Winerywise

WASHINGTON GUIDE TO SUSTAINABLE WINERY PRACTICES

ENERGY EFFICIENCY

WHAT DO I NEED TO KNOW ABOUT ENERGY EFFICIENCY IN MY WINERY?

CHECKLIST OF QUESTIONS TO ANSWER

1.0 ESTABLISHING AN ENERGY MANAGEMENT PROGRAM

1.1 Do you have a plan to achieve successful energy management at your winery?

- Do you have executive level commitment to a successful energy management program?
- Have you assigned an in house energy manager to oversee management of energy at your winery?
- Have you developed an in house energy management program?
- Have you established Standard Operating Procedures to guide energy use and management?
- Do you track costs and benefits of energy management?
- Do you strategically plan and set annual goals to improve energy management?
- Have you developed an inherent system for continuous improvement of energy management?

1.2 Are you using programs to optimize energy efficiency and control consumption?

- Do you utilize local utilities to assist in energy audits and obtain tax incentive credits and rebates?
- Have you established baselines using appropriate measures of performance for each system?
- Have you quantified current energy uses and losses?
- Do you shift electric consumption into less expensive off-peak times?
- Have you evaluated using alternative and/or renewable energy like wind, solar, biofules, others?
- Do you incorporate carbon footprint information in all energy management evaluations?

2.0 AUDITING ENERGY USE AND DETERMINING CONSUMPTION INFORMATION

2.1 What sources of energy does my winery use?

- Do you use power from an electrical power grid?
- Do you use onsite nonrenewable fuels-natural gas, fuel oil, petroleum, distilled alcohol, etc.?
- Do you use renewable power -hydroelectric, solar, wind, biofuel, geothermal, etc.?

2.2 What is the quality of the electrical power we use?

- Do you know the impact of your electrical power on the voltage tolerances of your equipment?
- Do you know the fluctuations associated with your electrical power?
- Do you know the reliability of your electrical power?
- Do you know the carbon footprint of your electrical power?

2.3 How much energy does my winery consume?

- How much of each energy source does my winery use?
- How much of each energy source does my winery use for each operation?
- How does my winery's energy needs vary over time?
- How much energy is used for each gallon of wine produced?
- How does my winery's energy use compare to industry standards?
- What percentage of energy sources used is carbon neutral or has lower environmental impact?
- Is the current utility fee schedule optimized for my current usage profile?

3.0 ENERGY EFFICIENCY AND CONSERVATION PROGRAMS FOR ALL OPERATIONS

3.1 What are the energy impacts of the packaging we use?

- Do you use reduced weight glass?
- Do you use reduced weight cardboard, labels, capsules, print?
- Do you utilize alternative containers which are lighter or use less energy to produce?
- Do you re-use glass?
- Do you track CO2 equivalents and employ offset practices?

3.2 What is the impact of energy used for transportation?

- Have you optimized process flow to reduce unnecessary or redundant steps?
- Do you schedule shipping to optimize efficient use of transport vessels?
- Do you schedule purchasing to optimize transportation energy?
- Do you use alternatives to traditional fossil fuel road transport; i.e. rail, electric, hybrids?
- Do you encourage company and employee ride share and carpools?
- Do you utilize truly carbon neutral bio-fuels?
- Do you source materials locally and sell products locally whenever possible?
- Do you use energy efficient vehicles in the winery?

3.3 What have we done to optimize our refrigeration and cooling efficiencies?

- Have you replaced Shaded Pole and Permanent Split-Capacitor (PSC) motors with Electronically Commutated (EC) motors? 
- Have you optimized suction pressure to reduce compressor power and save energy? 
- Dou you variably adjust condenser set-point temperatures to optimize compressor pressure difference for varying ambient temperatures? 
- Have you installed a thermo-siphon oil cooler to replace liquid injection oil cooling? 
- Have you increased System Piping Diameter? 
- Do you purge non-condensable gases? 

- Have you reduced excess heat gain from: interior lights (replace with LED), inadequate defrosting, inadequate insulation, excessive air exchange, worn weather stripping, etc.?
- Do you clean coils at recommended levels?
- Do you perform cooling tower water treatment at regular intervals?
- Have you replaced air cooled condensers with evaporative condensers?
- Have you employed oversize condensers where possible?
- Do you utilize heat recovery from refrigeration processes when possible?
- Have you insulated refrigeration lines?
- Have you installed thermal ice storage systems?
- Have you insulated jacketed and non-jacketed tanks?
- Do you optimize tank volumes?
- Do you utilize electro dialysis for tartrate removal?
- Do you use R-404 or 507 ammonia refrigerants?
- Do you utilize high efficiency heat exchangers?
- Have you installed variable speed controls on condenser and evaporator fans?
- Do you use cycle evaporators and condenser fans?
- Have you installed computer controls for optimal compressor efficiency?
- Do you optimize defrost control?
- Do you utilize absorption refrigerator systems which use a heat source to achieve cooling?

