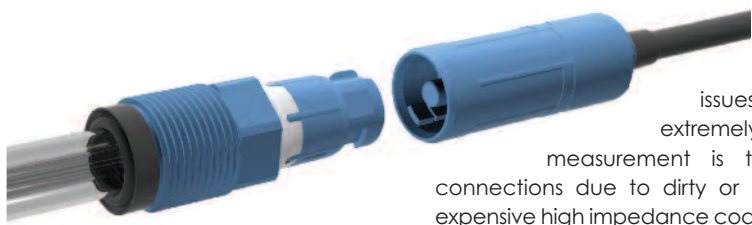


Memosens: the Digital Revolution in pH Measurement

Today, the use of analytical measurement technology is vital in providing process, product quality and productivity information. pH measurement in particular provides significant data related to these factors and often to a higher degree than other controlled variables. And, with labour and maintenance costs having a considerable impact on the business bottom line, the selection of the right pH system plays a key role in determining a company's competitiveness.



The limitations of conventional analogue pH measurements lie in the electrode design, the sensor connections and the cables, all of which influence the measurement. Increased stress on the sensor means that more frequent calibration is required in order to obtain accurate values. In many cases, calibrations and maintenance regimes are required several times a week to ensure correct measurements. Analogue systems are susceptible to moisture ingress, EMC (Electro-magnetic Compatibility) interferences and potential matching issues. The cleanliness of the connection is extremely important, as a common problem of pH measurement is the contamination of the electrical connections due to dirty or moist environments. To overcome this, expensive high impedance coaxial cables must be used on conventional analogue systems. Such cables are more sensitive to installation effects, requiring additional time and effort at start up. With moisture and dirt still being the main problem associated with analogue pH measurement, no connector system previously available on the market has been able to provide a 100% solution. The need to calibrate the sensor, cable and transmitter as a complete measuring chain requires significant time to be spent on site, often in hazardous or difficult to access areas.

Conventional analogue systems

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Efficiency of digital sensor technology

The Memosens pH sensor technology eliminates all of the problems encountered with conventional analogue measurement such as moisture ingress and corrosion by sending a digital signal between the sensor and the transmitter. This technology achieves interference-free transmission even over long distances (transmission circuits of up to 200m between sensor and transmitter) and resolves all the problems previously experienced with conventional analogue systems. The inductive connection between the sensor and cable using a simple bayonet lock makes the Memosens sensor independent of all environmental factors. The use of this hermetically sealed connection means that the sensor - cable connection can even be made under water without affecting the measurement. Thanks to the patented Memosens transmission technology, the problems of moisture ingress and corrosion are totally eliminated for the first time in pH measurement.

The bidirectional digital signal transmission between electrode, cable coupling and transmitter turns a simple pH electrode into an intelligent system capable of providing additional process and device diagnostic data and functionality.

Safety is increased because the bayonet fastening prevents the electrode from being unintentionally unscrewed out of the assembly when the cable is released. The cable properties and cable length no longer affect the measurement, so expensive semi-conductor coated cables are unnecessary. The Memosens pH system uses standard four core screened cable, which allows extended distances between sensor and transmitter. Potential matching problems are also eliminated because there is no longer a need to compensate for differences in electrical potential between medium and transmitter.

Intelligent technology - A new calibration philosophy

The Memosens sensor offers features that distinguish it from conventional systems. Using a built-in micro-processor, the system records all current process and measuring data and saves this data in the sensor head. This allows a new calibration philosophy, which is possible only as a result of the intelligent Memosens technology. The storage of calibration data in the sensor head means that on-site calibration is no longer essential. Instead, the user has the option to pre-calibrate the sensor in the laboratory or workshop, under optimum conditions, allowing the sensor to simply be replaced at the measuring point. Once replaced, all sensor data, including the calibration is uploaded from the sensor to the transmitter. In addition, the Memosens sensor provides all quality and process related data such as total operating hours including periods of exposure at extreme pH and temperature conditions. It also provides additional diagnostic functions such as SCS (Sensor Check System), which monitors the impedance of the glass to highlight sensor damage. Moreover, the serial number and the date of manufacture are available at any time and the traceability of all data important to technical production is ensured. This allows optimum evaluation of the measuring points, vital for predictive maintenance.

