Case study: Roche Fruit Company, Inc.

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“We definitely benefited. Anytime we have the chance to lower costs in the long run, it’s a good thing. FinAnswer’s a good program, and we were pleased with it.”

Michael Roche,
General Manager
Roche Fruit Company, Inc.

at a glance

Roche Fruit Company, Inc.

Yakima, Washington

Project :
Energy efficiency upgrades for a new 45,000 square foot packed fruit storage facility.

Annual Energy Savings:
$26,900 (721,850 kwh/year)

Percentage savings of projected refrigeration and lighting system use before upgrade:
over 50 percent

Consulting Engineer:
Cascade Energy Engineering, Inc.

Contractors and Control System Supplier:
Central Washington Refrigeration
All-Phase Electric
Techni-Systems

Project Costs:
$148,771 (for energy efficiency upgrades)

Other Benefits:

- Operational improvements due to the computer control system
- Improved space temperature control
- Improved troubleshooting capabilities, alarms
- Availability of data including trend log data to monitor operations
- Improved working conditions due to reduced noise levels
- Extended equipment life for condenser belts and sheaves due to the VFD
- Reduced maintenance costs

Case study:
Roche Fruit Co.

Roche Fruit Company, Inc., located in Yakima, Wash., has been incorporated since 1957. The company stores, packs and markets fresh fruits – primarily apples – for growers throughout Central Washington.

Roche Fruit heard about FinAnswer through its refrigeration contractor, Central Washington Refrigeration, when discussing plans for a new packed fruit storage facility. Roche was interested in the technical services FinAnswer provides and the program's financing capabilities. To complete its planned expansion, Roche would be making significant investments both in up-front construction costs and in long-term energy costs. The company wanted to be sure it minimized both while still achieving product quality goals.

The Project

The project involved upgrades in the design of a new 45,000-square-foot packed fruit storage facility.

The planned ammonia refrigeration system included:

- 100 hp FES 12S compressor
- 200 hp FES 16S compressor
- Evapco ATC-260 condenser
- 10 Aero AMH4-1604-240 evaporator coils

The original plans called for liquid injection oil cooling and standard slide valve capacity control for the two compressors. There was no computer control system in the original plans.

After discussing project plans with Roche, Pacific Power assembled a project team consisting of Roche Fruit's financial and operations experts, and Cascade Energy Engineering, an energy engineering consulting firm specializing in refrigeration. Also on the team were the contractors and suppliers Roche had chosen: Central Washington Refrigeration, All-Phase Electric and Techni-Systems. Cascade Energy Engineering reviewed Roche's plans, simulated the planned system using a sophisticated refrigeration system model, and then modified the model to incorporate energy-efficient upgrades identified by the project team.

The condenser has VFD control, allowing Roche to minimize energy costs at the condenser while still maintaining the lowest possible head pressure, which saves energy at the compressor.

The refrigeration system model incorporated detailed refrigeration load calculations and hourly local weather data. Cascade used sophisticated customized modeling techniques tailored to the project to accurately represent compressor full- and part-load operation at all suction and discharge conditions, liquid injection versus thermosiphon oil cooling, condenser wet-bulb approach type control and evaporator fan speeds as a function of load. Cascade created additional models to accurately represent the bi-level lighting system.

After completing and verifying the modeling work with the project team, Cascade wrote up the results in a study that was presented jointly with Pacific Power. The report detailed specific recommended upgrades and the cost and benefits of each one and included a financial offer from Pacific Power. Roche reviewed the recommendations and made implementation and financing decisions.

The Benefits

In addition to improving energy efficiency and long-term savings, the upgrades provided numerous other benefits.

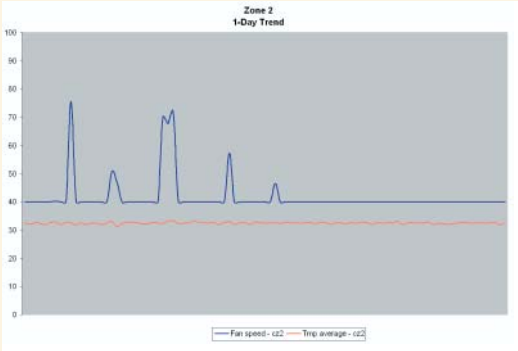
Switching to a computer control system better regulates the storage environment, maintaining fruit quality. It also centralizes important data for the facility, making it easier to monitor and perform troubleshooting.

