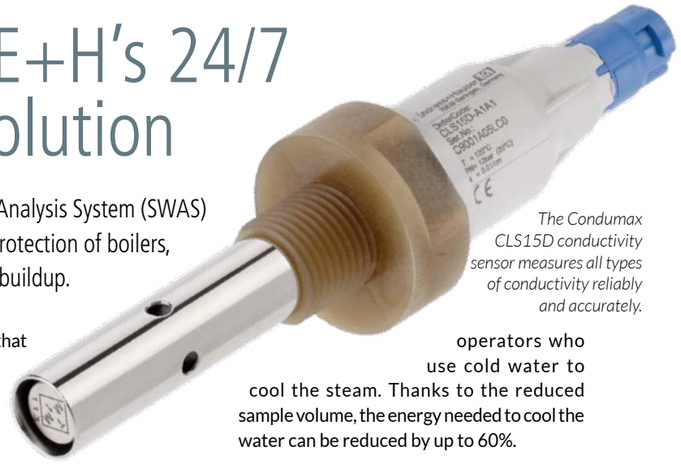
SWAS Compact: E+H's 24/7 boiler monitoring solution

Endress+Hauser's easily integrated compact Steam Water Analysis System (SWAS) delivers reliable and precise measurement results for the protection of boilers, turbines and heat exchangers from corrosion and deposit buildup.



The Condumax CLS15D conductivity sensor measures all types of conductivity reliably and accurately.

Operators of industrial boilers, such as laundries or breweries, are obliged to check the water quality in their boilers on a regular basis. At the same time, the number of specially qualified boiler engineers capable of performing this task is dwindling, and the expertise is being lost. For this reason, a compact steam analysis device for continuous monitoring has been developed specifically with these customers in mind.

Steam analysis systems are used to monitor corrosive and harmful substances in steam circuits. A sample is extracted from the steam circuit, cooled and examined for impurities, with the main focus on dissolved salts and oxygen, as these can cause corrosion and result in the plant's operating permit being revoked. The aim of monitoring is to fully document any impurities in order to prevent corrosion and to provide suppliers such as boiler manufacturers with proof that the water quality has consistently remained within the specified range.

Endress+Hauser can now offer a new, compact Steam Water Analysis System (SWAS Compact) that contains full instrumentation for the analysis of key parameters such as pH value, conductivity or oxygen, including sample preparation and cation exchangers. This saves space and makes it easier to install the sensors, since the panel design prevents any confusion regarding the installation positions.

The outstanding benefit of the SWAS Compact lies in the sophisticated geometry of the system. It is designed to use three times less analytical sample than conventional systems. This is of particular relevance to operators who use cold water to cool the steam. Thanks to the reduced sample volume, the energy needed to cool the water can be reduced by up to 60%.

The SWAS Compact is a solution for monitoring key parameters in steam generation, including sample preparation and cation exchange.

Customised alarm for temperature monitoring

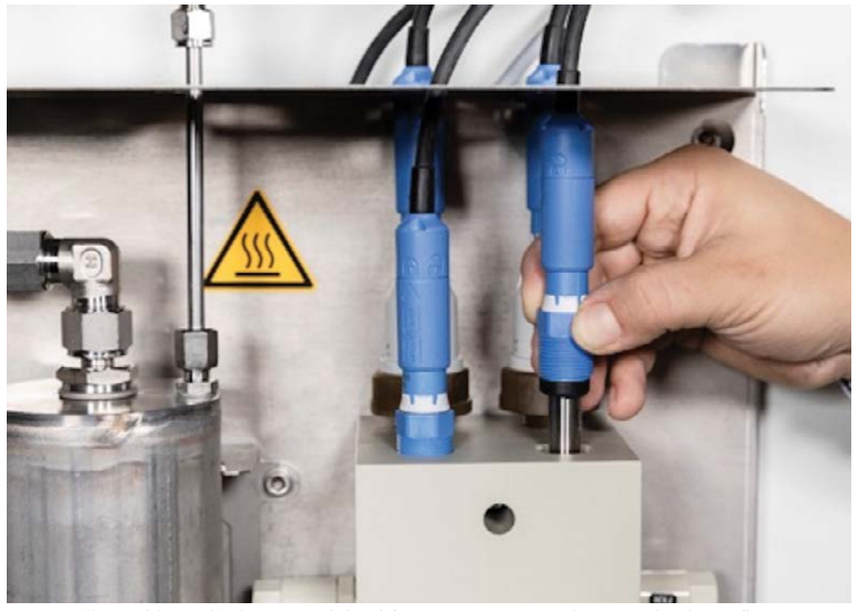
When a steam sample is cooled, it is cooled from up to 250 °C and 50 bar down to ambient temperature. If cooling fails, a temperature cut-off valve (TCV) prevents the measuring technology from overheating. Mechanical valves with a bimetal strip are often used here. However, since these are vulnerable to high ambient temperatures and contaminants, the Endress+Hauser SWAS Compact uses an electromagnetic valve.

