Case study
Cuxhaven, Germany

EWE WASSER GmbH

Application of a real-time assistance system to reduce aeration energy usage by over 26% and minimize operational expenses

EWE WASSER GmbH (EWE) is one of northwest Germany's largest wastewater disposal companies and is responsible for the transportation and purification of wastewater through 23 modern wastewater purification plants. In Cuxhaven, the company operates a large municipal wastewater treatment plant with a capacity of up to 400,000 population equivalents.

The challenge

In Cuxhaven, as in most cities, the pumping and treatment processes are the largest consumers of energy in the water cycle. Typically, aeration accounts for over 50% of wastewater treatment energy consumption.

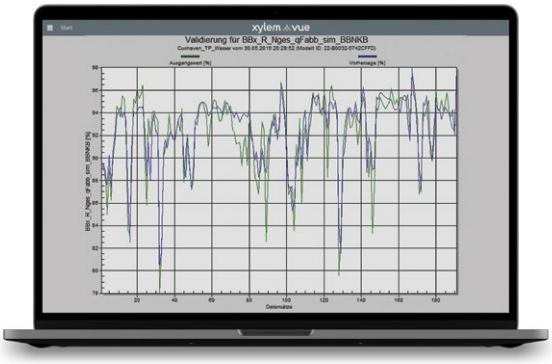
As a proactive wastewater treatment operator, EWE wanted a system to optimize the energy consumption associated with aeration, improve safety and streamline the use of chemicals. While EWE was hoping to reduce operating costs, the control system also needed to ensure effluent concentrations were within legal limits.

The solution

The project began in early 2017 with the creation of a real-time decision support system for wastewater treatment processes. Originally, EWE used conventional sensors and automation systems for process control, but did not have an underlying optimization strategy.

The aim was to optimize the aeration process at the biological treatment stage through real-time simulations. This was intended to reduce energy and chemical consumption while improving wastewater quality. EWE is now using Xylem Vue's Plant Management application. This technology uses models to degrade carbon, nitrogen and phosphorus that consist of high-performance neural networks. The application receives real-time data from the plant's existing control system to create a digital twin of the wastewater treatment plant to optimally regulate aeration and chemical dosing, depending on the load required by chemical and biological demands for oxygen, nitrogen and phosphorus.

As no online sensors were available to measure the feed concentrations, several "virtual sensors" were used to determine and predict the carbon and nitrogen loads in the feed in real time. Thus, feed concentrations could



Xylem's modelling maps target conditions vs. actual conditions within treatment processes.

Program highlights:

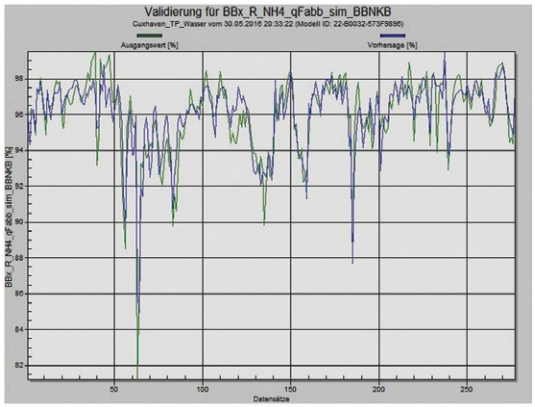
- Over 26% energy savings in aeration at the biological treatment stage (approx. 1.1 million kWh)
- Optimizing system operations led to a drastic reduction in peak energy consumption
- "Virtual sensors" helped to accurately estimate the feed concentration to efficiently control aeration.

be established to make the aeration process as efficient as possible. After several months of manual plant operation, Xylem Vue's Plant Management application was deployed to calculate the optimum setpoints for aeration at the biological treatment stage.

The results

At the end of 2017, the optimization results from this first phase were compared with previous data from manual operations at the Cuxhaven plant. An important success parameter is the specific energy requirement for the degradation of the inflowing organic load. Although it is not a process control parameter, it helps draw conclusions about fluctuations and peak loads during plant operations. Optimizing plant operations led to a drastic reduction in these fluctuations and prevented situation-related peak energy consumption.

Since the implementation of Xylem Vue's Plant Management solution, Cuxhaven wastewater treatment plant has reduced its aeration energy requirements by over 26%. This corresponds to around 1.1 million kWh, which is equivalent to supplying electricity to 275 four-person households for a year. Naturally, all effluent quality requirements are continuously met.



After deploying the optimization strategy, actual conditions now closely correlate with the optimal setpoints for wastewater treatment.

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