Using variable frequency drives (VFDs) reduces noise levels in the employee areas, making the work environment more comfortable. VFDs also reduce wear on condenser belts and sheaves since the VFD essentially acts like a soft start, extending equipment life.

Using thermosiphon cooling rather than liquid injection oil cooling reduces head pressure on the condenser, prolonging its life, improving refrigeration operation and lowering maintenance costs.

Energy Efficiency Measures

- **Computer control system:** Provides full control of the refrigeration system components, including compressors, evaporator fan motors, and condenser fan motors to maintain temperature and product quality.



The upper line in this trend log data for a 24-hour period in March shows the percent of speed of the evaporator fan ranges between 40-70 percent most of the time, and the control system maintains space temperature to plus or minus one degree Fahrenheit.

- **Evaporator Fan Variable Frequency Drives (VFDs):** VFDs adjust the speed of evaporator fans up and down to fit system needs rather than running the fans at full speed and cycling them on and off. Because of the cubic relationship between fan speed and fan power, small speed changes result in significant energy savings.

- **Compressor and condenser upgrades:** With liquid injection oil cooling, the minimum condensing pressure is 125 psig. Converting to thermosiphon oil cooling allows the minimum condensing pressure to be reduced to 90 psig. To minimize the increase in condenser fan energy use, VFD control was added to the condenser fan motor.

- **Bi-level lighting:** Automatically reduces the input power for the 400 watt metal halide fixtures from 458 watts (including the ballast) to 220 watts when employees are not present. Uses motion sensors to trigger full lighting. There is less heat load at the lower setting, resulting in lower refrigeration system consumption.

> ***We're in a better position to keep our fruit in proper storage conditions. There's less fluctuation in atmosphere and temperature. That's crucial because requirements for exporting fruit are very stringent. Documentation is required to show less than two degrees of temperature fluctuation.***
>
> **Will Harris,**
> Controller, Roche Fruit Company, Inc.

Richard Wall, Refrigeration Systems Manager, walks among the inventory of boxed apples. When someone is in the facility, occupancy detectors increase the lighting from 50 percent to full light output.

The Savings

Recommendations for the packed fruit storage facility upgrades reduced projected energy use by more than 50 percent or 721,850 kwh per year, a savings of $26,900 each year. With an implementation cost of $148,771, the simple payback period is 5.5 years.

Roche Fruit is pleased with the outcome of this project and another concurrent project completed by its subsidiary company, Jewel Apple Ltd., and has completed subsequent projects with Pacific Power.

About Pacific Power's energy efficiency incentive programs

Pacific Power has helped commercial and industrial customers save money and improve energy efficiency for more than a decade. In Washington, our **Energy FinAnswer®** helps eligible businesses build energy efficiency into new construction and more comprehensive system retrofits. Energy FinAnswer includes investment grade energy engineering assistance and financial incentives for up to 50 percent of the eligible costs of qualifying energy efficiency measures.

In addition to this program, **FinAnswer® Express** helps eligible customers upgrade to energy-efficient lighting, heating and cooling, premium efficiency motors and more. The program includes both technical expertise and financial incentives. Customers can choose a Pacific Power Energy Efficiency Alliance vendor or an independent energy consultant for technical expertise.

Do the bright thing

Washington Customers:

For more information on how Pacific Power can help your facility save energy and money,

- call our Energy Services Hotline at 1-800-222-4335,
- e-mail energy.expert@pacificorp.com, or
- visit our Web site at **pacificpower.net** and click on Business and Save Energy & Money.

Because we have some requirements to qualify for an incentive, it is important to call us **before** you start your project.

Oregon Customers:

For information about similar energy efficiency services, please contact the Energy Trust of Oregon before you start your project. Visit energytrust.org, e-mail info@energytrust.org, or call 1-866-ENTRUST.

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