Best Practice Guide to
Process Analytics in the Chemical Industry

Metller-Toledo
Process Analytics

pH, Gas Oxygen,
Dissolved Oxygen,
Conductivity and
Turbidity Measurement Solutions

Best Practice
Competitive pressures and increasing customer demand mean you never stop looking for ways to raise productivity, improve efficiency, and cut costs.

At METTLER TOLEDO we never stop looking for ways to help you achieve these goals.

This booklet contains a collection of success stories from a few of our many chemical and petrochemical customers. It highlights different analytical measurement challenges they faced, and how METTLER TOLEDO solutions provided the answer.
Chemical Industry
METTLER TOLEDO
Best Practice

Increase Your Chlorine Production with a Highly Durable pH Sensor

Reliably measuring pH levels during chlorine production is very difficult to achieve consistently. For the first time, a METTLER TOLEDO sensor has removed the barriers to precise, long-term pH determination. Chemical group Solvay has noticed a “dramatic improvement” in pH measurement.

Widely used element
Chlorine is one of the most commonly used chemical elements, with uses ranging from water treatment to synthesis of PVC to silicon chip manufacture. Production can be achieved through a number of methods, but the membrane cell process, during which brine is electrolyzed in large cells, is becoming most common for environmental reasons.

Harsh conditions for pH probes
The pH level throughout the chlor-alkali process is crucial to maximizing yield and minimizing damage to the expensive membranes that are used in the electrolysis cells. The combination of chlorine in the electrolyzed brine, crystallized salt, precipitated impurities and elevated temperatures is very demanding on standard pH electrodes. To maintain reliable pH measurements requires regular cleaning and calibrating of electrodes, and even then sensors typically have a short lifetime.

Sodium reference solves one issue but creates another
A more reliable alternative to conventional pH electrodes is probes with a hermetically sealed sodium (pNa) reference system. Because the brine concentration in the chlor-alkali process remains fairly static, these pNa/pH electrodes use the brine itself as a reference. And because the reference system is sealed from the process, there is no possibility of sensor poisoning from chlorine, or diaphragm clogging from salt or impurities. Unfortunately, there is a drawback to this design: pNa/pH electrodes output a very high impedance signal that is easily altered by surrounding electrical equipment. Additionally, the cable between sensor and transmitter acts like a radio antenna, which also affects the signal received at the transmitter and limits the length of cable that can be used. METTLER TOLEDO’s InPro 4850i sensor has solved this issue.

No more measurement concerns
The InPro 4850i is a high-quality pNa/pH electrode that is uniquely different to other probes for chlor-alkali use, because the InPro 4850i outputs a digital signal. The electrode is one of METTLER TOLEDO’s expanding portfolio of Intelligent Sensor Management (ISM) instruments. ISM significantly improves sensor handling, reduces the maintenance requirement for measurement systems and increases process availability, leading to greater productivity. Central to the way ISM sensors operate is a microprocessor in the sensor head. This digitizes the analog measurement signal which it...
then exchanges with the transmitter. Because the signal is digital, it is unaffected by electrical interference and remains unchanged, even over very long cable runs.

By combining a sealed reference system with Intelligent Sensor Management’s digitized signal along with ISM’s other significant advantages, the InPro 4850i provides unequalled measuring performance, requires little maintenance and is exceptionally durable.

“Dramatic improvement,” says Solvay

With 17,000 employees and revenue of over 7 billion euros in 2010, Solvay is one of the world’s major chemical companies. At their plant in Jemeppe, Belgium, Solvay produce chlorine through the membrane cell process.

Technicians were frustrated with the performance of their pH measurement equipment and were eager to try the InPro 4850i electrode. Systems were installed at a number of cells where the anolyte exits. pH measurement is particularly problematic here as the brine still contains some chlorine which enters and poisons the reference system of conventional pH electrodes.

After a few weeks it was obvious to Solvay technicians that they had found the answer to their pH measurement difficulties. The InPro 4850i sensors were operating flawlessly in the process and the digital ISM signals were unaffected by interference from surrounding equipment.

Neil Breton, Process Analytical Technologies Engineer at the facility is delighted with the electrodes’ performance, “Changing to the InPro 4850i has dramatically improved the reliability of our pH measurements. In the past, we were recalibrating some probes every week and changing them every two months. We are now simply checking them every two weeks. To this day, we have never suffered from probe failure.”

www.mt.com/pro-chlor-alkali
ISM Sensors Optimize Process Development in Titanium Dioxide Production at Kronos

Titanium dioxide is the world’s most widely used white pigment. For Kronos Titan, METTLER TOLEDO pH electrodes with their own diagnostic functions provide outstanding performance and a reduced maintenance requirement.

Global leader
Kronos Titan is one of the world’s largest manufacturers of titanium dioxide, with gross sales of US$ 1.1 billion in 2007. Two of six plants are located in Germany. In Nordenham, Kronos produces titanium dioxide using the sulfate process. In Leverkusen, along with the sulfate process, titanium dioxide is manufactured using the chloride process.

Titanium dioxide – the premier white pigment
All white commercial products that are not chlorine bleached or naturally white contain the pigment titanium dioxide, without which day-to-day life would be inconceivable. The advantages of titanium dioxide include its absolute non-toxicity and exceptional physiological compatibilities.

Kronos Titan in Leverkusen produces a variety of TiO₂ pigments with specific properties for a wide range of applications. The principal consumers are manufacturers of wall and emulsion paints, suppliers to the automobile industry (vehicle paint), the cosmetics industry (e.g. dentifrice, sun screen), food manufacturers and the paper and plastics industries. Titanium dioxide is not only the most widely used white pigment, it is also used as a brightener for colored paints because of its outstanding dispersion factor.

The technology center – production preliminaries
Kronos’s R&D department operates a technology center in Leverkusen where, among other things, wet-chemical after-treatment methods are developed and tested for production applications. Here, the actual TiO₂ pigment is provided with a treatment covering in order to specifically affect optical properties. The nature of this coating is governed by the subsequent area of application of the pigment. Kronos is continually developing the pigments and in the process takes into account specific customer requirements.

Precise pH measurement despite high contamination potential
Mr Sebastian Kühnel is the PLT operations engineer at the technology center, where he uses METTLER TOLEDO weighing and pH measurement technology. Along with a PBA 430 weighbridge, an automatic dispensing system is used which is controlled by a Panther weighing terminal. pH measurement is done using three fully automatic EasyClean measuring, cleaning and calibration systems. The EasyClean 350e system is controlled by a pH 2100e transmitter and the EasyClean 400 systems by an M700 transmitter. All drive an InTrac 777 retractable housing that is moved automatically in the after-treatment process and can be withdrawn for cleaning or calibration/adjustment of the pH electrode.
The digital Intelligent Sensor Management (ISM) InPro 4260 i electrode is used as the sensor. Automation of the measurement points increases accuracy and reliability of the measurements and frees personnel from time-consuming maintenance. Thanks to its special reference system, the InPro 4260 i pH electrode is particularly well suited for use in pigment suspensions.

