Investing in the Future – how a university met the challenge of using energy efficient technologies to build a new, green data center

Industry:
Higher Education

Coolcentric Products & Services
38 RDHx Units
Installation, Commissioning and Ongoing Service and Support

Customer Challenges
Commitment to Building a Green Data Center

Key Benefits:
Energy Efficiency
Space Conservation
Scalability
Passive – noise reduction

Data centers in the United States consume more than 60 billion kilowatt hours of electricity per year. In fact, energy had become the largest single cost in operating a data center. The amount of energy consumed is equivalent to electricity used by nearly 6 million households at a cost of nearly US$4.5 billion. And industry experts estimate that $2 billion of this energy use in the data center is wasted due to inefficiency per year. Given the reality of power consumption, an upstate New York university, a private institution of higher education that offers a broad range of bachelor, master and doctoral programs, was faced with the decision to build or retrofit its data center after it outgrew its existing facilities. The university opted to build a new 650kW data center. The decision was reached in part because of the university's commitment to environmental and social responsibility. One of its top priorities for the new data center was to build the most energy efficient, green data center as possible using advanced infrastructure solutions and smarter computing technologies.

The goals of the new "green data center" were threefold:

1) primary production data center for the entire University
2) demonstration center for the new technologies used in data centers to evangelize energy efficient technologies
3) research test bed for future innovation

Having made the commitment to build a new data center, the university had a unique opportunity to build a state of the art data center. The university was determined to avoid using a legacy design and wanted to take a fresh look at using all possibilities. University administration set the goal of this new data center to use 50% less energy than a traditional data center. A second goal was to design a data center that could achieve The U.S. Green Building Council LEED certification.

The Cooling Solution

The green data center team at the university investigated the latest in energy efficient computers and cooling technologies. The team considered a wide variety of cooling technologies from Computer Room Air Conditioners (CRAC) to In-Row cooling devices, to aisle containment, to passive Rear Door Heat Exchangers. After an exhaustive analysis the team chose to implement the Coolcentric™ LiquiCool® solution using Rear Door Heat Exchangers (RDHx) as the basis of the data center cooling. Rear door heat exchangers act like radiators when installed as a replacement to the standard enclosure rear door.

The design for the 6,000 ft^2 (560 m^2) white space consisted of 38 Coolcentric RDHx units which act as passive radiators to cool the exhaust air from each enclosure. Since the RDHx only consumes about 6" (15cm) of additional floor space at the back of each rack, hot aisle widths were not impacted. The RDHx units were connected by Coolcentric's pressure tested flexible hoses to a centralized plate and frame heat exchanger which transferred the heat to the building's primary chilled water loop. The centralized heat exchanger provided cost savings over the use of distributed Coolant Distribution Units and has the added feature of allowing future cooling capacity expansion.

The Details

The university embraced the use of liquid cooling as a means of cooling the data center. Besides the RDHx solution, the university also deployed several high performance computers that bring chilled water directly to the computer chassis to provide additional cooling. The use of chilled water and the close coupling method makes the RDHx a solution that delivers a highly predictable level of cooling which takes the guesswork out of the typical data center cooling design.

Liquid cooling also offered a level of flexibility which provided the University with the option of easily reconfiguring its center down to the rack level. There is no need for containment aisles or curtain systems which makes moving equipment difficult and expensive. And RDHx units can be easily installed and removed without powering down servers, eliminating downtime for service.

The energy efficiency of the LiquiCool solution was the overwhelming advantage. The RDHx are passive - they do not consume electricity and do not utilize any fans. The RDHx are close coupled to the rear of each rack which provides the ultimate in aisle containment and addresses the heat load at the source of the heat. When compared to using CRAC/H units to provide the cooling for the data center, the RDHx allowed a significant cost savings . The university did install three 30-ton CRAH units in the data center to maintain air flow and control humidity. Because the RDHx provide all of the cooling required, the university was able to use a high temperature set point on the CRAH units saving further energy.

The university identified several other advantages in using RDHx

1) Rear Door Heat Exchangers take up minimal space in the hot aisle, enabling the university to free white space and increase the number of racks. Some of the other cooling solutions considered consumed a lot of white space that took away valuable computing production space.
2) The scalability of the LiquiCool solution was a distinct advantage. RDHx's can be added to the system anytime allowing the University to avoid having to deploy the entire solution on Day One. As the individual departments within the University expand their compute requirements
3) Since the RDHx operates above the dew point, the need for additional pumps and systems to remove condensation was eliminated.
4) RDHx are passive, so there are no fans to add further noise within the white space. In fact they actually provide a small level of noise baffling.
Today, the university continues to ramp up the deployment of their computing power in the data center. The use of the LiquiCool solution along with other "green" innovations has the university hopeful they will achieve the U.S. Green Building council LEED Gold certification.