The Value of Benchmarking: Wastewater Treatment

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Driven to Discover℠

Overview

MnTAP Background

Value of Benchmarking

Types of Benchmarks

Energy Savings Strategies

MnTAP Background

Minnesota Technical Assistance Program

- State-wide, non-regulatory, no-cost, confidential technical assistance to Minnesota industrial businesses
  - waste, water, energy assessments
  - source reduction opportunities
  - grant project scoping
  - confidential regulatory questions
- Technical staff with backgrounds in engineering, science and industry with a passion for efficiency and the environment

Special Project - Wastewater Facilities

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Objective: Improve WWTP energy efficiency through

- Benchmarking
- Site assessments
- Implementation
- Intern projects
- Renewable energy assessments (CHP)

Minnesota Department of Commerce

MnTAP Minnesota Technical Assistance Program University of Minnesota

Minnesota Pollution Control Agency

Value of Benchmarking

Benchmarking makes energy efficiency known.

Benchmarking makes energy efficiency visible.

High benchmark scores are deserving of recognition.

Low scores can justify efficiency improvements.

High or low…

You can leverage your score to benefit your facility.

Benchmarking results in cost savings;

MnTAP's energy assessments averaged implemented savings of $13,000 per plant per year.

Benchmark scores help, but plant operators and managers are the efficiency champions.

Value Summary

Find energy efficiency relative to your peers.

Leverage that number into projects and upgrades that will make your plant more efficient and more effective.

Types of Benchmarks

Types of Benchmarks

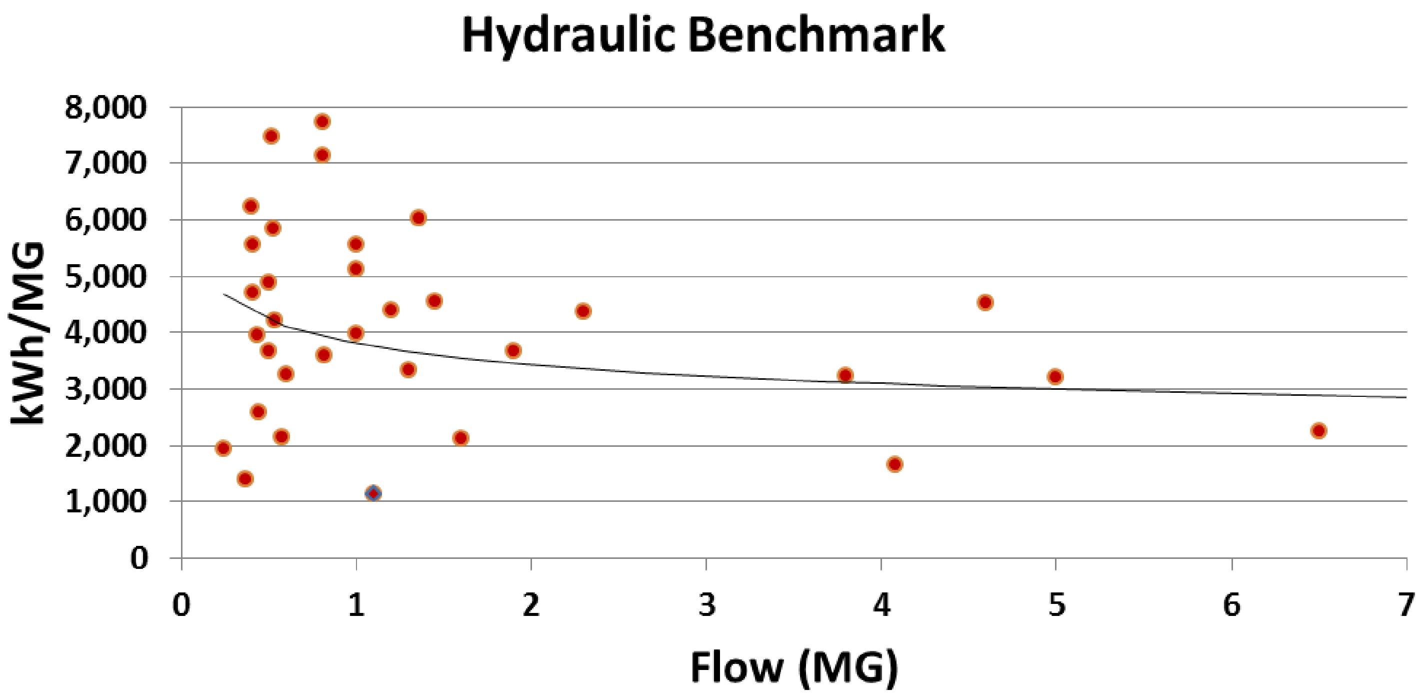
Hydraulic Flow Benchmark

BOD Load Benchmark

ENERGY STAR Portfolio Manager Benchmark

Hydraulic Flow Benchmarking (kWh/MG)

