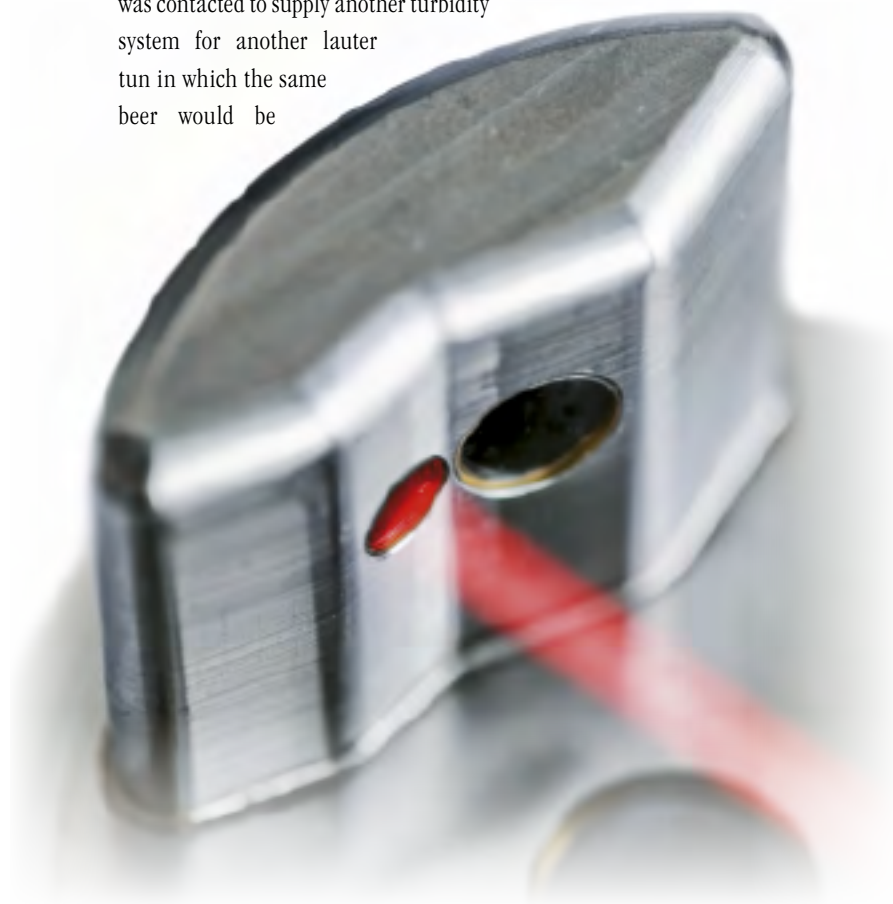
### Lauter tun turbidity

Turbidity and dissolved oxygen are the two most important analytical variables to be measured in a beer plant. Among turbidity applications, the most commonly


known are after the lauter tun and after final beer filtration. In both positions our customer has installed InPro 8600 sensors. While in the first case a one-angle turbidity sensor is employed, in the second a two-angle sensor is required for monitoring the particle size trend.

In the lauter tun, starch and proteins present in the malt go through several steps of conversion and dissolution, resulting in a liquid phase – the wort, and undissolved substances consisting of spent grains. During the lautering these undissolved substances are separated from the wort by filtration and sparging in three stages: recirculation of turbid wort, drawing off the first wort and sparging.

The first outflow of the wort is always very turbid, but as the process continues it



Turbidity sensor InPro 8600



becomes clearer and eventually can proceed to the next stage. During lautering the turbidity measurement is used to control the cutting knives inside the lauter tun which have a direct influence on the turbidity value. Finally, a sparging step is necessary to extract as much wort as possible.

The turbidity signal is the perfect way of deciding when the wort is at the stage where it can progress through the process, i.e. when wort turbidity is sufficiently low. If solids are carried forward, yeast metabolism is affected resulting in low productivity. Moreover, solids can also carry unwanted components which may adversely affect the final taste of the beer. In this specific case, a 4 to 20 mA output is used to control the lautering, where the 4 mA signal corresponds to 0 EBC and the 20 mA corresponds to 50 EBC.

