Campus Cooling Puts a Freeze on Utility Costs!

Campus Cooling Systems provide a sustainable alternative and can be up to 35% more efficient than traditional cooling systems!

The Blue Waters Super computer at the University of Illinois is cooled by cooling towers.

Many universities, college and corporate campus's are faced with unique challenges in today's complex marketplace. Increased energy and operating expenses continue to pose a problem, but there is a solution that can provide savings and supports the trend to be more "Green". The addition of a campus cooling plant, will provide more efficient cooling to campus buildings. Basically, this means you will be able to provide cooling only to the buildings that need it and will not be wasting energy by pumping large amounts of cooling water through the miles of piping around your installation.

Typical cooling systems utilize air, water, or adiabatic heat rejection methods. The use of a cooling tower enables building owners to take advantage of the operating cost savings inherent in water cooled systems. Water cooled methods are approximately 35% more efficient than their air cooled counterparts. With greater efficiency and lower operating costs, water cooled methods offer the best long-term investment, saving money in the long run and providing a reasonable (1-3 years) payback.

Design

Energy Efficiency - Cooling tower selection can be affected by many local and national codes, standards and rating systems that are becoming increasingly focused on green programs, energy savings, and environmental responsibility. Energy efficiency standards, such as ASHRAE 90.1, local regulations such as California's Title 24, and voluntary certifications like US Green Building Council's Leadership and Energy and Environmental Design (LEED®), can effect cooling tower selection. Campus facility managers should carefully analyze the life span of the cooling system in order to achieve the best value and energy savings.

Design Considerations - The operational efficiency of an evaporative cooling tower depends on an adequate supply of fresh, ambient air to provide design capacity. Proximity to building air intakes or discharges must be taken into account when selecting the equipment site. As the size of the installation increases, the total amount of heat being rejected into the atmosphere and the volume of the discharge air increases. In some instances, a portion of the discharge air may recirculate back into the cooling system for installations in an enclosure. The recirculation should be minimized or design wet-bulb temperature must be adjusted to allow for the recirculation.

Sound - Another selection criterion to consider is sound. On applications using cooling towers, the source of sound is a combination of the cooling tower fan(s), the fan motor(s), water, etc. Sound ratings should be considered if the units are located in densely populated areas and can be obtained from the original equipment manufacturer.

Reliability and Maintainability - Today's building owners are constantly challenged to reduce operating costs. Therefore, it is important that owners purchase a cooling tower that is reliable and maintenance friendly. An easy to access and maintain cooling system promotes routine maintenance and smooth, reliable year-round operation. A crossflow cooling tower typically meets these objectives and can provide an excellent method of campus cooling.

Ice Thermal Storage

While cooling towers can be used in the system on individual buildings or in power or cooling plants, another method that can be used to reduce the total cost of ownership and reduce environmental impact is to add ice thermal storage. This is a growing trend in the US and can save energy and money, while conserving natural resources.

Lower total cost of ownership - Ice Storage is the process of using a cooling tower and chiller to build ice on coils during off-peak hours. The ice is then melted to provide cooling during peak periods.

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This use of electricity at night versus peak hours can lead to large savings on energy bills. Ice thermal storage can lower peak electrical demand for the system by 50% or more. Since many campus electrical rates include demand charges during peak demand times and/or higher day versus night kWh charges, savings can be substantial. Some campuses with ice thermal storage are also eligible to receive demand response rebates from local utilities.

An example of this at the University of Maryland (UMD). UMD utilizes 8,900 ton hours of ice storage to shave off 1 MW of electric demand. According to John Vucci, Associate Director of HVAC Systems, the university saves approximately $70,000 a year by participating in a demand response program.

Ice Thermal Storage tanks at Catonsville Community College in Catonsville, MD, just outside Baltimore.

Reduced Piping and Pumping Cost - Ice thermal storage tanks can provide supply water as low as 34˚F (1.1˚C) to the system. Flow rate requirements are reduced by taking advantage of greater temperature ranges achieved when utilizing this colder supply water, providing substantial savings in the chilled water distribution loop. A range of 20˚F(10˚C) instead of the more traditional 10˚F (5.5˚C) can reduce the required system flow to half of a traditional system, resulting in significantly reduced pipe sizes and pumping energy for the chilled water system.

Environmentally Friendly - Storing energy as ice during off-peak hours allows the system to take advantage of cleaner and more efficient energy sources. Ice thermal storage lowers peak demand, offsetting the need to build new power plants, and helping to lower greenhouse gas emissions. An operating example of this can be seen in Florida. According to John Nix, Senior Engineer for Florida Power and Light, ice thermal energy storage has helped Florida Power and Light (FPL) avoid building 13 power plants in the past 20 years. To encourage load shifting, FPL provides $480/ton rebate incentive to customers installing thermal storage on their facilities. FPL also offers time of usage rates, – lowering the cost of electricity during off peak hours.