Plant energy consumption per unit flow



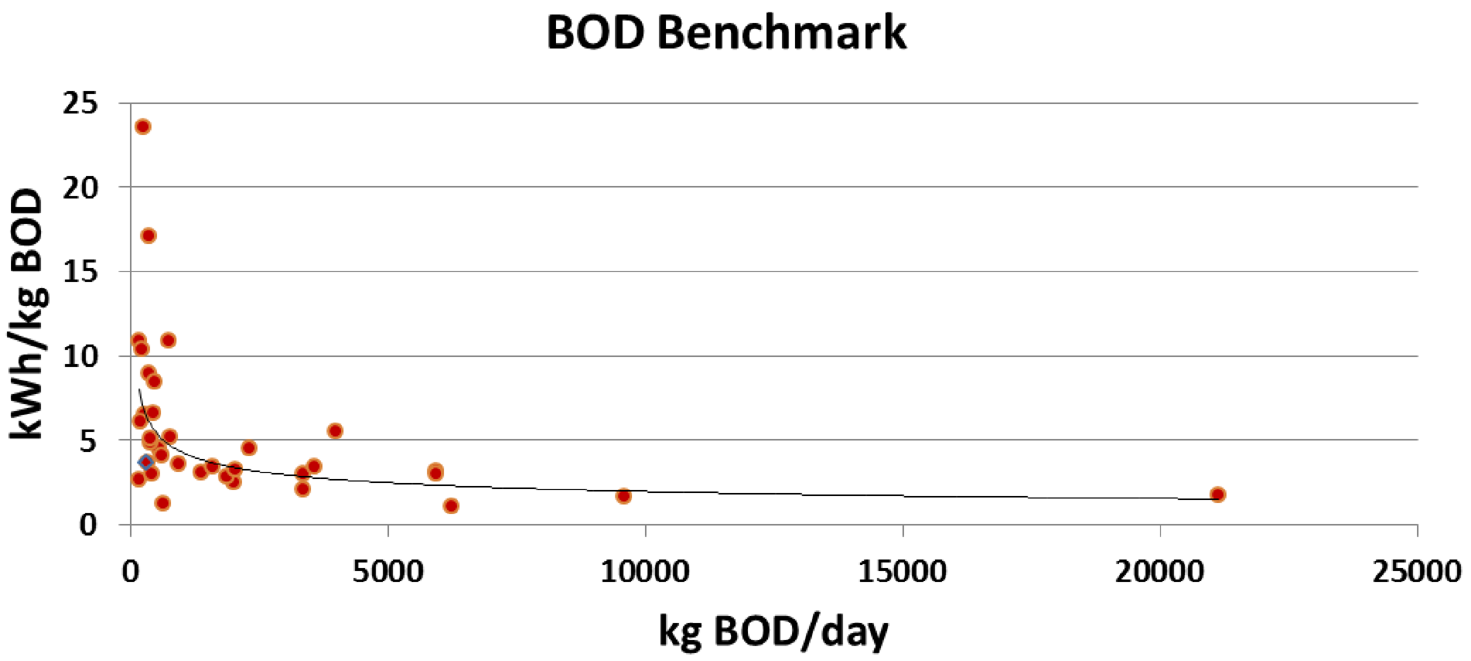
Hydraulic Flow Benchmarking (kWh/MG)

Hydraulic Flow Score Range

5000 kWh/MG 1500 kWh/MG

BOD Benchmarking (kWh / kg BOD)

Plant energy consumption per unit BOD removed



BOD Benchmarking (kWh / kg BOD)

BOD Load Score Range

5 kWh / kg BOD

1.5 kWh / kg BOD

ENERGY STAR® Portfolio Manager (ESPM)

Energy Efficiency as a Percentile Rank

- Energy Consumption
- Fuel Consumption
- Flow
- BOD Removal
- Climate
- Nutrient Removal
- Trickle Filter

ENERGY STAR® Portfolio Manager (ESPM)

