

Wineries are energy- and water-intensive businesses that can greatly benefit from conservation strategies. “Uncorking” savings can help boost your bottom line and help your winery attain a greener and more environmentally responsible image. These actions can be even more cost-effective in cases where utility incentives also apply.

How Wineries Use Water and Energy

The wine-making process involves harvesting, stemming, and crushing grapes; pressing and fermenting the juice; aging the new wine; and finally bottling and corking the finished product. Although the exact process followed and equipment used vary widely among wineries, most electricity generally goes toward refrigeration for fermentation cooling, cold stabilization, and cold storage. Other uses of electricity include compressed air, water heating, pumping, bottling, and lighting (**Figure 1**). Natural gas is also widely used for water heating.

Wineries also consume large amounts of water after the grapes leave the vineyard. Most of this water goes toward cleaning

the equipment, though it’s also used for cellar humidification and in other nonproduction areas.

First Steps

To begin harvesting energy savings, the first step is to perform an energy and water audit. This generally entails taking a look at existing equipment and systems, and measuring actual energy or water consumption, to verify that they are working as intended and to identify areas for improvement. Audits typically result in a list of straightforward and cost-effective measures that can conserve resources and improve system performance, and they provide baseline data that can be used to assess the effectiveness of larger improvements. Your utility can help you learn more about performing an audit, and it may offer an audit service free of charge.

Reduce Energy Consumption

There are a number of systems that offer substantial potential for energy savings in wineries, including refrigeration, compressed air, motors, and corking equipment.

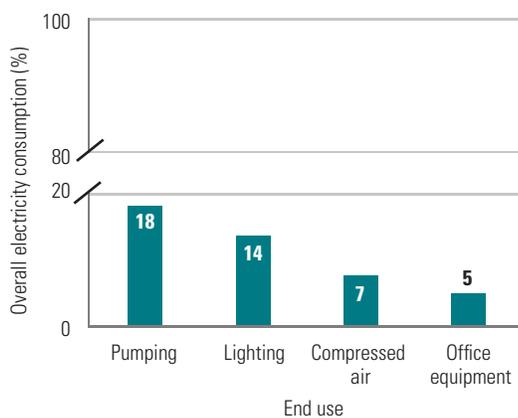
Refrigeration and Cooling

Because refrigeration and cooling generally use the most electricity in wineries, they are great areas for efficiency improvements.

Tank insulation. Making sure that storage tanks used for fermenting and aging wine are well insulated is an easy and effective way to reduce energy consumption. Multiple types of insulation exist, including spray-on (for large applications), foil-covered bubble wrap, and rigid foam. Though exact savings will vary depending on the specific tank and insulation used, this measure should generally reduce refrigeration energy use by about 25 percent.

Nighttime air cooling. Bringing in low-temperature outside air during the night to provide cooling can reduce electricity

FIGURE 1: Non-refrigeration electrical end uses in wineries
Although refrigeration generally represents the largest single source of electricity consumption in wineries, other applications can consume significant amounts of energy as well.



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consumption and lower peak power use during the day in such places as warehouses, offices, and cold stabilization areas where outside-air circulation is not already required. Savings can easily add up to about 20 percent of overall cooling energy.

Air infiltration through doors. By employing air-sealing and ensuring that doors are properly closed whenever possible, you can save as much as 15 percent of your total refrigeration energy consumption.

Optimize setpoints. A 1° Fahrenheit (F) increase in evaporating temperature, or a 1°F decrease in condensing temperature, can reduce energy consumption by 1 to 2 percent. Evaporation temperatures, in particular, are often set lower than necessary.

Electrodialysis. Tartrates are small crystals that form when tartaric acid mixes with potassium in the wine at low temperatures. Although these crystals are tasteless and odorless, they are often considered to be unsightly and are frequently removed from wine using a process called cold stabilization, which requires wine to be chilled and then reheated. However, a process called electrodialysis (which uses membranes in conjunction with an electric current) can reduce energy consumption by nearly 90 percent compared to cold stabilization because the need for freezing and reheating is effectively eliminated. Because membrane replacement can be potentially costly, check with a manufacturer first to ensure that this measure will be economical for your particular winery.

Properly sequence compressors. Compressors operate most efficiently at full load. In a system with multiple compressors, the most efficient operation occurs when you sequence compressors based on their loads and respective efficiencies, and ensure that only one compressor operates at part-load.

Install destratification fans in cellars. Destratification ceiling fans can help to maintain a consistent air temperature throughout a cellar, resulting in lower cooling requirements.

Cave storage. Storing barrels of wine in caves, rather than in above-ground buildings, can be an effective way to save energy while ensuring that temperatures and humidity levels remain at ideal levels on a continual basis. Payback periods vary, but

digging new caves to correspond to increases in capacity can be particularly cost-effective.

Compressed Air

Although compressed air is often viewed essentially as a free resource, these systems account for nearly 10 percent of overall electricity consumption in a winery and are often poorly designed or maintained.

Match your supply to your load. Generate compressed air at the pressure required—halving pressure can result in energy savings of more than 50 percent. Additionally, sequence your machines to ensure that when the demand is at less than full capacity, one or more compressors are entirely shut off (instead of having several operating inefficiently at part load).

Check for leaks. Leaks are a major source of energy loss and can effectively double the cost of compressed air. Because leaks also result in lower pressure at the end point, they can cause operators to set pressure levels higher than would otherwise be necessary. A leak detector can provide long-lasting benefits and can pay for itself in less than six months.

Switch off compressors. Turn compressors off when production is down, and consider making piping changes so that supply to production areas can be shut off when there's no need for compressed air.

Review operations. Look for areas where an alternative technology could replace compressed-air use.

