



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

AUGUST 2001

CASE STUDY

BENEFITS

- Saves \$3,700 in annual electricity costs
- Improves equipment life
- Increases efficiency

APPLICATIONS

Pump systems are widespread and can consume a significant portion of the electricity used in agricultural farms. In some cases, variable speed drives can provide an effective means of matching the pumping capacity to the system requirements, which can improve efficiency and operational reliability.

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.

Vacuum Pump System Optimization Saves Energy at a Dairy Farm

Summary

In 1998, S&S Dairy optimized the vacuum pumping system at their dairy farm in Modesto, California. In an effort to reduce energy costs, S&S Dairy evaluated their vacuum pumping system to determine if efficiency gains and energy savings were possible. The evaluation led S&S Dairy to implement an optimization project that decreased the energy consumption of the vacuum system by replacing an oversized pump and installing a Variable Frequency Drive (VFD) on the new pump that provides vacuum to the milk collection equipment. The project resulted in annual energy savings of \$3,700 and 55,000 kWh, which represents 72% of the electricity used by that pump. With a total cost of \$8,200, and a rebate from the dairy's utility of \$1,455, the simple payback was just 1.6 years. The project also decreased the pump's long-term maintenance costs.



S&S Dairy's 30-hp Vacuum Pump



Company/Plant Background

S&S Dairy is a dairy farm operating in central California and focuses exclusively on milk production. The Modesto farm, built in 1983 near Modesto, California, is a medium sized facility that produces 70-80,000 pounds of milk per day. Once the milk is drawn and put in containers, it is sent to processing plants and creameries, where it is converted into various types of milk (skim, 2%, regular, half and half), dairy creams, yogurt and ice cream. S&S sends its milk to processing plants in California, which then market the milk products throughout the United States.

Project Overview

The S&S Farm uses a vacuum system to draw milk from a tank into containers by using a pump that provides vacuum at a specific pressure to milk collection equipment. Prior to undertaking the project, the dairy vacuum system at S&S's Modesto farm was served by a vacuum pump with a 30-hp motor that operated at full throttle and used 16 kW. With some technical assistance from their utility, S&S examined their vacuum pumping system to determine whether it was operating efficiently. The evaluation determined that the pumping system's motor was oversized for the volume of milk that the farm was processing and that the farm could lower its energy costs with a smaller, more efficient system.

Project Implementation

Using the recommendations provided by the examination, the Modesto farm decided to implement a system-level optimization project on its vacuum pump system. Since the 30-hp motor was almost twice as powerful as needed for the volume of milk being moved, the farm decided to replace it with a new, energy efficient 20-hp motor. In addition, the farm installed a VFD on the new motor to adjust the pumping system speed based on the system load. The dairy could have installed a larger VSD on the existing 30-hp motor, but the system would still have been vastly oversized and the energy

savings would have been less significant.

Project Results

The implementation of the vacuum pump optimization project resulted in energy savings and more efficient production for the S&S's Modesto farm. While the original system drew 16 kW, the new system never uses more than 4.5 kW, even during peak needs. The farm was able to decrease the aggregate horsepower needed by the dairy vacuum system by 10-hp, or 30% of the system's total capacity, without any decrease in output or vacuum pressure. In addition, the VFD was able to change the pump's speed to more precisely match the pump's output capacity to the process flow requirements. The project's implementation has allowed the farm to achieve annual energy savings of \$3,700 and 55,000 kWh, representing 72% of the electricity used by that system. With a total cost of \$8,200 and with a \$1,455 rebate from the dairy's utility, the simple payback was only 1.6 years. The project also reduced long-term maintenance costs and will lead to increased equipment life.

Lessons Learned

Vacuum pumping systems do not need to be overly sized to achieve reliable production. Reconfiguring overly sized pumping systems can result in substantial energy savings. In the case of the S&S dairy, a smaller pump with a VFD was the most energy efficient configuration. Had the farm installed a VFD on the existing motor, it would have had to install a larger, more expensive one, and the energy savings would have been smaller. With the new configuration, the farm was able to minimize the energy consumption of its vacuum pumping system, while maintaining its output level without any decrease in operational reliability.



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and U.S. Department of Energy
present

ENERGY SOLUTIONS FOR CALIFORNIA INDUSTRY

Ways to Improve
Operations and
Profitability

Variable Frequency Drives (VFDs)

While often thought of as a way to improve energy efficiency, Variable Frequency Drives (VFDs), in fact, go far beyond reducing energy consumption. By furnishing more precise control over industrial processes, VFDs can improve product quality. In addition, VFDs can increase equipment life and decrease maintenance costs. VFDs are easily integrated with feedback and control systems, and can eliminate human error, which often undermines other control methods. Finally, VFDs can reduce noise levels.

PROJECT PARTNERS

- S&S Dairy
Modesto, CA
- Turlock Irrigation District
Turlock, CA

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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.