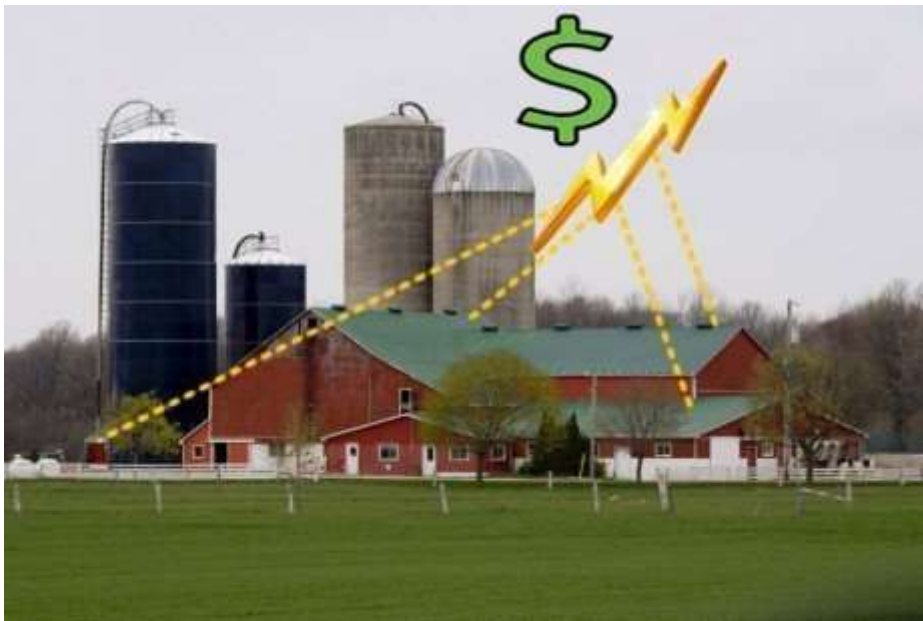




How a Dairy Farmer Can Improve Energy Efficiency

Are you looking for ways to cut your energy bill and stay competitive? If you're a dairy farmer, efficient energy use is critical to keeping your farm competitive in today's environment.

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Keep in mind that not every energy efficiency measure is economically worthwhile on every farm - it is best to have your farm's energy use carefully assessed before making changes. However, this list of measures is applicable to many typical dairy farms in Pennsylvania and beyond.

Some energy conservation measures can end up having negative impacts on a farm by reducing cow productivity or increasing labor or other costs. It is important to be on guard against "false efficiency" from measures that look good on the surface, but cause more problems than they're worth. The list given here focuses on measures that should be able to reduce energy use without affecting farm operations negatively. This list also focuses on the barn and milking operation, and does not consider field operations, which are also a good opportunity for energy conservation.

Use a Variable Speed Drive for the milking vacuum pump

This is probably the most valuable single measure for a dairy farm, resulting in a reduction of vacuum pump energy use of as much as 60% and typical savings of thousands of dollars per year for a medium-sized farm. The Variable Speed Drive (VFD) - sometimes called a Variable Frequency Drive - is installed in the electrical line that leads to the pump, and varies the frequency of the electrical current reaching the pump's motor. This has the effect of reducing the speed of the motor when appropriate, as well as its energy use. Without the VFD, the pump will run at 100% output all the time during the milking cycle. Once the VFD is installed, the pump will run at the lowest possible output that is needed to give adequate vacuum for the milking system. In order for the VFD to work well, you must have the right type of vacuum pump (lobe pumps are ideal), but once it is installed, the VFD results in significant savings with no discernable change in system performance. Costs for VFDs have come down a great deal in recent years, and most farms would stand to benefit a great deal from installing one.



A dairy farm's vacuum pump is one of the best places to look for energy savings.

Add a "pre cooler" to cool the milk

Pre-coolers use cold well water to take some of the heat out of the milk before it enters the refrigeration system - this reduces the amount of heat that the refrigeration system must remove as it cools the milk to its safe storage temperature. As a result, the amount of electricity needed to cool the milk is reduced. If a nearby well is available, a pre-cooler can be a very effective way to cut energy costs.