#### **Intelligent solution**

The InPro 8600 with its digital signal, and the Trb 8300 D transmitter, surpassed the customer's expectations, specifically because of the system's Intelligent Sensor

Management (ISM) technology. ISM greatly improves sensor handling, reduces maintenance costs and increases process safety. The Plug and Measure feature means that the sensor is ready to use as soon as it is connected to the transmitter. The InPro 8600 is shipped from METTLER TOLEDO already calibrated and this data is automatically uploaded to the transmitter upon connection.

As the InPro 8600 has no O-rings or light bulbs that need replaced and the windows are made of scratch-resistant sapphire glass, almost no maintenance is required.

#### **Clearly better wort**

In-line turbidity control guarantees uniform wort quality relative to low turbidity. If not controlled, beer taste can be damaged and shelf-life decreased due to the drag of solid components. Now, for our customer, wort of the best clarity possible is obtained.

Discover more about the InPro 8600, at:

► [www.mt.com/InPro8600](http://www.mt.com/InPro8600)

## Best Practice

### **Measure turbidity throughout the brewing process to optimize production**

To ensure your plant is operating at peak production, you need to control turbidity throughout the process. From the lauter tun to the filling line, METTLER TOLEDO offer a range of turbidity sensors to suit your requirements.

Find out more at:

► [www.mt.com/turb](http://www.mt.com/turb)

## Management of Sensor Assets Easy – with iSense

**Increasingly stricter regulations, stringent customer requirements and maximizing production uptime mean management of your analytical assets is an ever-growing concern. Throughout the life of a DO or pH sensor, ISM and iSense Asset Suite make life simpler and more efficient.**

### Measurement point management

Management of process analytical assets will become more and more important in manufacturing facilities. The ability to accurately track the use and condition of each measurement probe is already essential in the pharmaceutical industry. Such information is of growing significance in process industries where regulations concerning product quality or manufacturing effluent exist, or where simply meeting exacting customer requirements or maximizing uptime is a concern.

METTLER TOLEDO's Intelligent Sensor Management (ISM) technology coupled with iSense Asset Suite software offers new possibilities for detailed asset management and simplified maintenance.

With ISM and iSense:

- sensors are calibrated very accurately and the calibration result is documented automatically
- calibration is performed in the workshop and calibration utilities such as buffers, calibration gases and cleaning equipment are not needed at the measurement point
- sensor diagnostics allow for accurate maintenance planning, ensuring calibration is performed as soon as it is needed and only when it is needed.

Resulting in time saved and improved reliability of your analytical instrumentation.

### View sensor performance

iSense Asset Suite enables you to evaluate in an instant the condition of your ISM

sensors. Information is provided for: last calibration date, slope, zero point, response time, date of manufacture, operating time and maximum exposed temperature.

The most important question, "How long can I use this sensor?" is answered by the Dynamic Lifetime Indicator and, if required, the software informs you of what action is needed to recover the sensor for its next installation.

### Comprehensive electronic documentation

All sensor related activities such as calibration or maintenance are stored in iSense and can be documented electronically or by print-out from a PDF. The electronic logbook allows control and tracking of all activities, ensuring complete documentation of your sensor assets over their whole lifetime.

### User management

The user management feature allows control over possible actions that an operator can take. The ability to restrict a user to only certain functions of iSense, e.g. sensor calibration, enhances operational safety by tailoring iSense to the appropriate skills of technicians.

