Cooling Cost-Saving Strategies

Comfort Cooling vs. Precision Cooling
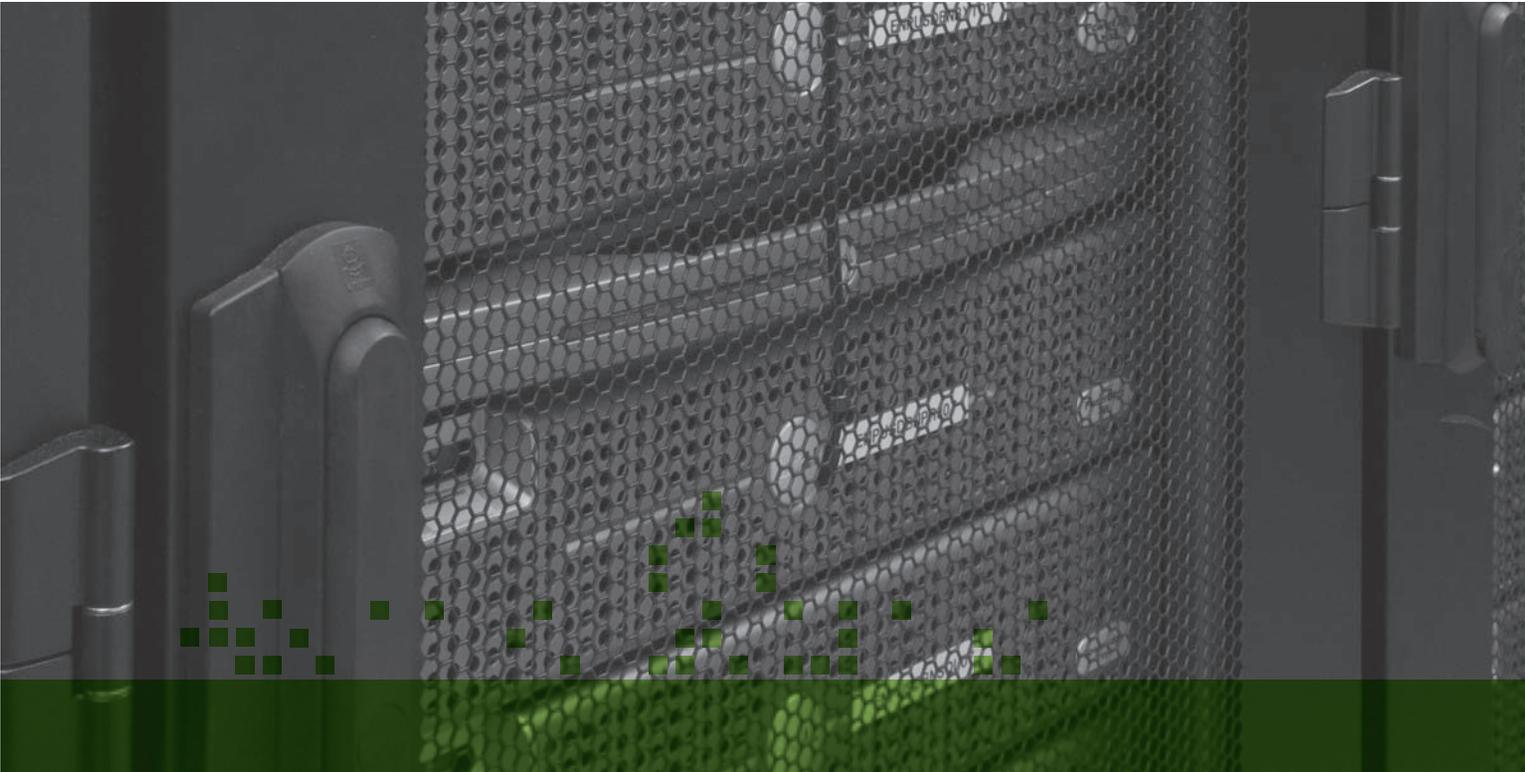
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Executive Summary

Computer systems are critically sensitive to extreme variations in temperature and humidity. High heat or humidity can cause failure, degrade performance and shorten equipment life. Important differences exist between precision cooling and building air conditioning (comfort cooling) in controlling these environmental conditions. These differences dramatically impact the cost effectiveness of these systems. In this paper, we compare both cooling systems' ability to maintain favorable environmental conditions, and their energy efficiency and annual operating costs.

