

refrigeration

Winery refrigeration systems account for up to half of a wineries total power use and also provide the greatest opportunity for cost savings.

The following energy saving tips focus on brine (ethanol) based systems though the principles are similar for glycol-based systems.

Off peak power

- Depending on your contract details with your energy supplier, power when used in off-peak times can be purchased for less than half the full tariff rate. For Synergy these off-peak times fall between 11:00pm and 9:00am (daylight saving 10:00pm–8:00am) weekdays and all weekend.
- With some business contracts, off-peak is the ideal time to set the refrigeration system to chill the brine as much as possible. Off peak is also a good time to chill down barrel storage sheds (even if this is a separate air conditioning system) and wine in tanks if they have brine jackets. The thermal mass of barrels and wine tanks means that if they are chilled below their normal set points at night time, then the more expensive day time cooling may not be required, especially if the building has sufficient insulation.
- Your refrigeration system also runs more efficiently during the cooler night off-peak tariff times

Insulation

- Greater operating efficiencies and energy savings can be achieved by ensuring all brine tanks and circulating lines are well insulated. If lines are icing up on the insulation it is a good indicator that the insulation is not adequate.
- Alternatives to copper and PVC for brine lines are Acrylonitrile butadiene styrene (ABS) or Polyethylene. These products have very low thermal conductivity characteristics and smooth bores to improve flow rates. Cost savings when using these products can be made by reduced insulation requirements and less energy required for pumping brine.
- Foil insulation is a cheaper temporary option to the more effective foam clad insulation and if the tanks are exposed to solar radiation then heat reflective paint is also beneficial.

Brine and brine storage

- Ensure brine is at its maximum allowable strength and there is sufficient volume to cover peak demand while taking full advantage of the off-peak power to super chill brine. Products such as Alcool LF can be used to gain lower temperatures.
- If possible use two brine storage tanks. The refrigeration plant draws from the brine return tank as it is more efficient at extracting heat from warmer brine. The refrigeration unit then discharges the refrigerated brine to the other tank where it is circulated throughout the winery.
- Use a Variable Speed Drive (VSD) on your circulating pumps that's linked to a pressure transducer. This means the pump will ramp up automatically as more tank brine valves are opened or a heat exchanger is in use. As the demand drops (valves are closed) the pressure in the brine system builds up so the pressure transducer then sends a signal to the VSD to ramp down speed. This system not only reduces energy use it also reduces the risk of brine jacket ruptures from brine pressure build up. This should reduce power use by up to 50%
- Automating your tank farm cooling system does have a considerable up-front cost but will save you time and improve efficiencies.

Maintenance

- Keep condenser coils and fins clean to maintain heat transfer efficiency.
- Ensure air can flow freely around air-cooled condenser coils and the refrigeration plant to remove heat build up.

- If using a cooling tower keep it serviced regularly to reduce the risk of Legionella disease and to minimise water use.
- Set brine temperature to work load requirements throughout the year, keeping in mind that the system becomes comparatively more inefficient and costly to run as the temperature is set lower.
- Ensure brine solution is at the maximum allowable concentration

Tank cooling

- Vertical cooling jackets are more effective than wrap around jackets as they promote thermal mixing and they also work with different tank volumes.
- If the tank is not insulated then it is worth using foil insulation to cover the exposed section of dimple plate.

Typical winery refrigeration system.