Discover how ISM and iSense can improve your operations, at:

► [www.mt.com/ISM](http://www.mt.com/ISM)

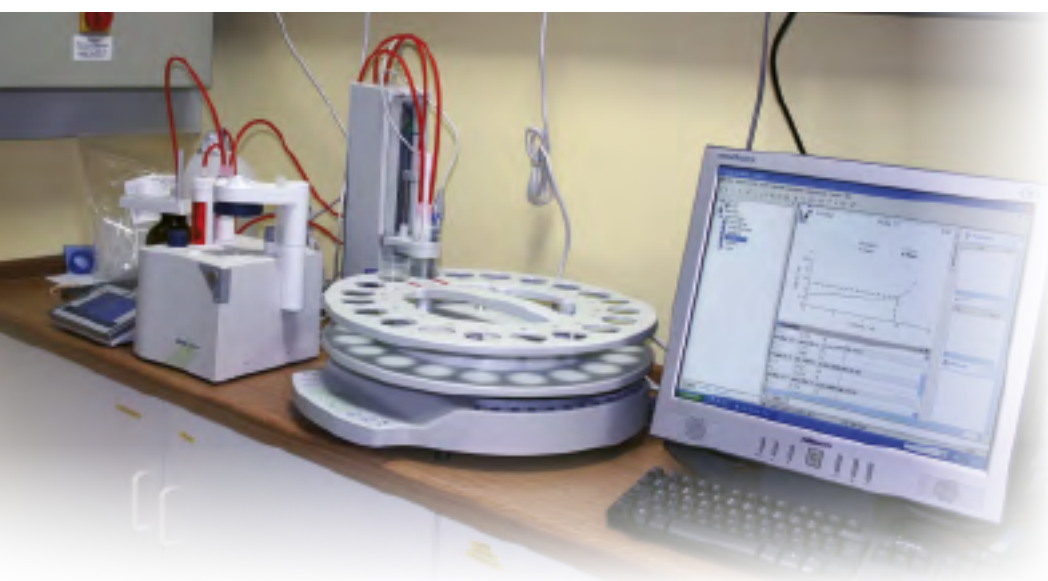
METTLER-TOLEDO iSense (R3-3)

**iSense**  
ISM Asset Suite



## Tailored Titration System for Automatic Alpha Acid Determination

The hop vine is a species of plant belonging to the hemp family. The high content of alpha acids (bitter substances) in hops makes it an essential ingredient in beer brewing. Variations of the amount added have a decisive influence on the taste of the beer.



- Excellence titrator with conductivity board
- InLab 718 sensor
- Rondo 20 for high sample throughput
- SP250 pump for rapid solvent addition
- LabX® titration PC software for the control, evaluation and archiving of results
- Rainin pipettes for titer standard and sample addition.

Download UserCom 14 for more information about determination of alpha acids in hop extracts by titration:

- ▶ [www.mt.com/AC-UserCom14](http://www.mt.com/AC-UserCom14)
- ▶ [www.mt.com/one-click-titration](http://www.mt.com/one-click-titration)

### Secrets behind the unique taste

To brew beer that always has the same taste, it is important to determine the exact content of alpha acids in hops. The content of these bitter substances is also one of the main factors that influence the amount paid by breweries to farmers. The European Brewery Convention (EBC) develops standards and analytical methods to ensure that chemical analysis is standardized. The EBC 7.4 method describes the conductometric titration of hops and pellets. In short, the sample material is extracted with toluene and an aliquot dissolved in methanol. This aliquot is then titrated conductometrically with lead acetate solution.

To determine the alpha acids, aliquots of the hop extracts are prepared depending on their type, the extract and its expected

content. These are then transferred to the titration beaker. The solvent mixture is added quickly and reliably by means of a peristaltic pump. After a short conditioning time, the solution is titrated with lead acetate solution and consumption, up to the equivalence point, is calculated as a content percentage of alpha acids.

### Comprehensive solution for hop analysis

The Hallertau region in Germany is the largest hop-growing region in the world and produces 85% of German hops. In 2008, this represented a worldwide market share of over 30%. Hop-processing companies need to be able to analyze large numbers of samples on a 24-hour shift operation. METTLER TOLEDO took up the challenge and our solution for improved hop analysis consisted of:

# The Universe of Intelligent Sensor Management

## Intelligent, Predictive, Tailorable, Adaptive

**Intelligent Sensor Management (ISM) is an innovative new concept for process analytical measurement solutions that simplifies sensor handling, enhances reliability and reduces sensor lifecycle costs through a groundbreaking new maintenance concept.**