ENERGY STAR Score Range

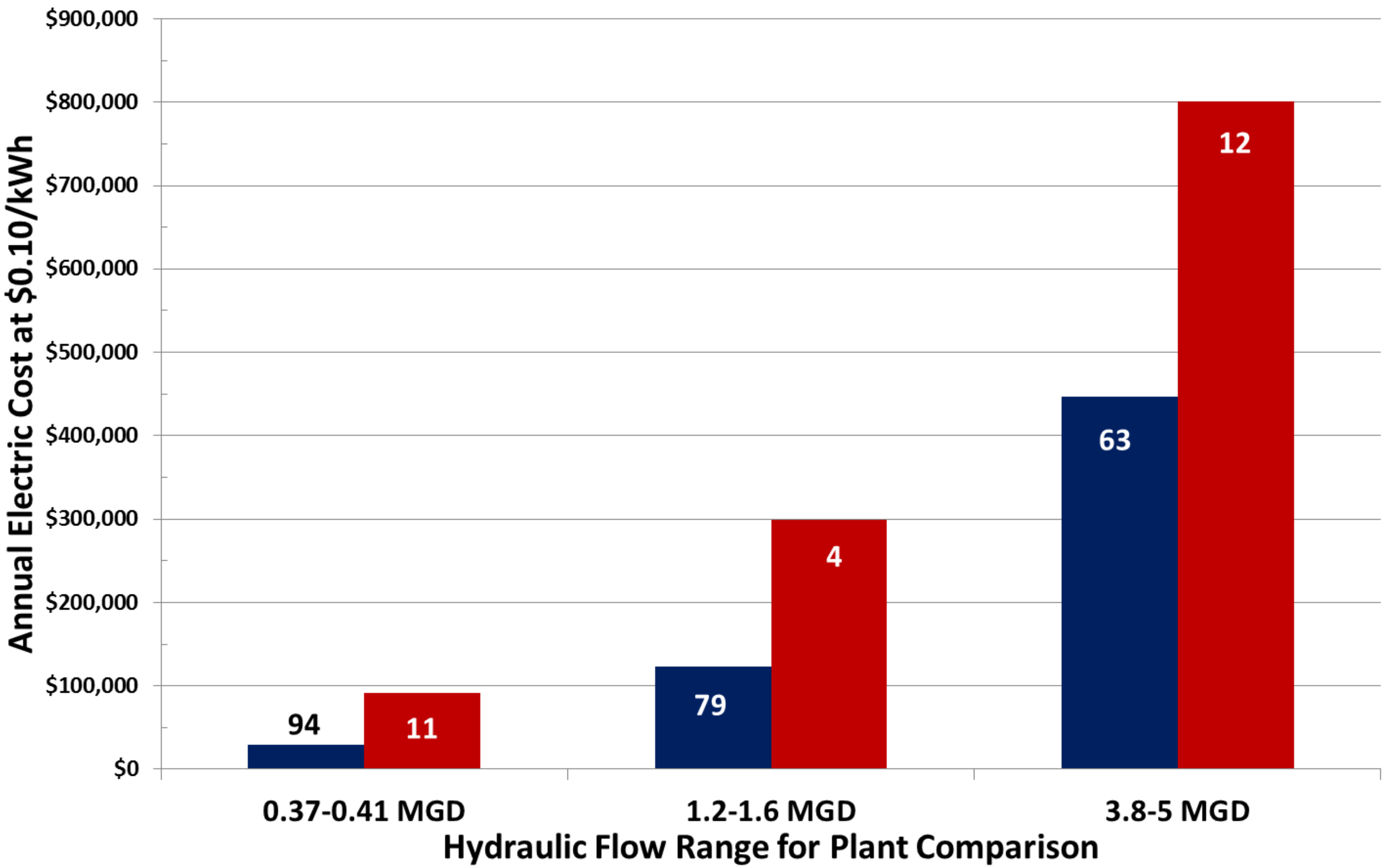
1 100

ENERGY STAR® Portfolio Manager (ESPM)

ENERGY STAR scores were developed using data from plants with flows over .6 MGD.

Smaller plants can calculate unofficial scores which are useful, but less accurate.

Electric Costs and ENERGY STAR (ESPM) Scores
MN Wastewater Treatment Plants with Similar Hydraulic/BOD Loads