3.4 Are we using the most efficient lighting sources and controls available?

- Have you established necessary light levels for specific areas when used and unused?
- Have you reduced lighting levels where appropriate?
- Do you utilize lighting controls (time clocks, by-pass/delay timers, photocells, motion detectors)?
- Do you make use of natural lighting (i.e Daylighting - use of windows and skylights)?
- Have you replaced HID fixtures with T5 or T8 fluorescent high bay fixtures?
- Have you installed T5 or T8 fluorescent fixtures with electronic ballasts in office, lab, and common areas?
- Have you installed compact fluorescent fixtures in bathroom and common areas?
- Have you installed LED exit signs?
- Have you replaced Compact fluorescent fixtures with LED white light fixtures or convert fluorescence fixtures to LED?
- Do you clean lighting fixtures once a year?
- Have you eliminated unused ballasts and remove burned out lamps to avoid ballast damage?

3.5 Are we utilizing programs to maintain and operate all motors, belts, drives, fans, pumps and compressors for optimum energy efficiency?

- Have you installed properly sized premium efficiency motors?
- Do you utilize directly coupled drive systems rather than mechanical drive?
- Do you utilize high torque or synchronous drive V-belts or cogged belts?
- Have you installed timers and sensor controls to turn off during idle time?

- Do you use an A System Approach for most efficient pump energy reduction?
- Have you installed properly sized energy efficient pumps and fans?
- Have you installed solid state variable speed drives on pumps and fans? (see page 7 for more information)
- Have you replaced tower fill material with cellular film?
- Have you installed energy efficient spray nozzles, airfoil fans, and motors on tower fans and pumps?
- Have you installed 2 speed energy efficient motors on condenser fans?
- Do you utilize floating head pressure control?
- Do you utilize floating suction pressure control?
- Have you replaced reciprocating compressors with properly sized screw compressors?
- Do you use PLC controlled equipment using external control of compressor cylinder loading and unloading?
- Have you installed automatic compressor sequencing controls and shut off timers?
- Do you perform regular preventative maintenance?

3.6 Do we manage our water practices to optimize associated energy needs?

- Do you utilize high efficiency boilers?
- Have you installed stack thermometer and boiler make up water meter?
- Have you installed time clocks on boilers and aerators?
- Do you perform recommended maintenance on boilers and aerators?
- Do you employ time-of-use rates when possible?
- Do you perform regular combustion analysis on boilers (air/fuel mixture)?
- Do you do water test and treatment at recommended intervals?
- Have you insulated hot water and steam lines?
- Do you use heat recovery off of stacks to preheat in-take water?
- Do you use full modulating burners (varies burner based on demand)?
- Do you base boiler blow down on the amount of total dissolved solids?
- Have you installed proper steam traps, condensate storage tanks and pressurized return systems?
- Do you match steam load to boiler output?
- Do you use automatic pump shutoff on low/no demand?
- Do you have affective pre-screening of fluids into ponds?
- Have you installed premium efficiency motors?
- Have you installed variable speed motors to vary speed based on demand?
- Have you installed dissolved oxygen sensors in ponds?
- Have you installed fine bubble diffusion aerators?

3.7 Have we optimized our building design for most efficient energy management?

- Does layout of winery processes make use of gravity flow?
- Does layout of equipment lend to most efficient processes flow?
- Have you optimized insulation on building and tanks?
- Do you utilize night air cooling?
- Do you utilize solar screens to reduce heat gain?

- Do you utilize daylight / skylight where possible?
- Have you installed strip curtains on conditioned buildings with high traffic?
- Do you use energy efficient timers and sensors for HVAC?

4.0 CARBON FOOTPRINTING AND CARBON OFFSETS

- Have you established an inherent system to continuously improve material handling?
- What opportunities are available to improve material handling and pollution prevention practices?
- Does my winery perform periodic audits and reviews of materials handling procedures?
- Does my winery sponsor a team of operating personnel to review and suggest improvements?

5.0 EMPLOYEE TRAINING AND ENERGY MANAGEMENT EDUCATION

5.1 Does my winery educate and train employees in the use of energy efficient practices?

- Do employees receive training in energy and water conservation?
- Have you assigned an energy manager and energy leadership team?
- Have you developed standard operating procedures for energy management?

