Winery Cooling Water

A white paper discussing the importance of proper cooling water management in the wine industry.

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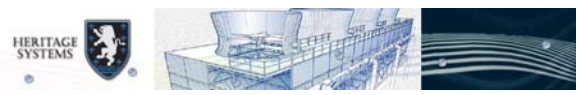
The wine industry has made significant strides over the years to manage water and energy resources. Our company has partnered with some of the most environmentally conscience wineries to manage water and energy since 1999.

Great progress has been made to conserve water in the areas of cleaning and sanitation, barrel washing, irrigation and wastewater reduction. Often times the cooling system in the winery is not a focal point of conservation efforts. Additionally, poorly managed systems can not only lead to excessive water use but also significantly higher energy costs and failed system components that can affect production.

Cooling water is essentially invisible to winery operators. When left unattended and improperly conditioned, water will support biological growth, corrosion and scaling. Proper treatment and management is important to process optimization and efficiencies.

COOLING WATER BASICS



In simple terms, a cooling tower is a device designed to reject unwanted heat into the atmosphere. Water is a highly effective heat transfer medium and as such is used extensively in the wine industry for rejecting heat generated in the cooling process. Cooling is necessary to the winemaking process.

Water evaporation in the cooling tower accounts for the majority of the heat rejected. Typically 75-80% of this heat is removed via evaporation (E). The remainder of the heat is removed through windage (drift) and by transfer into the air flow passing through the tower.

Blowdown (BD) is the intentional removal of water from the cooling tower and is important to prevent over-concentration of dissolved minerals and air-borne debris. These contaminants, if left alone to concentrate in the cooling water system, lead to scale and corrosion of system components and the potential for microbiological growth. High blowdown rates result in environmental problems associated with increased fresh water use, higher wastewater generation and increased costs. Makeup (MU) is the fresh water that is added to the cooling system to

replenish the evaporative and blowdown losses.

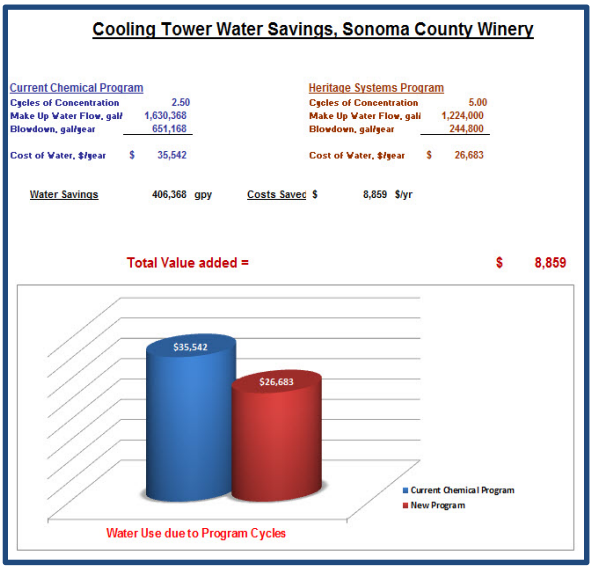
The number of times the makeup water is increased in concentration is commonly referred to as cycles of concentration (C). Cycles of concentration can be calculated by dividing the concentration of dissolved solids in the cooling water (usually measured as conductivity) by that of the makeup water. Low cycles of concentration leads to increased water usage.

Without proper environmentally friendly chemical treatment of the cooling water, in most cases, cycles of concentration are limited to 2. Higher cycling will cause scale and corrosion issues without proper treatment and control. Scale causes physical blockage of piping, equipment and cooling system components. Scale also increases the energy usage in the chillers used to cool the wineries process equipment. For example a calcium carbonate scale of 1.5 mil in thickness is estimated to decrease thermal efficiencies by 12.5% which on a 1,000 ton chiller would cause an increase in annual power costs by about $72,000 per year at current energy costs and typical chiller service loads.

Environmental requirements, dwindling water resources and LEED program requirements are driving factors for increasing cooling tower cycles of concentration. The USGBC LEED program awards certification points for properly managed cooling water systems. Make sure your cooling water service company provides LEED documentation for your particular system.

CHEMICAL TREATMENT BENEFITS

It has been said that chemical added to cooling water is bad for the environment. This is a misconception. The truth of the matter is that environmentally friendly formulations are available that have extremely low LC_{50} levels and are readily bio-degradable in the environment. The use of scale and corrosion inhibitors does not adversely impact the environment. One can make a compelling case that when used to increase cycles, proper scale and corrosion control chemistries lower the amount of fresh water used and wastewater generated.



Properly designed chemical treatment programs will also keep winery heat exchangers free of scale. This results in lower energy usage and lower environmental pollution from the commercial production of that energy. Think about this, a scale thickness of 0.08 inches can increase energy usage in a chiller condenser by 12%.

Warm cooling water is an excellent environment to grow microorganisms including pathogens such as legionella. This can lead to severe problems such as Legionnaires ' disease, process equipment fouling, increased corrosion rates and water and energy losses. Biocides are chemicals that are poisonous to microorganisms and are widely used to keep cooling systems clean. Be very careful here since improper choice of biocide will lead to environmental impacts. Make certain to choose a program that includes a bio-degradable biocide that does not have an environmental persistence and negative impact.

Biological fouling can cause severe problems such as Legionnaires' disease.

PROPER SYSTEM CONTROL

The best, most environmentally friendly treatment program will not provide optimum results without proper control of system operation. Make certain that your treatment program has automatic control of makeup, blowdown and cycles of concentration. Automatic introduction of scale, corrosion inhibitors and biocide are also necessary to ensure effective results.

Your cooling water treatment company should deliver chemicals into double contained storage tanks and leave no containers behind. This eliminates chemical handling concerns, disposal issues and reduces Green House Gas generation from plastic container production.

Automatic control system with double contained chemical Storage

In conclusion, cooling water maintenance is essential to efficient operation of your winery's cooling system. Water treatment is a complex undertaking with many things to consider. Consult a qualified water services company that can maximize your program results, minimize environmental impacts and conserve water and energy.