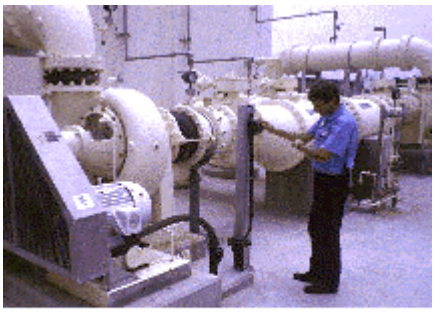
SUCCESS STORY

Encina Wastewater Authority

Service Area: **125 square miles**
Wastewater System Capacity: **36 million gallons per da**y
Wastewater Treatment Type: **Secondary**
Secondary Treatment Method: **Activated Sludge**
Annual Systemwide Purchased Electricity: **$174,300 (2.2 million kilowatt hours)**
Cogeneration Capacity: **1.4 megawatts**
Annual Savings Attributed to Energy Efficient Strategies: **$611,000**



Encina reduces costs by pumping off-peak

How does a wastewater agency continue to operate economically and maintain high quality while serving its rapidly growing customer base? Staff at the Encina Wastewater Authority decided energy efficiency was the answer. They set into motion a comprehensive energy management program addressing every aspect of the facility's energy use, from demand control to lighting retrofits. The plant now profits from increased energy efficiency, operational savings, and a staff more attuned to methods of achieving these benefits.

KEY IMPROVEMENTS

Staff integrated the following measures:

- Use cogeneration to produce on-site electricity and thermal energy
- Use fine-bubble diffusers for aeration
- Enact demand control strategies
- Pump water more efficiently with variable-frequency drives
- Upgrade standard motors to energy-efficient motors

The following sections highlight improvements that decreased energy use.

Cogeneration

Encina's system consists of three engine generators that run on purchased natural gas. Heat from the generators maintains a constant 96°F for digesters and is used to heat offices and run three absorption chillers that provide cooling. Although the system can produce 1,425 kilowatts, emission restrictions currently allow use of only two generator engines.

The facility's Cogeneration Optimization Project will improve the system's efficiency, giving Encina "qualified facility" status from the Federal Energy Regulatory Commission, which will lower costs for natural gas. Upgrades will reduce emissions by converting engines to "lean burn."

Aeration

Because aeration constitutes as much as 50% of an activated sludge plant's energy costs, increased efficiency in this area is critical. When expanding their plant, Encina chose fine-bubble diffusers over the less-efficient coarse-bubble versions previously used.

Encina has automated control of dissolved oxygen levels for over 10 years, using probes throughout the aeration basins to monitor and help maintain dissolved oxygen levels. Some facilities are reluctant to automate dissolved oxygen controls, because they are concerned that fouled probes will hamper reliable readings. Operations Superintendent Mike Hogan says the key is staff dedication. "The sensors have always worked well," he says. "Consistency is what it is all about. If you don't clean the probes properly and religiously they are not going to work, but it's not a big task. Our employees take pride in their work."

Demand Control

Encina's energy management program emphasizes off-peak pumping, enabling the facility to profit from lower utility rates. Staff manually shut down select high-demand equipment during on-peak periods. Because monthly billings are based on the highest energy demand in a 15-minute block, strict compliance is essential. Many wastewater agencies use control systems, but Encina staff have demonstrated that expensive automated controls are not a prerequisite for success.

To target areas for efficiency improvements, operators track monthly equipment energy use. Lee Cory, director of operations, sees significant benefits from manual collection. "Operators are much more familiar with which equipment is critical, more in tune with the processes, and more aware of the flexibility of those processes," he says. "Operators know just how much energy a piece of equipment is consuming and can spot problems by noting sudden changes in energy use."

BENEFITS

Cogeneration

Encina's cogeneration facility produces 80% of on-site power and provides heat to digesters and HVAC applications that would otherwise operate solely on purchased natural gas and electricity. As it currently operates, the system produces about 8 million kilowatt hours per year. When upgrades are completed, improvements in emissions will permit a third engine to be brought on line, increasing generation capacity by 50% while continuing to meet air quality restrictions.

Aeration

Automated controls maintain dissolved oxygen levels at predetermined set points. Because fine-bubble diffusers transfer more dissolved oxygen into the water than coarse versions, less oxygen needs to be introduced, lowering the energy required to drive dissolved oxygen compressors. The fine-bubble diffusers are estimated to save about 2,920,000 kilowatt hours per year. San Diego Gas & Electric financed 25% of the installation cost.

Demand Control

Encina adopted San Diego Gas & Electric's seasonally adjusted time-of-use rate. By shifting treatment process times, they were able to reduce their peak electricity demand, avoiding $10.94 per kilowatt peak demand charges.

Pumping off-peak has also produced savings. Equalization storage of process flows allows Encina to postpone disposal pumping until off-peak hours, at cheaper rates. Because the disposal pumps use 200 horsepower motors, savings can be considerable.

Energy Efficiency Improvement	Annual Estimated Savings
Cogeneration	$300,000
Fine-Bubble Diffusers	$225,000
Demand Control (peak shaving/off-peak pumping)	$50,000
Variable-Frequency Drives	$21,000
Energy-Efficient Motors	$15,000
Estimated Total Annual Savings	**$611,000**