With electrodes using conventional ceramic junctions the tiny pores clog very quickly. This can result in unreliable measurements because contamination of the junction would cause undesirable diffusion potentials that would adversely affect the electrode potential and distort the measurement. The METTLER TOLEDO InPro 4260 i pH electrode has a solid polymer electrode that eliminates the need for a ceramic junction. Instead, the reference system is in contact with the measuring medium by way of two open connections. Very fine particles that deposit there can be rinsed away again. This predisposes the InPro 4260 i for use in applications that would quickly contaminate other types of electrode.

Digital ISM sensors optimize process development

The use of sensors with the solid XEROLYT polymer electrolyte represents a clear improvement in pH measurement. For two years now Mr Kühnel has been taking advantage of the rewards of digital sensor technology. Of particular interest to him is the fact that ISM sensors feature diagnostic functions that make possible quick and simple analysis of the cause in the event of sensor malfunction. The M700 transmitter’s spider diagram shows at a glance an overview of the status of the pH electrode using its most important performance parameters. The requirement for maintenance operations such as electrode cleaning, calibration or replacement can be easily determined.

The Plug and Measure function reduces the expenditure for maintenance and service of pH measurement. Further, ISM sensors indicate process discrepancies that previously were difficult to identify. For example, they feature a temperature indicator that registers the maximum process temperature. Computation of the remaining life of a sensor by the integrated Dynamic Lifetime Indicator also provides information on unintended process conditions if the life of the electrode decreases at a faster-than-normal rate. The electrodes are evaluated, calibrated and adjusted by Kronos employees directly at a PC on which METTLER TOLEDO iSense Asset Management Software is installed. It makes it possible to manage sensors and to record and evaluate all important data.

Benefits of the measurement technology used

- InPro 4260 i pH electrode with polymer electrolyte – outstanding measurement performance even in media with a high contamination potential.
- EasyClean cleaning and calibration systems – reduction of maintenance overheads thanks to automation of the measurement point.
- ISM – diagnostic tools for process optimization.

Mr Kühnel will report in a second article on how the life span of pH electrodes used in TiO₂ production was extended from half a day to two weeks by using ISM technology.

> www.mt.com/InPro4260i
Reliable pH Measurement in Difficult Conditions
Means Improved Product Quality for P&G

For Procter & Gamble (P&G) in Italy, the quality of pH measurement equipment is very important. A METTLER TOLEDO ISM pH system provides precise determination and high repeatability, resulting in an increase in process analysis quality.

Procter & Gamble is the world’s largest producer of consumer goods, with annual revenues of over $70 billion. Their Campochiaro (Campobasso) manufacturing plant in Italy is the bleach production base for their Ace brand.

Flavio Di Salvatore (FDS) works in the hypo-chlorite production module, where a METTLER TOLEDO pH measurement system with Intelligent Sensor Management (ISM) technology was recently installed. The system comprises an InPro 2000 i pH electrode, M420 transmitter and InFlow 764 housing. We asked Mr Salvatore to describe the process and explain why P&G chooses METTLER TOLEDO.

MT: Mr Di Salvatore, would you please give a brief description of the production process you’re involved with.

FDS: We have a vessel containing a chloride brine, the pH of which is regulated by adding doses of hydrochloric acid since part of this solution will be used to fuel the electrolysis process.

MT: And during this phase of production, which analytical parameter is most critical in terms of safety, quality and productivity?

FDS: pH measurement, considering the difficult conditions, is one of the most critical. Lack of control in this area could produce very negative consequences for the electrolyzer.

MT: So it would affect productivity and possibly system safety as well.

FDS: Yes, it certainly would.

MT: Before installing the METTLER TOLEDO system that you are currently using, what were your most frequently occurring analytical problems?

FDS: Previously, the quality of pH measurement was influenced by many factors. These caused difficulties in reproducing and repeating measurements and values.

MT: You mean between the process itself and analysis conducted by the lab?

FDS: Yes, exactly.

MT: What kind of improvements did you expect to obtain?

FDS: Given the system’s issues, the objective was an increase in the reliability and quality of the analysis.

MT: What benefits have you noticed since installing the METTLER TOLEDO ISM system you are using?

FDS: The greatest benefit is that we have significantly increased the reliability and accuracy of the pH values. Another important achieved objective is that we can now control, over the medium period, the consistence and the solidity of this improvement, and results confirm that the improvement is constant.
MT: So the main benefit is regarding the accuracy and repeatability of analysis during measurement.

FDS: That’s exactly right.

MT: Are there economic benefits as well?

FDS: We have seen real gains in terms of precision, reliability and maintenance. This has produced an increase in quality and productivity. These results confirm without hesitation that investing in an ISM system was a good decision.

P&G is so satisfied with the performance of METTLER TOLEDO’s pH measurement solution that they are planning on purchasing additional systems to cover all of their production at Campochiaro.

www.mt.com/ISM
www.mt.com/pro-pH
Achieving High Product Quality in Cobalt Oxide Synthesis

The demand for cobalt oxide is increasing worldwide. For a Chinese producer, accurately measuring pH in their process was problematic. METTLER TOLEDO’s automated cleaning system improved reliability, thus making high product quality a certainty, even in harsh conditions.

Increasing demand
Located in Gansu Province, China, Jinchuan Group Limited is a large-scale, non-ferrous metallurgical enterprise, specialized in the production of nickel and cobalt materials. It ranks fourth in the world and first in Asia among nickel material providers.

With the popularization of portable electronic devices such as the notebook computer, mobile phone, PDA and MP3 player, and the rapid development of hybrid electric vehicles and pure battery-powered vehicles, the demand for chargeable lithium ion batteries is rising year on year. Cobalt (II,III) oxide (Co$_3$O$_4$) is an important raw material in lithium ion battery production, the grade of which can directly affect the quality of the finished batteries.

Wet synthesis
The production of Co$_3$O$_4$ comprises two processes: wet synthesis and thermal treatment. The wet synthesis process directly affects the microscopic pattern and chemical composition of Co$_3$O$_4$.

Using a water bath, the reactor is kept at a stable temperature and the reactants are fed at a constant rate. A specially designed agitator is used to ensure the evenness of the product, and during the process pH must be maintained at a precise level. As the reaction progresses, cobalt hydroxide precipitates and is converted into Co$_3$O$_4$ through heating.