This is controlled by the Liquiline multiparameter transmitter to which the analytical sensors and flow monitoring system are also connected. All Memosens sensors that are used in steam analysis have a temperature sensor for temperature compensation. The values of the temperature sensor are transmitted to the transmitter. Here, an individual alarm value can be configured at which the TCV is activated if temperatures are too high. In addition, the boiler engineer can enter plain-text messages for specific faults, which then help on-site staff to troubleshoot problems quickly.

Reliable conductivity measurement

Dissolved salts contain ions, which increase conductivity in the water and, together with oxygen, can lead to corrosion. Conductivity is measured via the potential differences in a conductive sensor. The sensor comprises two electrodes that are used to reliably measure all types of conductivity of relevance to steam generation, including total conductivity, acid conductivity and differential conductivity.

Since conductivity is dependent on temperature, the measured value is converted in the transmitter to be output as a standardised value. The transmitter detects the sensors automatically, which means that if a new sensor is connected, following a calibration for example, no additional specialised staff are required to recalibrate the system.



The panel design of Endress+Hauser's SWAS Compact prevents any confusion regarding the installation positions.

Accurate detection of trace oxygen

In addition to conductivity, oxygen is also responsible for corrosion in pipes, heat exchangers and assemblies in the steam circuit. Oxygen is chemically bonded before vaporisation, driven out with steam or separated via a vacuum. Any oxygen present is therefore in very low concentrations, which requires high measurement sensitivity and precision. The sensor must be carefully calibrated and serviced at regular intervals to obtain precise measurement results in this range.

Here too, the Liquiline platform makes life easier for operating staff as it guides the user specifically through the individual calibration steps, virtually ruling out any errors. With digital Memosens technology, the calibration time and calibration value are saved and documented transparently so plant operators have all the information they need for a predictive maintenance strategy.

Differential conductivity using purpose developed pH sensors

The pH value is another crucial measured value in the water/steam circuit. It provides information on the purity of the water and can be optimally configured by adding ammonia or bisulfite to form a protective layer and prevent as much corrosion as possible.

If the steam circuit does not contain any additional chemicals to protect against corrosion, the pH value can be calculated using conductivity measurements. Here the conductivity is measured upstream and downstream of a cation exchanger. This measurement is known as differential conductivity.

Total conductivity must first be measured at the inlet to the cation exchanger. As the process water contains H_2O ions in addition to OH^- ions, the conductivity of process water is higher than that of pure water. The OH^- ions are thus exchanged via a cation exchanger to rule out any cross-sensitivity to impurities.

The exchanger contains resin that has been regenerated with sulfuric acid and therefore contains H^+ ions. If these ions bond exclusively with the OH^- ions in the exchanger, H_2O is formed again. If the sensor readings for conductivity at the outlet are very low, the sample only contains minor impurities. However, if the sample contains many salts, such as chlorides (CL), these are converted into hydrochloric acid (HCL) in the exchanger when they bond with the H^+ ions. Since acids result in higher levels of conductivity, conductivity increases at the outlet of the cation exchanger and is referred to as acid conductivity, which is typically three times higher than the total conductivity at the inlet. By means of a formula programmed into the Liquiline transmitter, these values can be used to calculate the pH value and control the dosage of alkalinisation agents.

If, however, the sample contains additives such as amines, the cation exchanger becomes contaminated. In addition, amine degradation products also produce gases, which increase the conductivity. In this case, the pH value is measured directly via pH electrodes. To ensure reliable measurements in liquids with very low conductivity levels, the Memosens pH sensor is used with a salt ring that regularly releases ions. As this ring becomes exhausted, however, the sensor must be replaced at regular intervals.

Memosens technology also assists staff at the plant to perform this task, as a new sensor can easily be installed onsite thanks to the plug-and-play functionality, while calibration can be performed by specialists in the laboratory.

Preventive maintenance of the cation exchanger

Cation exchangers must be regenerated regularly with acid, which is why the Liquiline transmitter features a program to calculate exchanger exhaustion. As the resin capacity is known at the start, the resin capacity at the cation exchanger outlet can be calculated using the flow rate measured by the flowmeter. To implement preventive maintenance for this filter, the Liquiline allows users to set an alarm value to 20% of the remaining capacity. This makes it possible to schedule maintenance work better, and there is no need for daily inspections to determine the level of exhaustion using a chemical color indicator.

This turnkey SWAS Compact solution from Endress+Hauser helps boiler operators to operate their systems effectively with minimal installation and maintenance, ensuring durability and maximum uptime.

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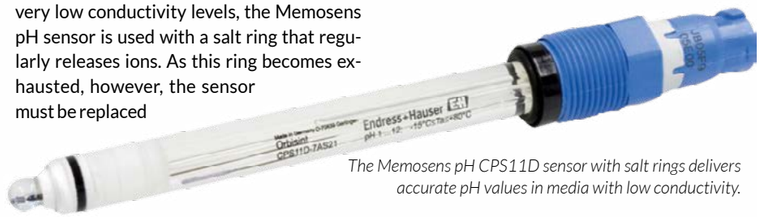

The Memosens pH CPS11D sensor with salt rings delivers accurate pH values in media with low conductivity.