### Intelligent

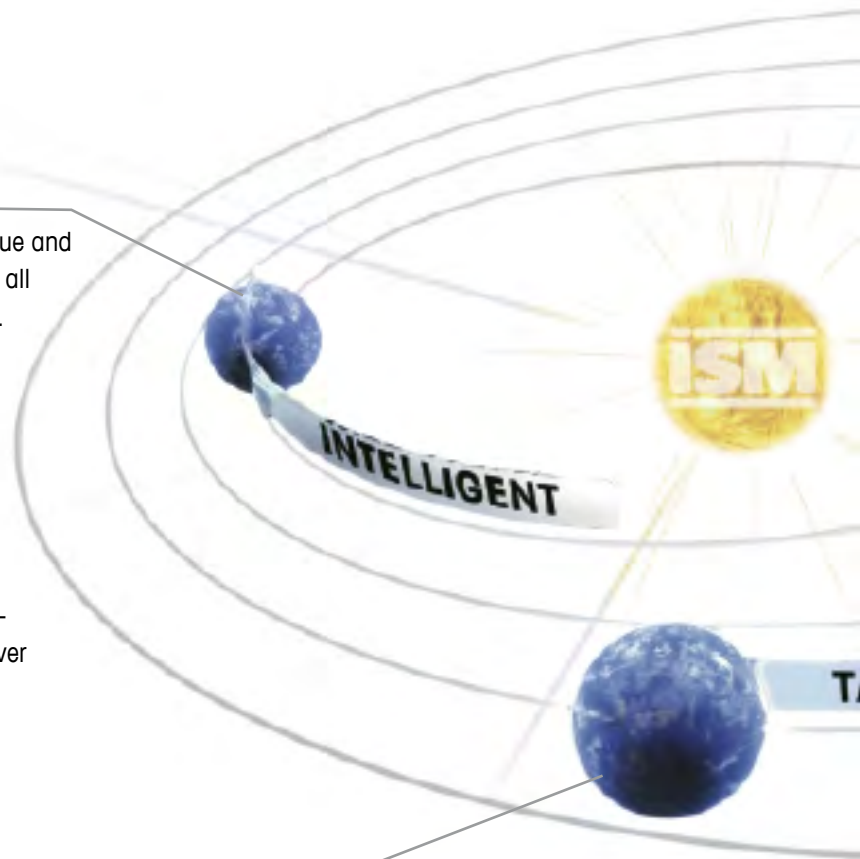
- The ISM universe offers unique and comprehensive solutions for all major analytical parameters.
- Digital sensor technology offers easy handling with pre-calibrated sensors, enhanced sensor performance and built-in diagnostics.
- An exclusive set of tools allows management and optimized service of sensors over their lifetime.

