

# Saving 65% Energy in Aeration

Full Scale Results from Sternö WWTP, Sweden

At a municipal WWTP in southern Sweden, a new aeration control system was installed together with new screw blower and Sanitaire Silver Series II LP diffusers in one of the two treatment lines. The result was a 65% energy savings compared to the existing tube diffuser and PD-blower system.

The energy consumption of aeration at a municipal WWTP constitutes between 25-60% of a plant's total energy consumption, so with increasing environmental awareness and rising electrical cost, the motivation to reduce the energy consumption has increased even within the wastewater industry.

## Test setup

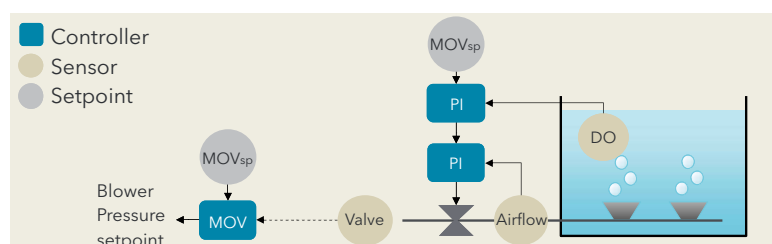
The WWTP consists of two separate lines. An energy optimized aeration system with new grids, blowers and control system was installed in one of the lines. The existing aeration system at the plant was kept in the other line, which was used as a reference.

## Evaluation periods

The new installations were done in steps, and the effect of each new installation was evaluated separately. Period 1 includes a new screw blower and a non-tuned DO cascade control system, Period 2, the Sanitaire aeration grids and Period 3, the Sanitaire process control system.

## Sanitaire Process Control System

The installed Sanitaire process control system with DO cascade control and Most Open Valve logic is illustrated below. In addition, the DO profile was energy optimized by changing the DO setpoints from 1.7/0.7 to 0.7/1.0 mg/l, which distributed the load more evenly over the length of the basin.



Test plant: Sternö WWTP, Sweden

PE-load: 26 000 pe (design)

Owner: Municipal of Karlshamn

Test dates: April 2011 to November 2011

## TEST TANK:

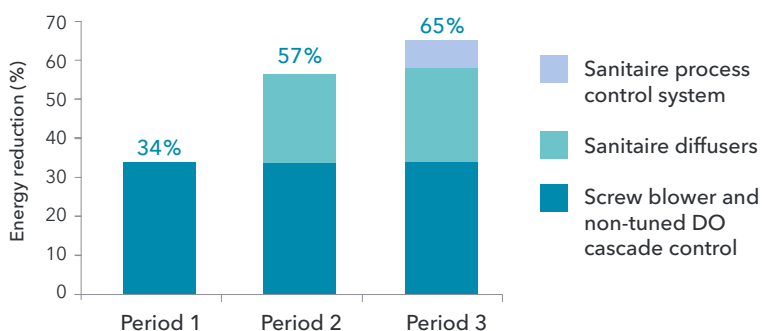
Shape	Rectangular	
Width	8.8	m
Length (aeration zone)	32	m
Water depth	5.50	m

## GRID DESIGN:

Grid design	SSII	
Number of grids	3	no.
Number of diffusers	440	no.
Submergence	5.26	m
ATAD	6	

## Energy savings

The graph below shows the reduction of energy consumption for the aeration in the test line compared to the reference line for the three evaluation periods. In total, 65% of the energy consumption was reduced.



During period 1, the majority of the energy savings was related to the increased efficiency of the blower. The additional 23% of energy savings gained during period 2 was acquired by the high SOTE and low system headloss of the new aeration system. Installation of Sanitaire process control system increased the energy reduction with additionally 9% by a combination of a further decreased system headloss from the Most Open Valve logic and the implementation of DO cascade control and an energy optimized DO profile.

## Airflow and aeration efficiency

As can be seen in the table below, the total required airflow in the test line was reduced with 30% compared to the reference line. The aeration efficiency was almost three times as high in the test line compared to the reference line.

Evaluation period	Airflow savings [%]	Aeration efficiency [kg O <sub>2</sub> / kWh]	
		Test line	Ref line
Period 1		2.1	1.4
Period 2	20	1.9	0.8
Period 3	30	2.2	0.8

## Payback period

The payback period for implementing the aeration system was calculated to 4 years. If both lines were to be upgraded, the payback period would decrease to 3 years. The reason for the reduction is that some equipment can be shared between the lines.

## Conclusions

In this study, the energy consumption of an existing aeration system was decreased by 65% by the implementation of a new blower, new aeration grid and a new control algorithm. These savings were gained by a combination of a more efficient blower, a higher SOTE, a lower headloss and an energy optimized DO control and DO profile, as well as from the combination of efficient equipment and knowledge of how to operate and optimize a process.



## TEST SETUP:

	Test line	Reference line
Aeration Grids	Sanitaire Silver Series Low Pressure diffusers	Fine bubble tube diffusers
Blower	Screw blower	Lobe blowers
Control System	Sanitaire process control system: - DO cascade control - Energy optimized DO profile - Most Open Valve logic	Simple DO control without cascade