Chemical & Petrochemical
Perspectives in Liquid Process Analytics

24 News

INGOLD
Leading Process Analytics

Trouble-Free Oxygen Measurement with a Unique Gas Analyzer

When corrosive gases damaged their paramagnetic oxygen analyzer, a major producer of manufactured fibers required a better solution. The GPro 500 is not only providing them with almost instant measurements, its very low maintenance is a significant time and cost saving.

The first manufactured fiber

Rayon, first produced in the 1880s, is the world's oldest manufactured fiber. It is a natural-based material that is usually made from cellulose derived from wood pulp. Improvements in the rayon production process have led to variations on the fiber such as modal which, due to its greater absorbency, is widely used in towels and bedsheets.

One of the world's largest producers of modal is the Lenzing Group, an international organization headquartered in Austria. Lenzing (Nanjing) Fiber, located in the Liuhe district of Nanjing, China was developed with investments from the Lenzing Group and the Nanjing Chemical Fiber Co., Ltd. The Lenzing project is currently China's largest Austrian investment. Lenzing (Nanjing) Fiber mainly produces rayon and Lenzing Modal® for non-woven fabric and clothing manufacture.

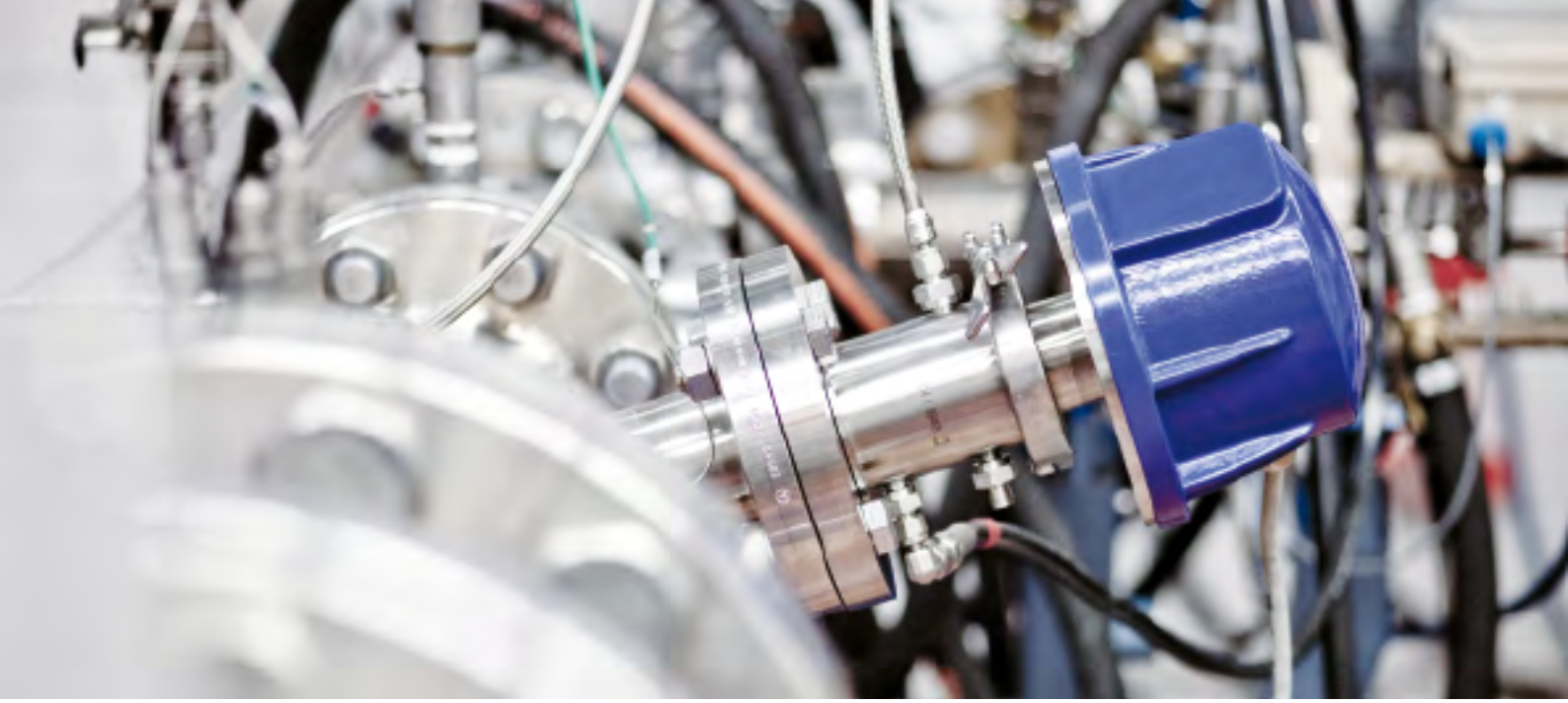
Oxygen in waste gas must be controlled

During production at Lenzing (Nanjing) Fiber, a significant amount of gas is produced. As it contains toxic combustibles such as hydrogen sulfide and carbon disulfide, the gas must be processed before it is vented to the atmosphere. During transportation by pipeline to the factory's waste gas processing unit, oxygen levels in the gas must be kept low to minimize the risk of explosion.

Corrosive compounds damage paramagnetic analyzer

A paramagnetic oxygen analyzer was in-

METTLER TOLEDO



stalled in the gas pre-treatment system. Conditioning equipment was also required to remove liquid, dust, and gases that could interfere with the paramagnetic analyzer's ability to measure reliably. Despite this treatment, engineers noticed the analyzer's performance deteriorating over time. Analysis showed that the corrosive gases were not being removed entirely by the conditioning equipment and that the analyzer's expensive motherboard was being damaged. Engineers therefore looked for a more robust measurement system.

Reliable tunable diode laser oxygen sensor

