

SUCCESS STORY

Moulton Niguel Water District

Service Area: **37.5 square miles**

Potable Water System Capacity: **48 million gallons per day**

Wastewater System Capacity: **17 million gallons per day**

Wastewater Treatment Type: **Tertiary**

Secondary Treatment Method: **Activated sludge**

Annual Systemwide Purchased Electricity: **\$1,310,000 (15.5 million kilowatt hours)**

Annual Savings Attributed to Energy Efficient Strategies: **\$332,000**

For over a decade, automation and instrumentation have helped Southern California's Moulton Niguel Water District supply water and treat wastewater economically and efficiently.

In the early 1990s, facing a major rise in energy costs, the agency explored other methods to increase energy efficiency. Working closely with Southern California Edison and San Diego Gas & Electric to identify optimal rate schedules and energy-efficiency strategies, the district implemented a program in 1992 that has yielded substantial savings in the reservoir-fed branches of their distribution system.



The district plans to investigate potential improvements to their potable water systems requiring full-speed pumping to maintain system pressure. **"This experience has motivated everyone to come up with new ideas,"** says **Phillip Lawler**, instrumentation and electrical superintendent at Moulton Niguel. **"It's an ongoing process."**

KEY IMPROVEMENTS

Staff implemented changes in the following areas:

- Install programmable logic controllers to benefit from lower off-peak utility rates
- Regulate lift station wastewater levels using proportional, integral, and derivative controls to automatically transmit data to a central computer
- Install variable-frequency drives on the wastewater system to control pump speed in coordination with the proportional, integral, and derivative system, reducing costs
- Specify that all motors used in new construction be 95-97% efficient; replace standard-

efficiency motors with energy-efficient motors (ongoing)

The following sections highlight improvements demonstrating the greatest benefits.

Programmable Logic Controllers

Moulton Niguel uses automated controls and programmable logic controllers to enable 77 district pumping stations to benefit from lower off-peak utility rates. The controls activate pumps during off-peak hours, bringing reservoirs to satisfactory levels. On-peak, pumping is halted, allowing reservoir levels to fall. Stations employing this strategy are on "reservoir duty"--meaning the system is pressurized by the static head of the reservoir. All stations previously operated in "closed grid mode," running pumps 24 hours a day to maintain system pressure.

The programmable logic controllers' sophisticated internal clock and calendar automatically adjusts for seasonal changes--consistently keeping equipment running off-peak. This strategy has decreased pumping costs, and allowing reservoir levels to fall has improved water quality.

Proportional, Integral, and Derivative/Variable-Frequency Drives System

Moulton Niguel previously cycled constant-speed wastewater pump drives on and off to distribute wastewater. As a result, drive control was limited, pump motors were subject to starting surges, and the system shutdown left sewage sitting in pipes, producing offensive odors.

They decided to replace their standard motor drives with [variable-frequency drives](#) linked to proportional, integral, and derivative controls. This system regulates wastewater levels by sending a signal to variable-frequency drives controllers to modulate wastewater flow. The new proportional, integral, and derivative/variable-frequency drives system provides a continuous, modulating flow that uses less energy, reduces motor wear and high energy demands from motor starting surges, and ensures that sewage does not remain stagnant in pipes, thereby reducing odor problems.



BENEFITS

Programmable Logic Controllers

The District now saves nearly \$320,000 annually by using programmable logic controllers to control off-peak pumping. First-year savings for Moulton Niguel's Country Village station were over \$69,000. In 1994, the District's electric bill fell more than 20%—from \$1.5 million to \$1.18 million. These savings are particularly meaningful considering that Moulton Niguel has been

impacted by a 14% electricity rate increase.

Proportional, Integral, and Derivative/Variable-Frequency Drive System

Moulton Niguel's use of the proportional, integral, and derivative/variable-frequency drives system for wastewater pumping has reduced pumping energy costs by about 4%. In addition, San Diego Gas & Electric has paid cash rebates to the District for installing variable-frequency drives—over \$30,000 in 1993/1994. Electricity savings, combined with the utility rebates, offset the cost of installing the system.

Energy Efficiency Improvement	Annual Baseline Energy Cost	Annual Post-Implementation Energy Cost	Annual Estimated Savings
Install programmable logic controllers in the potable water system	\$1.5 million	\$1.18 million	\$320,000
Specify energy-efficient motors instead of standard-efficiency motors in new projects	\$50,000	\$46,000	\$4,000
Replace existing standard efficiency motors with energy-efficient motors	\$32,000	\$27,000	\$5,000
Modulate wastewater flows by installing a proportional, integral, and derivative/variable-frequency drives system	\$72,000	\$69,000	\$3,000
ESTIMATED TOTAL ANNUAL SAVINGS			\$332,000