Recover heat from the milk cooler compressors

The refrigeration system for the milk draws heat out of the milk and dumps that heat - usually to the outdoor air. It is possible, however, to divert that heat to the water in a farm's hot water heater, which reduces the amount of energy needed to heat wash water for the farm. This is a valuable cost saver, but requires a bit of specialized plumbing if your refrigeration system and hot water heater aren't already set up for heat recovery.

Give your vacuum system a "tune up"

Over time, vacuum systems can lose some of their effectiveness if the vacuum setpoint drifts away from optimum or if deposits or wear change its performance. Just like a car or tractor needs a regular tuneup to run efficiently, your vacuum system should be checked on a regular basis to keep it running at peak performance.

Replace ventilation fans with high efficiency models

Not all fans are created equal - in fact, some ventilation fans are much more efficient than others. Cheap fans may have an attractive pricetag, but it pays to check their efficiency to see if they are actually energy hogs that are costing you more in the long run. As a side note, resist the temptation to turn ventilation fans off during warm weather just to save energy. Your cows' comfort is extremely important, and skimping on ventilation can result in lost income due to reduced milk production from heat stressed cows.

Upgrade the lighting

You may think that old fashioned light bulbs aren't costing you much to run, but upgrading to higher efficiency lights can save you a noticeable amount of energy while still providing lots of light to keep your operations safe and easy to use.

Clean the fans

Most people don't realize that dust on your ventilation fans can increase energy use significantly - as much as 10-20%! Keeping the fan blades and guard screens clean is a very easy thing to do that will help reduce energy use and keep more hard-earned money in your pocket. Just make sure that you're being safe - switch off the power to the fan circuit before removing any safety guards.

Replace motors with properly sized, energy efficient models

In general, equipment needs to be the right size and type in order to run effectively and efficiently. This is definitely true in the case of electrical motors. An electrical motor should be large enough to do the job, but no larger. Unfortunately, it's not easy to tell if a motor is properly sized. Direct measurements need to be made of the electrical kilowatts (kw) used by the motor when it is fully loaded. This usually requires the help of a trained electrician with appropriate equipment. Once you know the kw that is used by the motor, you can compare that to the rated kw full load of the motor. For example, if the motor is rated to use 1.0 kw, but it is only using 0.7 kw, the motor is operating at $0.7 / 1.0 = 70\%$ of full load. Oversized motors cost more to install and use more energy. "High efficiency" motors are a good option instead of "standard efficiency" motors, although it is often difficult to find high efficiency motors that are rated for farm duty.



Choosing an efficient ventilation fan can save quite a bit of energy and money - especially if you are using a large number of fans.

Use a Variable Speed Drive for the milk pump

The milk pump, which pumps milk from the receiver to the refrigerated tank, sometimes runs more heavily than it needs. Installing a Variable Speed Drive (VSD) can solve this problem, although it is usually only economical for dairies that milk many hours in the day.



Switch to an energy efficient feed storage and delivery system

Horizontal, bunker silos are economical to build and have proven to use less energy than vertical feed silos. Switching to horizontal storage can reduce your energy costs noticeably. However, this is a controversial measure, because some farmers have experienced increased feed spoilage and waste from horizontal storage systems. Some farmers feel that the loss of feed quality is too great to justify the energy savings from horizontal storage systems.

Saving Money Without Saving Energy

In addition to the above, it may be possible to save money on your energy bills by switching to a lower cost source of energy. Electricity, propane, natural gas, coal, oil, and wood are all sources of energy that can vary in cost quite a bit. Depending on your farm's operations, it might be worth your while to switch to a lower cost energy source. For example, electricity is often the most expensive fuel for heating

water, and switching to a less expensive fuel (i.e. natural gas) can be a real cost saver. Penn State Extension's Energy Selector Tool can help you compare different energy types, to determine whether or not switching fuels would save you money.

Conclusions

If you aren't already using many of these Energy Conservation Measures on your farm, it would be worth your while to sort out which ones would work and be economical for your operation. It is unlikely that every one of these measures will make sense for your farm, but chances are that several of them could be used to reduce your energy consumption and save you on your monthly bill.

Prepared by Daniel Ciolkosz, Penn State Department of Agricultural and Biological Engineering.

Reviewed by Sarah Dinh and Dan McFarland, Penn State Extension