Case study
South Tyrol, Italy

ARA Pustertal AG

Reducing aeration energy consumption by 10% in a WWTP thanks to a digital twin

ARA Pustertal AG operates the Innichen-Sexten wastewater treatment plant (WWTP) in the South Tyrol area of Italy. The plant, which has a capacity for 36,000 inhabitants, uses a conventional activated sludge process, with pre-denitrification and biological phosphorus removal.

The wastewater treated at the facility consists of approximately 50% wastewater from tourism, 25% from municipal sources, and 25% from commercial wastewater. Local dairies, a juice producer, and a bacon and sausage manufacturer contribute the bulk of the commercial wastewater.

The challenge

ARA Pustertal AG was looking to ensure safe compliance with effluent limits whilst minimizing energy consumption of the activated sludge system in its Innichen-Sexten plant.

This involved optimizing the high energy-consuming processes of aeration and pumping, which are essential for treatment. Aeration introduces dissolved oxygen into wastewater to support aerobic oxidation and nitrogen removal, whilst pumping moves and recirculates water and sludge through the treatment process sequence.

The solution

The utility selected Xylem's Treatment System Optimization (TSO) solution, which has now been included as a module in **Xylem Vue's** Plant Management application, to optimize processes through real-time analysis of operational parameters and recommendations based on more effective, safe and cost-efficient management criteria. The system can run in manual mode, delivering recommendations that are performed by operators, or automatically, when the solution controls the WWTP with ex-post supervision.

The project included the development of a digital twin of treatment processes that uses real-time data. This model, powered by artificial neural networks, enables operators to better understand correlations between given influent loads, quantities, temperatures, aeration profiles and other process variables, along with the resulting degradation rates and effluent concentrations.

Program highlights:

- Deployment of a digital twin model of the Innichen-Sexten wastewater treatment plant (WWTP)
- 10% reduction in energy consumption
- 16% decrease in total nitrogen and 25% in total phosphorus to meet effluent requirements

The system calculates setpoint recommendations and their related costs for different scenarios to ensure reliable effluent value compliance with minimal energy consumption. It also provides 24h-forecasts for ammonium and nitrate based on current measurements as well as determining the most favorable operating setting (aeration of the individual line, recirculation, operating mode, etc.) by selectively changing the control variables.

The results

ARA Pustertal AG reduced energy consumption by 10% in the Innichen-Sexten WWTP, despite a 33% load increase, thanks to the digital twin deployed. The plant also decreased total nitrogen in effluent by 16% and total phosphorus by 25%, compared to normal operations. This project enabled the utility to reduce costs, achieve excellent purification performance, and meet effluent requirements.

> "Xylem enabled us to address the pressing need for greater energy efficiency and cost savings by applying decision intelligence, using data to optimize processes, obtain better results and reduce energy use."
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> Konrad Engl,
> Managing Director, ARA Pustertal AG

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