Case Study: Church Hill, TN

June 2021

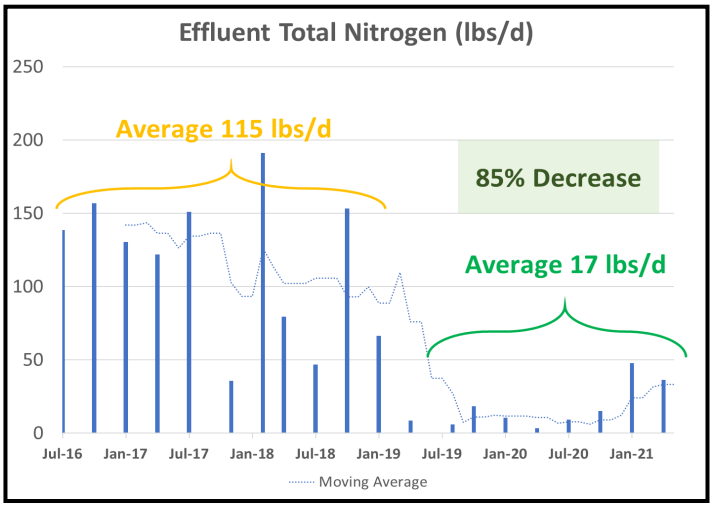
In 2016, staff from the Church Hill, TN wastewater treatment plant (WWTP) were invited to participate in the Tennessee Water and Wastewater Energy Efficiency Partnership, a joint technical assistance program through the U.S. EPA Southeast Regional Office, U.S. Department of Energy, and the Tennessee Department of Environment and Conservation. Representatives from those agencies, the University of Memphis and the University of Tennessee Municipal Technical Advisory Service (MTAS) conducted a site assessment in late 2016.

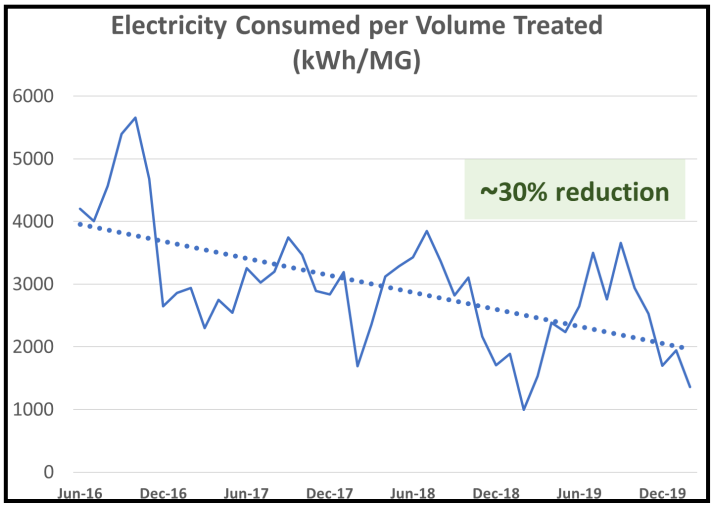
Church Hill Wastewater Treatment Plant

Over the past five years, Operator Jerry Simpson and Supervisor David Wood worked diligently with MTAS to develop and pursue an optimization strategy to save energy and improve nitrogen removal. The plant is neither designed or required to remove total nitrogen, and has a relatively high monthly average ammonia limit of 15 mg/L. Despite this, the city pursued gradual reductions in the aeration supply, transitioning from four 100 horsepower rotors operating 24/7 to two rotors operating intermittently, about 20 hours per day. This change created the conditions necessary for biological nitrogen removal, and the plant now regularly achieves effluent total nitrogen concentrations below 5 mg/L. This success reduces nitrogen loading to the Holston River by 35,800 lbs/year. Moreover, idling the aerators has results in electric savings of about $2200/month despite ongoing rate increases. The city also expects to save an additional $800/month after renegotiating its billing structure with the local power company.

Church Hill is a city of about 6,800 situated on the banks of the Holston River, just outside of Kingsport. The WWTP has a design capacity of 2.5 million gallons per day (mgd), and currently treats about 0.75 mgd of municipal wastewater. The plant consists of preliminary treatment, a single oxidation ditch with two final clarifiers, and UV disinfection. Biosolids generated during treatment are further treated in two aerobic digesters, dewatered with a belt press, and land applied.

Diligent operator oversight was necessary to implement these changes. The project team appreciates the continued efforts of the Church Hill WWTP staff and the valuable support of its Mayor and Board.





♦ **Annual Energy Savings:**	**310,000 kWh/year**	♦ **Annual Cost Savings:**	**$26,000/year**
♦ **Energy Savings:**	**▼30% kWh/MG**	♦ **Cost Efficiency:**	**▲30% (MG/$)**
♦ **Effluent Nitrogen:**	**▼85% lbs TN/yr**	♦ **Implementation Cost:**	**<$1000**

For more information, please contact Ben Bolton at TDEC Office of Energy Programs (ben.bolton@tn.gov)

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