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Leading Process Analytics

Automated pH Cleaning System Boosts Lifetime and Minimizes Maintenance

In a paraffin wax refining process, measurement of pH and ORP values was optimized in association with an electrode cleaning and calibration system. This process improved electrode life to six months and minimized maintenance effort.

Sasol Wax GmbH

The corporate headquarters and main facilities of Sasol Wax GmbH are located in the Hamburg port area. Current production of paraffin and paraffin-related products amounts to approx. 350,000 tons/a. Apart from standard products the company also provides customized solutions.

Hydrogenation of macro and microcrystalline paraffins

Macro and microcrystalline paraffin waxes display outstanding features for a wide variety of applications, ranging from mass-produced items through to specialties for innovative solutions, e.g. heat storage media. Derived from fossil raw material, paraffins are mainly made up of saturated hydrocarbons. Potentially

harmful constituents such as hydrogen sulfide or aromatics are removed using e.g. high-pressure hydrogenation, rendering them completely toxicologically safe.

Why ORP and pH measurement?

The poisonous hydrogen sulfide removed during the above-mentioned hydrogenation is converted to elementary sulfur in an absorber column via an oxidation stage. Full equation for this conversion is:
$$\text{H}_2\text{S} + \frac{1}{2} \text{O}_2 \rightarrow \text{S} + \text{H}_2\text{O}.$$

To ensure consistent oxidation of sulfide (S^{2-}), the redox potential values before and after the oxidizer are important control criteria for optimal removal of hydrogen sulfide (H_2S) in the column. Optimal process function is achieved with redox potential values of approx. -300 mV at the entry to the oxidizer and approx. -100 mV



METTLER TOLEDO

at the exit. If the redox potential becomes too positive salts can form that have a negative influence on the absorption of H₂S. At the same time the pH value of the washwater also acts as a criterion for the absorption quality. If the value is too acidic, caustic neutralization is necessary.



Expectations of Sasol Wax

Sasol Wax expected reliable analysis of the pH and redox potential values before and after the oxidizer. Originally the procedure was to be based on daily measurement of random samples. This, however, resulting in a substantial amount of work and high indirect costs.

The main requirements of the customer were:

- Measurement of the pH and ORP values at the different measuring points to be taken daily at different times with visualization via the PCS.
- Last measurement values to be held fixed throughout the period until the next measurements have been taken.
- Longest possible service life of the electrode.
- Ability to calibrate and monitor both parameters.
- Maintenance effort to be reduced to a minimum.

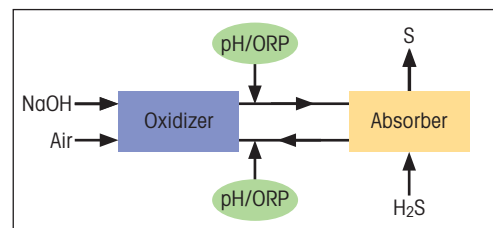
The METTLER TOLEDO solution

It was proposed to use XEROYL[®] Plus type electrodes InPro 4250 (SG) in conjunction with fully automated, freely programmable EasyClean 400 X systems. The selected electrode version is able to measure pH, ORP, as well as temperature, and has proven already its ability to operate reliably over an extended period in other applications involving H₂S-bearing media.

and a 1-point calibration for ORP. The specific membrane resistivity values of the electrodes are stored in the transmitter so that any change in these values through e.g. junction fouling will prompt a warning. In addition, if the set tolerance values for redox are exceeded or understepped, this also triggers an alert. Sasol's Planning Engineer and Plant Engineer both voiced positive opinions about the high system functionality and measurement availability. With a 6-month electrode life the system solution put forward by METTLER TOLEDO had fully reached expectations.

▶ www.mt.com/cleaning

▶ www.mt.com/pro-ph



A measurement system that fulfilled all expectations

The EasyClean 400 X Systems installed at Sasol were programmed such that the electrodes insert into the process every two hours for a defined period. For the rest of the time each electrode is stored wet, safely protected inside its own retractable housing. This guarantees extended life of the electrodes avoiding undue exposure to the process medium. The electrodes are automatically calibrated and adjusted weekly with a 2-point calibration for pH

Main benefits of EasyClean 400 X

- Fully automated electrode cleaning and calibration
- Easy integration into PCS
- Freely configurable interval programs
- Use in hazardous areas

Benefits of the pH electrode InPro 4250

- No risk of clogging of junction
- Developed for aggressive process media
- High pressure resistance
- Superior process reliability and performance
- Exact temperature compensation and easy calibration

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Manage your ISM Sensors the Easy Way

iSense ISM Asset Suite for the Process Analytics represents a big step into a more controllable future of your sensors life – starting at the first implementation into your process until to the decision to eliminate the sensor.

