Large savings opportunities identified at Minnesota wastewater treatment facility

Cities are under constant pressure to deliver improved services and manage operating costs. Wastewater treatment services can be a high cost effort due to the energy intensity of the operating equipment and the need to meet increasing effluent quality requirements for positive public health and environmental outcomes. Nearly 4% of U.S. electricity goes to moving (80%) and treating (20%) water/wastewater.[1] Energy is a large component of wastewater facility operating costs accounting for 25-40% of most wastewater utility operating budgets.[2]

In Minnesota, wastewater treatment facilities operate in approximately 600 communities. The age of wastewater facilities across the state ranges from less than 10 years to greater than 40 years[3] in communities ranging in size from some of the largest, such as those in and around the Twin Cities, to cities and towns with 2,000 people or less. Effective water and wastewater infrastructure is critical for continued economic development and job growth in all regions of Minnesota. The cost to operate and maintain these systems, however, can be a burden to many smaller communities. Optimizing the operations and energy use of wastewater facilities can help communities save money to put toward other critical community needs.

Recently, the Minnesota Technical Assistance Program (MnTAP) in partnership with Southern Minnesota Municipal Power Agency (SMMPA) identified large energy and cost savings opportunities at the City of Saint Peter Wastewater Treatment Facility (WWTF). First, to identify the opportunity, SMMPA worked with cities that have wastewater plants in their territory and provided the plant energy data for MnTAP to conduct a benchmarking analysis. The benchmarking results showed that Saint Peter was one of the facilities with a relatively low score, meaning there was high potential for energy optimization opportunities.

Next, the facility energy assessment was carried out. MnTAP worked directly with the Saint Peter WWTF to take a deeper look at the energy efficiency potential in this type of facility. The analysis included a thorough process to both understand the facility's current energy usage and operating methods followed by a MnTAP Intern Project to test for energy reduction recommendations that would also ensure the plant's wastewater treatment requirements were still met.

At the conclusion of the assessment, MnTAP identified $23,200 in annual net savings and an annual energy reduction of 289,600 kWh through the optimization of Saint Peter WWTF's control system and through the installation of variable frequency drives for the biological aerated filter (BAF) blowers. Together, these two recommendations have a payback period of just over one year. Additional testing of BAF blower optimization is underway to determine if additional savings are achievable. Similar operation in the biosolids storage aeration blower have the potential to save an additional 246,500 kWh of electricity and $19,700. Table 1 below provides a summary of the various opportunities identified at the plant, some of which have been implemented and some of which are planned for future implementation.

Table 1. Summary Saint Peter's Energy Efficiency Opportunities

Recommendation	Annual Reduction (kWh)	Annual Savings	Status
Opportunity 1: Biological Aerated Filter Blower Efficiency			
SCADA adjustment of target cell	153,600	$12,300	Implemented
Install VFDs to reduce effluent DO concentration	173,600	$13,900	Recommended
Combined effects of SCADA and VFD implementation	289,600	$23,200	Recommended
Anticipated maximum savings achievable	405,490	$32,400	Needs testing
Opportunity 2: Biosolids Storage Aeration Blower Efficiency			
Install VFD to control biosolids blower with tank level	246,500	$19,700	Planned

For a link to MnTAP's full Saint Peter WWTF case study, read more (pdf).

These wastewater treatment assessments are related to a U.S. Department of Energy grant that Commerce was awarded to provide tools and other resources that can help increase energy efficiency at Minnesota wastewater plants. To learn more about this effort and how you can participate, please visit the project webpage or contact Adam Zoet.

References

[1] Electric Power Research Institute, Inc. (EPRI) (2002) Water & Sustainability (Volume 4): U.S. Electricity Consumption for Water Supply & Treatment - The Next Half Century.

[2] Municipal Wastewater Treatment Plant Energy Baseline Study, Pacific Gas & Electric, 2003, http://www.scribd.com/doc/62799540/Waste-Water-Treatment-Plant-Energy-Baseline-Study

[3] Minnesota Office of the State Auditor, Civil Infrastructure Project http://www.osa.state.mn.us/maps/