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Towers help computer equipment stay comfortable

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When it comes to energy, data centers are faced with a serious dilemma. Over the past decade -- and particularly in the past two years -- growing IT demands have forced managers to crowd their expansive data centers and server farms with more and more equipment, driving energy demands through the roof.

To make matters worse, the heat generated by added processor hardware is forcing companies to expend even more power to keep it cool, a trend that the U.S. Department of Energy believes will only worsen in the near future.

According to the DOE, data centers consume up to 100 times more energy than standard office space. The vast majority of this energy is consumed by the cooling infrastructure that is needed to keep the data center's sensitive equipment within a specified temperature range.

The DOE reports that data center energy consumption doubled from 2000 to 2006, reaching more than 60 billion kilowatt-hours per year. That number could double again by 2012, outpacing the U.S. power generation infrastructure, which will likely drive cooling costs even higher.

As a result, the IT industry is actively seeking new and innovative solutions to improve cooling efficiency, at the lowest possible cost. This has led to a variety of unusual solutions, from pumping cool air and liquid through servers and racks, to relocating computer centers to arctic regions in order to use frigid air or water to handle cooling needs.

Facebook, for example, plans to build three giant server farms, covering an area the size of 11 football fields, at the edge of the Arctic Circle. AOL has followed suit by constructing a facility that will be cooled by the natural environment of Iceland. Google is opening the world's first seawater-cooled data center in a former paper mill located near Helsinki.

However, not every organization wants to relocate its data center equipment to Arctic areas to solve its cooling problems. Many server farms, and the majority of data centers, are still located at domestic facilities throughout the United States.

For example, while Google has facilities throughout the world, it also has major data centers at many U.S. locations, including those that experience very hot weather.

Recently, eBay opened a major data center in the Phoenix area where temperatures often exceed 100 degrees in summer. In this case, the facility is kept cool by employing more conventional systems to cool its computer environments.

Throughout the U.S. and most of the world, the mainstay of data center cooling systems remains the traditional HVAC combination of chillers, air handlers and cooling towers. The pressing challenge for these facilities is to increase the efficiency of those mechanical cooling systems in order to reduce energy expenditure, particularly in locations where triple-digits temperatures occur during summer months.

However, as far as efficiency is concerned installing extra air conditioning to cool down data center hot spots is like replacing one headache with another. Refrigeration cycles use a lot of energy – as much, if not more, than the computer hardware it's intended to chill. Therein lies the question, how can your air conditioning system be made more efficient?

Rising energy costs and environmental issues have driven substantial progress in the efficiency of HVAC systems in recent years. Yet, one cooling system component that can often be made more efficient and also "greener" is the cooling tower, where inefficient, 50-year-old designs are still in common use.

Cooling towers have a long history of effective use in expelling heat from the water used in many industrial and commercial applications, such as process heat exchangers, as well as the chillers in HVAC systems that commonly support office buildings and data centers of various sizes.

However, in many instances the cooling tower that supports these applications is of the old-style, metal-clad design, which is often less energy efficient, less environmentally friendly, more maintenance intensive and less reliable than the improved, engineered plastic cooling towers that are available now.

Pioneered by Delta Cooling Towers of Rockaway, N.J., these new, engineered plastic models are constructed of seamless high-density ethylene (HDPE), which is impervious to the corrosive effects of ambient air and water treatment chemicals that plague metal-clad cooling towers. Therefore, the plastic models require far less downtime for cleaning, repair or replacement, making them considerably more available as far as uptime is concerned.

"Of all cooling system components, the cooling tower is the most susceptible to downtime. If it fails, it can shut down an entire facility despite being one of the least expensive components," says Delta Cooling Towers' Tom Ryder.

To help protect data centers and other temperature-sensitive systems from cooling tower downtime, many businesses and even entire university campuses are turning to engineered plastic cooling towers for more reliable, virtually service-free performance, Ryder explains.

Because of uptime improvements, these new plastic cooling tower models can reduce the cooling system energy burden by reducing the number of refrigeration cycles, including during cooler months when air conditioning is not needed - provided that the cooling tower is online and operating efficiently.

During the hot summer months, when heat most often causes thermally-sensitive equipment to fail, keeping cooling towers online is even more critical for data centers and server farms, which are subjected to high utilization. Designers using less reliable models often have to build in redundancy

by including spare towers to compensate for unforeseen downtime. This raises capital costs significantly.

Although energy savings and uptime may be the paramount advantages, the engineered plastic cooling tower can also save substantial money on water treatment chemicals. The protection of conventional metal-clad cooling tower "shell" requires precise maintenance of water treatment chemicals to prevent metal panel failure while maintaining proper water pH. Because the monolithic HDPE shell of the plastic cooling tower is impervious to those chemicals, that precision is not required and less chemicals need to be used.

"Green" is also a consideration, as the IT industry had adopted a forward-thinking mentality both for electricity generation (solar, wind, hydro) and for more efficient cooling methods.

The engineered plastic cooling tower provides other green benefits the IT industry seeks, including improved sustainability, added water conservation and a smaller carbon footprint.

With improved thermal performance, the counter-flow plastic cooling tower designs have less of an environmental impact than cross-flow models. Counter-flow designs create much less water splash than cross-flow models, particularly during high winds or when fans are off at low-load or low wet-bulb conditions.

Counter-flow models also can incorporate the industry's best drift eliminators at 0.001 percent or even Delta Cooling's optional 0.0005 percent of the re-circulating flow.

Engineered plastic cooling towers models are available that keep water totally enclosed and free from sunlight, thereby lessening the occasion for biological growth, thus greatly reducing the need to use harsh water treatment chemicals.

In the past, plastic cooling towers were too small for many industrial and commercial facilities. However, today that situation has changed. Delta Cooling, for example, has introduced a series of factory-assembled plastic towers to suit almost any size requirements up to 2,000 cooling tons in a single, modularized unit.

The modularity of this system also makes the cooling tower scalable, a highly desirable feature for those who have smaller or intermediate cooling requirements today, but also want the convenience of easily expanding their cooling capacity as the business grows.