



The California Energy Commission and the U.S. Department of Energy,  
Office of Industrial Technologies BestPractices present:

# ENERGY SOLUTIONS FOR CALIFORNIA INDUSTRY:

## WAYS TO IMPROVE OPERATIONS AND PROFITABILITY

JANUARY 2002

### CASE STUDY

#### BENEFITS

- Saves \$57,000 in annual energy costs
- Saves \$14,000 in annual maintenance costs
- Saves 475,000 kWh annually
- Improves equipment life
- Increases pump efficiency

#### APPLICATIONS

Wastewater treatment plants are good candidates for pump system improvement projects. Treatment plants have high demand for electricity to drive their pump systems. Properly configuring pump systems is essential to improve efficiency and save energy.

#### ABOUT THIS EVENT

The purpose of the Energy Solutions for California events is to provide a *professional, solutions-oriented* environment for industrial electricity users who face serious challenges to remaining operational and profitable during the current energy crisis. Industrial electricity users have the opportunity to receive unbiased information and analytical tools that can increase reliability and manage short and long-term production costs.

## Pump System Upgrade Saves Energy and Increases Efficiency at a Wastewater Treatment Plant

### Summary

In 2001, the Inland Empire Utilities Agency upgraded the pumping systems at its Ontario, California regional wastewater treatment plant. Faced with rising energy costs, the Ontario plant decided to evaluate the treatment plant's pumping system to determine whether efficiency gains and energy savings were possible. The evaluation led the plant to implement a system-level project that removed eddy current clutches from many pumps and retrofitted most of the plant's pumps with high efficiency motors. This project increased the efficiency of the plant's major pumping system, resulting in projected annual energy and maintenance savings of \$71,000 and 475,000 kWh, which represents 10% of the electricity used by that process. With a total cost of \$188,000, and a \$15,000 grant from the California Energy Commission, the simple payback is just over 26 months.



Inland Empire Utilities Agency's Ontario Plant



## Company/Plant Background

The Inland Empire Utilities Agency (IEUA) owns and operates water recycling facilities in Southern California. The IEUA serves about 700,000 people within a 242-square-mile area that includes the cities of Fontana, Rancho Cucamonga, Ontario and Chino. The regional plant in Ontario is one of four similar facilities operated by the IEUA.

The IEUA's Ontario, California facility is served by a total of 19 vertical turbine and horizontal centrifugal pumps. Of these 19 pumps, 10 serve the Intermediate Pumping System (IPS), which is responsible for lifting the primary effluent up to the secondary treatment area. The other 9 pumps serve the Returned Activated Sludge (RAS) system that moves activated sludge from the secondary treatment area to the primary treatment area so it can begin treating the incoming sludge. Prior to the project, the plant's pumps totaled 1195 hp and pumped approximately 6,000 gallons of liquid per minute.

## Project Overview

Prior to the project, the Ontario facility was experiencing inconsistent pump performance and increasing energy costs due to rising energy rates. Of the plant's 19 pumps, 15 had eddy current clutches to make them operate at variable speeds. Over time, the plant's flow requirements increased to the point that many of the pumps were operating at full speed. Since the pumps were not operating at part load, the wear rings on the eddy current clutches were becoming worn more quickly, which led to increased slippage by the eddy current clutches and lower efficiency. This led the eddy clutches to require frequent maintenance in order to maintain the wear ring tolerances needed for reliable operation. In addition, each eddy clutch had to be overhauled every three years at a cost of \$4,500. An evaluation performed by an outside vendor showed that of the 19 pumps, the only ones that operated near 70% wire-to-water efficiency were three whose eddy current clutches had recently been overhauled. The rest operated at efficiencies lower than 60% with some operating at efficiencies as low as 47%.

## Project Implementation

The Ontario plant decided to retrofit the majority of their pumps by removing the inefficient eddy current clutches and installing more efficient motors. They removed the clutches and motors on the 8 least

efficient of the 15 pumps with eddy current clutches, and installed high efficiency direct drive motors on them. The new motors were rated to be 4-6% more energy efficient than the existing ones. The plant then retrofitted 6 other pumping systems (2 of which had eddy current clutches) with motors that were similarly rated for greater energy efficiency. Although more technologically sophisticated, the 14 new motors matched up well with the plant's pumping systems and did not require new starters or additional wiring for their installation.

### Project Results

The removal of the eddy current clutches and the installation of more efficient, direct drive pumps has resulted in substantial energy and maintenance savings as well as greater pumping system efficiency. The plant neither has to perform as much routine maintenance on the eddy current clutches nor send several of them to be overhauled each year. Because of this, the plant's maintenance costs have declined by approximately \$14,000 per year. The increased efficiency of the new pumps is projected to save \$57,000 and 475,000 kWh in annual energy savings, lowering the plant's electricity consumption by 10%.



**The IPS Pumping System with 6 New Direct-Drive Pumps**

With a total cost of \$188,000, and a \$15,000 grant from the California Energy Commission, the simple payback is just over 26 months. The project also allowed for increased equipment life of the existing pumps.

## Lessons Learned

Eddy current clutches have been used for speed control in Heating, Ventilation and Air Conditioning (HVAC) systems and pumping systems for many years. In many cases, well-engineered and maintained eddy current clutch applications can save energy by allowing motors to operate at reduced speeds. In the case of IEUA's Ontario, California plant, the plant flows had increased to the point that many of the eddy clutches were operating at 100% speed the majority of the time. This allowed for their replacement with direct coupled, energy efficient motors since they did not need to operate at part load. The implementation of this project led to important energy savings and allowed the plant's pumping systems to operate more efficiently.



## PROJECT PARTNERS

- Inland Empire Utilities Agency  
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- Emerson Motors  
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- Pumping System Analysts  
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### United States Department of Energy's Office of Industrial Technologies BestPractices

BestPractices is part of the OIT's Industries of the Future strategy, which helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together the best-available and emerging technologies and practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

### California Energy Commission

The California Energy Commission is the state's primary energy policy and planning agency. It is the California Energy Commission's mission to assess, advocate, and act through public/private partnerships to improve energy systems that promote a strong economy and a healthy environment.