

## **Real time aeration control in wastewater treatment plants using in-situ sensors with ion-selective electrodes**

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### **Abstract**

A pilot scale activated sludge wastewater treatment plant (AS WWTP) operated with nitrification and pre-denitrification is monitored and controlled with a set of online instruments and in-situ sensors. Chemical online analyzers, UV and UV-Visible in-situ sensors and in-situ sensors based on ion-selective electrodes (ISE) are in use. New ISE sensors for ammonium, nitrate and nitrite, specific for water and wastewater matrices, have been released in recent years and, with adequate quality control, proved to be highly accurate and reliable in activated sludge (AS) reactors. The real time and continuous ammonium measurement of these ISE sensors was successfully used for the control of aeration, even at the end of the AS zone, working at low ammonium concentrations (1-2mgN/l). Several feed-forward and feed-back control strategies for the aeration were tested using ammonium ISE. The first aim was to keep inorganic nitrogen compounds, i.e. ammonium, nitrate and nitrite, as low as possible in the effluent, and within Swiss national standards.

All the strategies were effective at keeping ammonium low and intermittent aeration allowed gaining denitrification capacity. Some control strategies however generated temporary peaks of ammonium or accumulation of nitrite.