Motors

Motors are widely used in fan and pumping applications and are a good target for efficiency improvements. Pumping systems in particular can account for 10 to 25 percent of electricity consumption in wineries, and simple changes have potential for significant energy savings.

Variable-frequency drives (VFDs). VFDs match motor output to real-time load and can result in savings as high as 45 percent, depending on the application. They can also improve power factor, potentially resulting in fewer utility surcharges.



Use multiple pumps. In many cases, using multiple pumps can be a cost-effective and efficient way to handle varying loads. This measure can save anywhere from 10 to 50 percent of energy used for pumping.

Downsize your motors. Motors are often more powerful than necessary, producing needlessly high energy consumption and peak power draw. If possible, consider replacing such motors with smaller units.

Upgrade to high-efficiency motors. When considering whether to repair or replace aging motors, keep in mind that new, more-efficient units can save significant amounts of energy and yield short simple payback periods.

Lighting

In many wineries, lighting accounts for 8 to 20 percent of electricity consumption. Improving the efficiency of your lighting systems can be a straightforward and inexpensive way to save energy.

Fluorescent lamps. If your facility uses T12 fluorescent lamps, relamping with modern T8 lamps and electronic ballasts can reduce your lighting energy consumption by 35 percent or more. Adding specular reflectors and new lenses can increase these savings and yield short simple payback periods. Also, new federal regulations set for July 2012 will severely limit the availability of T12 lamps.

Install occupancy sensors. Areas that are not consistently occupied, such as storage rooms, restrooms, back offices, and walk-in refrigerators, are ideal places for occupancy sensors. They can save 30 to 75 percent in lighting energy consumption and typically yield simple payback periods of one to three years.

HVAC

As in all buildings, HVAC systems represent a consistent source of energy consumption and can be adjusted to operate more efficiently.

Change HVAC settings. During closed hours, turn temperature settings down in heating seasons and up in cooling seasons. You can automate these settings with programmable thermostats.

Additionally, make sure that HVAC settings in stockrooms, offices, and other peripheral spaces are at minimum settings to maintain comfort while saving energy.

Maintain your HVAC system. Making sure that your HVAC system is regularly cleaned and serviced can help prevent costly heating and cooling bills. If your system uses an economizer, have a licensed technician check, clean, calibrate, and lubricate it about once a year, as economizer failure can increase heating and cooling costs by up to 50 percent.

Packaging

Packaging comprises everything from bottle-filling to palletizing and can be a major source of energy consumption in wineries. As a result, the implementation of efficiency measures related to packaging can be a great way to cut costs and conserve resources.

Use heat recovery. To help ensure that labels stick, wine bottles are often heated to about 50°F. Adding a heat-recovery system can help drastically reduce the energy used for this purpose while also reducing water consumption and maintenance costs.

Run conveyors only when necessary. Conveyors are widely used in bottling and palletizing and may run even when not fully loaded. This simple step can save money by reducing energy consumption and demand while also conserving lubricants and water. Although this can be done manually, automation controls can make it easier.

Conserve Water

Reducing water consumption is another great way to lower utility bills, especially because hot water use also significantly increases energy consumption.

General

Some of the most basic water-conservation measures are also the most cost-effective to implement.

Create a water-management plan. According to the California Sustainable Winegrowing Alliance, wineries that have implemented a comprehensive water-conservation program, monitored and recorded total use, set yearly goals, and set up

a water team have generally achieved water savings of 10 to 15 percent.

Find and repair leaks. Leaks can occur any place where water is used and may add up to considerable water waste. Establishing an ongoing effort to detect and repair leaks can yield significant savings at low cost.

Cleaning

Keeping equipment clean is an essential part of running a winery, but one that can consume lots of water. By making simple changes to your cleaning procedures, you can save water and money in nearly every aspect of the wine-making process.

Sweep floors. As much as 20 percent of the water used to wash floors can be saved by simply sweeping away solid debris first.

Use high-pressure nozzles. By providing more-effective and focused cleaning, high-pressure nozzles can reduce water consumption by up to 40 percent compared to standard washing options, making them highly economical.

Cooling Towers

Cooling towers are used to remove heat from chilled-water HVAC systems and can consume large amounts of water. In addition to the water lost from evaporation, additional water is lost through bleed-off, in which a portion of the circulating water is discharged from the system to remove solids that have built up over time.

Upgrade the water-treatment system. By upgrading the water-treatment system, you can reduce the number of times that bleed-off is needed each day, yielding large savings from reduced water consumption, chemical consumption (for water

treatment), labor costs for maintenance, and the energy savings that result from cleaner heat-transfer surfaces. Upgrades may include the installation of automatic controls (to monitor water pH levels and the concentration of dissolved solids, and to add chemicals or bleed-off water as appropriate), make-up and blow-down submeters, sidestream filtration, ozonation, and high-bonding chemical or physical treatment. Though the actual savings from upgrades will depend on the individual cooling-tower system, payback periods can be as short as six months, according to the Saving Water Partnership, a group of Oregon utilities that promote water conservation.

The Bottom Line

All of the measures discussed above represent good investments. Not only will they save you money, but they can also help your winery establish a greener image that can lead to improved sales.

Resources

Benchmarking and Energy and Water Efficiency Savings Tool (BEST) for the Wine Industry, <http://best-winery.lbl.gov/>. This collaboration between Lawrence Berkeley National Laboratory and the California Energy Commission can help wineries identify a number of energy- and water-saving measures that will be particularly effective.

“Comprehensive Guide to Sustainable Management of Winery Water and Associated Energy,” www.wineinstitute.org/winerywaterguide. This guide provides extensive information on water- and energy-saving measures and includes worksheets to help wineries benchmark and monitor water and energy use.

