App note
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# Monitoring of a new central water softening plant

## The Seebachgebiet Water Supply Association relies on the WTW Drinking Water Panel

Fig. 1: View of the administration building (former pumping station building) of the Seebachgebiet Water Supply Association, photo: Rudolf Uhrig

**Customer:** Seebachgebiet Water Supply Association – Osthofen Waterworks

**Application requirement:** Continuous and reliable measurement of pH, conductivity, and temperature at three measurement points within the process of a new central water softening plant.

**Result:** Three WTW Drinking Water Panels equipped with pH, conductivity, and temperature sensors were installed. The system continuously and reliably monitors water quality throughout the treatment process, helping to ensure consistent compliance with drinking water quality requirements.

The Osthofen Waterworks, operated by the Seebachgebiet Water Supply Association, supplies drinking water to approximately 60,000 residents across four municipal districts and several districts of the City of Worms. Previously, consumers were supplied with groundwater from deep wells at different locations, exhibiting varying water qualities.

To establish a uniform and softer drinking water quality throughout the entire distribution area, the association decided to construct a new central water softening plant and develop additional high-capacity wells at the Osthofen site. This investment represents an important contribution to supply security and allows the utility to phase out the less productive wells at the secondary site.

To monitor the process performance of the new water softening plant, Xylem installed three WTW Drinking Water Panels at the Osthofen Waterworks. These continuously measure and log pH, conductivity, and temperature values. Read on to learn more about the application and the measurement solution provided by Xylem.

## 1. Water softening as a core treatment process

Centralized water softening is achieved using a rapid decarbonization system (SEC), which reduces the raw water hardness from approximately 23 °dH (hard water) to approximately 12 °dH (moderately hard water). Within fluidized bed reactors, calcium is precipitated as calcium carbonate by increasing the pH value. Maximum calcium carbonate precipitation typically occurs at a pH of approximately 9.8 [1]. The precipitated calcium carbonate deposits onto seeded particles (fine sand grains with diameters between 0.2 and 0.4 mm). Once the particles reach a size of approximately 1 mm, they are removed from the process. Finally, the softened water is blended with untreated water to achieve the desired hardness level while ensuring compliance with drinking water quality standards. Importantly, the essential trace element magnesium remains in the treated water.

Fig. 2: The new SEC system at the Osthofen Water Treatment Plant for softening drinking water

Unlike some other SEC installations, the Osthofen Waterworks uses sodium hydroxide (caustic soda) instead of lime milk for pH adjustment. To optimize this process, the water is first passed through a degasification tower prior to decarbonization, where dissolved $CO_2$ is removed. The presence of $CO_2$ affects the subsequent reaction with sodium hydroxide and increases chemical consumption. By removing $CO_2$ beforehand, sodium hydroxide consumption can be reduced by up to 30 %. [2]

The complete drinking water treatment process includes the following stages:

1. Groundwater abstraction from deep wells
2. $CO_2$ removal via degasification tower
3. Softening in the SEC plant using fluidized bed reactors
4. Iron and manganese removal through filtration
5. Distribution to consumers

## 2. Application of the WTW Drinking Water Panel

As with any water treatment process, precise online instrumentation enables effective process control and straightforward monitoring of treatment efficiency. At the Osthofen Waterworks, operation of the SEC plant is controlled using pH measurements upstream of the degasification tower, downstream of the degasification tower and at the outlet of the SEC plant.

Process efficiency is monitored through a differential conductivity measurement between the inlet of the degasification stage and the outlet of the SEC plant.

Conductivity is a suitable indicator because the removal of hardness-forming minerals reduces the overall conductivity of the water. To enable meaningful comparison of conductivity measurements throughout the process and with laboratory results, automatic temperature compensation is required. Reliable temperature compensation is essential for establishing a dependable correlation between calcium carbonate precipitation and conductivity reduction under operating conditions.

Temperature monitoring is provided directly through the integrated temperature sensors within the pH and conductivity probes. The instrumentation is distributed across three WTW Drinking Water Panels and integrated into the process as summarized in Table 1.

Table 1: Overview of online instrumentation for the new SEC Plant

| Position | Upstream of degasification tower | Downstream of degasification tower | SEC plant outlet |
|---|---|---|---|
| Parameters | pH<br>conductivity<br>temperature | pH<br>temperature | pH<br>conductivity<br>temperature |
| Function | Determination of raw water quality | Verification of degasification performance | Verification of softening performance and water quality |

The system utilizes the low-maintenance SenTix 945 IDS pH electrode, featuring gel electrolyte filling, a high-quality glass shaft, and a triple ceramic diaphragm. The IDS technology stores the last ten calibrations and the sensor serial number directly within the sensor, simplifying electrode replacement and maintenance.

For conductivity measurement, the TetraCon 925 IDS is used. This low-maintenance four-electrode conductivity sensor features graphite electrodes and a robust epoxy body. Within the IQ Sensor Net platform, the reference temperature can be configured to either 20 °C or 25 °C.

The sensors are installed within the WTW Drinking Water Panel, a configurable monitoring solution specifically designed for drinking water applications with adjustable flow control for bypass operation. The panel incorporates the proven IQ Sensor Net system, which acquires, stores, displays, and transmits measurement data to the plant control system.

Fig. 3 and 4: WTW Drinking Water Panels continuously and reliably monitor water quality at the Osthofen Waterworks (above: upstream of degasification tower, below: at SEC plant outlet).

> “Practical aspects of maintenance, servicing, and calibration were taken into account during the design stage. Even with iron- and manganese-containing raw water, the instrumentation has proven to be robust and low-maintenance.”

