Utilizing Instrumentation and Control Tuning for BNR Optimization

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ABSTRACT

The Control Engineer has the option of a number of process variables for control of a Biological Nutrient Removal (BNR) wastewater treatment process. The standard of years past, Dissolved Oxygen (DO), has limited resolution in the process's anoxic zones. Anoxic zones are desirable to achieve optimal nutrient removal. Operationally, systems using DO were over-aerated in order to register a reliable reading. Alternative process variables such as Oxidation Reduction Potential (ORP) have the requisite resolution across the entire BNR process operating range, especially in the anoxic range. As such, ORP has allowed better process optimization resulting in lower cost of treatment, the more complete removal of nutrients, and better effluent quality.

This presentation discusses a recently constructed wastewater treatment facility owned and operated by Polk County Utilities (PCU) Division in Florida, the Northeast Regional Wastewater Treatment Facility. By fully automating the control process for the BNR system utilizing multiple instruments including level and ORP a more efficient and consistent treatment process was developed that also allowed for equalization with the BNR itself. The selected instrumentation utilized for controlling the BNR process will be discussed along with one general automated control strategy of the BNR process. Tuning of the process will be discussed, and the effluent quality of the treatment process both before and after tuning. Finally, the Human Machine Interface (HMI) will be discussed to show how it led to further optimization through operator tuning of set points.

ABOUT THE AUTHORS

Craig Fuller, P.E. *has over 10 years of experience in water and wastewater process design. He is experienced in the design and implementation of control schemes for wastewater treatment processes, from conceptual design through startup. He also performs project management and design for Water and Wastewater Projects. Craig has a B.S. and graduate level work in Ch.E. from the Florida Institute of Technology. Craig is a member of the Florida Water Environment Association's Wastewater Process Committee. Contact: craig.r.fuller@aecom.com.*

Norman Anderson, P.E. *has over 10 years experience in the design and commissioning of Process Control Systems for the Water Sector. Norman has provided secure and reliable PLC, SCADA, and Network hardware and software architecture designs and provided control system automation solutions for a range of facilities. Norman has an M.S. in EE from Iowa State University and an M.S. in Physics from the University of Florida. Contact: normananderson@polk-county.net.*

Charles Nichols *has over 35 years of experience in the management and operation of primary, secondary, advanced, and reclaimed wastewater treatment facilities. This includes 5 years of managing regional wastewater treatment plants for Polk County. Charles has an "A" Wastewater Treatment License in the State of Florida.*

David Fitzgerald, PE *has over 25 years of experience in water and wastewater facility and process design. He is experienced in the design, implementation, commissioning, and trouble-shooting of control systems for water and wastewater process controls. In 2000, David founded D. P. Fitzgerald, a firm specializing in Process Control solutions for Water and Wastewater treatment, based in Alachua, Florida. David has an M.S. in ME from the University of Florida and a B.S. in ME from Virginia Tech.*

Donald Schlicht, PE *has over 30 years of experience in designing, building and programming control and instrumentation systems. This includes over 15 years in the water and wastewater area. Donald has a BSEE from Rice University and is a licensed professional engineer in the State of Florida and the State of Georgia.*