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Let's Solve Water

Case Study
Aachen-Soers Wastewater Treatment Plant

Better effluent quality with the fourth wastewater treatment stage at Aachen-Soers

The Eifel-Rur Water Association operates the largest sewage treatment plant on the river Wurm, with the Aachen-Soers wastewater treatment plant having a load of 458,000 population equivalents (PE). It has a dry weather flow of 6,480 m³/h (41 millions of gallons per day, MGD) and a peak wet weather flow of 10,757 m³/h (68.2 MGD), which are treated in the plant and discharged into the receiving watercourse Wurm. In search for the best wastewater treatment process in terms of removal of microbiological contaminants and the abatement of bromate discharge, RWTH Aachen University, along with the other environmental institutions, launched a research project and partnered with Xylem to test the effects of wastewater ozonation on water quality and its ecosystem. The Wedeco ozone systems, Lowara cooling water pumps and WTW multi-parameter online measurement devices were installed. The Wedeco ozone system has demonstrated an astounding performance in three aspects: 1) Elimination of 1 to 3 logs of E. coli, Enterococci and its antibiotic-resistant variants; 2) Reduction and partial elimination of eco-toxicity; and 3) Ensuring bromate level in the effluent is far below the permitted environment quality standards or UQN value.

Country: Germany

Customer: Aachen-Soers Wastewater Treatment Plant

Application: Wastewater, Water treatment and transport

Product:

- Three Wedeco SMOevo 860 ozone generators producing 10,8 kg/h ozone each
- Two Wedeco residual ozone destructors
- Five Wedeco ozone concentration measurement device (in gas)
- Three Lowara CEA cooling water pumps
- Four WTW NiCaVis UV 705 IQ NI Multi-parameter online measurement for TOC, COD, SAC_{254}, nitrate and nitrite

Delivery: 2018

Foto: © WVER

Task

In dry weather conditions, the Wurm contains up to 80% wastewater, which is mainly discharged from the Aachen-Soers treatment plant. This flows through a nature conservation and recreation area and later discharges into the Maas river via the Rur, from which the Netherlands obtains its drinking water. If the wastewater is not sufficiently treated by the treatment plant, this can have serious consequences for the water quality of the Wurm and for the production of drinking water in the Netherlands.

In order to protect the ecologically sensitive watercourse from chemical and microbiological contamination from the large sewage treatment plant, the extensive research project DemO3AC* was launched in 2015, pursuings two overarching goals. Firstly, it evaluates the effects of wastewater ozonation on water quality and ecosystem. Secondly, it investigates the process optimization of the ozone system. For this, the project partner is the RWTH Aachen University wworks with the Institute of Urban Water Management (Institut der Siedlungswasserwirtschaft, ISA), the Institute for Environmental Research (Institut für Umweltforschung, IfU), the Research Institute for Ecosystem Analysis and Assessment (Forschungsinstitut für Ökosystemanalyse und -bewertung, gaiac) and the Institute for Applied Microbiology (Institut für angewandte Mirkobiologie, iAMB).

* https://demo3ac.wver.de

During of the research project, ozonation turned out to be the best process for wastewater treatment at the Aachen-Soers plant as compared to other alternatives, in terms of degradation capacity, space requirements, solids sensitivity and costs. Special consideration was given to the handling of geogenically induced bromide discharges (from thermal springs) in the inflow to the wastewater treatment plant and the minimization of possible bromate discharge in the Aachen-Soers effluent. Therefore, during the construction of the system, great importance was emphasized on minimizing the formation of the transformation products and bromate. Despite the temporary introduction of several hundred micrograms of bromide per liter, the UQN value of 50 µg/l bromate is far below the limit found in the effluent.

Wedeco SMOevo ozone generator

Lowara CEA cool water pump

WTW NiCaVis UV 705 IQ NI Multi-parameter online measurement

Since February 2018, the Wedeco ozone system has been operating on a large scale without interruption.

Xylem's Scope of Supply

The ozone system is comprised of three Wedeco SMOevo 860 generators, each having an ozone production capacity of 10.8 kg/h, thus, jointly generating a maximum of 32.4 kg/h. Additionally, two residual ozone destructors and five ozone concentration measurement devices (in gas) were installed. The retention time of the wastewater in the reactor is between 13.5 minutes in wet weather conditions and 30 minutes during the dry seasons.

In addition to the ozone system, Xylem has supplied three Lowara CEA cooling water pumps and four WTW NiCaVis UV 705 IQ NI multi-parameter online measurement instruments to monitor levels of contaminants and organic compounds in water. Xylem also provided process engineering support for the feasibility study, technical equipment, evaluation of the research project, and dimensioning of the large-scale plant using EI&C technology.

A dosage of 3.5 mg ozone proves to eliminate a good amount of trace substances (an average of over 80% lead substances removed). In addition, operating costs are saved, as only one ozone generator needs to run 80% of the operating time. The specific total costs (investment and operating costs) is between 0.04 €/m³ and 0.05 €/m³ of treated wastewater.

Results

With wastewater ozonation, eco-toxicity has been abated and even partially eliminated. It was confirmed that a reduction of 1 to 3 log levels of E. coli and Enterococci bacteria including antibiotic-resistant variants can be achieved. Furthermore, an efficient ozone system at water entry ensures that the UQN value of 50 µg/l bromate in the plant's effluent is far below the permitted levels, despite the temporarily high bromide values in the influent.

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