REFERENCE PROJECT

Wastewater Treatment Plant Aachen-Soers

Energetic optimisation of the aeration

April 2018

German Water Partnership

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KEY DATA

Wastewater treatment plant

Population equivalent:
458,000

Maximal intake:
approx. 3,000 l/s

Basin volume per street:
10,587 m³

Basin volume of all streets:
74,110 m³

Target setting:
holistic energetic optimisation of the ventilation

Result:
more than 50% savings in energy consumption in the biology

INITIAL SITUATION

What to do when a wastewater treatment plan reaches its maximum expansion limit?

The Aachen Soers wastewater treatment plant had reached its maximum expansion limit. In addition, there was enormous energy consumption for the aeration, which accounts for about 60% of the energy costs of the wastewater treatment plant. In order to be able to operate the oxygen input economically and to adapt it to the increasing inlet load in the future, it was decided to carry out an integrated optimisation of the activation stage (ventilation systems, agitator technology, process air generation and control system).

As a first step, an overall optimisation concept was worked out on the basis of a two-year large-scale test in order to carry out the measure, and then the complete execution was awarded to a plant constructor in the context of a tender.

IMPLEMENTATION OF THE MEASURES

How consistent engineering and optimal adjustment lead to sustainable efficiency increases

The decisive factor for success was consistent engineering as well as the optimal adjustment and dimensioning of the individual components to a harmonious overall system. The high efficiency of the ventilation system, consisting of large-format plate aerators and an individual superordinate control concept, ensures optimum oxygen supply to the aeration basins. By switching to an alternating and intermittent mode of operation, the newly installed 164 plate aerators per street enabled the required oxygen to be introduced in a much more targeted and energy-efficient manner, which, of course, also benefits the improved discharge values.

With the help of a CFD simulation developed in advance, the agitators and the ventilation system were optimally matched to each other.

The innovative agitator technology with a three-lobe propeller and IE 4 motors ensure the best possible thrust coefficient, resulting in additional energy savings. The economic efficiency analysis was based on the fact that the 12 agitators in the denitrification zone work in continuous operation. The other 12 agitators are only used in the changing zones for about 50% of the time.

With the new operating mode, the 10 turbo compressors were replaced by 17 energy-efficient rotary lobe compressors. The machines are characterised by a very large control range, which has been tailored to the newly installed ventilation system. All machines are installed locally (not central = alternatively) at the aeration tank. Unnecessary pipe losses could be avoided and the outdoor installation ensures that the coldest air with the maximum oxygen content is always supplied to the ventilation process.

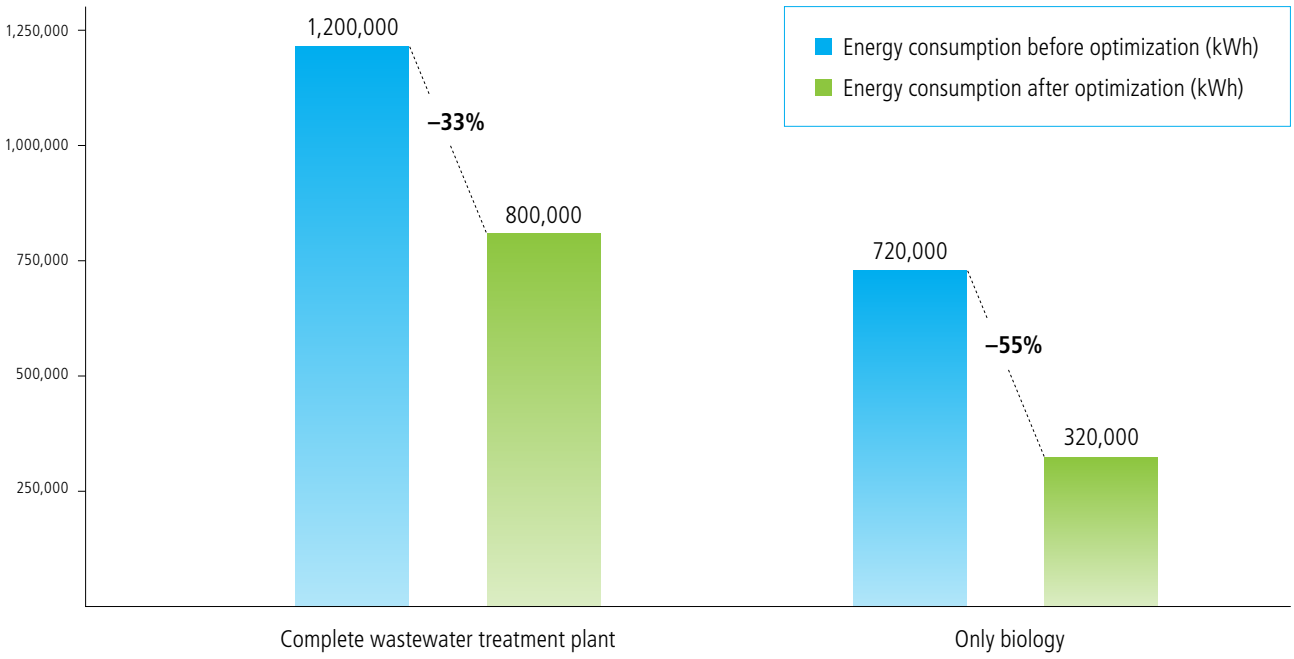
Decentralisation was consistently continued with the EI&C technology and a control logic based on the approaches of Water 4.0 was established. In this way, the treatment and transfer of waste water is carried out in accordance with the measurement and process engineering specifications. Individual plant areas are operated autonomously and operated and monitored via a central process control system. WASSER 4.0 thus offers considerable future opportunities by integrating individual process steps over the entire plant cycle – from engineering and operation to ongoing optimisation.

CONCLUSION

The result: high operational reliability, permanently low discharge values and significant energy savings

The symbiosis of process engineering and plant construction as well as the use of perfectly matched system components lead to high operational reliability, permanently low discharge values and the following energy savings shown below:

Electrical connected load of the biology



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German Water Partnership with its strong network of companies, professional associations and institutions from science and research within the water industry drives innovation and bundles information. Such coordination and commitment shows how the implementation of WATER 4.0 can overcome the gaps in the engineering disciplines and obstacles in the trades.

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