TECHNICAL NOTE

CHEMSCAN APPLICATION SUMMARY

AMMONIA BASED AERATION CONTROL

STATEMENT OF THE PROBLEM

In wastewater treatment plants that are tasked with meeting stringent Total Nitrogen (TN) effluent limits, reliable control of nitrification is a critical operational component. One common strategy is to achieve complete nitrification, resulting in effluent ammonia concentrations that are as low as possible. This allows more leeway in the operation of the denitrification processes while still satisfying effluent TN limits. Complete nitrification is typically accomplished by maintaining adequate nitrifying biomass through proper SRT control and by controlling aeration rates, providing sufficient oxygen to drive the biological oxidation of ammonia. Ineffective aeration control can result in over-aeration, causing excessively high dissolved oxygen concentrations that not only risk process performance upsets, but can drastically drive up power consumption.

CONTROL STRATEGY

Ammonia Based Aeration Control (ABAC) is growing in acceptance as a process-control tool that attempts to balance the need for effective biological process performance with the desire for energy efficient process economy. ABAC uses the measurement of ammonia at various points in the treatment process to control the rate of nitrification by modulating the air supply directly or in conjunction with DO setpoint control based on feedback or feedforward strategies.

Until now, the successful implementation of ABAC strategies has been limited by the lack of rugged and reliable ammonia sensors that supply accurate ammonia readings at sufficiently low concentrations to verify complete nitrification has been achieved. Ion selective electrodes (ISE), gas-sensing electrode (GSE) and other probe-based systems require frequent calibration and maintenance to overcome the drift and interferences inherent in this technology. In addition, the accuracy of ammonia data at concentrations below 1.0 or 2.0 mg/L makes control of complete nitrification problematic when attempting ABAC with these methods.

APPARATUS

An online analytical system can be used for effective and cost-efficient ABAC implementation. The system consists of a robust, field-proven online colorimetric ammonia analyzer that uses auto-zero and auto-clean functions to reduce maintenance time to less than two hours per month. The other integral component is an in-tank sample filter wand assembly employing a disposable filter element that can be replaced in less than five minutes once every few weeks. Field data has demonstrated outstanding correlation with lab ammonia values. The filter can supply adequate sample to the analyzer without operator intervention for many weeks, before replacement is required. Together the analyzer and filter provide reliable, accurate data required for Ammonia Based Aeration Control.