ENERGY EFFICIENCIES

Compiled by: Solarponics, Inc. (805) 466-5595 www.solarponics.com

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

CHECKLIST OF QUESTIONS TO ANSWER

AUDITING ENERGY USE AND DETERMINING CONSUMPTION INFORMATION

- What sources of energy does my winery use?
    1. electrical power grid
    2. onsite nonrenewable fuels: natural gas, fuel oil, petroleum, distilled alcohol, etc.
    3. renewable: hydroelectric, solar, wind, biofuel, geothermal, etc.
- What is the quality of the electrical power we use, its impact on voltage tolerances of equipment?
- What percentage of energy sources used is carbon neutral with lower environmental impact?
- Is the current utility fee schedule optimized for my current usage profile?
- 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?

ENERGY EFFICIENCY AND CONSERVATION PROGRAMS

- Are we utilizing programs to optimize energy efficiency and control consumption?
    1. assign an in house energy manager
    2. develop an in house energy management program
    3. establish baselines using appropriate measures of performance for each system and quantify current energy uses and losses
    4. set annual energy reduction goals
    5. utilize local utilities to assist in energy audits and obtain tax incentive credits and rebates

- What are we doing to reduce and offset GHG emissions associated with the package we use?
    1. reduced weight glass
    2. reduced other packaging weight - cardboard, labels, capsules, print
    3. utilizing alternative containers
    4. CO_2 equivalents offset practices

- Do we plan strategically to reduce fuels used for transportation?
    1. optimize process flow to reduce unnecessary or redundant steps
    2. schedule shipping to optimize efficient use of transport vessels
    3. schedule purchasing to optimize transportation energy
    4. use alternative to traditional fossil fuel road transport; i.e. rail, electric, hybrids
    5. encourage company and employee ride share and carpools
    6. utilize truly carbon neutral bio-fuels

- What have we done to optimize our refrigeration efficiencies?
    1. replace Shaded Pole and Permanent Split-Capacitor (PSC) motors with Electronically Commutated (EC) motors
    2. optimize suction pressure to reduce compressor power and save energy
    3. variably adjust condenser set-point temperatures to optimize compressor pressure difference for varying ambient temperatures
    4. install a thermosyphon oil cooler to replace liquid injection oil cooling
    5. increase System Piping Diameter
    6. purge non-condensable gases
    7. reduced excess heat gain from: interior lights (replace with LED), inadequate defrosting, inadequate insulation, excessive air exchange, worn weather stripping, etc.
    8. clean coils at recommended levels
    9. perform cooling tower water treatment at regular intervals
    10. shift electric consumption into less expensive Off-Peak times
    11. replace air cooled condensers with evaporative condensers
    12. oversize condensers where possible
    13. utilize heat recovery from refrigeration processes when possible

14. insulate refrigeration lines
15. install a thermal ice storage systems
16. insulate jacketed and non-jacketed tanks
17. optimize tank volumes
18. utilize electro dialysis for tartrate removal
19. use R-404 or 507 ammonia refrigerants
20. utilize high efficiency heat exchangers
21. install variable speed control on condenser and evaporator fans
22. cycle evaporator and condenser fans
23. install computer controls for optimal compressor efficiency
24. optimize defrost control
25. utilize absorption refrigerator systems which use a heat source to achieve cooling

- Are we using the most efficient lighting sources and controls available?
    1. replace HID fixtures with T5 or T8 fluorescent high bay fixtures
    2. install T5 or T8 fluorescent fixtures with electronic ballasts in office, lab, and common areas
    3. install compact fluorescent fixtures in bathroom and common areas
    4. install LED exit signs
    5. replace Compact fluorescent fixtures with LED white light fixtures or convert fluorescence fixtures to LED
    6. utilize lighting controls such as time clocks, by-pass/delay timers, photocells, and motion detectors
    7. clean lighting fixtures once a year
    8. eliminate unused ballasts and remove burned out lamps to avoid ballast damage
    9. reduce lighting levels where appropriate
    10. natural lighting (i.e Daylighting - use of windows and skylights)

- Are we utilizing programs to maintain and operate all motors, belts, drives, fans, pumps and compressors for optimum energy efficiency?
    1. install properly sized premium efficiency motors
    2. utilize directly coupled drive systems rather than mechanical drive
    3. utilize high torque or synchronous drive V-belts or cogged belts
    4. install timers and sensor controls to turn off during idle time
    5. use an A System Approach for most efficient pump energy reduction
    6. install properly sized energy efficient pumps and fans
    7. install solid state variable speed drives on pumps and fans
    8. replace tower fill material with cellular film
    9. install energy efficient spray nozzles, airfoil fans, and motors on tower fans and pumps
    10. install 2 speed energy efficient motors on condenser fans
    11. utilize floating head pressure control
    12. utilize floating suction pressure control
    13. replace reciprocating compressors with properly sized screw compressors
    14. PLC controlled equipment using external control of compressor cylinder loading and unloading
    15. install automatic compressor sequencing controls and shut off timers
    16. perform regular preventative maintenance

- Do we manage our water practices to reduce associated energy needs?
    1. utilize high efficiency boilers
    2. install stack thermometer and boiler make up water meter
    3. install time clocks on boilers and aerators
    4. perform recommended maintenance on boilers and aerators
    5. employ time-of-use rates when possible
    6. perform regular combustion analysis on boilers (air/fuel mixture)
    7. water test and treatment at recommended intervals
    8. insulate hot water and steam lines
    9. heat recovery off of stacks to preheat in-take water
    10. full modulating burners (varies burner based on demand)
    11. base boiler blow down on the amount of total dissolved solids
    12. install proper steam traps, condensate storage tanks and pressurized return systems
    13. match steam load to boiler output
    14. automatic pump shutoff on low/no demand
    15. affective pre-screening of fluids into ponds
    16. install premium efficiency motors
    17. install variable speed motors to vary speed based on demand
    18. install dissolved oxygen sensors in ponds