5.2 Do we notify employees and customers of company energy programs and accomplishments?

- Do you inform employees and costumers about efforts to improve energy practices and carbon footprint?
- Do you provide a forum for employee input to the energy management plan and SOP's?

5.3 Does my winery have an employee incentive program?

- Do you have incentive and recognition programs for achievement of energy efficiency goals?

6.0 IMPROVING THE FACILITY ENERGY MANAGEMENT PROGRAM

- Does my winery have a protocol for evaluating, auditing, and monitoring energy results?
- Does commitment to improve energy efficiency remain strong from executive through all levels?
- Is a continuous improvement system embedded in your energy management program?
- What energy management practices are being evaluated for improvements in the coming year?

(The following is additional information from page 4, question 3.5 - Have you installed solid state variable speed drives on pumps and fans?)

Look for symptoms associated with inefficient energy consumption:
- Throttle-valve control for the system
- Cavitation noise or damage in the system
- Continuous pump operation to support a batch process
- Constant number of parallel pumps supporting a process with changing demands
- Bypass or recirculation line normally open
- High system maintenance
- Systems that have undergone change in function.

Pumping System Assessment Tool (PSAT) Saves Energy
The Pumping System Assessment Tool (PSAT) software uses data that is typically available or easily obtained in the field (e.g., pump head, flow rate, and motor power) to estimate potential energy and dollar savings in industrial pump systems. The software, developed by the U.S. Department of Energy (DOE) Industrial Technologies Program (ITP) is available at no cost for evaluating industrial pump systems.

Smoothing the outer front and back shroud of the impeller can be a cost-efficient procedure to improve pump efficiency and reduce the clearance of the sealing gaps to the smallest possible value in order to increase the volumetric efficiency. From investigations based on statistically evaluated data it is known, that the largest potential regarding an improvement of efficiency exists at low specific speeds.

Various conditions that decrease the efficiency of your pump should be checked for and corrected. These include:
1. Packing generates approximately six times as much heat as a balanced mechanical seal. Carbon film, polymeric composite, or Ultrananocrystalline-Diamond (UNCD) mechanical seals demonstrate generally higher efficiencies.
2. Wear rings and impeller clearances are critical. Anything that causes these tolerances to open will cause internal recirculation that is wasting power as the fluid is returned to the suction of the pump. If the wear ring is rubbing, the generated heat is consuming power.
3. A bypass line installed from the discharge side of the pump to the suction piping. The heat generated from this recirculation can, in some cases, cause pump cavitation as it heats the incoming liquid.
4. A double volute design pump restricts the discharge passage lowering the overall efficiency.
5. Running the pump with a throttled discharge valve.
6. Eroded or corroded internal pump passages will cause fluid turbulence.
7. Any restrictions in the pump or piping passages such as product build up, a foreign object, or a stuck check valve.
8. Over lubricated or over loaded bearings.
9. Rubbing is a major cause of energy loss. It can be caused by:

- Misalignment between the pump and driver.
- Pipe strain.
- Impeller imbalance.
- A bent shaft.
- A close fitting bushing.
- Loose hardware.
- A protruding gasket rubbing against the mechanical seal.
- Cavitation. (5 kinds)
- Harmonic vibration.
- Improper assembly of the bearings, seal, wear rings, packing, lip seals etc..
- Thermal expansion of various components in high temperature applications. The impeller can hit the volute, the wear rings can come into physical contact etc.
- Solids rubbing against the rotating components, especially the seal.
- Operating too far off of the best efficiency point of the pump.
- Water hammer and pressure surges.
- Operating at a critical speed.
- Dynamic, non o-ring elastomers that cannot flex and roll, but must slide, eventually fretting the shaft or sleeve.
- A build up of product on the inside of the stuffing box rubbing against the mechanical seal.
- Grease or lip seals rubbing the shaft next to the bearings.
- Over tightening packing or improper seal installation.

RESOURCES:

Washington State Department of Ecology
Bonneville Power Administration
Pacific Power
Benton REA
Benton PUD
Kennedy/Jenks Consultants
Consortium for Energy Efficiency, Inc.
Department of Energy
The World Resources Institute GHG protocol
The Wine Institute wine green house gas protocol
Environmental Protection Agency
The Wine Institute winery water guide
Leopold Center for Sustainable Ag
LIVE
Energy Industries
BioEnergy Washington
Best Winery
Carbon Reduction Challenge
Winemakers Federation of Australia
American Association of Wine Economists
Integrated Production of Wines in South Africa
Integrated Renewable Energy

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