Monitoring system
The control of the cobalt hydroxide synthesis reactor is vital to successful wet synthesis. The temperature inside the reactor, the pH value and the mixing speed are major control parameters. The temperature and the mixing speed can be easily controlled by using the hot water tank circulation method and the general converter, respectively. However, due to the complexity of the precipitant solutions (which include acid, alkaline and ammonium) and given that the precipitation of cobalt hydroxide generated comprises micron level particles that easily adhere to and pollute the electrode, accurate measurement of the pH value is difficult.

Unreliable measurements can lead to reduced product quality, so to try and solve the problem Jinchuan Group trialed several solutions from a number of manufacturers. They finally decided that a METTLER TOLEDO system best met their needs.

The selected solution comprised the following:

**InPro 4800 electrode:**
Its two electrolyte chambers and PTFE annular junction make it eminently suitable for use in applications where polluting materials and large changes in temperature are present.

**pH 2100 e transmitter:**
An extremely stable and reliable unit which features SensoCheck for continuous monitoring of the glass and reference electrodes.
InTrac 777 housing:
The housing chosen is air-powered, retractable and includes a flushing chamber in which the electrode can be cleaned and calibrated. The InTrac 777 is equipped with a location detection feedback element so that its operating status can be determined remotely.

EasyClean 300 cleaning/calibration system:
In combination with the InTrac 777 housing the EasyClean 300 provides completely automatic electrode cleaning and calibration. Since installation at Jinchuan Group’s facility, the EasyClean 300 has been superseded by the even more advanced EasyClean 350e.

Installation and programming
The METTLER TOLEDO system was interlinked with the PLC of the facility’s Central Control Room (CCR) so as to constitute a fully automatic in-line pH measurement and control solution.

To meet the requirement of free-from-site operation, signals between the pH measurement point and the CCR are transmitted via hard wire, the pH value signals are sent via 4~20mA signals, while the housing operation and the electrode location feedback are transmitted through the node signals.

The hardware configuration means that real-time monitoring of pH is conducted in the CCR. The status of the pH measurement system as well as the location information from the housing, and maintenance requirements, are also monitored so that use of the system becomes safer, easier and quicker.

During the cobalt hydroxide synthesis process, fixing the alkali flow and adjusting the acid flow are based on the pH value. Controlling the valve aperture through adjustment of a PID parameter in the PLC allows stable control of pH during the whole reaction process.

Excellent results
Engineers at Jinchuan Group report that the system runs very stably and reliably, and completely meets the design requirements. The operation of the automatic pH measurement and control system has proven far superior to the previous method, which relied on manual cleaning and calibration. Now, pH control precision during the synthesis process reaches ±0.02 pH. This helps Jinchuan Group provide a strong guarantee of high product quality to their many customers, and helps them keep up with ever increasing demand.

Best Practice
Save costs by switching to automatic sensor cleaning and calibration
An automatic sensor cleaning and calibration system has many clear benefits:

• More efficient: Downtimes caused by insufficiently maintained sensors are eliminated
• Less inventory: Regularly maintained sensors have a longer lifespan
• Safer: No engineer exposure to hazardous media or high temperatures

www.mt.com/pro-pH
Reduced Maintenance Costs and Lower Product Loss

In the copper flotation process pH is one of the most important parameters and decisive when it comes to both yield and quality. METTLER TOLEDO pH electrodes help a Russian metal processor minimize product losses.

Major processing company
Ural Mining and Metallurgy Company (UMMC) is one of the biggest metal and mineral processing holdings in Europe. UMMC employs 100,000 people in 47 operations in Russia, and owns 40% of the Russian domestic market for copper, zinc and lead, and 50% of the European copper powder market. Further, the company is a major player in copper rod, base metals and rolled products.

Copper flotation
In UMMC’s Svyatogor plant, copper concentrate is produced by means of flotation. Using the physico-chemical properties of various mineral particles, froth flotation separates the copper minerals from crude ore. Firstly, copper ore is ground into fine powder in large ball mills. The ground ore is then brought into a slurry and fed to flotation cells. Strong agitation, air injection and chemical additives (so-called collectors and frothers) create a froth in which copper and copper mineral are concentrated and can be collected. The gangue is left in the tailings.

Importance of pH
Usually flotation is carried out in alkaline media; in UMMC’s case the pH range is 10 – 12. Regulators for pH control are added as the pH value determines if the desired particles develop an affinity for the air bubbles or toward the water phase. At slight pH off-sets, valuable minerals and copper end up in the tailings as waste rather than in the froth layer. Also, undesired metals and minerals might be present in the concentrate, making the refining of the concentrate more difficult. Therefore, process and profits depend to a large extent on a very delicate balance between pH and reagents.

The total costs of pH regulators, such as lime and sulfuric acid, usually greatly exceeds those of other chemicals used in the froth flotation process. So not only should the pH regulators be chosen wisely, pH measuring is also of vital importance.

Poor performance ...
For years, UMMC experienced tremendous difficulties with their pH electrodes. No matter which brand or type of sensor they tried, the high concentration of suspended solids in the flotation process continuously clogged and fouled the diaphragm of the reference electrode, causing electrodes to read false pH values. This, in turn, led to production losses and loss of profits, as well as a very high maintenance demand.

Part of the problem was solved when pH electrodes with liquid electrolyte and a flowing reference junction were installed. However, maintenance remained an issue as frequent refilling of electrolyte was required.
... not anymore
Five years ago, when UMMC started to use METTLER TOLEDO’s pH electrodes with Xerolyt solid polymer electrolyte, the situation improved dramatically. Due to the absence of a diaphragm at the reference junction, fouling and clogging problems stopped occurring. Through an open junction, the process medium is in direct contact with the electrolyte, allowing highly accurate and stable pH measurement, even under these difficult conditions. Being solid, the Xerolyt obviously requires no refilling.

UMMC recognized the high quality of METTLER TOLEDO instrumentation and the Svyatogor plant has installed a dozen complete pH measurement loops. The electrode used is the InPro 4260, the latest generation with Xerolyt Extra electrolyte. UMMC also use METTLER TOLEDO’s M700 transmitter and praise its diagnostics capabilities, which provide fast troubleshooting, checking of sensor condition and maintenance requirements.

Less maintenance
The InPro 4260 pH electrode is also available with ISM technology. ISM sensors are fully digital and offer unique diagnostics that enable the user to predict when maintenance is needed. With its Dynamic Lifetime Indicator the sensor even informs the user when to replace it before the measurement starts failing.