They were immediately drawn to tunable diode laser (TDL) technology as it is a non-contacting measurement technique, so there is no possibility of process gases entering the sensor body. The available TDL analyzers in the marketplace were investigated and the Lenzing (Nanjing) Fiber engineers became particularly impressed with the METTLER TOLEDO solution.

Most TDLs are composed of two parts: a unit that outputs a laser beam of a frequency equal to the absorption frequency of oxygen molecules; and a unit that receives the laser light, analyzes it, and calculates the oxygen level in the process. The two units require very precise alignment, which is not easy to achieve.

The METTLER TOLEDO GPro 500 sensor, on the other hand, features a probe that protrudes into the gas stream. A corner cube at the end of the probe directs the laser beam back to the receiver / analyzer in the sensor head. Alignment is never required and because the laser beam travels twice through the process gas, measurement accuracy is very high. Also, the sensor has no moving parts. This means the analyzer requires no maintenance other than occasional cleaning of its optical windows and annual verification.

Unique process adaptions

The GPro 500 is available with a series of unique process adaptions that replace the standard probe. These adaptions greatly increase the range of applications suitable for the GPro 500. Lenzing (Nanjing) Fiber installed a GPro 500 with a sampling cell adaption. This has allowed them to use the GPro 500 along with their existing sample conditioning equipment. In addition, installation was conducted without any interruption to the gas treatment process.

Lenzing (Nanjing) Fiber are more than satisfied with their decision: "The analysis capability of the GPro 500 meets all our requirements. Furthermore, it's superior to the paramagnetic analyzer in terms of response speed and maintenance."

► **www.mt.com/TDL**

GPro 500 oxygen sensor with sampling cell adaption

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Can You Be Sure
That Your pH Measurements Are Reliable?

The vast majority of installed pH measurement systems in the process industries still use analog glass sensors. And although such sensors are highly dependable, issues with cables and the environment around the process mean that your pH measurements could be out by several units! The answer? Digital technology.

The problem with cables

The issue of unreliable pH measurements does not lie in the use of glass sensors themselves: They have proven to be dependable since they were first introduced 100 years ago. The cause of untrustworthy measurements lies elsewhere – with the cable, or more precisely, the signal that travels along it.