Cost-saving calibration concept

Remote calibration of the Memosens sensors makes a change in maintenance strategy possible, offering an enormous potential for cost savings. Optimum laboratory conditions enable precise calibrations and, therefore, more accurate process management. Regular regeneration and cleaning prolongs the operating life of the pH sensors. In addition, no specialised knowledge of pH measurement technology is required to replace a sensor, allowing them to be replaced by operating staff. The procedure is simple - the installed sensor is simply replaced by a sensor which has been pre-calibrated in the laboratory or workshop. The existing sensor is returned to the workshop for regeneration, new calibration and storage. Further cost savings can be made where there are multiple sensors installed on site where all can be exchanged at the same time. This reduces the time required to exchange sensors on site. Pre-calibrated sensors can be stored in the workshop or laboratory ready for future use. A further benefit is that calibration of multiple sensors in a controlled environment significantly reduces the amount of buffer solution used - an extra cost saving factor. If a sensor fails, it can be replaced in minutes, ensuring minimal downtime. Experience of users shows that maintenance savings of more than 50% are achievable using Memosens technology.

Maintenance costs for pH measuring points

	Analogue pH	Memosens pH	Cost Saving
No. of pH systems on site	50	50	
No. of Calibrations per month per measuring point	6	6	
Time required for calibration and exchange (minutes)	Minutes	Minutes	
Time required for lab calibration	Not possible	5	
Time required to exchange sensor on-site	Not possible	5	
Time required to transport old sensor to lab	Not possible	10	
Time required for calibration on-site	40	Not required	
Variable costs			
Hourly rate plant staff	£30.00	£30.00	
Costs per calibration	£20.00	£10.00	£10.00
Monthly calibration costs	£6,000.00	£3,000.00	£3,000.00
Annual calibration costs	£72,000.00	£36,000.00	£36,000.00

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Memobase - an important tool for collating sensor data

Using the Memobase database, all data specific to a measuring point, calibration and adjustment as well as the process data are recorded and processed while the sensors are calibrated. This means that the complete life cycle of a sensor – from its manufacture through to its disposal – is tracked and analysed. The data can be used to optimise measuring systems and maintenance concepts. Memobase sensor management ensures that the operational personnel are always aware of the sensors they have at their disposal. This enables them to clear a pH measurement fault within minutes without having to call on an expert, due to the simple onsite sensor exchange process. The cost of ownership is considerably reduced and the user is provided with higher added value, especially since the Memosens digital sensors are similar in cost to conventional analogue devices.

Future developments

The Memosens revolution does not stop here. In addition to pH measurement, the technology is now being rolled out to other key analytical parameters including redox, conductivity, chlorine and dissolved oxygen. The development of additional predictive maintenance features are being enhanced to predict on site failures whilst optimising sensor lifetime and calibration intervals.

Conclusion

Comparing the acquisition and calibration costs of traditional analogue technology vs. Memosens digital technology, investment in Memosens pH systems results in considerable savings for the user. While the cost of acquisition is roughly equal, analogue sensors require calibration and replacement by a specialist on site, which takes up to 40 minutes on average. Memosens sensors however can be replaced by operational staff at the measuring point in approximately 10 minutes.

Further consideration should be given to the number of times that an analogue and a Memosens digital sensor need to be calibrated. Experience has shown that users make considerable savings in both time and money by switching from analogue to Memosens digital based technology. Benefits vary according to the number of installed systems, the calibration interval and the hourly rate of plant personnel, but savings in excess of £500 per system per annum are being realised when multiple systems are in use. In addition, the elimination of moisture ingress and the associated need to replace costly high impedance cables, as well as the cost of the downtime required to do this can significantly add to these savings. Furthermore, the ability to regenerate the electrodes between uses has allowed users to considerably extend electrode life, which again drives down costs even further. Whichever way you look at it, Memosens can save users considerable time and money.