Replacement is easier than ever with Plug and Measure functionality which allows pre-calibration of sensors. And to make things even simpler, no configuration is required as the sensor takes care of that part itself!

www.mt.com/PRO-pH
www.mt.com/ISM

ISM
Specialty chemical manufacturer
Clariant is a world leader in specialty chemicals. There are more than 100 affiliated companies within the group, with around 22,000 Clariant employees at eleven production sites in Germany.

Clariant’s Gendorf industrial park facility is located in the South Bavarian Chemistry Triangle at Altötting. There are 18 companies at that location and Clariant is the largest of them. The 900 employees and 70 trainees produce an approximate 800,000 tons annually of preliminary and intermediate chemical products.

The Gendorf Clariant product range includes starting and auxiliary materials for the manufacture of aircraft and runway de-icing agents, thermal conductor and brake fluids, for petroleum recovery and processing, and for cosmetics, body care, disinfection agents, and industrial and domestic cleaning agents.

Tensides
Tenside production is also part of these primary and auxiliary products. Tensides are synthetic detergents found in washing products, rinses, shampoos and shower gels. They are comprised of a hydrophobic part consisting of hydrocarbons and a hydrophilic residue. Tensides deposit on dirt and grease particles with their hydrophobic part and raise it from the matrix, envelop it and disperse it. The hydrophilic part is oriented towards the water so that the dirt can be carried off by the water.

There are four types of tensides:
• cationically active tensides (positive charge)
• non-ionic tensides (no charge)
• amphoteric tensides (positive and negative charge on the same molecule)
• anionically active tensides (negative charge)

Less Maintenance, Greater Process Safety
Clariant Switch to Electrode Cleaning System

Sensor maintenance is vital for ensuring your processes are running correctly. But what if a process allows only periodic access to a sensor? Automatic cleaning and calibration means sensor access at any time, no manual maintenance and improved process reliability. Just what Clariant wanted.
It is anionically active tensides that are manufactured by Clariant at Gendorf.

**Automated electrode cleaning and calibration**

During manufacture of their tensides, a pH measurement system is used that was initially installed with an insertion housing. The pH electrodes could not be cleaned or calibrated when needed but only when the process allowed it. In order to undertake the maintenance work, the electrode had to be unscrewed from the housing and this was only possible if the line was empty. Initially, maintenance was done once a month because it was a complicated procedure and the course of the process did not permit it more frequently.

Based on the fact that the exact pH value is extremely important for the quality of the tensides, Clariant decided to automate the measurement. A METTLER TOLEDO InTrac retractable housing became the basis for the automation of the measurement point, along with an EasyClean 400 cleaning and calibration system. This system means that the pH electrode can be exchanged if necessary, even in a running process.

EasyClean 400 takes over the previously labor intensive cleaning and calibration of the electrodes. Due to the availability of predefined and freely configurable programs, the system can be adapted to the individual requirements of the operation in which it is installed. The programs can be individually set for weekly intervals within which any weekday can be individually programmed, or a fixed interval can be used for continuous processes.

**Longer electrode life**

The system, which is controlled via the facility’s process management system, has been running successfully at Clariant in Gendorf since January 2009.

Along with the advantages of having access to the electrode at any time, and that automation has minimized maintenance costs, process safety has increased due to frequent calibration of the probe. And with maintenance service that can be adapted both to the process conditions as well as the performance of the electrode and does not have to accommodate production sequences, the life span of the electrodes has been extended.

> [www.mt.com/EasyClean](http://www.mt.com/EasyClean)
How Precise pH Control in Process Water Can Reduce Costs and Lower Maintenance

Water is necessary in refineries, but in certain processes if its pH is not properly regulated the resulting corrosion leads to high maintenance. The InPro 4260 electrode reduces maintenance costs significantly.

pH measurement is essential
Water is an essential agent in refining crude oil. However, due to many contaminants present in crude oil, water becomes one of the major causes of corrosion in petroleum refineries. Accurate pH control of the process water can significantly reduce corrosion in several key processes.

Refining crude petroleum
Crude oil that enters a refinery undergoes a series of operations in order to arrive at products that industry and especially we ourselves need daily: gasoline and diesel fuel, naphtha, kerosene, domestic fuel, oils, bitumen, butane and propane gas.

In refining crude there are three main operations:
• Separation – obtaining the different types of products from the heaviest to the lightest
• Conversion – modifying the natural properties of the types of products to respond to consumer demands
• Upgrading – removing undesirable compounds and modifying the characteristics of certain products to obtain high octane fuel.

Some of the key processes of the refinery such as desalination and distillation of the crude, as well as the cracking units and hydro treatment, use significant amounts of water.

The problem
Our customer is a French refinery that is part of a large petroleum group which employs more than 100,000 people worldwide. A pH loop is installed in the overhead condenser boot water and is a classic application that is notoriously problematic. Parts of the top section of the distillation tower and condenser tubing suffer seriously from corrosion if pH is not properly controlled. Various contaminants such as sulfur, salts, and organic and mineral acids that are naturally present in the crude dissolve in the process water and are very damaging under low and high pH conditions.

The customer already had a competitor’s pH measurement loop installed, however, the electrode required daily maintenance and cleaning, and measurement was not reliable.

Customer requirements
The customer wanted electrodes that were reliable, accurate, required less maintenance and, in particular, would be less susceptible to fouling – thus ensuring a longer service life. They approached METTLER TOLEDO for a solution.
The solution
METTLER TOLEDO proposed the InPro 4260 electrode. This pH electrode addresses the requirements of many chemical processes and ensures high performance in a wide range of applications. Improvements made to our Xerolyt solid polymer reference electrolyte makes it particularly well suited to difficult applications in the petrochemical industry.

The InPro 4260 electrode with the Xerolyt Extra polymer offers the following advantages:
• High performance over a pH range from 0 to 14
• Minimal maintenance costs due to the solid polymer reference system
• Enhanced longevity in acidic/basic environments or in the presence of organic solvents
• Reduced maintenance – no electrolyte top-off required
• Integrated temperature sensor – its positioning in the glass membrane ensures fast and reliable temperature measurement
• Open junction between the measurement medium and the reference electrolyte (no diaphragm means no blockage enables reliable measurements in highly contaminated media or those containing proteins, as well as in suspensions and emulsions.

Longer lifetime and reduced maintenance
The customer’s high expectations were met during a testing phase during which the following results were obtained:

Compared to the competitor’s electrode, the InPro 4260 …
• was far more resistant to fouling
• had a significantly longer lifespan
• provided more accurate measurements
• required cleaning only every one to two months.