Moisture ingress at the cable connector can severely disturb a signal. As a glass sensor has a high electrical impedance of several hundred megaohms, liquid in the connection will cause a short-circuit, creating an equivalent impedance within the system. This can change the mV output of the sensor to such an extent that your transmitter will calculate pH values that are several units off the true level, or cause polarization effects that might be interpreted as drift.

Subassembly of a digital pH electrode

The corrosive vapors in harsh chemical environments can attack metallic connectors, generating unpredictable amounts of millivolts and resulting in pH measurements so wrong that you will no longer be able to properly control your process.

Using cable that is not properly shielded can also have undesired effects. Due to the high impedance nature of the measurement the cable acts like an antenna, and vibration and fields generated by surrounding equipment will manifest as continuously fluctuating pH values.

100 % signal integrity

All these effects are eliminated completely with the use of digital Intelligent Sensor Management (ISM®) technology. Using an on-board microprocessor, pH is calculated inside the sensor itself (which means it is more accurate) and forwarded to the transmitter in a digital format. Being digital, the signal is immune to the foreign influences that affect analog signals. Even in the presence of moisture and over long cables, ISM's digital transmission gives you 100 % signal integrity – all of the time.

▶ **www.mt.com/ISM-chem**

Interview

Developments in Process Analytics
for the Chemical Industries

Stefan van der Wal at METTLER TOLEDO is an expert in the deployment and use of process analytical measuring systems in (petro)chemical production. He travels around the globe advising companies on how to improve their processes and increase profitability. Chemical and Petrochemical News spoke to him about the growing role of process analytics.

Mr. van der Wal, process analytics is playing an increasingly bigger role in the chemical and petrochemical industries. How do you explain this?

I think there are several reasons. First of all, there is increased competition in the chemical industries due to globalization, and in order to stay competitive, many processing plants run their processes at speeds that are significantly above design capacity. Without proper process monitoring, this can have a serious negative impact on product quality and also on plant operations itself. Wear and tear due to corrosion may occur at a much higher rate, there is an increase in waste effluent, and at the same time plant operators want to cut maintenance costs.

Also, there is ever stronger environmental legislation that requires monitoring and control of waste effluent.

Secondly, though being very conservative, the industry understands that in-line analysis has enormous benefits over laboratory analysis of grab samples. The value of a real-time continuous measurement at process conditions is so much higher than periodic analyses of samples that may have been taken hours before and therefore no longer represent anything that is going on at the process side.

And thirdly, the quality of raw materials may have an effect as well, particularly in petrochem.

Can you give an example?

Crude oil. More and more bottom of the barrel conversion is done and more and more so called sour crude, with a high sulfur content, is being processed; on the one hand because it's cheap, on the other because the world is running out of sweet crude.

To deal with the sulfur, many new processes have been introduced in refineries and that raises the need for process analysis. Besides that, most refineries are not equipped to deal with the high sulfur load equipment-integrity-wise, and there is increased corrosion. Of course, this doesn't fit within the refinery's desire to extend the intervals between plant shutdowns. That is where we come in. Parameters such as pH are very significant when it comes to fighting corrosion. Measuring pH under the very difficult and harsh process conditions that usually occur in refineries is something that we understand very well.

By going after these applications we help our customers to fulfill their maintenance objectives. Not only in oil refining, but in virtually all other process industries.

Is that METTLER TOLEDO's typical competence, difficult applications?

Partly. We have a proven track record and a long history of measuring where others can't. Our competence goes further though. When we take a look at the indus-

tries we are serving, we see a change taking place. Whereas we used to talk to the "analyzer guy" or the QA manager, we are now in contact with the Reliability Engineer. It's usually still the same person but his title has changed and with it his responsibilities. He is no longer just there to make sure that the measurement loop works. His job is to guarantee both product quality and process availability and due to budget restrictions he probably has fewer people to do it with.

How does METTLER TOLEDO help here?

One of the key contributors to making his job easier is predictive diagnostics. By offering in-depth on-line diagnostics from our digital ISM sensors, we provide a wealth of information with regard to the measurement and the condition of the probe. Now he knows when each sensor will need calibrated or maintained, so he's not servicing sensors when they don't need it, or worse, when it's too late.

