

Cooling Tower Water Management for USGBC LEED Green Building Certification

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The USGBC LEED program is designed to minimize the environmental impact of building operations via a certification program for new and retrofit buildings. Certification points are awarded for various aspects of the building in areas such as site planning, energy and water management, material use, environmental impact, indoor air quality, and innovative design. Four levels of certification are presently awarded based upon the total number of certification points obtained during the LEED certification process: Certified, Silver, Gold, or Platinum.



Typical HVAC Cooling Tower

Cooling towers are commonly used for air conditioning cooling in many commercial buildings and will typically account for 10 to 45% of a facilities total water use. In the water management area, LEED points can be awarded for reducing water consumption via increased cycles of concentration, elimination of the hazardous chemical biocides normally used to control biological growth in the cooling water, eliminating cooling tower blowdown, and innovative technology which covers the last three water management changes.

LEED water management certification points can thus be obtained in four areas related to cooling tower water management; water use reduction by increasing cycles, reduction of environmental impact from use of non-hazardous biocides, elimination of blowdown, and use of innovative technology.

Increasing Cycles to Decrease Water Use

From 75 to 80% of the water used by a cooling tower is evaporated to remove heat; 0.2 to 2% 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 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 two (2) to six (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.

There are three methods to increase cycles; acid feed to control pH, advanced scale prevention chemistry, or softening of the makeup water. Acid feed, using hazardous acid, is not practical due to safety and control concerns. In some cases, an improved the scale inhibitor chemistry can be used to increase cycles.

ProChemTech offers complete water management programs based on advanced, non-toxic organic scale control chemistries that often permit scale free operation of cooling towers at higher cycles values. Softened water can be used as makeup in hard water areas to provide an increase in cycles to the maximum level (without bypass filtration) of six (6). ProChemTech provides both water softeners and proven water management program chemistry for control of corrosion, including white rust, when softened makeup water is used.

Hazardous Biocide Replacement

The greatest adverse environmental impact, and a major safety hazard, from cooling tower operation is the use, with subsequent discharge in the blowdown, of hazardous chemical biocides to control biological growth. Hazardous chemical biocides can be easily replaced by the non-hazardous electrolytic bromine biocide system developed by ProChemTech. This advanced, patent pending technology converts a harmless aqueous solution of sodium bromide and chloride into electrolytic bromine, via direct current electrolysis, on-site as needed. After addition to the cooling tower and reaction with target biota, the electrolytic bromine rapidly degrades back to harmless bromide ion as found in sea water. Shown at the right is a drum mounted electrolytic bromine unit suitable for cooling towers to 2000 tons capacity.



Zero Blowdown

In situations where water is in very short supply, or maximum LEED points are desired, 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, which **requires use of bypass filtration to control deposition.** Due to the high corrosivity of highly cycled soft water, very specialized chemistry is required for corrosion control. ProChemTech is the experienced world leader in zero blowdown, softened cooling tower makeup water technology. We furnish a complete “single source”, patent pending technology package: water softeners, bypass filters, electrolytic bromine biocide, and special water treatment chemistry required to operate a cooling tower system with corrosive, cycled soft water.

A current LEED Platinum project by ProChemTech 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 providing the water softener, bypass filter, electrolytic bromine unit, and a complete water management program based upon our specialized soft water chemistry.

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