The customer purchased our electrode and even informed one of their associates in the petrochemical industry of our electrode’s performance. This refinery also ordered our InPro 4260. The equipment has now been installed and pH measurement is functioning perfectly to both customers’ complete satisfaction.

> www.mt.com/PRO-pH
> www.mt.com/ISM
Treatment of Toxic Effluent
Made Easier with Rugged pH System

To ensure correct processing of toxic salts and that resulting effluent complies with regulations, involves precise pH measurement. To meet this challenge a metal treatment company required a highly capable pH measurement system. For accuracy, reliability and sensor lifetime METTLER TOLEDO’s solution excelled.

Liquid waste processing specialists
Afig Foessel Engineering is a France-based design-production-assembly firm specializing in industrial liquid waste processing. One of their customers was looking for a highly accurate pH measurement system for use in the pre-treatment of toxic effluent. METTLER TOLEDO provided the ideal solution.

Toxic waste
Afig Foessel’s customer is a metal treatment company who employ electrodeposition to apply a metallic deposit onto the surface of metals. The waste water from these processes requires conditioning in an effluent treatment system before being discharged into municipal sewers. Some of the electrodeposition processes involve hexavalent chromium which must undergo pre-treatment upstream of the general distribution channel.

Dechromatation (the reduction of hexavalent chromium salts to less toxic trivalent chromium) is possible only with a sufficient quantity of a reducer such as sodium bisulfite and a strong acid (hydrochloric or sulfuric acid at pH 2).

In order to ensure satisfactory dosing of acid and sodium bisulfite and rapidity of the reaction, a pH/redox measurement is necessary. The measurement is done directly in the dechromatation tank at room temperature.

Expectations
Afig Foessel’s customer was looking for a pH/redox solution that would be easy to install and control, and which would be low in maintenance. But more importantly, it had to be very accurate to verify that the customer was complying with stringent regulations.

METTLER TOLEDO solution
After thoroughly examining the process conditions that measuring equipment would face, we proposed a solution comprising our InPro 3250 i pH electrode and M300 transmitter.

InPro 3250 i pH electrode
The InPro 3250 i series are low-maintenance pH electrodes that have been designed for a wide range of demanding applications in the chemical industry. The electrodes are available with an array of pH-sensitive glass membranes to provide optimum measurement performance regardless of process conditions.

A major feature of the electrodes is METTLER TOLEDO’s proprietary Intelligent Sensor Management (ISM) technology. ISM reduces the installation, maintenance and calibration efforts of measurement equipment, while increasing process reliability, productivity and system availability.
Toxic Waste Water Treatment

**M300 transmitter**

The M300 is a robust transmitter which combines simplicity, reliability and affordability. Its wide screen, easy-to-access cabling terminals, plain text interface and fast start-up menu ensure practical operation. Like the InPro 3250i electrode, the M300 is equipped with ISM technology which, for transmitters, allows much easier configuration and commissioning. The unit is equipped with two 0/4…20mA outputs that make it possible to monitor pH and redox signals simultaneously.

**Excellent performance**

Afig Foessel’s client is delighted with the METTLER TOLEDO system. They report that accuracy is excellent, and that the electrodes perform reliably and have a long lifetime despite the harsh conditions they are exposed to. Afig Foessel themselves are also very satisfied and plan to use METTLER TOLEDO systems in future projects.

**www.mt.com/PRO-pH**

**www.mt.com/ISM**

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**Best Practice**

**Reduce maintenance by selecting the appropriate sensor**

METTLER TOLEDO understands the importance to you of keeping time intensive maintenance to a minimum. That is why the InPro 3250i pH electrode was designed with the chemical industry in mind.

**InPro 3250i**

- Resists fouling
- Range of membranes to best match your process
- Features ISM for low maintenance and high availability

**www.mt.com/InPro3250**
TNK-BP Improves Their Desalting Process with Dependable In-line pH Analysis

Inadequate desalting was causing significant problems for TNK-BP. Thanks to the robust, reliable pH system provided by METTLER TOLEDO not only has desalting greatly improved, the quality of the final products has benefitted too.

Major producer
TNK-BP is a leading Russian oil company and is among the top ten privately-owned oil companies in the world in terms of crude oil production. The company was formed in 2003 as a result of the merger of BP’s Russian oil and gas assets and the oil and gas assets of the Alfa, Access/Renova group (AAR).

TNK-BP employs approximately 50,000 people, mostly located in eight major areas of Russia and Ukraine. In 2009 the company produced on average 1.69 mboed.

At one of TNK-BP’s refining subsidiaries in western Russia, they produce a wide range of high-quality oil products including motor gasoline, diesel fuel, jet fuel and lubricants.

Importance of pH
In the desalter operation at the refinery they use a pH measurement to monitor the water effluent as it allows the control of pH in the desalter itself. However, they were unhappy with the performance and lifespan of the pH electrodes they were using which, because of incorrect measurement, was leading to corrosion and fouling problems downstream. They asked METTLER TOLEDO Process Analytics if we could provide a more dependable system that would be easy to maintain.

Complete system
We recommended our InPro 4260 electrode combined with the InTrac 777 retractable housing and pH 2100 transmitter.

- **InPro 4260**
  This electrode features Xerolyt EXTRA solid polymer electrolyte for precise pH measurement and longer lifetime, even in the most difficult high particle concentration and hydrocarbon environments. Instead of a diaphragm, the probe features an open junction, allowing direct contact between process media and electrolyte. The absence of a diaphragm means the possibility of clogging is greatly reduced, as is the need for frequent cleaning.

- **InTrac 777**
  This retractable housing includes an integral flushing chamber in which the electrode can be cleaned without process interruption.

- **pH 2100**
  A 2-wire transmitter which is available with PROFIBUS PA, FOUNDATION fieldbus or HART interface protocols. The transmitter is designed for continuous, accurate, reliable measurement of demanding process applications.
Crude Oil Desalting

TNK-BP

Satisfied customer
The complete system provides exactly what TNK-BP required: longer electrode life, accurate measurements and simple maintenance. But even more importantly, the more efficient desalting has improved the quality of the refinery’s final products. Such is TNK-BP’s satisfaction that they are planning to install six further METTLER TOLEDO systems.

www.mt.com/PRO-pH

Best Practice

In-line measurement means optimized production and lower operating costs

The continuous stream of data that in-line measurement provides tells you if your processes are working as they should, and informs you the instant that they are not - helping you to maximize production and save on lab costs.

www.mt.com/pro

InPro 4260 pH electrode showing the open junction and Xerolyt EXTRA solid polymer electrolyte
Oxygen Measurement in Waste Gas for Effective Explosion Protection

Real-time monitoring of the oxygen concentration in waste gas plays a key role in explosion prevention. Using amperometric oxygen sensors there is no need for complex and costly sample handling systems.

