

SUCCESS STORY

Madera Valley Water Company

Service Area: **2.25 square miles**

Potable Water System Capacity: **8.21 million gallons per day**

Source Water: **100% groundwater**

Annual Cost of Purchased Energy: **\$124,620 (1.27 million kilowatt hours)**

Annual Savings Attributed to Energy Efficient Strategies: **\$19,000**

The Madera Valley Water Company serves its 1,600 residential customers exclusively with groundwater drawn from wells located within the distribution system. Currently, five wells discharge into a single pressure zone with a capacity of 5,700 gpm—sufficient to meet current peak day and peak hour needs. As demand grows, the agency is adopting new technologies and operating methods to optimize the existing system.

For example, Madera Valley launched an energy management program in 1991 that enabled it to meet higher demand in 1994 without increasing operating costs.

The program focused on modifying two wells to better maintain system pressure. At two other wells, Madera Valley has since upgraded its standard-efficiency motors to energy-efficient units.



"These improvements can be made by any water agency, regardless of size," says Roy Jones, general manager. "It only requires a degree of inquisitiveness and willingness to learn about new techniques and equipment."

KEY IMPROVEMENTS

Staff implemented changes in the following areas:

- Install [variable-frequency drives](#) and programmable logic controllers to regulate pumps and monitor flow and pressure
- Upgrade to energy-efficient motors to reduce pumping energy requirements
- Retrofit the pump bowl at one well to optimize operation

The sections below highlight improvements demonstrating the greatest impact on energy use or operations.

Variable-Frequency Drives and Programmable Logic Controls

Madera Valley installed variable-frequency drives and programmable logic controllers on motors used to drive the deep well turbine pumps on a new well, number 10, and on the existing number 1 well. These wells provide the system's primary pumping operations. The three remaining pumps are pressure-activated, as needed, to meet customer demand and system pressure requirements.

The variable-frequency drives and programmable logic controllers on the pumps at wells 1 and 10 control motor speed to distribute water evenly throughout the pressure zone. They have reduced the zone's pressure differential from 22 to 5 psi, improving pumping efficiency from all wells. In addition, each of the two pumps runs an average 40 hours before cycling. The minimized cycling, along with gradual start-up and shut down, have reduced wear and tear on equipment, which in turn increases equipment life and reduces maintenance costs.

Energy-Efficient Motors

Madera Valley installed a 200 horsepower energy-efficient motor at well 10 and an energy-efficient 150 horsepower unit at well 1. These new motors, combined with the subsequent motor upgrades at well sites 2 and 3, bring all well pumps from standard-efficiency to energy-efficient operation. (Well number 6 was originally built with an energy-efficient motor.)

Madera Valley estimates that the new motors at wells 1, 2, and 3 increased efficiency of the three original motors by about 2%. The cost savings of this upgrade amounts to almost \$1,300 per year.

Pump Bowl

Madera Valley took advantage of the retrofit at well no. 1 to install a new pump bowl. This change was particularly critical because the original bowl assembly had the potential to incur cavitation problems that would impede pumping efficiency. The new bowl assembly was positioned 40 feet lower in the column for optimum efficiency and to eliminate the possibility of cavitation. It allows the propellers to lift greater quantities of water, improving capacity output and providing better capability to help release pressure off the other wells.

The new pump bowl cost \$2,200, with some added costs for tubing and other improvements. Actual energy savings from the new pump bowl—which are likely to be very small—have not been quantified. The more significant benefits from the pump bowl changeout lies in the new bowl's contribution to improved operation overall.

BENEFITS

The combined improvements to Madera Valley's pumping operations enabled the agency to provide 22% increased capacity in 1994—from 514 million gallons in 1993 to 627 million gallons in 1994. In addition, energy costs per household fell by 22%—from an average \$7.46 per household each month in 1993 to an average \$5.82 in 1994. Systemwide, this translates into annual savings of about \$18,946, or over 15% of total energy costs.

Energy Efficiency Improvement	Annual Baseline Energy Cost	Annual Post-Implementation Energy Cost	Annual Estimated Savings
Install variable-frequency drives and programmable logic controls at wells 1 and 10	\$68,000	\$51,000	\$17,000
Install energy-efficiency motor instead of standard motor in new well (no. 10)	\$40,000	\$39,000	\$1,000
Replace standard efficiency motor with energy efficient motors (wells 1, 2, and 3)	\$76,000	\$75,000	\$1,000
Estimated Total Annual Savings			\$19,000