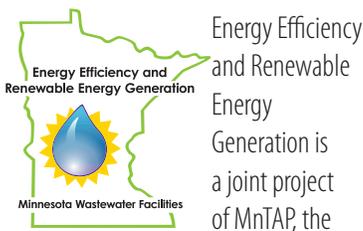




Why benchmark?

Calculating the process energy benchmark for your plant can:

- Suggest whether an energy efficiency opportunity exists
- Indicate how big and where opportunity is
- Help track the impact of changes you make
- Assist the design of a new plant or major changes in an existing plant



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Energy Benchmarking in Wastewater Treatment Plants

Benchmarking can help identify energy-saving opportunities

Energy is a significant part of wastewater treatment plant operating cost. Estimates suggest energy accounts for 25–40 percent of the operating budgets of most wastewater utilities, and energy has the greatest potential for reduction. Energy use at wastewater treatment plants varies considerably even accounting for plant size and load differences.

Energy benchmarking is a way to normalize and compare operations on a common basis. There are a number of different ways to benchmark energy performance, but using appropriate benchmarks allow you to judge whether significant opportunities to reduce energy operating expenses exist, and roughly what the dollar amount might be. Benchmarking does not tell you how easy or expensive it would be to achieve better energy performance.

Why Benchmark Energy?

Benchmarking your plant’s energy footprint can help:

1. Illuminate opportunities to reduce energy use.

Comparing your plant’s benchmark to others can show you:

- What other plants are doing differently and well
- Which design differences that tend to lower energy use
- Where to focus conservation efforts.

2. Guide plant design decisions with estimates of future energy use and help answer these questions:

- What are the consequences of this design?
- What is the trade off between initial cost and lifetime cost?
- What is the energy cost at full capacity load?
- What is the energy cost at partial capacity/current load?

3. Monitor your plant’s benchmark performance over time:

- Look for indicators of degraded operation or maintenance issues.
- Verify the effectiveness of plant improvements.

Energy use benchmarks are heavily affected by equipment size, design and operation.

For optimal performance:

- Right-size equipment for the entire design life of the plant.
- Maintain, don’t restrict, minimize pressures.

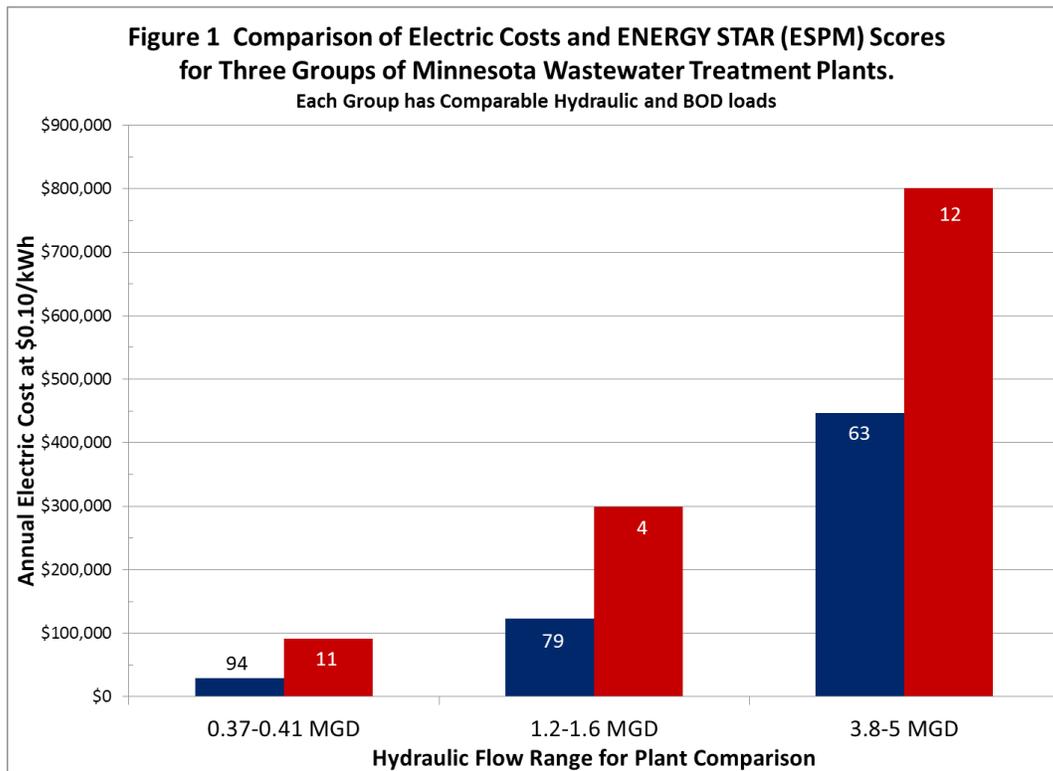
Types of Benchmarking for Wastewater Plants

Energy Star® Benchmark

The most sophisticated tool for benchmarking wastewater facilities is available through Energy Star Portfolio Manager (ESPM). ESPM provides a percentile rank score allowing the broadest

comparison to wastewater facilities nationally. The Energy Star® benchmark is derived from statistical correlations for the most important factors — process and climate — affecting energy consumption. The Energy Star® benchmark is best for comparing different plants and accounting for energy consumption closely related to difference in plant loading. It is not convenient for tracking changes in a single plant. In order of importance, you will need these plant details to use the Energy Star® tool:

- a. Average influent flow
- b. Plant load factor (inflow/design flow)
- c. Influent BOD
- d. Effluent BOD
- e. Presence of trickle filtration
- f. Presence of nutrient removal
- g. monthly electric and gas consumption



Two- to three-fold differences in energy costs are common between plants treating similar loads. Larger plants generally have the potential for larger dollar savings. For the 3.8-5 MGD group, the least efficient plant could save \$350K/year, were they to raise their ESPM score to the 63rd percentile. However, among smaller plants there tends to be even greater variation in energy use, so the percent reduction can be larger. For the 0.37-0.41 MGD group there is a three-fold difference in energy consumption between the most and least efficient plants. A plant in this category that achieved an ESPM score of 94 could save \$62K/year.

Hydraulic Load Benchmark

The simplest benchmark method, takes the electricity consumed by a plant in a month or a year and divides it by the volume of water treated in that month or year. This method provides an overall energy use per volume treated and can be good to get a general idea of how energy/cost intensive your process may be. It is adequate for comparing smaller plants and those with largely residential loads.

Biological Oxygen Demand Benchmark

Another method takes the electricity consumed by a plant in a month or a year and divides it by the amount of BOD treated in that month or year (BODin – BODout). This accounts for differences in organic loading between plants. It is also good for tracking a single plant, especially if BOD is variable.



For more information on benchmarking methods, visit mntap.umn.edu/POTW/benchmarking.html