About the company
The Langelsheim plant in Germany is the largest and most diversified facility of the Chemetall Group. The product spectrum ranges from specialty chemicals for surface treatment of metals to ultra pure metals and metal compounds of cesium, barium, titanium and zirconium. Production at the Langelsheim site includes 20 facilities of different types and sizes from which the majority are under the German Federal Emission Control Act.

Identification of potential explosion hazards
Complying with the “Technical Guidance for Air Quality Control” a new waste gas incinerator was built. As safety has top priority at all Chemetall sites, the unit was equipped with two METTLER TOLEDO oxygen analyzers which main purpose is to identify possible explosion hazards. When burning process off-gases, oxygen content in the feedstock must at all times be lower than 1 % by volume in order to rule out any risk of explosion or fire. Being intrinsically safe the oxygen sensors were directly installed in two collector lines. With a lower range limit of 0,1 vol.-%, any ingress of air is detected in the earliest stage. If the oxygen level exceeds the threshold value, nitrogen is automatically fed to the system thereby diluting the flow and keeping safety uncompromised. Since oxygen could only enter the system due to leakage at certain valves, the cause of the problem can be located easily and countermeasures can be taken rapidly.

Ease of maintenance
In contrast to common alternative analytical methods for this application, the METTLER TOLEDO solution with InPro 6800 G sensors does not require any sample conditioning, despite a process temperature of up to 60 °C (140 °F) and pressures down to –100 mbarg. This has resulted in significantly lower installation costs and maintenance requirements. Calibration of the electrodes is carried out using normal air and is completed in a matter of minutes. The rugged design guarantees longevity, also under tough conditions.

With all components being certified for hazardous area use, the system is very compact and allows for field mounting. The transmitter is even equipped with a flash memory card for audit trail purposes recording events with time and date and registering calibration data.
Basic features of InPro 6800 G sensor

- Service in seconds with “Quick Disconnect” system
- Long life membrane
- Certified for use in hazardous areas
- Measurement is not affected by moisture or most organic solvents

www.mt.com/InPro6800Gas
www.mt.com/DO
Protection from Gas Explosion
Inerting During Centrifugation

Comi Condor are one of the leading suppliers of vertical continuous and horizontal centrifuges for the fine chemicals industry. It has selected METTLER TOLEDO for oxygen measurement in the inerting control system of its products. The result is improved centrifuge productivity and performance through in situ measurement, and less maintenance.

Class-leading centrifuges
The Italy-based Comi Condor company has supplied world-class filtering centrifuges for fine chemical and pharmaceutical ingredient production for over a century. It draws on decades of innovation and continuous improvement for developing the best separation techniques that fulfill the most stringent industry requirements for product quality and yield. Their products also comply with some of the world’s most rigorous safety regulations.

Founded in 1885, the company develops, manufactures and sells its centrifuges from two plants located in Milan and Pavia. It is the leader in robust and reliable centrifuges with particular emphasis on compliance and GMP fulfillment for the pharmaceutical industry.

Highest inerting requirements
Comi Condor has developed a monitoring and control system based on the continuous measurement of centrifuge overpressure and oxygen level. The system allows safe operation of purging, filling, processing and emptying of the centrifuge.

The safety requirements for running centrifuges (next to the ones necessary for hazardous area certification) can vary from one country to another. Italy applies one of the most stringent concepts that can exist: overpressure and oxygen control must be present on each centrifuge control system. This is considered the safest method of operation compared to overpressure control only. Control of oxygen can ensure that that particular element of the explosion triangle is continuously kept below a safe limit during all stages of the centrifugation process.

How the application was originally handled
Comi Condor has manufactured safe centrifuges using oxygen and overpressure control for the fine chemicals industry for decades. However, the company’s customers often noted tedious and sometimes even unpredictable maintenance operations on the extractive oxygen systems as a significant drawback. Disturbed batch manufacturing schedules and yield loss were the result, thus impacting the overall performance of the centrifuge.

In situ oxygen measurement
Comi Condor contacted METTLER TOLEDO for a more reliable and easier to maintain solution. They selected one of our amperometric systems based around the
InPro 6800 G sensor to replace the extractive installation in the control system of the centrifuges. Moreover, the InPro 6800 G can be mounted directly into the centrifuge, so the delicate gas sampling system they had been using could be removed, thereby increasing reliability and saving on costs.

Accurate and fast
After a successful test period, good practical experience was gained with the features of the new system. A comparison of both the extractive and the amperometric equipment showed that the simpler METTLER TOLEDO solution displayed excellent measurement accuracy and proved to be as fast as the extractive solution.

Competitive advantage
Comi Condor has gained a competitive edge by offering its customers more reliable centrifuges that reduce downtime and require minimal maintenance. For new centrifuges where both oxygen and overpressure control is required, Comi Condor now preferably chooses METTLER TOLEDO amperometric systems.

Benefits of the InPro 6800 G at a glance:
• Cost-effective: Amperometric design means costly gas extraction and conditioning system is not required
• Reliable: Unaffected by exposure to water, water vapor or most organic solvents
• Low maintenance: Membrane body replacement takes just five minutes and can be conducted on site by the user
Sulfuric acid production requires constant monitoring
A global player in the chemical industry operates a production site in Brazil where large quantities of sulfur trioxide are produced. The compound is used at the plant as a prime material in the manufacture of other products. The SO₃ is generated in a continuous process, and at times when it cannot be used elsewhere at the facility it is washed with water to produce sulfuric acid which is subsequently sold to other companies.

Control of H₂SO₄ concentration is vital as too weak a solution cannot be sold and too strong a solution means overuse of SO₃ and a reduction in profit margin. Due to the exothermic nature of the reaction it is not practical to dilute a highly concentrated solution in a later process. Likewise, it is not worth the production costs involved in making weak solutions stronger. Therefore, successful production involves continuous monitoring of the H₂SO₄ as it is generated.

Inductive conductivity sensors for harsh environments
Determination of acid concentration by in-line conductivity measurement is ideal for this application; however, most sensors are unable to withstand the extremely acidic, high temperature process conditions. The chemical company was looking for a precise and process-tolerant measurement system that would provide continuous concentration data. Their research identified solutions based on inductive conductivity sensors as being most suitable. Company engineers decided on a METTLER TOLEDO system comprising the InPro 7250 inductive conductivity sensor with perfluoroalkoxy (PFA) coating, and M420 Cond Ind transmitter.

