Minnesota Technical Assistance Program

Energy Efficiency for Wastewater and Drinking Water Plants

Cindy McComas
University of Minnesota, MnTAP
612-624-4678
mccom003@umn.edu

Helping Minnesota businesses maximize resource efficiency, increase energy efficiency, reduce costs, and prevent pollution

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Topics to Be Covered

- Energy use at wastewater and drinking water plants
- Steps to get started
- Energy efficiency opportunities
- Case Study: Metropolitan Council Environmental Services
- Available resources

Energy Use at Wastewater amd Drinking Water Plants

- National
  - 52,000 facilities
  - Energy use is 50 billion kWh @ $4 billion/year
  - 10% goal = 5 billion kWh = $400 million savings
- Minnesota
  - 1000 facilities
  - Energy use is 1 billion kWh @ $80 million/year
  - 10% = 100 million kWh = $7 million savings

Getting Started

- Set goals, get commitment, and designate energy efficiency champion
- Get a handle on energy use
  - Utility bills
  - Metering
  - Peak vs. off-peak usage
- Share energy use reports and educate others
- Develop relationship with your utility
- Identify large energy using operations
- Benchmark against Energy Star (kWh/MG)
- Prioritize and focus on certain operations

Energy Efficiency Opportunities

- Aeration systems including blowers and compressors
- Anaerobic digesters
- Motors and variable frequency drives (VFDs)
- Pumps
- Steam systems
- Lighting and HVAC

Aeration Systems

- Use up to 50% of total plant energy use
- Ensure system is properly sized
- Switch from coarse to fine bubble diffusers
- Conduct real-time DO monitoring
- Sequence blowers—match needs to what blowers can provide
- Shut off when not needed based on flow, loading, and maintenance scheduling

Case Study: Metropolitan Council Environmental Services

- Repair air leaks in system
- Take advantage of different efficiencies of 7 blowers – blower optimization
- Install dissolved oxygen (DO) meters for real-time monitoring
- Evaluate impact of diffuser cleaning

Anaerobic Digesters

- Set optimum temperature for microbe growth
- Recover biogas to use in on-site electricity generation

Motors

- Conduct motor inventory
- Develop motor maintenance plan
- Set criteria for replacement (need maximum efficiency) vs. rewinding (lose efficiency)
- Standard vs. high efficiency motors
- Have spare motors available
- Develop emergency replacement plan

Variable Frequency Drives

- Electronic devices used to control motor and equipment speed, depending on demand
- Identify which processes are good candidates for VFDs
- Identify how can they be used to reduce/shift electrical load

Pumps

- Predominant equipment type in treatment plants
- Ensure proper sizing for application and loading—typically oversized
- Optimize for peak conditions and flow variations
- Use pump controls for systems with pumps in parallel
- Implement a maintenance program

Steam System

- Sometimes used for heating or humidification
- Conduct steam trap testing
- Check condensate return to boilers
- Insulate steam lines

Lighting and HVAC

- Check light levels with light meter
- Use occupancy sensors
- Upgrade for efficiency (T12 to T8)
- Turn off during process shutdown
- Use ceiling fans to de-stratify temperature zones

Summary

- Understand system operation and costs
- Ensure effective blower utilization
- Minimize pressure drop through air system, based on system design
- Use maximum efficiency motors and pumps since they work all the time
- Optimize operations based on needs
- Ask: Where can energy be saved?

Resources

- MnTAP: www.mntap.umn.edu
- Utility rebates/audits: your local utility
- Center for Energy and Environment (lighting and building): www.mncee.org
- Energy Star Challenge: www.energystar.gov
- Focus on Energy (WI): www.focusonenergy.com
- DOE Motor Master: www1.eere.energy.gov/industry/bestpractices/motors.html