

Easy maintenance of pH electrodes with EasyClean 200

The sugar factory "Klein Wanzleben" of Nordzucker in Sachsen-Anhalt, completely rebuilt between 1992 and 1994, continues to set technology standards. During the barely 100-day annual sugar campaign from September to December, the beet is subject to a range of different processing steps, whereby purification of the beet juice is of primary importance. It is essential to be able to constantly check the pH value of the juice, and reliable measurement is assured through regular cleaning of the pH electrode, using the EasyClean 200.

Currently, Nordzucker AG operates nine modern plants which, on average, together process some 9500 tons of sugar beet per day. The factory in "Klein Wanzleben," with over 150 employees, is situated in one of the most historic sugar regions in Europe, and is rich in tradition. The technical installations in the production area offer high flexibility in fulfilling special requirements. This is the result of continued and successful partnership, where advances in beet cultivation and innovation in processing methods go hand in hand.

pH measurement and automatic cleaning during the juice purification process.

The harvested sugar beet is first cleaned and cut into chips. With the aid of

hot water, the sugar content is removed from the chips in large counterflow extraction columns, to produce the so-called raw juice. Apart from sugar, the raw juice contains other soluble contents of the beet, such as minerals, a variety of acids, invert sugar and protein. By adding milk of lime $[Ca(OH)_2]$ and carbon dioxide, 20 to 25 per cent of the non-sugar content is thereby bound and separated (precipitated) from the raw juice. Feed of carbon dioxide is controlled and held stable by use of the low-maintenance electrode InPro® 3200, with a gel-electrolyte reference system. After a short time however, the electrode tip becomes coated with lime from the process, and must be cleaned. The installed EasyClean 200 system, controlled by a transmitter, periodically sucks in a prepared



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cleaning solution at an appropriate concentration and feeds this directly to the flushing chamber of the retractable housing.

Significant time savings with Easy Clean 200 during the carbonation process

Tasks that formerly had to be carried out manually at the end of every shift, are nowadays fully automatically controlled by a transmitter. Every four hours, the pH-electrode InPro 3200 is withdrawn from the process by the retractable housing InTrac 777, cleaned with a 5% HCl solution for 30 seconds, and then flushed before reinsertion. The installed cleaning unit EasyClean 200 guarantees continual, regular removal of lime from the electrode surface, without allowing any cleaning liquid to ingress and acidify the thin juice undergoing purification.

Mr. Heinelt, Head of Measurement Control, declares that, "This fully automatic cleaning system really takes a great burden off those personnel responsible for maintenance of the measuring point, and at the same time guarantees shortest possible interruption of the pH signal".

Multifunctional pH-Transmitter 2500 with EasyClean 200 in a heated cabinet next to the measuring point.



Retractable housing InTrac 777 for pH electrode InPro 3200.

EasyClean – the modular cleaning and calibration system for process electrodes

Benefits provided by the use of EasyClean:

- Minimal maintenance costs
- Higher productivity
- Increased process reliability
- Reduced downtimes
- Longer operational life of the electrode
- More precise process control
- Choice of cleaning media

With the EasyClean product family, METTLER TOLEDO offers solutions for the most diverse application requirements. EasyClean 100 and EasyClean 150 are both suitable for the regular flushing of electrodes subject to light to medium contamination. The EasyClean versions 200 and 300 as well as EasyClean 350 offer solutions for measuring points with a potential for heavy fouling. The EasyClean 300X version allows the cleaning system to be employed in hazardous areas. ■

► www.mtpro.com/cleaning

Coverpage: Nordzucker "Klein Wanzleben", plant.

Conductivity measurements in sugar cane and alcohol mills

pH control is not the only critical factor in sugar cane refining (see Newsletter 2). Conductivity measurement is another very common parameter monitored in sugar and alcohol mills operations. METTLER TOLEDO offers proven solutions for the key applications.

Monitoring water purification for power cogeneration

Conductivity measurement also deserves special consideration in sugar and alcohol mills. Two primary applications are most common: monitoring the return of condensed water, in the boilers, and analyzing water quality during reverse osmosis purification for power cogeneration. Both applications involve low conductivity values, which is best monitored with 2-electrode conductivity sensors.

Monitoring of condensed water

The condensate of the steam generated by the boilers is continuously reused, which requires carefully controlled conditions for maximum efficiency and longevity of the equipment. Using conductivity to evaluate water quality is cost-effective and very reliable. The ideal conductivity value for this application is 20-50 μ S/cm at approximately 100 °C. The METTLER TOLEDO INGOLD measurement system recommended is:

- InPro 7001
- InFit 761-25BT
- Cond 7100 e Transmitter

Currently, it is very common to find power-cogeneration technology employed in the sugar and alcohol industry because of the cheap and readily available cane bagasse to serve as fuel for the steam-generating boilers. The water used in the boiler must be very clean, i.e. free from ions capable of forming insoluble salts with the capacity to build up in the boilers' pipes, which would lower thermal efficiency and cause accidents as well.

