REFERENCE PROJECT

Wastewater Treatment Plant Petingen

Efficiency increase and modernisation during ongoing operation

March 2019–March 2024 (implementation)

German Water Partnership
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KEY DATA

WWTP Petingen – two-stage activated sludge plant with three cascades each

After reconstruction:
115,000 PE

Maximum inflow:
approx. 1,000 l/s

Basin volume all stages:
17,600 m³

Target: expansion of the capacity to 115,000 PE as well as adaptation to new, much stricter limit values

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

THE INITIAL SITUATION

Excessive load in limited space

Since 2016, the Petingen wastewater treatment plant (50,000 PE) suffered from overload and insufficient pressure ventilation, which was temporarily alleviated by cost-intensive pure oxygen ventilation. This prompted the operators to search for efficient solutions adapted to the plant's limited space. The modernisation of the plant, which is based on detailed studies, focuses on the high quality, durability and energy efficiency of all selected products. A particular challenge is the conversion of the plant during operation under very cramped conditions and in compliance with the strict discharge limits.

The engineering services as well as the works (component, mechanical engineering, electrical equipment, building services equipment) were awarded in the course of an EU-wide tender. The key success factor here is consistent engineering and the optimal coordination and dimensioning of the individual components to create a coherent overall system. The modernisation of the plant offers scope for the future integration of a fourth treatment stage for the elimination of micro-pollutants.

IMPLEMENTATION MEASURES

Achieve sustainable efficiency through coordinated engineering and optimal, flexible solutions

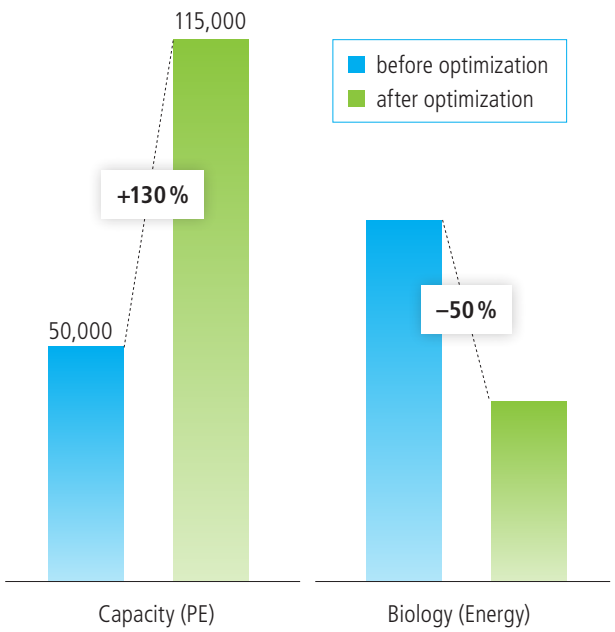
A cascade plant for biological treatment serves to expand the plant to 115,000 PE, which integrates existing technology (pre-treatment, renovated digesters) and new expansions (newly built two-stage screening plant and combined grit and grease trap, sludge storage hall), whereby the available space is optimally utilised. The complex, multi-level and two-stage cascade activated sludge plant enables compliance with increasingly strin-

gent discharge limits (e.g. for ammonium) due to its robustness against load peaks. Should another extension become necessary, conversion to a fluidised bed biology is possible at any time.

The separation of the sludge water treatment supports compliance with the very strict effluent limits, relieves the biological stage and decomposes nitrogen in the most energy-efficient way possible. The entire measurement, control and automation technology as well as the existing process control system (WinCC) were also renewed.

The high efficiency of the aeration system is achieved, among other things, by the optimal arrangement of the 232 large-format plate aerators and the individual overriding control concept for optimal oxygen supply to the aeration basins. With the help of a CFD simulation worked out in advance, the agitators and the aeration system were optimally matched to each other. The innovative agitator technology with three-blade propeller and high-quality IE 4 motors ensure the best possible thrust performance figure, resulting in additional energy savings. All electrical sub-distributions are cooled via a cooling distribution system based on the discharge water of the wastewater treatment plant if temperatures are too high.

In the future, the compressed air will be generated by a combination of two turbo compressors and an energy-efficient rotary lobe compressor. The wide control range of this combination enables optimal matching to the newly installed ventilation system. After the optimization process, the compressors will be installed in a decentralized manner at the aeration basin, thus avoiding pipe losses. For optimal air distribution, the air supply to the individual basin areas is controlled via orifice plate regulators. Decentralisation is also being consistently pursued in the EMSR technology and extensively networked control logic is being developed based on the Water 4.0 approaches. The process specifications for wastewater treatment are monitored by a variety of online measuring devices and probes. The individual plant areas are operated via decentralised control and regulation technology and are operated and monitored via a central process control system.



CONCLUSION

High-tech plant with high operational safety despite its low energy consumption

The first commissioning took place in the middle of 2021, which is why no up-to-date operating data is currently available. The aim is to operate the plant as flexibly as possible and to achieve a high level of operational safety in conjunction with permanent compliance with the very strict effluent values by means of sophisticated process engineering in conjunction with competent plant construction, as well as the use of perfectly coordinated system components. A major success will also be the consistent use of energy while complying with the much stricter requirements.

German Water Partnership

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