TECHNICAL NOTE

CHEMSCAN APPLICATION SUMMARY

NITRIFICATION PROCESS CONTROL

STATEMENT OF THE PROBLEM

Nitrification is a biological wastewater treatment process for the conversion of ammonia to an oxidized form of nitrogen. The process is mediated by two specialized microorganisms. The first microorganism, nitrosomonas, converts ammonia into nitrite (NO2). The second microorganism, nitrobacter, converts nitrite into nitrate (NO3). Complete nitrification is achieved when substantially all of the ammonia present is fully converted into nitrate, leaving little or no remaining ammonia or intermediate nitrite in the effluent.

Assuming that continuous, real-time measurements are available, one of the first signs of a decrease in the nitrification rate is a corresponding decrease in the NO3-N concentration, accompanied by an increase in the NH3-N and NO2-N concentrations. Failure to promptly detect and correct nitrification problems can result in a buildup of nitrite to toxic concentration and/or a drop in dissolved oxygen to the point where further nitrification is inhibited.

CONTROL STRATEGY

Frequent automatic analysis of ammonia, nitrite and nitrate from sample points within the aeration basin can be used to monitor nitrification process and to observe the results of operational changes such as increased or decreased aeration rates, RAS rates and retention times.

When the process is achieving full nitrification under variable influent ammonia conditions, aeration rates may be able to be reduced without sacrificing nitrification efficiency, thus saving substantial energy costs.

Some operational strategies may allow a small concentration of ammonia to bleed through in order to provide a source of ammonia for chloramine formation during disinfection. This strategy requires careful and continuous analysis of ammonia, nitrite and nitrate, especially under variable influent ammonia loading conditions.

High nitrite concentrations can result in excessive consumption of chlorine during disinfection. Continuous monitoring can assure that the process is fully nitrifying at all times.

APPARATUS

One ChemScan Process Analyzer can detect ammonia, nitrite and nitrate as individual parameters from multiple process sample points or basins. ChemScan has multiple sollutions for this application, ranging from a single sample point with submersed filter to a system monitoring up to eight sample points. Complete, fully integrated sample handling, analysis and data communication systems are available.

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1-800-446-7488 (toll-free in U.S.A. and Canada) • 1-970-498-1500 (U.S.A. and international)

221 East Lincoln Avenue, Fort Collins, CO 80524 USA