SUCCESS STORY:
AERZEN - WWTP
Rheda-Wiedenbrück

AERZEN PACKAGE CONTROL FOR ENERGY SAVING OPERATION EVEN IN CASE OF LOAD CHANGES

Background:
In 2013, the modernisation work of the wastewater plant began. Connected are the citizens of the Rheda-Wiedenbrück region as well as Germany's largest pig slaughterhouse. A project objective was, to supply the biology more efficiently with air, by not only replacing old ventilation grids by new, but also installing these 30 cm deeper at the ground of the aeration basins. "In view of the surface of the six basins we could increase our processing volume by several hundred cubic metres", explains wastewater manager Hendrik Wulfhorst. Subsequently, however, 30 cm space gained mean an increase of the system pressure of 30 mbar, which had to be considered accordingly concerning the design of the blower technology.

Requirement:
Before the modernisation of the plant, the biology had been run with a high excess of oxygen in the basins, in particular to cover safely the fluctuations concerning the entry values of the slaughterhouse. Finally, with the order to reduce the operating costs and the associated CO2-emission, a clear objective of the project was, to couple in future the aeration of the basins considerably more closely with the fluctuating wastewater load and the resulting oxygen consumption. This implied in the first step the needs-oriented speed control of the totally four blower units made by AERZEN.

Solution:
For the base load supply of the biology, forming alternately a circuit of ventilated and unventilated basins with three purification stages, the engineering office in Hanover instructed with planning and realisation selected among others a turbo blower made by AERZEN.
For Cord Utermann, sales engineer at AERZEN, turbo blowers are classical representatives of energy-optimised base load machines which should run permanently for 24 hours within the nominal value parameters since then they operate at the highest economic efficiency. "As with almost any turbo technology, the energetic efficiency falls as soon as the machines are driven into the partial-load range", explains Utermann. As a consequence, concepts are to be developed which care for the energy-efficient cleaning of dirt loads

Segment	Environmental engineering
Problem	Aeration adjustment on intense fluctuating wastewater loads
Solution	AERsmart
Results	More than 35 % energy saving by process controlled combined operation mode
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varying during the day from high to low. For an optimum of energy efficiency in a wastewater treatment plant, this approach means that the air requirement, exceeding the base load, has to be covered by displacement machines like positive displacement blowers and rotary lobe compressors. They are strong in high control ranges between 25% and 100% and have good efficiency, also in part-load operation. Therefore, two AERZEN packaged units type Delta Hybrid (D 62 S) and one Delta Blower (GM 80 L) are also part of the compound system in the wastewater treatment plant in Rheda-Wiedenbrück.

The oxygen demand in the three clearance stages is the basis for the optimisation of the control system with the AERsmart control. The indices are processed by the central PLC of the plant and the resulting target pressure is transferred by Profibus to the blower control. AERsmart then cares for the optimally combined operation of the four packaged units in relation to energy saving. "The turbo blower used here has, for example, the highest efficiency at a capacity of 83 per cent", explains Cord Utermann. If the air requirement is beyond this value, it can be more efficient, to switch-off the base load machine completely and to cover the relatively low air requirement by both Delta Hybrid machines.

Result:
"The high art of the control engineering is to create the transitions between the overlaying operating areas as fluently as possible and as energy-efficient for every load as possible, i.e. to operate the different machines in the combination always at total optimum." Those are resulting from "every load complying with the real need" according to Markus Haverkamp. This "always includes upward and downward peaks". Since three different machines with diverging operation ranges and efficiencies are applied in the wastewater treatment plant in Rheda-Wiedenbrück, their operation must be co-ordinated in such a way "that the number of switching operations will be as low as possible. Since the permanent switching-on and switching-off would increase wear", the project engineer of aquaconsult reveals. "An efficient air distribution among the aeration tanks (sliding pressure control, intrusion of disturbances as for example NH4-N, amount of water etc.) and the efficient machine selection are necessary for an optimal overall efficiency. This is realised by means of the new control system of AERZEN."

Conclusion:
As an interim result, the wastewater treatment plant in Rheda-Wiedenbrück could save about 30 per cent energy in the biology with the energy-optimised blowers and a relatively simple process control which is more closely linked to the prevailing actual values. AERsmart provides further five to eight per cent due to the optimisation on blower level. The field test in the wastewater treatment plant will prove how much this will be in a longer operating phase. Rheda-Wiedenbrück is the first wastewater plant in Germany testing the AERsmart under real conditions. "We need the application on site as we can only recognise the complex connections of a wastewater treatment plant in field; this cannot be reproduced on a test bench. This is why the intensive cooperation with our customers is so important, as only this proceeding provides us with a close application reference for future-oriented developments", summarises Cord Utermann.

AERZEN. Verdichtung als Erfolgsprinzip.
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