Sustainability through Automation of Wastewater Treatment

A Case Study on the Energy and Water Quality Impacts of DO, NH4 and SRT Control Strategies at a Conventional Activated Sludge Plant

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ABSTRACT

The nation's water industry is ground zero for sustainability. Water and wastewater treatment facilities consume 3% of the electrical energy produced. Furthermore, the quality of effluent from wastewater treatment has a profound impact on the ability of surface waters to mitigate the impacts of climate change. Energy demand reduction through automation is an important way to increase sustainability in the water industry. Furthermore, greater automation enables water utilities to achieve a higher quality product, thereby avoiding expensive equipment upgrades or discharge fines.

This paper presents a case study performed in a full scale conventional activated sludge plant in central Wisconsin. The goal of this study is to test several stand-alone control strategies in order to determine energy savings and effluent quality produced by each. All existing mechanical equipment at the plant will remain unchanged throughout this study, such that any energy savings or effluent quality improvement could be directly associated with each control strategy. The control strategies to be examined are as follows: DO control, NH4 control, and SRT (solids retention time) control*.

The pilot site currently implements a control strategy using DO probes in the basin connected to a blower VFD programmed with improperly scaled parameters. In order to perform this study, the plant was furnished with an NH4 and TSS probe in the basin, and a TSS probe in the shared waste/return activated sludge (WAS/RAS) pit. During the benchmark stage of this study, the plant will be operated under the existing mode of control and energy consumption, influent and effluent parameters will be recorded. In subsequent stages, an alternate DO control strategy, a cascaded NH4/DO control strategy and a SRT control strategy will be implemented consecutively with the online sensors provided. Throughout all four stages of testing, measurements of influent/effluent flow and quality along with energy expenditure will be recorded.

The result of this study will demonstrate the potential for energy demand reduction through automation of biological nutrient removal and help operators and engineers make better decisions on control strategies to achieve the highest quality of treated effluent at the lowest energy consumption.

* Further studies on additional control strategies will be performed at the site, but will not be completed before the 2014 ISA conference.

ABOUT THE AUTHORS

Irina Gokhman *is an Application Engineer for the Sanitaire Biological Solutions group with two years of experience. She provides customers with biological nutrient removal system design, and supports projects from the preliminary design stage through start-up. Irina holds a B.A.Sc. in Chemical Engineering from the University of British Columbia.*

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