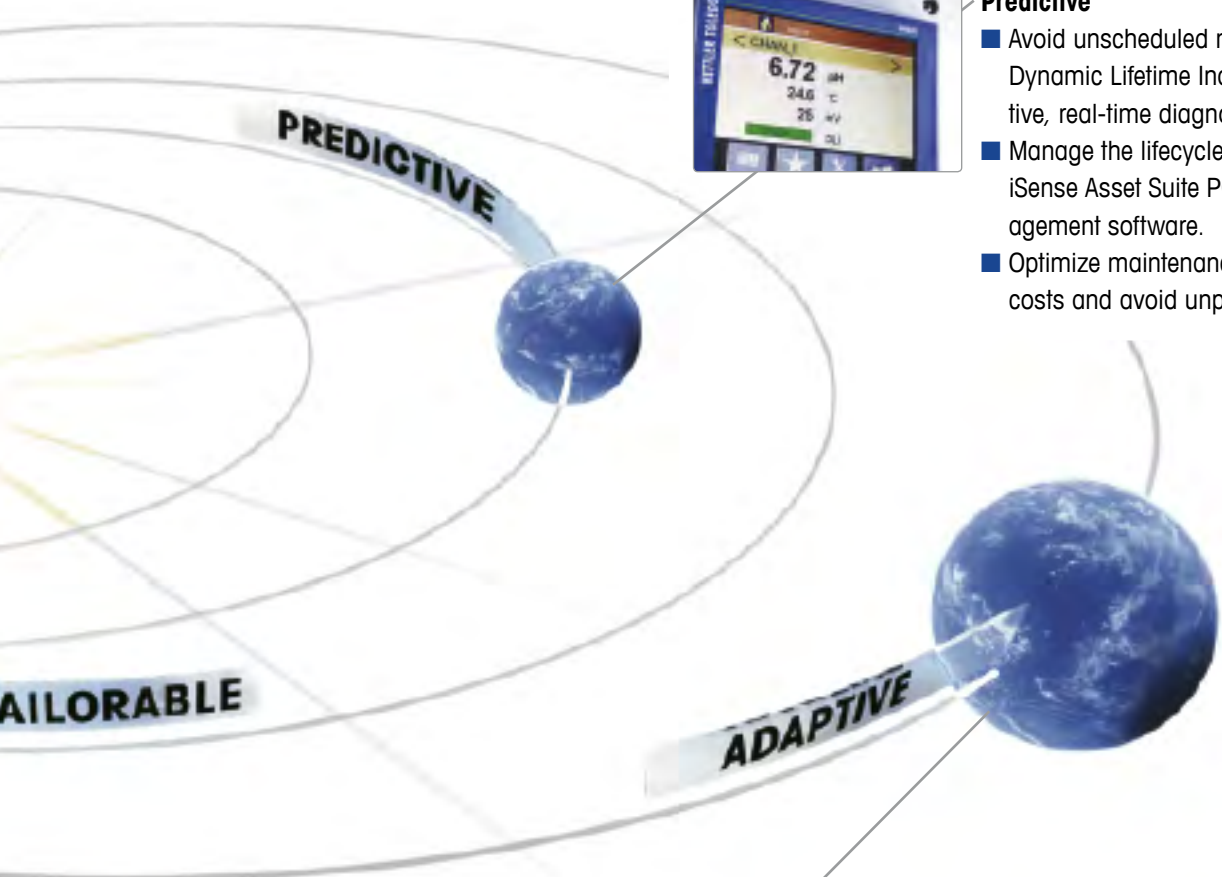


### Tailorable

ISM offers industry specific solutions tailored to respective needs.

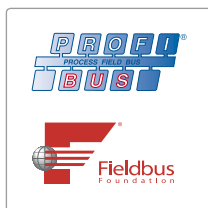
- **In Pharmaceutical and Biotech**, accurate calibration and comprehensive electronic documentation offer full traceability.
- **In Chemical and Petrochemical industries**, pre-calibration in a maintenance shop and optimized sensor management improve process reliability and reduce operating costs.
- **In Breweries**, pre-calibrated optical DO sensors offer more reliable measurement and less maintenance.





### Predictive

- Avoid unscheduled maintenance with the Dynamic Lifetime Indicator; a unique, predictive, real-time diagnostic function.
- Manage the lifecycle of your sensors with the iSense Asset Suite PC-based sensor management software.
- Optimize maintenance schedules to reduce costs and avoid unplanned shutdowns.



### Adaptive

- ISM allows seamless integration of on-line diagnostics information into process control systems via Profibus PA and Foundation fieldbus transmitters or Ethernet.
- Low-power concept offers wireless installations and Bluetooth-based temporary loggers.
- Direct integration into analog controllers via 4 ... 20 mA converter cables offers the best of both worlds, ISM based maintenance with iSense and local diagnostics, with robust analog signal integration.

# The Information you Want is at [www.mt.com/pro](http://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



# Get in-line with METTLER TOLEDO



## Turbidity and Color Measurement for Increased Process Efficiency

Turbidity and color measurement systems from METTLER TOLEDO are cost-efficient, simple to install and easy to maintain. Whatever you chose: a single system for turbidity or color, one for water/product separation or filter control, or for parallel product quality monitoring of color and turbidity, our systems will give you the highest process safety and measuring accuracy – without compromising process reliability.

► [www.mt.com/turb](http://www.mt.com/turb)

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