You mentioned digital sensors. Will they become the accepted standard in the chem and petrochem industries?

Without doubt. The advantages are just too great. Analog-to-digital conversion directly in the sensor provides a robust signal which suffers no interference from humidity and allows longer cable lengths. This is a big improvement in sensor signal transmission.

Another major benefit of ISM technology is the possibility to do bench calibrations. No longer do you need to carry buffer solutions around the plant. ISM allows you to take a sensor out of the process and calibrate it at your desk under controlled conditions. Bench calibration and sensor diagnostics reduce cost of ownership.

And that's what matters most these days, isn't it?

That and avoiding standstills. Nobody wants unscheduled shutdowns due to some unreliable measurement or failing process equipment. That's why sensor diagnostics are so valuable.

Corrosion Prevention in Chemical Plants and Refineries

This free guide includes best practice examples from leading chemical companies and refineries, and articles on the role in-line analytics play in corrosion prevention:

Download your copy today.

► **www.mt.com/corrosion-in-chemical-plant**

Dramatic Reduction in Sensor Maintenance
Intelligent Solution Surpasses Expectations

Scrubbers are tough environments for pH sensors. Switching to a METTLER TOLEDO solution with Intelligent Sensor Management (ISM®) has dramatically reduced measurement point running costs for a US chemical company. Now, the need for calibration has dropped by 70 %.

Amine producer

Our customer is a USA producer of specialty amines used in the manufacture of agricultural chemicals, biocides, and other intermediate chemicals. In its production processes, ethylene oxide is used as a feedstock. Due to its toxicity, any fugitive emissions of unreacted ethylene oxide in off-gas must be removed before the exhausts can be released. For this, the exhaust is scrubbed with a sulfuric acid solution.

Measurement frustration

To determine correct acid dosing in the scrubber, technicians use in-line pH sensors. However, the frequent maintenance and calibration required for the probes they were using were causing frustration. If operators received unreliable readings, instrumentation personnel had to be called out to maintain or replace the probe. This meant that during sensor maintenance, the scrubber was being operated blindly. Further, the probes were surviving for no more than three months.

Reliability and longevity are essential

The customer began looking for reliable sensors with a minimum lifetime of six months. They also wanted a retractable housing that would allow extraction of the sensor while the scrubber was operating.

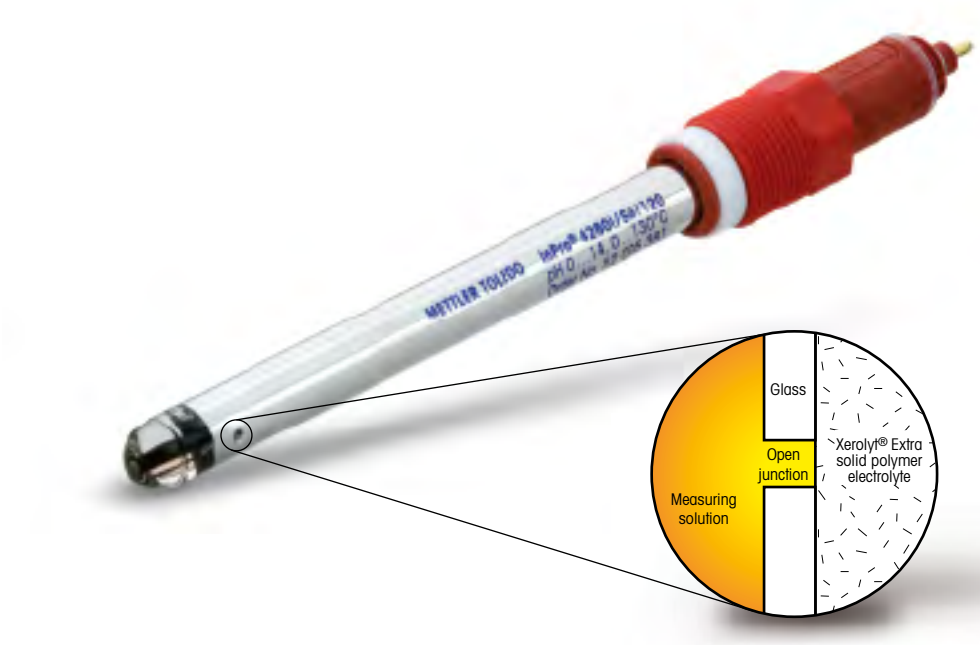
METTLER TOLEDO supplied a system that far surpassed our customer's expectations.