Swen Wagner, Project Manager – Technical Department, Seebachgebiet Water Supply Association

The three panels are interconnected via the IQ Sensor Net, allowing all measurement points to be viewed on a single display while enabling centralized data transmission to the SCADA/process control system.

Since commissioning in July 2025, the panels have demonstrated excellent reliability, an intuitive operator interface, and ease of operation. The sensors are typically verified manually every one to two weeks, and in some cases even less frequently when measurement values remain stable. Maintenance or calibration is performed only when necessary.

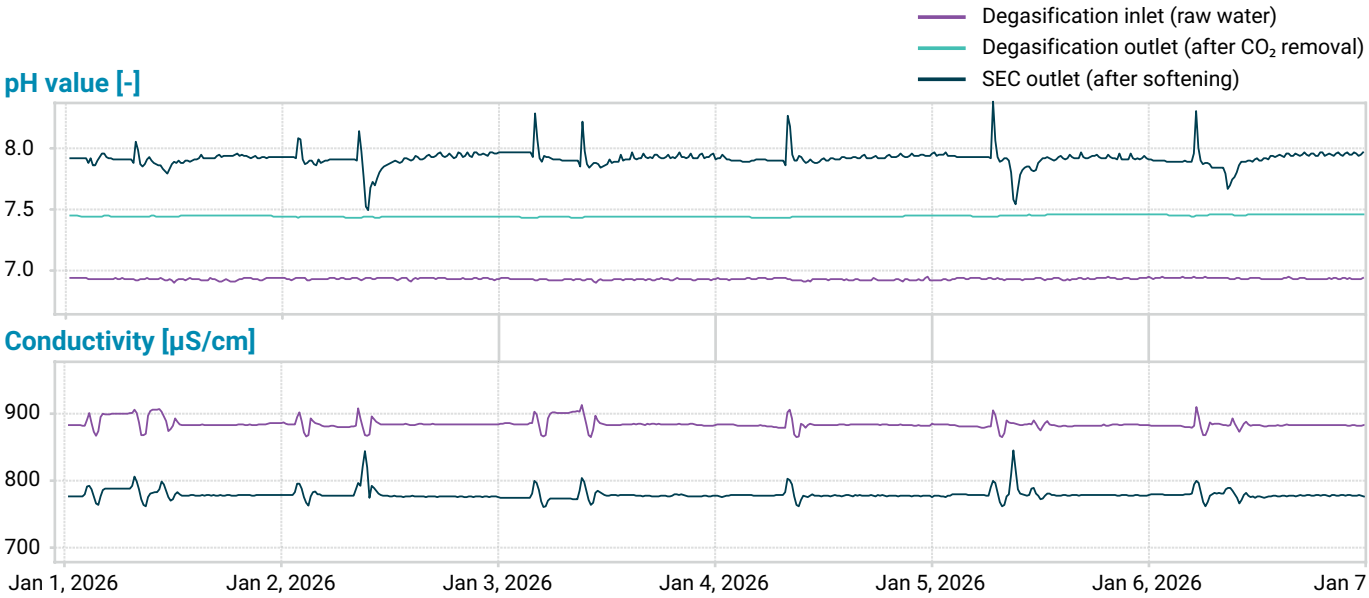


Fig. 5: pH and conductivity trends over a one-week operating period.

Figure 5 provides an overview of plant measurement data during the first week of January 2026. The graph shows the three pH measurement points (degasification inlet, degasification outlet, and SEC outlet) together with the two conductivity measurement points (degasification inlet and SEC outlet). The data clearly show that both the degasification stage and the SEC process increase pH by approximately 0.5 pH units. At the same time, conductivity decreases by approximately 100 µS/cm throughout the treatment process.

The observed spikes in conductivity and pH downstream of softening occur because, during daily plant startup, sodium hydroxide concentration temporarily increases, causing corresponding short-term increases in both parameters. Additionally, harmless iron and manganese deposits may form during overnight plant shutdown periods. These deposits are flushed out during startup and can cause brief increases in conductivity.

> "Xylem Analytics provided competent consultation from the initial contact and continued support beyond commissioning."
>
> Swen Wagner, Project Manager – Technical Department, Seebachgebiet Water Supply Association

## 3. Summary

In 2025, a new water softening plant was commissioned at the Osthofen Waterworks with the objective of providing a consistent and softer drinking water quality throughout the entire supply area.

Continuous online monitoring technology from Xylem supervises the process at three measurement points, providing valuable operational insight and enabling verification of both the effectiveness and efficiency of the softening process.

Both the instrumentation and customer support have met the operator's expectations and contributed to a high level of customer satisfaction. We would like to thank Mr. Swen Wagner and the Seebachgebiet Water Supply Association for their excellent cooperation and for enabling the publication of this application report.

**Key takeaways**

- pH, conductivity, and temperature are critical parameters for controlling and monitoring rapid decarbonization systems used for hardness reduction.
- For its new softening plant, the Seebachgebiet Water Supply Association relies on Xylem and the WTW Drinking Water Panel as a clear, user-friendly, and effective instrumentation solution for continuous measurement of these parameters.
- Three WTW Drinking Water Panels monitor the treatment process and contribute to safeguarding drinking water quality throughout the distribution area.

**Products used in this application:**

- IQ Sensor Net MIQ/TC 2020 3G controller
- DW/P Drinking Water Panel with MIQ/IDS-2 module to connect up to 2 IDS sensors
- IDS sensors SenTix 945 and TetraCon 925

*References:*
*[1] Hahn, Stefan & Stetter, Dieter & Panglisch, Stefan. (2021). Die Schnellentcarbonisierung zur zentralen Enthärtung von Trinkwasser – ein Praxisvergleich.*
*[2] WZS Osthofen, https://www.wzs-osthofen.de (accessed 15 April 2026)*

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