Raising demand on control data

The large number of calibrations performed each year has to be collected, managed and analyzed efficiently to satisfy regulatory requirements without taking up too much of your limited time and resources.

ISM – plug and measure technology

The digital “Intelligent Sensor Management®” concept makes it decidedly easier to operate process analytical systems from initial installation to maintenance right through to sensor exchange. It ideally supports the vertical integration of diagnostics information into the process control environment. Predictive sensor wear or adaptive calibration timer information can be integrated into your PLC via field-bus technology.

iSense – the key to maximize the benefits of the ISM technology

iSense allows verification and calibration of METTLER TOLEDO digital ISM pH electrodes and of digital sensors to measure dissolved oxygen in laboratory conditions.

Easy connection to your computer

Simply connect your ISM sensor via a USB port to your computer and follow the instructions of your iSense software. No transmitter will be necessary as interface.

View in an instance the sensor performance

iSense enables you to evaluate in an instant the conditions of your ISM electrodes/sensors. Broad information is provided for: last calibration date, date of

adjustment, slope, zero point, response time, date of manufacturing, time of operation, max. temperature and condition of sensor ware.

Intuitive calibration support

Enhance your productivity with the advanced iSense application for your sensor calibration management. An analysis has shown that you may reduce drastically duration and frequency of calibration resulting in savings of about 25% with a ROI as short as 3 months!

Manage your ISM sensors over the entire life cycle

A complete view of all sensor data is provided by a SQL database allowing you to have access to all previously stored data of any equipment that has ever been used in the process. Unlimited data export opens abundant possibilities to optimize your measuring system and process. A protection of your sensor assets is guaranteed.



iSense is a very user friendly and unique software. Just connect your sensor via a USB port to your cable.

www.mt.com/ism

iSense
ISM Asset Suite

Monitoring of Gaseous Oxygen Reduces Emission of VOC

Volatile organic compounds (VOCs) require emission controls because of their noxious characteristics. When VOCs are disposed of by combustion, monitoring and control of gaseous oxygen it allows the confirmation of both the delivery of gases to be processed and the supply of the correct amount of oxygen for good combustion.

A French pharmaceutical company reduced atmospheric emissions

A French pharmaceutical company has made a major upgrade investment in a plant for manufacturing pharmaceutical active principles. This upgrade includes facilities to reduce atmospheric emissions, including emissions of VOCs, and the ability to save energy by recovering the heat of combustion.

Volatile organic compounds (VOCs)

VOCs are a large class of organic compounds characterized by normally being in the gaseous state or evaporating readily at standard temperature and pressure (20 °C, 105 Pa). As to toxicity, common VOCs can give rise to various symptoms and effects ranging from mild irritation to severe respiratory distress and some are suspected carcinogens. VOC emissions are governed by EU Directive 99/13, originally issued March 13, 1999, which sets forth limits on point source (stack) and diffuse emissions with special provisions for certain more toxic solvents requiring reduction or substitution.

Treatment of VOCs

For onsite treatment of VOCs, at the above-mentioned pharmaceutical plant, gases generated by manufacturing processes are collected at each production unit and are sent under pressure to an incinerator. To facilitate complete disposal, the resulting combustion gases are employed to generate steam used on-site.

The content of oxygen in the combustion gases is monitored and controlled at the important points in the process; namely the collection reservoirs ahead of the burner, and the burner itself. This benefits operation as well as safety. It is desirable to keep the content of gaseous oxygen low in the collection system to eliminate explosion risk. At the level of the burner the correct ratio of gaseous oxygen will optimize combustion and thereby ensure thorough conversion of the VOCs.

Because of the importance of the oxygen monitoring the sensor employed needs to be highly responsive, and at the same time durable and reliable. This means in particular that it must be resistant to any of the media to which it might be exposed.



The solution offered by METTLER TOLEDO

The solution for measurement of gaseous oxygen proposed by METTLER TOLEDO is comprised of the following components:

- an M 700 (X) transmitter with an O₂ 4700 (X) module;
- an InPro 6800 gas sensor, type Ka (Kalrez membrane); and
- an InFit 761 stationary housing.

Before this monitoring system was installed permanently, a test setup was installed for checking proper function under the conditions of the particular plant.

Characteristics and advantages of the InPro 6800 gas sensor

- Rapid response time, as a result of utilization of the “Clark principle” in the probe design;
- Minimal maintenance;
- Calibration using air;
- Certified safe for use in explosive atmospheres (ATEX II/2G EEx ia T6/T5/T4)
- Other certification: FM IS, Class I, Div. 1, Group A, B, C D.