19. install fine bubble diffusion aerators

- What have we done to optimize our building envelope?
    1. optimize insulation on building and tanks
    2. utilize night air cooling
    3. utilize solar screens to reduce heat gain
    4. install strip curtains on conditioned buildings with high traffic
    5. energy efficient timers and sensors for HVAC

- What have we done to optimize our process flow and building efficiency design?
    1. gravity feed instead of pump
    2. efficient equipment layout

- Are we using any forms of alternative and/or renewable energy?
    1. solar
    2. wind
    3. bio-fuels
    4. other

CARBON FOOTPRINTING AND CARBON OFFSETS

- What is my winery's carbon footprint?
    1. Quantify carbon footprint of all production components
    2. WRI based green house gas protocol – International Wine Carbon Calculator
    3. LIVE closure CO2 calculator and energy use summary

- Do we utilize any carbon sequestering practices?
    1. grape marc composting
    2. vineyards

- Do we employ any carbon offsets or credits?
    1. bio-mass conversion to heat or fuels

ENERGY EFFICIENT PRACTICES AND EMPLOYEE TRAINING

- Does my winery educate and train employees in the use of energy efficient practices?
    1. employees receive training in energy and water conservation
    2. assigned an energy manager and team

- Do we notify employees of company energy programs and accomplishments?
    1. inform employees and costumers about efforts to improve efficiencies

- Does my winery have an employee incentive program?
    1. incentive and recognition programs for achievement of energy efficiency goals

ESTABLISHING AN INHERENT SYSTEM TO CONTINUOUSLY IMPROVE ENERGY EFFICIENCY

- Do we have commitment from executive through all levels to improve energy efficiency?
- Is a continuous improvement system imbedded in your energy management program?

RESOUCES:

Solarponics Energy Systems http://www.solarponics.com/wineries
Washington State Department of Ecology http://www.ecy.wa.gov/tree/index.html
Best Winery http//best-winery.lbl.gov/
Bonneville Power Administration http://www.bpa.gov/corporate/
Pacific Power http://www.pacificpower.net/Homepage/Homepage35750.html
Benton REA http://www.bentonrea.com/
Benton PUD http://www.bentonpud.org/
Consortium for Energy Efficiency, Inc. http://www.cee1.org/
Department of Energy http://www.eere.energy.gov/
The World Resources Institute GHG protocol http://www.wri.org/project/ghg-protocol
The Wine Institute wine green house gas protocol http://www.wineinstitute.org/ghgprotocol
Winemakers Federation of Australia http://www.wfa.org.au/environment.htm
Environmental Protection Agency http://www.epa.gov/smartway/
The Wine Institute winery water guide http://www.wineinstitute.org/winerywaterguide
Food Miles Calculator http://www.leopold.iastate.edu/pubs/staff/files/food_travel072103.pdf

American Association of Wine Economists http://www.wine-economics.org/workingpapers/AAWE_WP09.pdf
Integrated Production of Wines in South Africa http://www.ipw.co.za/
LIVE http://www.liveinc.org/wineries.html
Energy Industries http://www.energy-industries.com
Integrated Renewable energy http://intergratedrenewableenergy.com
BioEnergy Washington http://www.bioenergy.wa.gov/
Central Washington Biodiesel http://www.cwbiodiesel.com/

Special Thanks To The Following For Their Contributions:

Tom Osborn, Mechanical Engineer, Bonneville Power Administration
Bradley D. Miller, Agriculture Sector Lead, Bonneville Power Administration
Bill Clemens, Regional Community Manager, Pacific Power
Bruce Etzel, Community Development & Member Relations Manager, Benton REA
Kevin Fischer, Key Accounts Representative, Benton PUD
Washington Department of Ecology TREE team
Meryl Rickey, Enologist, Snoqualmie, Ste. Michelle Wine Estates
Warren Kenney, Maintenance Supervisor Snoqualmie, Ste. Michelle Wine Estates
Jeff Paeschke, Technical Specialist Projects, Ste. Michelle Wine Estates

Some facts about converting to LED lighting:

- Save money – low temp and low voltage
- Ultra strong and robust – no glass or filaments to break
- Zero maintenance – lifetime = 75,000 hours
- Environmentally friendly – no mercury
- Superior light quality – mimics sunlight, no flickering/buzzing

COST COMPARISON CHART

(BASED ON 100 FIXTURES)

	Incandescent	Fluorescent	LED
Existing Watts	40	17	2.4
Hours per day	24	24	24
Cost per KWH	$0.10	$0.10	$0.10
ANNUAL ENERGY COST	$3,504.00	$1,489.00	$210.00
Hourly Rate	$25.00	$25.00	$25.00
Replacement Time	30min.	30min.	30min.
Yearly Replacements	2.9	0.9	0
ANNUAL LABOR COST	$3,625.00	$1,125.00	$0.00
# of Lamps	2@$3.25 ea	2@$4.86 ea	0
# Times Replaced	2.9	0.9	0
ANNUAL LAMP COST	$1,885.00	$875.00	$0.00
TOT. ANNUAL COST	$9,014.00	$3,488.00	$210.00
SAVINGS:	**$8,804.00**	**$3,278.00**	