Case Study: Sequent

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"Precision vs. Comfort Cooling in Smaller IT Spaces"

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HEAT REMOVAL Ratios

- <u>Understanding heat removal ratios</u> is important to understanding the efficiency of cooling systems. There are two types of cooling: latent and sensible. Latent cooling is the ability of the air conditioning system to remove moisture, which is important in comfort cooling environments where people give off humidity. Sensible cooling is the ability of the air conditioning system to remove heat that can be measured by a thermometer. The dryer heat generated by electronic equipment is included in this category.

- The <u>American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)</u> recommends guidelines for data center heat and humidity. ASHRAE recommends data center temperatures fall between 18 and 27 degrees Celsius (64.4 to 80.6 degrees Fahrenheit) and that data center humidity levels be measured by dew point and fall within 5.5 and 15 degrees Celsius (41.9 to 59 degrees Fahrenheit).

  Comfort cooling systems have a sensible heat ratio (SHR) of 0.60 to 0.70. This means 60 to 70 percent of their energy used is dedicated to lowering temperature, and 30 to 40 percent is dedicated to removing humidity. IT spaces require a 0.80 to 0.90 sensible heat ratio for effective and efficient cooling. Precision cooling systems have been designed with a sensible heat ratio of 0.85 to 1.0. This means 85 to 100 percent of their effort is devoted to cooling and only 0 to 15 percent to removing humidity; therefore, it will take a larger comfort cooling unit to cool the same IT environment as a precision system. In general, it takes three tons of comfort cooling capacity to equal two tons of precision cooling capacity.

Comparing Annual
OPERATING COSTS

- Comparing heat removal costs between comfort and precision cooling systems reveals significant operational savings for precision systems, even for relatively small data centers.

- For example, in a 500-square-foot data center operating at 72 degrees Fahrenheit and 50 percent relative humidity, with equipment producing a heat load of 9 tons and an energy price of $0.10/kWh, a 15-ton comfort cooling system consuming 18.5 kW of power to run the compressors and fan would cost $1,878 per sensible ton per year to operate for heat removal alone. A 10-ton precision cooling system consuming 12.5 kW of power to run the compressors and fan, by comparison, would typically cost $1,258 per sensible ton per year.

Bottom line: When the cost of re-humidification is factored in, the total annual operating cost of the comfort cooling system is $11,986 higher than the operating cost of the precision cooling system. Such savings may offer a typical payback within 12 months on the additional cost of a precision cooling system. *

* Re-humidification based on 2.34 kW of latent heat removal per ton of sensible cooling for the comfort cooling system and 0.39 kW of latent heat removal per ton of sensible cooling for the precision cooling system, with the humidifier running from November through March for a total of 3,650 hours.

You Tube

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 "Selecting a Cooling System"

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☐ Consider Total Cost of Ownership

Conclusion

Because they are more effective at removing sensible heat and controlling humidity levels, precision cooling systems require less power to operate than comfort cooling systems. When initial costs and operating costs both are taken into account, precision cooling systems represent the most cost-effective solution to cooling critical IT equipment.

If you're looking for more information on this subject, check out a "Feel the Heat: Precision vs. Comfort Cooling in Smaller IT Spaces" webcast.

Additional Resources

If you're interested in learning more about trends and topics related to powering, cooling or monitoring data centers, check out these white papers from Emerson Network Power.

Best practice case studies of how other companies have solved data center challenges are available in narrative and video forms. Case studies are from small to large companies across numerous industries.

If you have specific questions, a Liebert Representative from Emerson Network Power or a Liebert certified IT reseller can help you out. Click here to find your local contact.

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