

CASE STUDY: AMMONIA EVAPORATOR VFDs

Electric Savings

Success Story

The penthouse coolers operated at fixed speed, with no automatic temperature before the central control system was installed, typical of many cold storage spaces.

Adding the temperature feedback controls in conjunction with the evaporator VFDs provided the direct savings claimed in the project, but also provided new information to the central plant control system. Using this information, the plant management can maintain visibility on the space temperature, which will provide many benefits in the future, including product quality reliability, and behavioral reminders if outside doors are left open more than necessary.

Improving access to information helps the plant operate more efficiently, but it also allows the soft benefits described here, that provide for small, incremental improvements that provide for better products and better profitability for all managers and employees.

Dairy Plant Improves Refrigeration System Efficiency Using VFDs Installed on Evaporator Fans

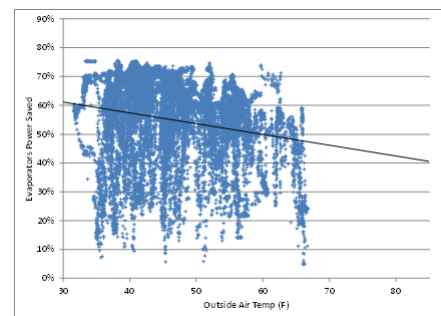
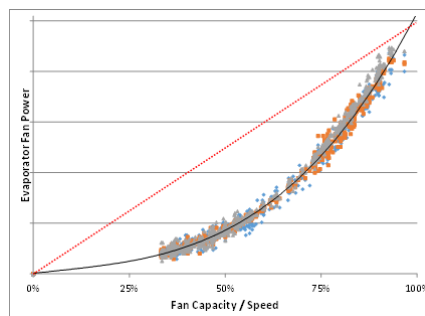
CHALLENGE— Achieving Year-Round Benefits Using VFDs Installed on Penthouse Evaporator Fans

A dairy processing plant, focused on fluid milk pasteurization and bottling, was installing a comprehensive ammonia refrigeration control system and wanted to achieve maximum efficiency of the entire system, including end use loads – evaporators. The selected evaporators were penthouse fans for cold storage (space temperature between 35 and 40 degrees F). Baseline operation included fixed speed operation of the fans with no space temperature feedback.

After measuring system performance, including power logging and equipment reviews of the evaporators, a comprehensive plan was proposed to reduce energy use of the system. Part of the plan included improving the end use efficiency using VFDs installed on the penthouse evaporator fans, totaling over 35 HP.

SOLUTION— System Savings Through Integrated Controls and Evaporator Fan VFDs

The control system was installed, including condenser fan VFDs and condenser pump The control system was installed, including a space temperature feedback, and evaporator fan VFDs. The VFDs were modulated to maintain air circulation, while using the affinity laws governing fan power and heat transfer to save energy at part load. Fan power decreases with the cube of the speed of the fan, while heat transfer decreases nearly linearly with airflow, which is proportional to speed. Because of this relationship, the efficiency of heat transfer improves significantly at part load.



Measurements after installation of the controls showed a significant energy savings, as holding temperature is usually a task for which evaporators are oversized per best ...

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SOLUTION—Continued

practices of design. While savings were observed to decrease as outside temperatures rose, extrapolating the data still shows an expected fan savings of about 40% even at temperatures above 80 degrees, indicating that some level of savings are expected year-round, with temperatures maintained at least as consistently as they are before the project.

RESULTS— Significant System Energy and Cost Savings, Large Utility Incentive Payment to Help Support the Effort

Key Results

Annual Energy Use Reduced by 39% .
System Peak Demand Reduced by 32% .
Annual CO ₂ Emissions Reduced by 743 Tonnes.
Annual Cost Savings of \$ 96,900.
Awarded an electric utility incentive of over \$290,000.
1.0 Year Simple Payback.
Evaporator Fan VFDs account for ~14% of project savings

Key Benefits

Cost Savings	Total annual savings of \$ 13,600.
Energy Savings	Annual Energy Savings of 233 MWh,
Carbon Reductions	Annual Reduction of 104 Tonnes of CO ₂
Fuel Type	Electricity
Payback	1.0 Year Simple Payback, after Incentive

Financial Data

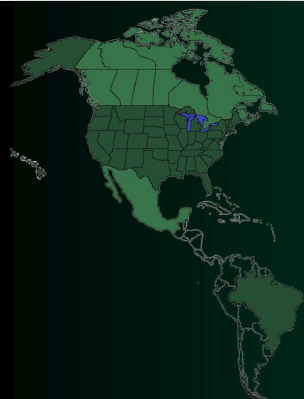
Investment	Development: \$ 17,800 Component of Larger Capital Project
System	PLC Control System, Allen-Bradley VFDs, Touch-Screen Interface, System Commissioning & Personnel Training, Long-Term Monitoring & Central Control System Tie-Ins.

Customer Profile

Headquarters	Springfield, Missouri
Locations	14 Production Locations in 7 States throughout the Midwest.
Number of Employees	Approximately 1,000
Estimated Sales	\$1 Billion
Industry Type	Dairy – Fluid Milk, Juice, & Beverages



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