

## CASE STUDY—VARIABLE SPEED DRIVE • VENTILATION • LIGHTING • MOTOR

### Farm Energy Audit Program (FEAP)

U. S. Dairy Sustainability  
Commitment



#### Quick Facts

- A milk pump variable speed drive can cut electricity usage up to 67 percent.  
*Source: EnSave, Inc.*
- The U.S. Department of Energy estimates that the NEMA Premium motor program can potentially save 5,800 gigawatts of electricity over the next 10 years, preventing the release of nearly 80 million metric tons of CO<sub>2</sub> — the equivalent of keeping 16 million cars off the roads.
- Proper ventilation helps maintain both herd health and profitability, since heat stress causes cows to decrease food intake, which in turn lowers milk production. Cows start to experience heat stress at temperatures above 77 F, or lower if the relative humidity is above 90 percent.

Sources: Virginia State University publication 442-763, [www.ext.vt.edu](http://www.ext.vt.edu); University of Vermont Extension publication BR-869, [www.uvm.edu/extension](http://www.uvm.edu/extension).

- A typical energy audit includes a phone interview and a two-hour farm visit. The farm provides one year's worth of energy-use information prior to the audit and receives a detailed audit report and recommendations in six to eight weeks.

#### Tools and Resources

- Federal incentives may be available through the USDA's Renewable Energy & Energy Efficiency Program (Section 9006 of the Farm Bill), now called the Rural Energy for America Program. Visit [www.rurdev.usda.gov/rbs/farbill/index.html](http://www.rurdev.usda.gov/rbs/farbill/index.html).
- Some audit programs offer reimbursements and energy savings incentives if recommendations are implemented. Check with EnSave for opportunities in your area.

## Energy audit supports sustainability commitment at cost-conscious Maryland dairy

Palmyra Farm in Hagerstown, Md., is a 30-year-old dairy operation producing 2.7 million pounds of milk each year. Owner Ralph Shank wanted to find ways to reduce energy use and save money while emphasizing sustainable farming practices. In December 2007 Shank worked with energy efficiency experts at EnSave, Inc. to complete an energy site assessment as part of its Maryland Farm Energy Audit Program.

Prior to the audit, Shank had already made changes to reduce energy use and utility costs, including installing high-performance compressors for the dairy's milk cooling system. He wanted to find other upgrades and procedures that would fit his budget and his long-range plans.

The assessment included customized energy usage data for heating and cooling, water heating, compressors, lighting, ventilation, variable speed drives, motors, heat exchangers and pumps. The final audit report also provided specific recommendations for energy efficiency upgrades and processes as well as information about resource conservation and renewable energy. Based on these recommendations, Shank made several upgrades throughout his operation, and continues to make energy efficiency a priority whenever equipment upgrades or replacements are needed at the dairy.

#### Best practice: Install a NEMA Premium® motor

Shank installed a new 7.5 horsepower NEMA Premium® motor for the vacuum pump. NEMA Premium is a program of the National Electrical Manufacturer's Association ([www.nema.org](http://www.nema.org)), designed to identify motors that offer high energy efficiency and reliability based on established industry standards.

#### Best practice: Add a milking vacuum pump variable speed drive

A variable speed drive allows the milking vacuum pump motor to run more efficiently based on actual (rather than maximum) vacuum requirements. By making this improvement, Shank gained significant energy savings each year. He saw an immediate savings on his electric bill, and has noticed that the new drive has made it a lot quieter in the milking parlor — making the area more comfortable for both dairy staff and livestock.

#### Best practice: Replace old ventilation fans

Replacing multiple small old ventilation fans with six 52" or 60" high-efficiency fans on timers provided the same cooling effectiveness while reducing the farm's daily energy use and lowering noise levels. Adequate ventilation reduces heat and moisture build-up and is vital for the health of animals and people. Efficient ventilation helps ensure proper temperature maintenance in the barns, which is shown to enable optimum milk production. (See Quick Facts for additional information.)

