Taking De-Nitrification to the Next Level: An Upgrade of Proven Technology with 21st Century I&C

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ABSTRACT

In 2006, one of the largest wastewater reclamation facilities in the northern Virginia area recognized the need to expand the facility from 18 to 24 mgd (million gallons per day). In part, the upgrade was triggered by regulations requiring reduction of Total Nitrogen discharge on an annual basis to 3 mg/L. At the same time, there was a need to replace their plant-wide data acquisition and control system (DACS), with a new modern supervisory control and data acquisition (SCADA) system.

This design-build project also provided "limit of technology" nutrient removal; the existing aeration basin volume was doubled and reconfigured to allow operation in either 4-stage Bardenpho or modified ludzack ettinger (MLE) modes; 14 new de-nitrification filters were implemented for a total of 24; and a second/standby chemical analyzer was installed for redundancy purposes. Furthermore, methanol feed was automated to be flow paced and controlled by a proprietary software calculation algorithm.

The proprietary software calculation algorithm for control is feed-forward/feed-back based upon flow and influent and effluent nitrate concentrations. This enhanced the operation and reliability of the process and also reduced the risk of methanol overdose by more closely matching the methanol to feed demand. Consistent methanol dose control is challenging when trying to meet low effluent total nitrogen while simultaneously maintaining a low Carbonaceous Biochemical Oxygen Demand (CBOD).

This plant is currently in full operation, being controlled by plant staff, and in compliance with the regulation requirements that triggered the plant-wide upgrade in the first place. This paper will discuss the integration of new technologies, the operational benefits, and the startup coordination required to reliably meet the new operating permit limits.

About the Author:

Jaime A. Alba: Mr. Alba is an automation engineer with over 8 years of experience in the water and wastewater industry. His experience includes SCADA design and implementation; human machine interface (HMI) design, configuration, and implementation; PLC controls programming; systems integration; training; implementation and execution of QA/QC procedures; start-up coordination; and construction management. Mr. Alba holds an Associate's Degree in Electromechanical Engineering, a Bachelor's of Science in Mechanical Engineering, and a Master's of Science in Aerospace Engineering where he specialized in control theory.