Cooling Tower Water Conservation

11/07

HVAC Cooling Tower, Peoria, AZ

Cooling towers are commonly used for process and air conditioning cooling in many industrial and commercial buildings. Typically, a cooling tower will account for 10 to 35% of a facilities total water use. The water consumption of a cooling tower can be significantly reduced by use of an effective cooling water management program that increases cycles of concentration and with regular cooling tower maintenance.

Increasing Cycles to Decrease Water Use

From 75 to 80% of the water used by a cooling tower is evaporated, in heat removal; 0.1 to 0.5% is lost due to "windage"; and the remainder is lost due to "blowdown". "Blowdown" is water intentionally removed from the cooling tower to control the buildup of dissolved solids resulting from the evaporation. To prevent scale formation within the cooling system, this buildup, measured as cycles of concentration (cycles), the number of times the water is concentrated by evaporation, is controlled to a specific value. The maximum cycles obtainable in any cooling tower is a function of the makeup water quality and scale inhibitor chemistry used, with cycles typically ranging from 2 to 6. Cycles obtained controls the amount of water used for cooling tower blowdown per unit cooling. For example, a 200 ton load cooling tower operated at 2 cycles will blowdown 5,300 gpd, while the same unit operated at 4 cycles will have a blowdown of just 1,767 gpd, a substantial decrease. In addition to the water use decrease, operation at higher cycles also reduces the use of water treatment chemicals.

Increasing cycles decreases water use and costs associated with purchase of water, sewerage charges, and chemical costs.

The most cost effective means to increase cooling tower cycles is to improve the scale inhibitor chemistry used in the water management program. This generally entails operation with increased levels of higher performance scale inhibitor chemistry, such as the HighCycle tm products developed by ProChemTech.

In situations where water is in very short supply, blowdown can be eliminated by softening of makeup water and increasing cycles to the point where windage, the small amount of actual water removed by passage of air through the cooling tower, equals blowdown. Generally, zero blowdown is obtained between 12 and 20 cycles and bypass filtration is required to control deposition. Due to the high corrosivity of cycled soft water, specialized chemistry is required for corrosion control. A recent study for the City of Tempe, AZ, shows a water use reduction of 756,000 gpy on a 176 ton cooling tower by going from three (3) cycles to zero blowdown. ProChemTech is the experienced world leader in zero blowdown, softened cooling tower makeup water technology furnishing a complete "single source" technology package: water softeners, bypass filters, and the specialized water treatment chemistry required.

Decreasing Water Use via Regular Cooling Tower Maintenance

- Regularly check the makeup water float and valve for correct setting and leakage. An incorrect setting, or valve leakage, can cause constant cooling tower overflow resulting in substantial excess water usage.

- To reduce water loss from cooling tower drift, water suspended in the air flow through the unit, ensure that the unit drift eliminators are in good working order.

- Regularly check the seals in the cooling system recirculation pump(s) for leakage, repair any leakage immediately.

- Routinely review the entire cooling system piping system for any leakage, repair immediately.

- Prevent any cooling water overflow from the system during cooling tower shutdowns by installing a check valve on the pump discharge and ensuring that the cooling tower sump, or cold well, is properly level controlled and of sufficient size to contain all drain down.

- Conductivity meter/controllers are commonly used for control of cooling tower blowdown, a fouled conductivity probe leads to inaccurate measurement and can cause excessive water use via unneeded blowdown. Conductivity controllers should be calibrated on a routine basis and serviced as needed or replaced by trouble free makeup proportional blowdown controllers.

- Ensure that the fill in the cooling tower is in good condition to obtain optimum cooling and reduced drift.

- Make sure that the water distribution system in the cooling tower is clean and maintains an even, consistent flow across the fill.

- If several cooling tower units are used in parallel, confirm that the return water distribution manifold is appropriate and not overloading individual units.

- Regularly check the blowdown valve to ensure that it is operating properly, a stuck shut valve will cause overcycling with scale formation, while a stuck open valve will cause undercycling and excessive water loss. We recommend installation of a cleanable Y or basket strainer in front of the blowdown valve to minimize plugging problems.

ProChemTech International offers complete water management programs based on both advanced organic “green” scale control chemistries that permit scale free operation of cooling towers at high cycles values and zero blowdown cooling tower operation based on use of softened makeup water.

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