Characteristics and advantages of the M700 (X) (with O₂ 4700 (X)) transmitter

Simultaneous monitoring of oxygen and temperature;

- Certified safe for use in explosive atmospheres (ATEX II 2 (1) G EEx ib [ia] IIC T4
- Other certification: FM IS, Class I, Div. 1, Group A, B, C D.

Results of the testing

The operation of the InPro 6800 gas sensor was evaluated over a period of two months, to validate the measuring circuit proposed by METTLER TOLEDO. The sensor demonstrated its capability for reliable real-time monitoring of the gaseous oxygen content, its minimal maintenance costs due to rapid replaceability of the membrane, and its ease of calibration, which can be accomplished directly in atmospheric air. The METTLER TOLEDO system, with its simultaneous monitoring of the temperature, and ATEX certification of each of the components in the

measuring circuit, would thus seem to be an ideal system for monitoring and control of gaseous oxygen.

Also noteworthy is the fact that the sensor demonstrated excellent robustness; particularly the durability of its Kalrez membrane under difficult measurement conditions which included the presence of numerous alkenes and solvent vapors.

Installation on-site

The InPro 6800 gas sensor was installed directly in the conduit, using an InFit 761 stationary housing. This eliminated the need for a sampling system.

To provide for optimal monitoring of the gaseous oxygen content over the entire installation, a validated measuring circuit was installed at each critical point, particularly the junction points of the conduits from each of the individual production units. Additional measuring circuits are planned for installation in the coming months – particularly at the outlet of the burner unit and at the exit points of the gases from each of the production units. The total number of measuring circuits in the completed installation will be 20.

Customer benefits

- Reliable real-time monitoring
- Minimal maintenance costs
- Ease of calibration
- Excellent sensor robustness

Conclusions

The oxygen monitoring system employing the METTLER TOLEDO InPro 6800 gas sensor enabled the pharmaceutical company to fully meet its objective of substantial reduction of VOC emissions in accordance with the EU Directive and the company's own program for health, safety, and environmental protection. The heat recovery system provides economical steam for use on-site, as well as providing an additional level of emission control. After the installation of the complete system, and the control of each of the oxygen measuring circuits installed, the client will perform validation of the overall installation with a view to employing comparable systems at its other plants.

► www.mt.com/O2

► www.mt.com/transmitter



InPro 6800.

InFit 761.

M 700 transmitter.

Turbidity Measurement in Waste Processing – Improves Filter Efficiency

Online monitoring of wastewater in a chemical-physical waste treatment process using backscattered light technology improves filter efficiency and also guarantees compliance with effluent discharge regulations.

Credo of the Waste Processing Company in Hamburg, Germany

The Waste Processing Company (Abfallverwertungsgesellschaft mbH) in Hamburg (AVG) disposes huge amounts of different types of waste every year and does this in an environmentally responsible way. The company's activities are centered around a high-temperature incineration plant, one of the largest and most modern of its kind in the world. Moreover, apart from various storage facilities as well as a separator unit, the AVG in Hamburg also maintains a chemical-physical treatment plant (CPA). In this plant, inorganic wastes that can be pumped are treated in chemical-physical processes in such way that the resulting effluent can be discharged safely into the public sewer system in compliance with official regulations.

Conserving natural resources

The energy produced by the waste incinerator is supplied to the Hamburg district heating network via a neighboring cogeneration power plant. In this way, some 30'000 households are supplied with waste heat from the incineration plant, thereby saving expensive conventional fuels and contributing towards conservation of natural resources. AVG's high-temperature incineration plant is the focal point of an efficient disposal center. Besides the incineration process, large amounts of inorganic liquids, oil-water mixtures as well as wastewater from the

stack gas scrubber of the incinerator are treated in the CPA.

Chemical-physical plant (CPA)

By means of chemical reactions in the aqueous phase, harmful substances present in the wastes are either oxidized and/or reduced, neutralized, precipitated out, as the case may be. For this, four stirred reactors are available, connected to the various storage tanks for the treatment chemicals. Following treatment, the neutralized waste mixture is discharged to a sedimentation basin and finally the precipitated sludge dewatered by a chamber press. The effluent is subsequently passed through a gravel/active carbon filter and before final discharge to the public sewer system is subjected to analysis in accordance with official regulations covering the discharge of wastewater.

InPro 8200 protects and monitors the gravel filter

For control of the effluent stream, the AVG in Hamburg relies, among other factors, on backscattered light turbidity measurements using equipment supplied by METTLER TOLEDO. To prevent clogging of the gravel filter and the downstream active carbon filter, solid matter concentration may not exceed a limit value of 25 g/l; since this would mean having to carry out time-consuming and costly backflushing of the gravel filter and regeneration of the active carbon. The limit value is monitored by the turbidity sensor InPro 8200 in conjunction with the turbidity transmitter Trb 8300. Ease of handling and the rugged design of the sensor are particular advantages offered by this combination.