Energy Savings Strategies

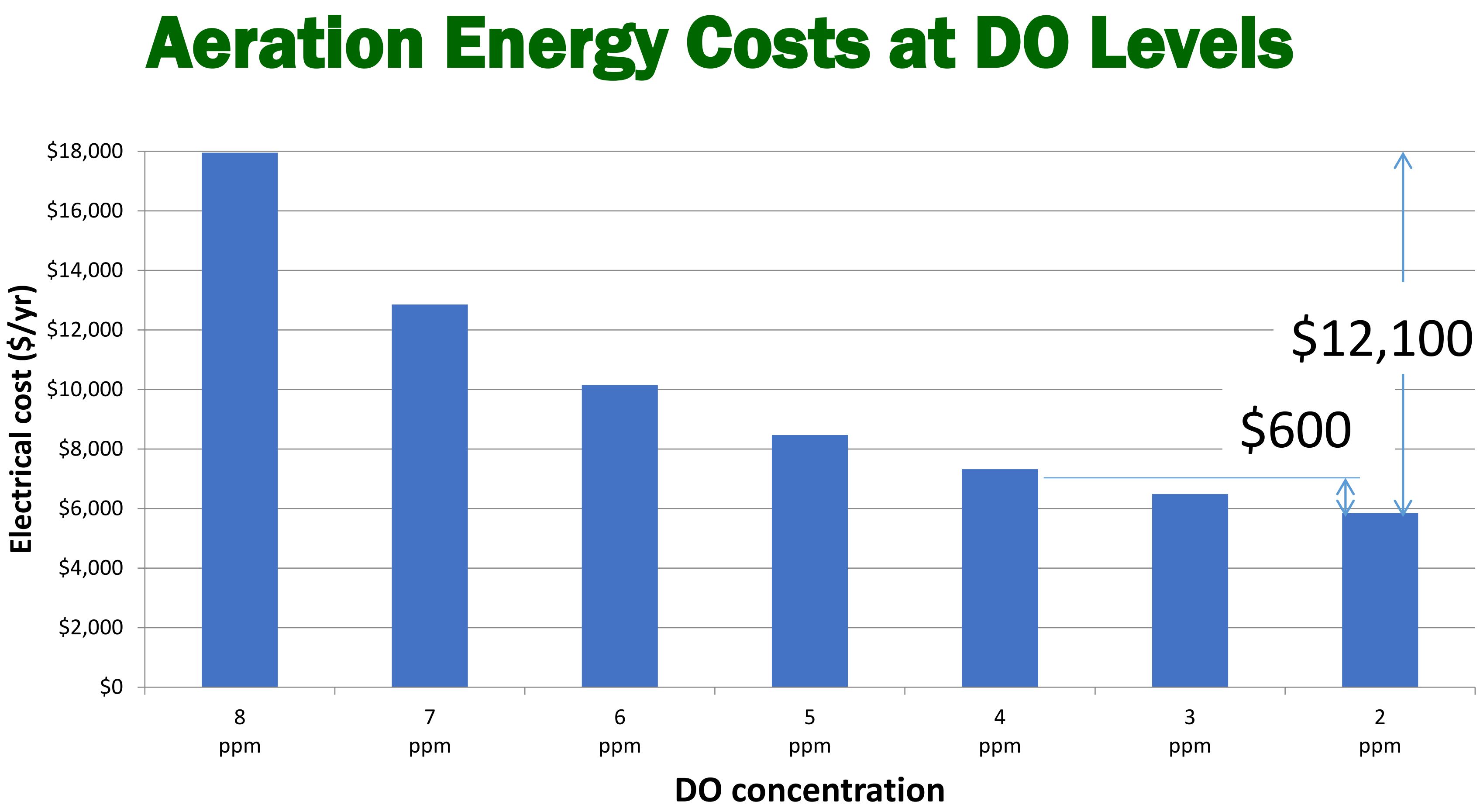
MnTAP Project Background

- 11 Wastewater Plants
- $450,000 in recommended annual energy cost savings
- $150,000 in annual energy savings implemented to date
- $13,000 per site average

Secondary Aeration DO

Is your secondary aeration basin running at over 2 ppm DO?

Secondary Aeration DO



Secondary Aeration DO

Reduce blower speed by reducing VFD frequency (if possible).

Cycle equipment on and off to reduce average aeration

(using mixers during off time as needed).

Get a smaller blower that can efficiently maintain lower DO.

Aerobic Digester Aeration

Is there opportunity to reduce aerobic digester aeration?

Aerobic Digester Aeration

The Ten State Standards recommends

30 scfm / 1000 ft^3.

Many sites can run even lower.

Aerobic Digester Aeration

Reduce blower speed by reducing VFD frequency
(if possible).

Cycle equipment on and off to reduce average aeration.

Get a smaller blower that can efficiently meet air requirements.

Aerobic Digester Detention Time

Is there opportunity to reduce aerobic digester detention time?

Aerobic Digester Detention Time

Ten State Standards mentions a

27 day detention time basis.

Some sites can run lower than this.

Aerobic Digester Detention Time

Ensure waste is stabilized with SOUR testing.

Reducing detention time will also reduce aeration requirements, allowing you to use less energy.

Anaerobic Digester

Consider Combined Heat and Power (CHP)

This study found simple payback periods ranging from 4-10 years.

Case Study Examples

http://www.mntap.umn.edu/industries/facility/potw/energy/

Share the benefits of these successful projects.

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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
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Contact us for more information!

The magnitude of these opportunities is expected to correlate with benchmark score.

Benchmarking is the first step towards efficient wastewater infrastructure.

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