High performance sensor

The InPro 4260 i is the ideal pH sensor for this process. It features Xerolyt® solid polymer electrolyte, which provides a long lifetime and accurate measurement even in the harshest scrubber environments. To meet customer requirements, the sensor was mounted in an InTrac 787 retractable housing.

Maintenance known in advance

For the transmitter, an M400 has been installed. This is a single-channel, multiparameter unit with ISM technology. ISM plays a significant role in this application. It features diagnostic tools that continuously monitor the installed sensor's condition. These tools are displayed on the M400



InPro 4260 i pH sensor with solid electrolyte

> … calibration has changed from a monthly process to being conducted every three to four months.

transmitter and forwarded through the plant's control system for remote monitoring. Two key tools, the Adaptive Calibration Timer (ACT) and Dynamic Lifetime Indicator (DLI), mean instrumentation personnel know when the sensor will need calibrated or replaced.

All ISM sensors, including the InPro 4260 i, retain their own calibration data. This provides our customer with another significant benefit. If the installed sensor requires calibration, it can be quickly swapped at the measurement point with a second sensor that has already been calibrated. Therefore, there is no break in the measurement.

More than 18 months without a hitch

The METTLER TOLEDO solution has been running for over a year and a half, and the original InPro 4260 i sensors are still working reliably. The customer also reports that calibration has changed from a monthly process to being conducted every three to four months. The benefits of ISM have convinced the customer to install similar systems elsewhere in their facility.

▶ **www.mt.com/InPro4260i**

Cogeneration News

Sodium Analyzer Lowers Operating Costs in Chinese Cogeneration Plant

The high maintenance workload and operating costs of a sodium analyzer were unacceptable at a Chinese cogeneration facility. Installation of a METTLER TOLEDO Thornton 2300 Na has eliminated the time spent on calibration.

Energy conservation at Chinese power plant

Jiahua Energy Chemical Industry Co., Ltd. in Zhejiang Province, China operates multiple coal-fired generating units to supply electric power and up to 550 tons / hr of steam. Their mission is to provide sufficient energy to support the many businesses in the region.

In response to a national call for energy conservation and improved operating efficiency, Jiahua Energy Chemical Industry has focused on recycling as much of the produced steam as possible. At the same time, they need to protect the turbine / generator sets and condensate recycling systems from corrosion. As a result, plant engineers have very strict requirements on condensate quality. For this reason, continuous real-time measurements are made of conductivity, sodium, pH, TOC, and other process parameters.

Problem of sodium contamination

Monitoring the sodium ion content in the recovered steam is critical and has been challenging for Jiahua Energy Chemical Industry. Too high a sodium content leads to increased corrosion of the components of the turbine, and can result in serious accidents in production. It could cause unplanned outages costing Jiahua Energy and its customers hundreds of millions of dollars in lost production. Therefore, Jiahua Energy must maintain very strict control of the quality of the condensate returned to the feedwater train.

Sodium, as one of the most common ionic contaminants, is a very sensitive and accurate indicator of the quality of water and can be an early indicator of process leaks from heat exchangers.

Time-consuming maintenance for original analyzer

The maintenance workload for Jiahua Energy's original sodium analyzer was significant and included calibration every two weeks, each time requiring two to three hours.

In addition, the analyzer had difficulty dosing the alkaline reagent accurately, showed poor signal stability, and had leaking components.

New analyzer ensures correct reagent delivery

For ion-selective sodium measurement, control of sufficient sample alkalization is critical to analyzer performance to prevent hydrogen ion interference. But adding an excess of alkaline reagent adds to costs as well as frequency of reagent replenishment, and delivers no benefit. Therefore, measurement of the adjusted sample pH value to monitor the alkalizing process can ensure proper dosing of reagent, thereby giving accurate and reliable measurement results.