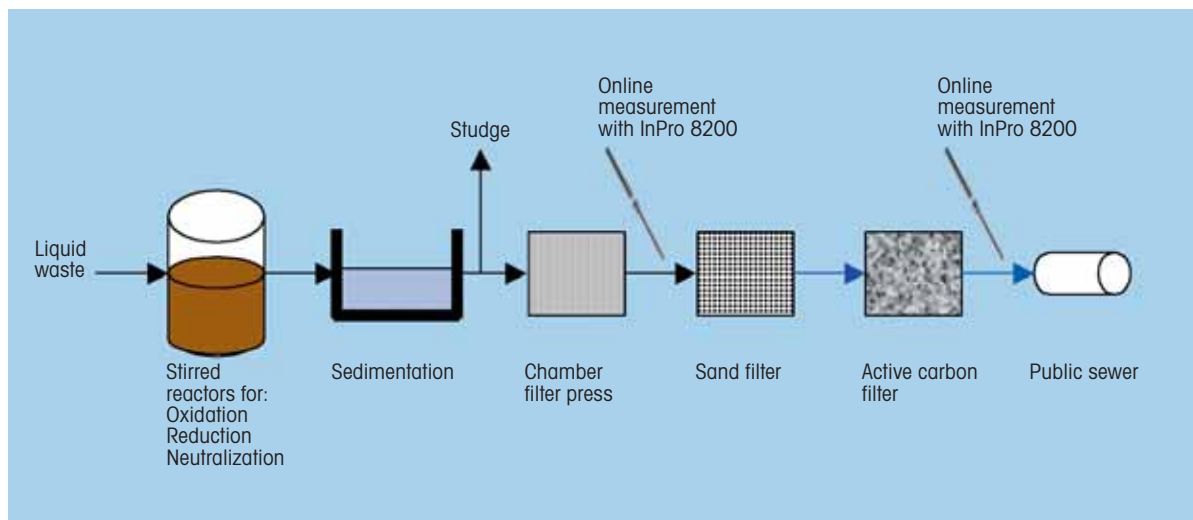


Fig. 1: CPA – schematic representation of the cleaning stages.

Previously, the turbidity value was determined using 90° scattered light measurement. However, with this technology it was not possible to achieve reproducible measurement values. Only after installation of the InPro 8200 turbidity sensor was online measurement truly feasible. Measurement is done in the bypass of the main feed pipe to the gravel filter, and the sensor installed in such way that air bubbles are unable to interfere with the actual measurement.

The second turbidity measurement system is positioned at the point of effluent discharge into the public sewer system. The limit value for solid particles in this case is 15 g/l. The InPro 8200 turbidity sensor together with transmitter Trb 8300 are used as the preferred measurement system in this application. Measurement here takes on particular importance; as it is used to monitor compliance with official discharge regulations.

Particular benefits of the InPro 8200

The dual optical fiber sensors InPro 8200 offer high resolution in the low-temperature turbidity range and high linearity in the mid turbidity range.

■ High resolution

Reliable measurements in the range 5...4000 FTU and 0...30 g/l suspended solids.

■ Wide scope of application

Versatile, compact 12 mm design.

■ Robust, with low maintenance requirement

Sapphire windows protect the optical fibers against abrasion and fouling.

InPro 8200.



Trb 8300 transmitter.

► www.mt.com/turbidity

New Developments in Process Analytics

METTLER TOLEDO delivers powerful solutions to optimize your processes and reduce maintenance costs. Recently, we introduced new intelligent technologies that allow you to improve handling and optimize maintenance thus addressing your most pressing needs.

ISM – the next generation of intelligent process analytics!

With the groundbreaking ISM technology METTLER TOLEDO provides another milestone in process analytics measurement!

Dissolved oxygen sensors and pH electrodes with integrated preamplifier are using a new technology with “Plug and Measure” and intelligent diagnostics functionalities. The Intelligent Sensor Management (ISM) technology simplifies all maintenance operations of the sensor. Process interruptions are shorter or even avoided, leading to enhanced productivity.

iSense – the key to maximize the benefits of the ISM technology

iSense ISM Asset Suite allows efficient and easy verification and calibration of METTLER TOLEDO digital ISM pH and DO sensors in an instant with an intuitive software application that includes advanced analysis and documentation functionalities to support your sensor management.

Digital transmitter line M300

The digital M300 transmitter represents an easy-to-use version of the M300 transmitter line. Its unique “Plug and Measure” features enable a fast start-up and robust measurements for digital pH/ORP and dissolved oxygen sensors. Its versatility and reliability make this instrument the ideal choice for a wide range of applications.

If you want to take advantage of these advanced products ask your local METTLER TOLEDO representative or visit www.mt.com/ISM.



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