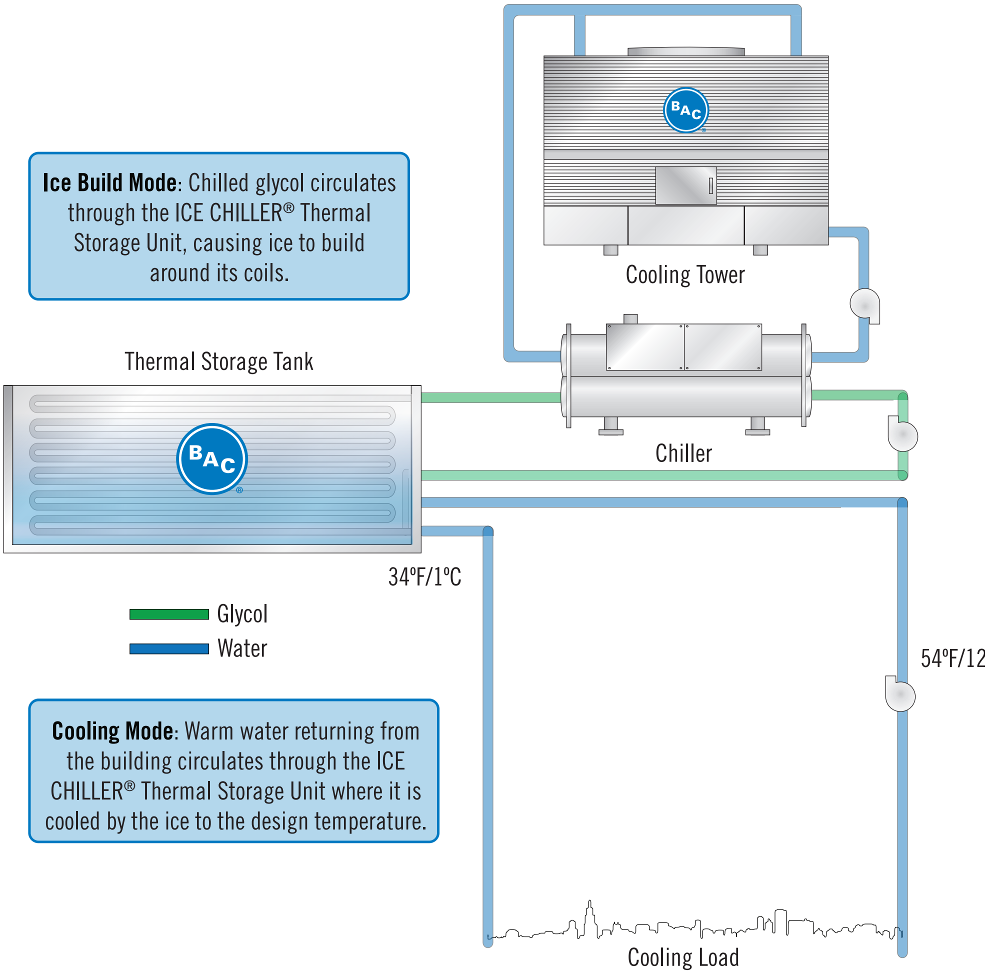
Another environmental benefit to ice thermal storage comes with reducing the size of other system components. Reduced peak load allows for the use of smaller chillers in the system. Smaller chillers require lower refrigerant charges, which reduces the use of ozone depleting refrigerants and the overall impact on the environment.

LEED® Certification

As a green technology, an ice thermal storage system can also help qualify a building for a number of LEED® points specific to LEED for Schools as well as LEED for new buildings and renovations. Designs that reduce a building's energy consumption and environmental impact through efficeincy can help a building receive LEED points that can contribute to a buildings over all certification. LEED points can be earned in the following areas: Energy Performance, Refrigerant Management, Acoustic Perfromance, and Demand Response.

Installations

Campus projects that incorporate ice thermal storage to cut peak electric demand and reduce operating costs include NOVA Southestern University, University of Pennsylvania, Johns Hopkins University, University of Maryland College Park, and George Mason University.



Details of how an ice thermal storage system operates

Conclusion

Water-cooled towers and ice thermal storage systems are the best overall choices for supplying cold water for most installations on campus whether it be for air conditioning, lab processes, or for a central campus power plant. These units offer reliability, energy savings, conserve resources and are environmentally friendly.