



WASTEWATER TREATMENT EFFICIENCY – NORTHFIELD, MN

Challenge

Operators at the Northfield Wastewater Treatment plant understood that they were spending a lot of money on energy – roughly \$310,000 per year. The team at Northfield is passionate about sustainability, and in 2017 they chose to address their energy challenge head-on.

Approach

Northfield contacted MnTAP about an energy assessment for some help in finding energy savings opportunities. After extensively digging through spreadsheets, sifting through data, and performing analysis, valuable information was uncovered that gave the team at Northfield what they needed to make changes to save significant energy in their wastewater treatment process.

Results

Potential Savings
1,259,900 kWh / yr
\$93,300 / yr

Tune primary clarifier and take four BAF cells out of filtration

Time cycle digester blowers

Install and use VFDs on BAF Blowers

MINNESOTA TECHNICAL ASSISTANCE PROGRAM

612-624-1300

MnTAP.UMN.EDU

Contact us for more information!

Findings

BAF Treatment

Comparing treatment data from 2002 to data collected in 2017 showed that something was wrong. Influent BOD, TSS, Ammonia, and Phosphorus were very similar between the two time periods. However, in 2002, the plant was able to function with just four BAF cells in filtration – in 2017, the plant was running with eight.

Continued analysis showed that the main difference was the waste removal within the primary clarifiers. The primary clarifier TSS removal percentage had dropped from roughly 90% to 50%. The difference was being made up within the BAF cells in secondary treatment, at the cost of running four additional cells (\$62,000 per year in energy).

Northfield operators were able to partially resolve this issue by turning their backup primary clarifier online, reducing the number of necessary BAF cells from 8 to 6. Operators are now studying their coagulant and mixing procedures to look for additional ways to get their primary clarifier to run at optimal efficiency. When the primary clarifiers are performing well, fewer BAF cells are needed to treat the wastewater. The two BAF cells taken offline so far will save the plant \$30,000 per year. Operators are looking at options to take two more offline, which will result in a total savings \$62,000 per year in energy.

Digester Aeration

The air being generated by Northfield's digester blower was compared to the Ten State Standards recommended digester aeration. This standard declares that air should be sent to the digesters at a rate of 30 scfm / 1000 ft³ of sludge. That means that as the digester tank fills with sludge, the amount of air being sent to the tanks should increase, allowing the supplied airflow to match the required airflow throughout the sludge stabilization process. The assessment showed that, given the air generated by the digesters at Northfield, the blowers should run from 9 minutes per hour for a nearly empty tank to 42 minutes per hour for a full tank. Switching to this operating procedure from simply running the blower constantly will save Northfield 115,000 kWh, or \$8,300 per year. Due to some piping issues, this change is scheduled for 2021.

VFDs

The blowers within the BAF cells at Northfield are run without VFDs. MnTAP was able to use an aeration model to determine what speed the blowers would need to run to maintain a Dissolved Oxygen (DO) level between .5 and 2 within the BAF cells. It was found that with four cells in filtration, the blowers could be turned down to roughly 50% speed and still maintain adequate DO within the cells. For the four remaining cells in filtration, this change will result in an overall energy savings of 250,000 kWh, or \$20,000 per year. This upgrade is budgeted and scheduled for 2024.

Getting Started with Energy Efficiency

Benchmarking your wastewater plant is a great way to get a sense for the magnitude of savings potential for your plant. B3 Benchmarking for Minnesota Wastewater Plants can be completed here:

<http://mn.b3benchmarking.com/WastewaterTreatmentPlants>

For more information on wastewater treatment efficiency, please give us a call (612) 624-1300, email mntap@umn.edu, or visit our website: <http://mntap.umn.edu/POTW/wwtp.html>

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