The InPro 7250 sensors have been designed specifically for measurement in such applications. As there is no electrode in direct contact with the process liquid, they are not affected by media that would foul traditional contacting probes. In addition, the sensor’s PFA coating is highly resistant to aggressive chemicals.

The M420 Cond Ind is a 2-wire transmitter with Ex approval for hazardous area use. Among its features is a sulfuric acid curve function; this provides accurate concentration measurement across wide conductivity and temperature ranges.
Reliable sensor improves productivity
For our customer the METTLER TOLEDO system and subsequent control of the SO₃ feed means H₂SO₄ concentration can now be maintained within the desired range. Sulfuric acid that is either too weak or too strong is no longer produced, reducing waste of SO₃ and increasing the plant’s productivity. The success of this application has led to the installation of other systems at additional units in the plant.

www.mt.com/InPro7250
More Accurate Process Control
Leads to Superior Zinc Production

Precise control of sulfuric acid concentration is vital for efficient leaching of zinc calcine. But lab titration consumes too much time and resources. The answer? In-line conductivity measurement.

Demand for zinc
Zinc’s uses are broad and varied: from galvanizing steel to a white pigment in paints, from a primary metal in coins to a fire retardant. Such is the need for zinc that over 11 million tons of the metal are produced annually worldwide.

Binani Zinc Ltd. in Binanipuram, Kerala, India has been producing zinc since 1967. In the 1980s the company began manufacture of special high-grade ingots with 99.995% purity. The plant has a current capacity of 38,000 tpa and is planning to expand this to 50,000 tpa to meet increasing demand. In an ongoing process to raise efficiency, the company has streamlined and de-bottlenecked many of its systems and is constantly looking at process improvements. Binani Zinc were not satisfied with the efficiency of their zinc leaching procedure and believed far greater productivity could be achieved.

Zinc leaching
The first step of the plant’s zinc extraction process involves roasting zincblende to convert the zinc sulfide in the ore into zinc oxide. A by-product of the calcination is sulfur dioxide, which is subsequently converted to sulfuric acid and used later in the zinc extraction process.

Leaching of zinc from zinc calcine is carried out in a two-stage countercurrent process. Firstly, finely ground calcine is leached in a dilute sulfuric acid solution taken from the second leaching stage to produce a first stage leach solution containing a high zinc concentration. This contains low iron and sulfuric acid concentrations.

After suitable purification treatment, zinc is recovered from this solution by conventional electrowinning. The residue from the first stage, which still contains a certain amount of zinc, is leached further in a separate tank with electrolyte from the electrowinning operation. The liquid from this second stage becomes the solution used for the first leaching. Crucial to obtaining high zinc yield from the entire process is the control of sulfuric acid concentration.

During the two leaching stages, sufficient but not excessive sulfuric acid must enter the leaching circuit to ensure that the solution drawn from the first leaching stage will contain enough dissolved zinc (approx. 140 – 150 gpl) to make it suitable for zinc recovery by electrolysis. Also, the quantity of oxides entering the first stage leach must be in excess of the quantity required to react with all available acid in the solution recycled from the second leaching stage.
Requirements
Binani Zinc had been using sample based lab analysis for acid concentration measurement. However, they found that effective process control was not possible because of the time taken to perform measurements and their infrequency.

As part of their philosophy of continuous improvement, Binani Zinc looked for a reliable system for determining acid concentration, with high repeatability, very low maintenance, a reasonable cost of ownership, and an ability to withstand the process conditions.

After discussions with METTLER TOLEDO engineers, it was agreed that indirect acid concentration measurement by determining conductivity in the process medium would be the best solution. Binani Zinc purchased seven identical systems, comprising InPro 7250 PEEK conductivity sensors, M700 transmitters and InDip 550 PVDF housings.

Concentration and conductivity
Before using the METTLER TOLEDO systems, a few steps had to be taken. Firstly, lab titration to determine acid concentration of the leaching solutions was correlated with conductivity levels measured in-line with InPro 7250 sensors. The data was then entered into the M700 transmitter’s Concentration Table function. Further testing of the conductivity level as it altered during the process, was measured against levels determined in the lab. After some final adjustments to the Concentration Table, the engineers had sufficient confidence in the measurement system that lab testing was no longer required.

Process improvement
Before installation of the METTLER TOLEDO systems, acid concentration fluctuated from 30–90 gpl. Thanks to the InPro 7250 and M700, that range is now held to a much more satisfactory 55–70 gpl, leading to the better process control and improved productivity Binani Zinc were looking for. In addition, plant engineers appreciate the robustness and maintenance-free operation of the InPro 7250. The sensor’s PEEK body is resistant to acids and has no electrodes in contact with the process medium that could become fouled. In combination with the M700 transmitter, engineers find the whole system simple in use and operation.
Dissolved Oxygen Measurement Reduces Corrosion in Water Injection

Water injection in offshore fields can significantly improve the recovery factor, but high oxygen levels in the water cause serious corrosion problems. For an American oil producer, a METTLER TOLEDO dissolved oxygen sensor has helped them save thousands of dollars.

Dissolved oxygen is a major cause of corrosion
The continuous extraction of petroleum from reservoirs diminishes the exiting pressure over time, reducing the output of the well. In order to increase oil recovery from offshore fields, seawater is injected into reservoirs to maintain pressure.

Dissolved oxygen (DO) is one of the key contributors to serious corrosion of the steel injection pipes. Oxygen also stimulates the growth of bacteria which can cause scaling, produce toxic hydrogen sulfide and lower oil recovery through clogging. Therefore, the seawater must first undergo treatment before being injected.

Our customer operates a number of rigs off the coast of Brazil. Having had first-hand experience of the consequences of injecting seawater with a high DO level, they were keen to fit deaeration equipment on a rig where water injection was soon to be required.

Trace DO sensor provides assurance of water quality
In the deaerator, first a countercurrent gas flow brings the level of oxygen down to 60–200 ppb. As this level is still much too high, sodium bisulfite is added to chemically reduce almost all of the remaining oxygen. However, too much of this salt would have a negative impact on the oil quality. To accurately control the dosing of sodium bisulfite, the dissolved oxygen level is measured to an accuracy of 1 ppb. To minimize the influence of oxygen, the injected seawater requires a DO level below 10 ppb. To ensure the injected water was always within the desired range, a METTLER TOLEDO InPro 6900 i trace oxygen sensor and M700 transmitter were installed.

Following deaeration, the water is filtered and through a series of pumps the pressure is increased before it is finally injected into the reservoir. The ideal place to measure the DO level is in the header exit; however, at this location the pressure is above 140 bar (2000 psi) which is not suitable for DO sensors. The InPro 6900 i was therefore placed in a sample line where pressure reducing valves lower the pressure of the water to an acceptable level.

