

# Water Intelligence System Reduces Phosphorus Levels and Improves Denitrification

## Problem

A wastewater treatment plant in Hassen, Germany needed to improve its denitrification processes. At the same time, there was an opportunity to qualify for a fee reduction/waiver from the government if phosphorus levels could be dropped by at least 20%.

## Solution

A Hach® Real Time Control (RTC) system was installed, including a Phosphax sc unit, a Solitax sc unit, two LDO Model 2 oxygen sensors and two AN-ISE probes (for  $\text{NH}_4$  and  $\text{NO}_3$ ) as well as a Claros-Enabled RTC interface and Prognosys predictive-diagnostics for instrument maintenance.

## Benefits

Immediate and major improvements were made in a variety of metrics, notably phosphorus outlet (-45% year-to-year),  $\text{N}^{\text{tot}}$  outlet (-64% year-to-year), and energy consumption (-66% year-to-year). The plant also qualified for the fee reduction/waiver for lowering phosphorus.

## Background

The wastewater treatment plant in Hessen was last modernised in 1998 and has the task of continuing to maintain the good condition of the Nidder river. The plant processes the wastewater of two connected communities. Designed for a population equivalent of 23.000, it treats a sewage volume of more than 2.300,000  $\text{m}^3$  per year. A mechanical cleaning system transports the wastewater into the two-lane biological system. The water is biologically cleaned in the anoxic tanks (Increased biological phosphorous removal upfront) and the two aeration tanks with a pre-aeration tank using alternating/intermittent aeration. The treated water moves into two final sedimentation tanks before it is finally introduced into the river Nidder. The wastewater treatment plant was in need of a solution to optimise denitrification (excess  $\text{NO}_3\text{-N}$  at outlet) and also to reduce phosphorus. An earlier attempt at optimisation in 2011 did not work properly, and the effort was scrapped in 2013.



*"Two lane" layout of the wastewater plant*

## The Solution

The scope of the project was clear: to improve denitrification (less aeration time in low load situation/intermittent operation), and adherence to new P-limits (mandated by the German government) and to qualify for a fee reduction/waiver if P levels were dropped by a minimum of 20%. Following an initial basic determination of the potential for optimisation, a more detailed analysis of the operating data was carried out in collaboration with Hach consultants. The plant was visited in order to gain an accurate insight into the current situation. We were able to offer target measurements and a standardised RTC System with 2 channel N/DN and 2 channel P. The customer ordered our solution within weeks.

Following the initial setup, parameterisation of the system was continuously monitored via the internet also patched to an SC1000 controller. The RTC solution was continuously adapted in consultation with the personnel at the wastewater treatment plant. The solution module has now been running successfully for three years and can be operated by the plant personnel themselves if the parameterisation needs to be adjusted, based on what they need at that time. The solution included a predictive diagnostic system Prognosys as well, which offers the customer the foresight and assurance that both the sensors and analysers are running efficiently. The Prognosys system is a beneficial tool for personnel insofar as it is quickly able to identify the condition of the measuring instrument and the quality of the measurement value and whether there is a need for action – for example, cleaning or the replacement of reagents.

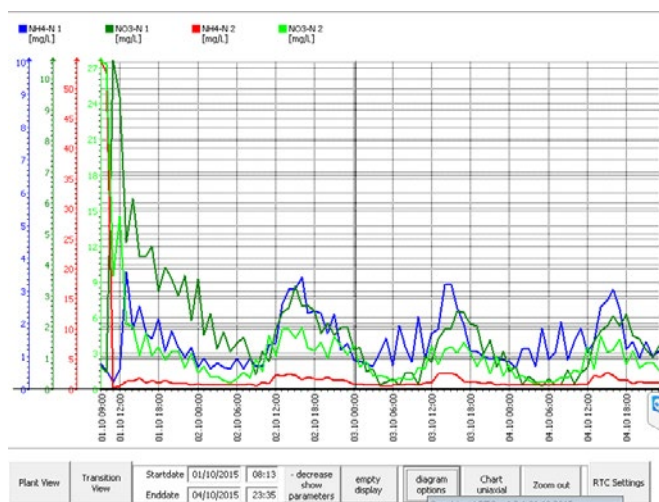
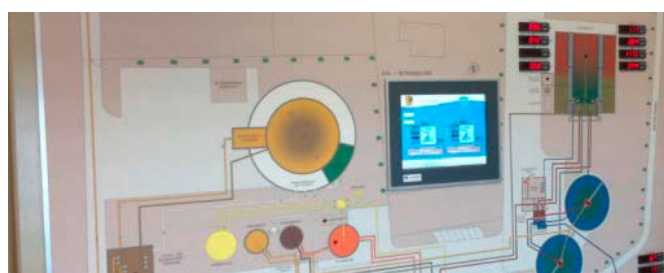


Figure 1: The results were immediate and dramatic with the installation of the water intelligence system, with reductions in all parameters measured in the outflow, and in energy consumption in bio tank blowers.

## Improvements/Benefits

Thanks to the lower NO<sub>3</sub>-N in return sludge, the Increased biological phosphorous removal upfront began to work properly.

Immediate and major improvements were made in a variety of metrics, notably phosphorus outlet (-45% year-to-year, dropping from 0,42 to 0,23 mg/L), Ntot outlet (-64% year-to-year, dropping from 3.89 to 1.41 mg/L), and energy consumption (-66% year-to-year, dropping from 22,38 to 7,62 kWh/d). The plant also qualified for the fee reduction/waiver for lowering phosphorus.



In a nod to continuity, a central control panel which had been used at the plant for nearly 20 years was modified rather than discarded. The panel's original LED data displays were left intact, and a new full-colour computer display was added to reveal the water intelligence system information to plant operators.