

Optimized Cooling Concept

Energy Efficiency for your data center – Application Sheet.
Data center solutions from Siemens for the factories of the 21st century.

Cooling systems are a primary area for energy efficiency measures. Siemens will analyze the energy usage of the cooling systems in your data center and will identify areas of improvement.

Customer challenge

In contrast to the seasonal cooling requirements of commercial buildings the cooling load of data centers – IT racks and support equipment – is less related to weather. The main electricity consumer is the cooling system; associated costs can account for half of the operating costs. These operating costs are rising while the infrastructure is degrading and financial resources are declining. At the same time, data centers are subject to new energy and environmental sustainability goals and legislation as well as a constantly changing energy market.

Siemens solution

Siemens develops and implements a variety of cooling concepts to increase cooling efficiency. Solutions address existing and new data centers and range from Demand Flow™, described in a separate Application Note, to chiller plant infrastructure upgrades to free cooling concepts. The applications are comprehensive – from proven algorithms developed for heating, cooling, ventilation and air-conditioning plants to advanced monitoring and performance contracting to help implement these measures.

Chiller plant upgrades in existing data centers

Siemens analyzes operational and energy cost data in chiller plants of existing data centers and will assess the benefits gained by upgrades. If chiller replacement is the optimal solution, Siemens will select chillers which have better performance and require less maintenance than the existing chillers based on the

current facility cooling load profile. The chillers will be interfaced with the building automation system to monitor relevant system information. Siemens will also consider upgrading or replacing pumps and cooling towers. These components will be selected to match the new chiller equipment, and existing refrigerant monitoring system compliance with local standards such as ASHRAE-15 will be reviewed.

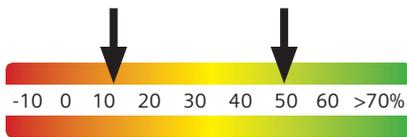
Direct free cooling in new and existing data centers

With direct free cooling, Siemens helps customers use exterior air directly through air handling or ventilation units when it is cold enough outside. This reduces or eliminates the need for mechanical cooling through a planned or existing chiller system and can help save a significant amount of energy depending on the annual temperature and humidity profile. In some regions, such as Scandinavia, direct free cooling can satisfy a larger amount of annual demand than in other regions, such as Middle East. The implementation of direct free cooling is more economical for new construction than for existing plants. Due to the requirements on air humidity and contamination, careful design considerations are required to make sure savings are not canceled out by expensive humidification and filtration requirements.

Water-side free cooling for data centers

In a water-side free cooling system Siemens uses the condenser loop consisting of water-cooled towers, hybrid towers or dry coolers to meet demand. Siemens

Estimated Savings Potential



These values are guidelines only based on data from actual Siemens projects. The energy savings potential must be calculated individually for each project.



Water-cooled chiller plant

integrates the cooling towers through separate heat exchangers into the chilled water loop. The cooling tower water passes through one side of the heat exchanger; the chilled water passes through the secondary side of the heat exchanger if the outside conditions are favorable. Similar to direct free cooling, water-side free cooling generates higher savings in some regions than in others but water-side free cooling can be used for longer run hours in the same location if evaporative cooling towers are used. Water-side free cooling can be used in new and existing sites and can be combined with Demand Flow.

Indirect adiabatic cooling

Indirect adiabatic cooling basically combines the best of water-side free cooling and direct free cooling. In this solution, water is evaporated into an external flow of outside air. The washed outside air cools off and approaches the wet bulb temperature. The colder outside air flow is then passed over a heat exchanger and cools or pre-cools the re-circulated air of

the data center. In situations where adiabatic cooling and the free cooling options mentioned above are insufficient to meet the cooling load, mechanical cooling can be used in peak situations.

Customer benefits

Siemens investigates different cooling concepts and compares their associated upfront investment against annual energy costs. If the data center cooling system includes pumping of chilled water and cooling water, these solutions can be combined with Demand Flow. Siemens goes beyond simply maximizing the efficiency of single components in a cooling system and addresses all subsystems of a plant. Siemens can implement and help finance these improvements under a performance contracting model. The funds saved by reducing energy consumption can then be used to finance cooling system improvements and associated services.

Highlights

- (10% to 50%) Chiller Plant Energy Savings
- Reduced maintenance and operating costs associated with maintaining existing old chillers
- Improved redundancy and availability
- Extended Equipment Life is extended relative to the replaced systems

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