Consequently, before feeding the boilers, the water must undergo treatment (reverse osmosis and deionization with ion exchange resins). Measuring conductivity after treatment will verify the water's purity and will trigger the water to be diverted away from the boilers if the conductivity values fall outside of pre-established standards. The treated water should have a conductivity ranging between 0,5 – 10 μ S/cm after reverse osmosis or demineralizing treatment. A system suitable for this measurement is:

- InPro 7001
- InFit 761-25BT
- Cond 7100 e Transmitter



InPro 7001 conductivity sensor.

All of the analytical systems presented are available with a wide variety of other types of sensors, housings, transmitters, and process connections, depending upon specific case-by-case requirements. Standard configurations have been discussed, which usually meet the general requirements for each measurement point concerned; however, METTLER TOLEDO technical representatives can provide additional information for more specialized applications. ■

► www.mtpro.com/conductivity



Cond 7100 e transmitter.

Wet corn milling – maintenance free pH measurement

Wet corn milling operations include a host of down-stream industrial processes, including: the production of sugars and starches, ethanol and wastewater treatment. These down-stream operations in addition to the wet corn milling operation itself provide a myriad of inline pH measurement challenges: high solids, low conductivity, high temperature, aggressive fouling or a combination of the above. METTLER TOLEDO INGOLD has a field proven solution to wet corn milling pH measurement with the versatile and unique InPro 3200SG electrode, extending calibrations intervals up to a year in some applications.

The METTLER TOLEDO solution is a full system approach. At its heart is unique electrode technology. The InPro 3200SG has a proven field success record in the wet corn milling industry. It will function for a year with optimal protection and in some cases longer.

The next most important element in pH measurement is the transmitter. The pH 2100e transmitter platform has superior electronic isolation. The measuring loop is equally isolated in that it will float to system potential without the need for a liquid earth ground. This means it will never have a ground loop problem with an pH 2100e transmitter.

The internal sensor diagnostics are also unique. Its Sensoface interface indicates any problem with the electrode and, even more important, monitors the health of calibration. During a calibration, the

Sensoface oversees the three key electrode characteristics: slope, offset and response time. The final piece in the pH measurement system is the housing. Ingold housings are designed to handle all offered electrode technologies, while, in many cases providing a gateway to automation.

Application Challenge

An enzyme saccharification tank (SAC) at a wet corn milling operation in the Midwest (USA) is utilized to convert starches to sugars. The process takes place at approximately 80 °C (176 °F) and 5.2 pH. A pH adjustment is required at the end of the batch to cease the conversion process. The tank itself is steam cleaned between batches. Optimal pH control during the batch increases conversion of starches to sugars and minimizes down-stream costs. ■

▶ www.mtpro.com/pH



InPro 3200SG.

Solution

In this case the InPro 2100 2 wire transmitter was recommended with the InPro 3200SG electrode. The housing was a InTrac SLM 777 manually retractable housing designed for immediate access to the electrode at any time during the process. This was important to the customer based on their previous poor track record with pH measurement.

The 3200SG was originally chosen to withstand the steam cleaning operation. It has been tested to withstand sterilization to 140 °C (284 °F). The pressure in the system was only the head pressure on the tank (approximately 12 meters high).

Result: up to 11 months without calibration

Performance was being tracked by comparing offline versus online pH measurements. After one month of service and nearly continuous processing, the electrode stayed within 0.2 pH units when comparing to the offline samples. The slope and offset were 97% and 9 mV, which meets MT specifications for a new electrode. This performance continued for 11 months without a calibration.

After nearly a year of continuous operation the slope was >95% and the offset was less than 20 mV. The pH remained within 0.2 pH units of the offline samples and the electrode was never recalibrated. ■



pH 2100 e transmitter.



The InTrac 777 SL manually or pneumatically retractable housing is available in various metallurgies, process fittings and insertion lengths.

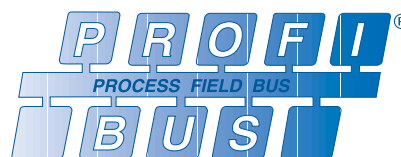
pH, Conductivity and DO transmitters with PROFIBUS®PA interface

For some years, METTLER TOLEDO has been offering transmitters with HART® Communication which superimposes a digital signal on the customary 4 - 20 mA DC analog signal. This enables the transfer of additional information than just a measurement signal.

From now on, transmitter units are also available which incorporate a fully digital PROFIBUS PA interface according to the "Profile for Analytical Devices, Version 3", suitable for measurement of dissolved oxygen, electrolytic conductivity (conductive and inductive) and pH value.

Simple connection to the PCS through Plug & Play

Connection to the PROFIBUS DP level is possible either by direct linkage or through a segment coupler. The instrument interface employs the FISCO model to ensure intrinsically safe networks. The existing well-proven functions such as automatic calibration (Calimatic®), sensor diagnostics (SensoCheck®) and parameterization can be accessed via the PCS just as easily and comfortably as before. ■



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