In the METTLER TOLEDO Thornton 2300 Na Sodium Analyzer, a controlled amount of diisopropylamine (DIPA) reagent is added to the sample by its vapor permeating through a length of silicone diffusion tubing carrying the sample. Because the vapor pressure of reagent is constant, regardless of the level of liquid reagent in the bottle, the rate of addition is consistent.

Also, because DIPA is used at 100 % concentration, its level in the bottle is a clear indication of its consumption rate. The 2300 Na Analyzer includes continuous

monitoring of the sample pH after DIPA addition, to ensure interference-free sodium measurement.

Up to six hours saved in conditioning and calibration

For Jiahua Energy steam customers, the sodium concentration in the sample is usually only a few ppb or less. This low concentration requires frequent conditioning of the sodium electrode to obtain satisfactory response. In the 2300 Na Analyzer's automatic calibration process, exposure to a high concentration of sodium is automatically performed as the first step of every calibration. This conditions the electrode to maintain its response.

During conditioning and calibration, a sodium analyzer measures higher concentrations of sodium than the actual sample. The residual left in the electrode flow chamber and fittings can take a very long time to flush out when the sample flow is resumed. With the manually calibrated analyzer Jiahua Energy had been using, the electrode conditioning, two-point calibration, plus full rinse down time took field instrument maintenance engineers three to six hours.

The Thornton 2300 Na provides electrode conditioning as the first step of automatic calibration. The calibration is completely unattended: Users can set the calibration time interval for days or weeks to automatically execute the electrode conditioning, double known addition calibration, and system rinse down; significantly reducing the instrumentation engineers' on-site maintenance workload.

2300 Na Analyzer reduces maintenance and labor costs

The 2300 Na uses a number of components designed to provide overall ease of operation, long-term durability, and dependable performance. The combination pH and reference sensor uses self-contained pressurized gel electrolyte without an external reservoir and tubing. This sensor design eliminates the need to refill electrolyte and possible spills or leaks that could cause corrosion inside the analyzer. These design factors significantly reduce the potential for leakage and corrosion problems due to aging of components and moving parts, while effectively lowering instrument maintenance and labor costs.

Robust digital communication

In industrial field environments, electromagnetic interference sometimes causes unstable readings from high impedance sensors such as sodium and pH sensors. In addition, measurement ground loop interference can occur. These problems are virtually eliminated using Intelligent Sensor Management (ISM®) technology. In the 2300 Na Analyzer, sodium concentration, pH, reference, and temperature are all measured with built-in circuits within the sensors that provide robust two-way digital communication to the transmitter in the Analyzer.

"Stable and reliable"

Jiahua Energy and Chemical Co., Ltd. has substantially reduced sodium measurement operating costs and on-site technician workload by using the automatic, on-line 2300 Na Sodium Analyzer. The company's field instrumentation engineer stated, "Compared with the original sodium analyzer, the measurement results from the 2300 Na are more stable and reliable, and are very fast, clearly indicating changes in the amount of sodium in the steam system. The 2300 Na's maintenance workload is very small, and now, the only thing we have to do is to add reagent every two to three months and replace the diffusion tube every six to eight months. The rest of the time, the 2300 Na runs automatically!"

► **www.mt.com/Thornton-sodium**

Maximize Efficiency
Preventative Maintenance Avoids Downtime

Even small inefficiencies add up to big costs. The innovative POWERCELL® technology inside the new PowerMount™ weigh module improves overall efficiency from installation to day-in-day-out operation of tanks, silos, hoppers, conveyors and other customized weighing systems.

The numerous traditional analog load-cell weighing systems – which perform many heavy-duty industrial tasks – are both rugged and sensitive. Their accuracy depends on the installation of the system, correct component connectivity and the calibration of the basic system components.

Alerting the operator to errors

Without continuous monitoring, errors, such as load-cell overload, poor communication between modules, out-of-symmetry errors and out-of-range temperatures can go unnoticed for long periods. When they do, out-of-specification batches and poor quality product are the results. Significant costs and damage to company reputation also can occur.