#### Best practice: Replace old light fixtures

There are many energy-efficient lighting options available. Shank focused on his feed trough area, replacing four T12 fluorescent fixtures and three 175-watt mercury vapor fixtures with four 4' T8 and two 8' T5 fluorescent tube fixtures. All the new fixtures featured electronic ballasts and timers for even greater energy efficiency. The new lights generate more light per watt, run cooler and use less energy. Shank and his staff have noticed that the cows visit the feed trough more regularly than before, and thinks this may be due to the brighter lighting in that area. They are also upgrading small incandescent bulbs to compact fluorescent lamps on an ongoing basis as old bulbs burn out.

## Key Benefits

**Energy savings** — The combination of upgrades at Palmyra Farm has produced energy savings of \$1,670 per year, based on a reduction of 17,954 kWh of electricity use at a cost of \$0.093 per kWh. Implemented measures from the audit also were eligible for an incentive through the Maryland program of up to \$0.06 per kWh saved, to a maximum of \$1,200.\*

**Payback** — The farm will realize a complete payback in 6.8 years. This figure includes energy savings plus incentives from the Maryland Farm Energy Audit Program and the Maryland Agricultural & Resource-Based Industry Development Corporation (MARBIDCO). The audit itself provides Shank with a blueprint for future energy- and money-saving improvements at Palmyra Farm.

**Greenhouse gas (GHG) reduction** — The savings in electricity use from the improvements is equivalent to 29,380 pounds of CO<sub>2</sub> per year. This equals the amount of CO<sub>2</sub> emissions from 1,513 gallons of consumed gasoline. Sources: EPA Power Profiler ([www.epa.gov/cleanenergy/energy-and-you/how-clean.html](http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html)) and EPA Greenhouse Gas Equivalencies Calculator (<http://www.epa.gov/RDEE/energy-resources/calculator.html>).

**Quieter, brighter environment** — The fans and variable speed drive have both reduced noise levels in the barns and milking parlor, while the new lights have made the feeding area brighter, making these areas healthier and more comfortable for people and livestock.

## Energy audit provided roadmap for current upgrades and future planning

### Challenge areas: Balancing costs and energy savings for long-term viability

An overall energy assessment at Palmyra Farm identified several areas where small upgrades would deliver significant energy savings for a relatively low investment. The improvements also help to ensure animal health and support optimum milk production.

### Plant profile: Palmyra Farm

Palmyra Farm is a dairy farm located in Hagerstown, Md., with 140 cows producing 2.7 million pounds of fluid milk annually. Owner Ralph Shank has been farming for 30 years and seeks to continue farming for the next 10 years, and has made long-term sustainability and viability an important concern for his operation. In addition to his energy-reduction initiatives, Shank has committed to sustainable grass and cropland management practices.

### Financial Information

<b>Investment</b>	\$13,827.27
<b>System includes</b>	7.5 horsepower NEMA Premium motor Milking vacuum pump variable speed drive Six circulation fans measuring 52" or 60" Four 4' T8 and two 8' T5 fluorescent fixtures
<b>Offsetting incentives</b>	\$1,077.24 Maryland Farm Energy Audit Program \$1,374.96 MARBIDCO incentive**
<b>Payback period</b>	6.8 years, including incentives and annual energy savings estimated at \$0.093/kWh*

\*Energy cost savings were calculated at the time of project completion, based upon the regional cost of energy for the farm's location. Energy costs may fluctuate over time and by geographic region.

\*\*State and federal incentives will vary by farm.

The Farm Energy Audit Program (FEAP) identifies effective agricultural energy efficiency programs, educates the dairy industry on the benefit of energy audits, and helps dairy producers access resources and incentives to complete an energy audit. FEAP is one of 12 projects identified by the Innovation Center for U.S. Dairy sustainability initiative that aims to help reduce greenhouse gas emissions and increase business value across the dairy industry.

This is one of a series of validated case studies that has been proven to be economically viable for dairy producers. Together, these case studies help identify energy efficiency opportunities and best management methods for improving efficiency and lowering costs. For more information about the program or to join our mailing list, e-mail [innovationcenter@rosedmi.com](mailto:innovationcenter@rosedmi.com).

The Innovation Center for U.S. Dairy aligns the collective resources of the dairy industry to offer consumers nutritious dairy products and ingredients, and promote the health of people, communities, the planet and the industry.