ABSTRACT

A reverse A²/O system demonstrated better phosphorus removal efficiency than the regular A²/O system by inverting the sequence of anaerobic and anoxic zones. Placing an anoxic stage before the anaerobic stage in the reverse A²/O process resulted in a lower oxidation-reduction potential in the anaerobic zone, which contributed to higher P uptake by bacteria under subsequent aerobic respiration.

The effectiveness of nano zero-valent iron (NZVI) in nutrient removal was also determined under anaerobic, anoxic and aerobic conditions. The highest P removal efficiency by NZVI was observed under anoxic abiotic conditions. Furthermore, a single dose of NZVI at the final concentration of 100 mg Fe/L in the mixed liquor reduced the number of filamentous bacteria Type 021N by 2-3 log units. The side effect of the use of NZVI depended on sludge bulking conditions and biomass concentration.

Process improvements to remove melamine were also evaluated. Even after a long period of sludge adaptation, melamine appeared not to be easily biodegradable in any of the conventional activated sludge (CAS) and membrane bioreactor (MBR) systems. However, a significant reduction in toxicity of melamine to the activated sludge was observed in MBR systems, demonstrating the significance of MBR operation at high sludge concentrations.