As the InPro 6900 i is one of METTLER TOLEDO’s Intelligent Sensor Management (ISM) sensors, it features includes advanced diagnostics that predict when sensor maintenance, calibration and replacement will be required.
Less corrosion, more oil
Rig engineers are highly satisfied with the performance of the METTLER TOLEDO solution. The real-time measurements from the system allow engineers to make appropriate changes to sodium bisulfite feed to prevent over- or under-feeding. Besides the sensor’s very high accuracy in extremely low oxygen concentrations, engineers are impressed with the fast and easy maintenance and ISM’s predictive diagnostics. Tight control over DO has significantly reduced corrosion and bacterial growth, saving the rig operators on expensive, time-consuming maintenance and also helping to maximize petroleum recovery.

www.mt.com/InPro6900
Kemira Reduces Maintenance Costs
Thanks to Robust Dissolved Oxygen System

Kemira was experiencing poor performance from a dissolved oxygen measurement system, resulting in unnecessarily high maintenance costs. A METTLER TOLEDO solution provided the reliability and the reduced maintenance they required.

Water treatment technology
With expertise in fiber, chemical water treatment and water separation technologies, Finnish chemical industry group Kemira has created an extensive product portfolio.

At its UK facility in Bradford, Kemira manufactures organic flocculants for use in the water treatment industry. Kemira’s flocculants are high molecular weight water-soluble polymers and are available in a wide range of charge type, chemistry, charge density, molecular weight and architecture.

Polymerization
The application in question is a copolymerization involving acrylamide and a quaternary ammonium compound. Monomers and polymer initiators are combined immediately prior to injection into the reactor, which is blanketed with nitrogen. The polymerization takes place as material enters the reactor. At the reactor outlet the polymeric product passes through a series of cutting processes which break the solid material into small pieces ready for drying and packaging.

Oxygen acts as an inhibitor to the polymerization, i.e. if oxygen levels are not kept below a certain level sufficient polymerization will not take place. If this happens there is a risk of un-reacted monomers entering the cutting system causing a potential environmental issue and undesirable process downtime. Measurement of the dissolved oxygen level in the monomers is therefore critical in preventing out-of-spec material entering the reactor stage of the process.

High quality membranes
METTLER TOLEDO was approached after Kemira experienced problems with their existing dissolved oxygen measurement system. They were seeing unexpected membrane failures in their DO equipment and generally poor membrane lifetime lasting anything from a couple of weeks, down to only a few days in extreme cases.

Before a METTLER TOLEDO system was put in place, samples of the monomers were taken back to our lab so that the suitability of our dissolved oxygen membranes could be evaluated. At the end of the trials no significant change or damage to the membranes was observed.

Rugged performance
Following this successful evaluation Kemira purchased a system to install on one of their monomer lines. The system chosen comprised the InPro 6800 DO sensor and M700 multi-parameter transmitter. The M700 was selected because it would allow access to raw signal
data and calibration statistics, which would help in Kemira’s management and long term evaluation of the system. The installation has now been in place for several months without any membrane problems and hence no maintenance requirement.

**Less maintenance**

As a result, Kemira has recently purchased a second system, this time upgrading to the new InPro 6850 i digital sensor allowing them to take advantage of Intelligent Sensor Management (ISM) technology. ISM uses advanced diagnostics to provide real-time information on sensor condition. By using the predictive maintenance functions of the M700 transmitter, maintenance tasks at Kemira can be performed before a critical drop in sensor performance occurs. The result is reduced maintenance costs with higher process availability and a very satisfied customer.

![InPro 6850 i Dissolved oxygen sensor](image1.png)

![M700 Multi-parameter transmitter](image2.png)

Does your current DO system know when the sensor is going to fail?

The Dynamic Lifetime Indicator in the ISM transmitters calculates and displays the remaining lifetime of the InPro 6850 i DO sensor.

With METTLER TOLEDO’s ISM technology, expensive process downtimes to replace failed sensors have become a thing of the past.

*www.mt.com/DO*
Turbidity Measurement Controls Quality in Biodiesel Production

Filtration is an extremely important step in biodiesel manufacturing. Using an in-line turbidimeter with forward scattered light technology, filter performance is monitored and consistently high quality biodiesel is ensured.

The biodiesel market in Brazil
The biodiesel segment experiences rapid growth in Brazil, mainly because this renewable fuel pollutes considerably less than conventional diesel and because it is CO₂ neutral. Biofuels already go back a long time in Brazil and the use of bioethanol is very common. With biodiesel Brazil further decreases its dependency on petroleum. Today, seven companies are heavily investing in biodiesel projects. The entire production capacity was almost 2 billion liters in 2008, 180% higher than the previous year.

Multiple processes controlled with turbidimeters
Purification is important throughout the production process of biodiesel. In one of the first steps an acidic water wash does the first cleaning. The removal of wash water is carried out through simple phase separation, a process that is completely controlled by measuring turbidity. A more complex application however is the measurement of the product turbidity after the last filtration step, just before the biodiesel is filled into storage tanks.

As a product of natural origin, contaminants such as proteins, fibers and bacteria occur. Since modern car engines require high quality fuels, all these contaminants need to be completely removed in order to avoid engine fouling, corrosion and loss of performance. Thanks to absolute confidence in our products and services, our customer, a global company in agricultural products processing, has decided to monitor the most important filtration operation with a METTLER TOLEDO turbidimeter.

Our technicians took samples of the biodiesel and recognized the extremely low turbidity levels. In order to sustain the same very high quality level our recommendation was to install an in-line turbidimeter that uses forward scattered light technology to monitor the final filtration performance.

METTLER TOLEDO solution
The system installed in this application consisted of:
• InPro 8400 turbidity sensor
• Trb 8300 F/S transmitter

Turbidity sensor InPro 8400
This factory-calibrated turbidimeter comes as a spool piece equipped with sapphire optics. Simultaneous measurement of direct and scattered light compensates for color changes and aging of the light source.

Turbidity transmitter Trb 8300 F/S
The METTLER TOLEDO Trb 8300 transmitter series provide detailed information on sensor performance, easy setup of the instrument and require very low maintenance.
**Customer feedback**

Measuring turbidity of the filtrate is a typical application that will help to optimize the filtration process and improve both quality and yield. Having an in-line turbidity analysis has drastically reduced product downtime.

After the implementation of the first system, the customer was very impressed with its performance and its user friendliness. New installations are currently being evaluated.

> [www.mt.com/turbidity](http://www.mt.com/turbidity)
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