PowerMount™ weigh modules offer predictive diagnostics and help ensure any load-cell deviation is discovered right away. The PowerMount continuously reads the load cell signal to verify proper functionality. Operators are alerted to variances with an email, text message, or log file entry, depending on preference. This helps to avoid poor quality or even waste.

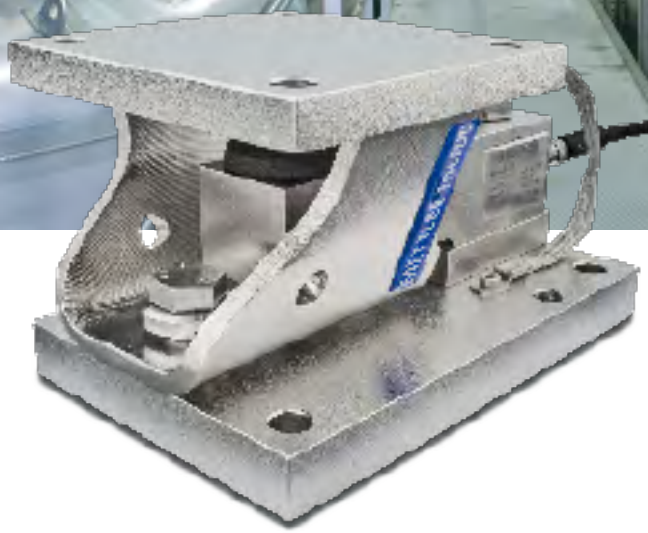
Adjusted for environmental effects

METTLER TOLEDO PowerMount weigh modules are equipped with POWERCELL® load cells. These state-of-the-art load cells have on-board microprocessors that adjust the weighing signal to compensate for environmental changes. This allows it to provide accurate weighing regardless of the effects of temperature, linearity, hysteresis and creep.

PowerMount also features easy calibration with automated CalFree™ Plus. This enables calibration without test weights or where use of test weights is impractical.

Eliminating error sources

With POWERCELL, load cells are connected in a daisy chain network. This eliminates junction boxes, a well-known source of weighing system failure. The entire system design supports the replacement of load cells and cables without labor-intensive recalibration for significant savings of time and effort.



SWB605 PowerMount™ weigh module

- Capacity: 22 kg – 4400 kg
- Load Cell: SLB615D POWERCELL®
- OIML: C3 3,000e, C6 6,000e, C10 10,000e
- NTEP: IIIM 5,000d, IIIM 10,000d
- ATEX Zone: 2, 22, FM: Division 2
- Mounting Plates: 304/316 or carbon steel
- SafeLock™ for easy and safe installation
- Optional stabilizers to suppress vibrations

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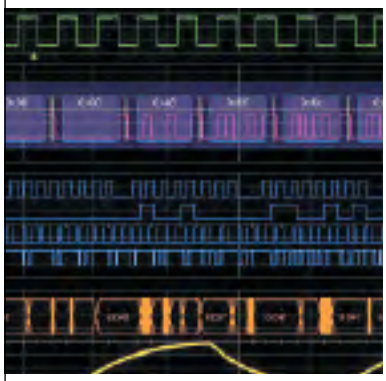
Safe Data Transfer



Digital data transfer is less sensitive to electromagnetic or radio frequency disturbances than analog signals.

No Junction Box

The linear daisy chain-type network topology for connecting the load cells doesn't require a junction box.

Fast Installation

Fast installation or exchange of POWERCELL® load cells without recalibration.

Get in-line with METTLER TOLEDO

ISM®

New! DIN Rail Transmitter

High Performance in a Minimum of Space

The M100 DR is a compact, versatile and easy to commission transmitter for DIN rail mounting. It is a single-channel, multi-parameter unit compatible with 1-wire Intelligent Sensor Management (ISM®) sensors for measuring pH, oxygen and conductivity.

Carrying the HART protocol, the M100 DR is simple to configure and allows straightforward integration of ISM sensor diagnostics, such as the Dynamic Lifetime Indicator, into asset management platforms.

► **www.mt.com/M100**

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