Eliminating hot spots

On average, computer rooms have three times more cooling than required - yet many are still having hot spot problems. **By Robert F. Sullivan, Ph.D. Triton Technology Systems.**

Engineers from Triton Technology Systems, Inc. and The Uptime Institute, Inc. recently completed a comprehensive survey of actual cooling conditions in nineteen computer rooms comprising 204,400 ft^2 of raised floor. Over 15,000 individual pieces of data were collected. What follows are some valuable excerpts from the field data and an analysis of the performance consequences of current industry computer room cooling practices.

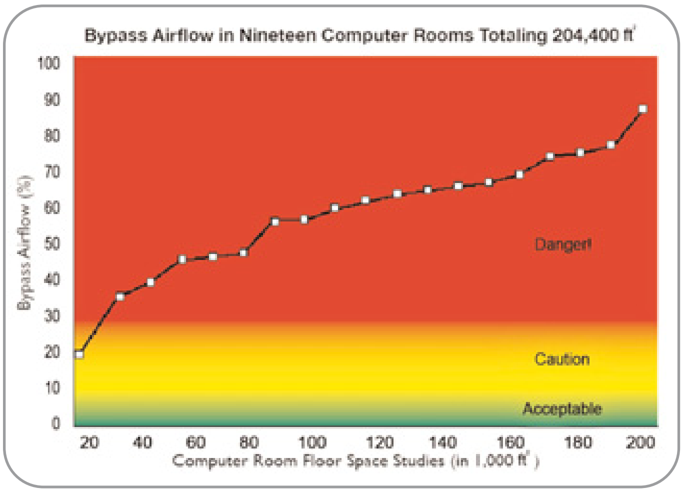
● Hotspots are a problem. Ten percent of the racks in the computer rooms studied had ambient temperatures of 24°C (75°F) or higher at the computer equipment air intake at the top of the rack.

● High temperatures are causes of decreased hardware reliability. Intermittent ghosts and outright hardware failures are three times more prevalent in the top third of racks than the bottom two-thirds. But high temperatures alone do not explain this failure rate. One hypothesis is that low relative humidity results in spontaneous electrostatic discharge (ESD) caused by the triboelectric effect. This can happen even without anyone touching the computer equipment. For a room operating at 22°C (72°F) and 45% relative humidity at the return to the cooling units, the relative humidity at the top of a hot rack will be 29% (at an air intake temperature of 29°C (85°F)).

● Cooling overcapacity is not a predictor of successful cooling. On average, the nineteen rooms studied ran 2.7 times more cooling equipment than required to cool the computer heat load. Two rooms ran 16 times more cooling than required, yet one had 20% hot racks/cabinets and the other had 7% hot racks/cabinets.

● Sixty percent of the available supply of cold air in the computer rooms studied is short cycling back to the cooling units. Called "bypass airflow," this means that only 40% of the cold air supply is directly cooling computer equipment. The remaining 60% of cold air mixed with the exhaust air is exiting from the heat load. This un-engineered mixing of ambient air provides indirect and uncontrolled cooling, especially for the equipment at the top of racks.

● While virtually every room studied had more than enough cooling capacity, all cooling units had to remain running in order to compensate for the low static pressure due to airflow wasted through excessive numbers of unmanaged cable openings. Lack of static pressure resulted in both zone hot spots where there just wasn't enough cold air in large areas and in localised vertical hot spots where the supply of cold air was fully consumed by the equipment in the lower part of the rack or cabinet. Eliminating bypass airflow is critical to getting the flow of cold air to the right places to eliminate zone and vertical hot spots.



Conclusions

● Solving the current air distribution problem in the computer rooms studied is deceptively simple:
(1) optimize the quantity and location of perforated tiles.
(2) seal cable cutout openings starting with the largest openings.

● A complete understanding of the potential consequences of these modifications is necessary before incorporating these suggestions in computer rooms. Adjusting the quantity or location of perforated tiles or closing openings is a high-risk proposition since much of the available cooling is coming from the ambient air and not from perforated tiles in the cold aisle. Making these adjustments in the wrong sequence can result in very rapid ambient temperature changes.

It is critical that site managers have a full understanding of the airflow dynamics in the room before attempting these modifications. Failure to do so could result in severe hardware damage before it is even recognized that temperatures are out of control.

The complete white paper, **Reducing Bypass Airflow Is Essential for Eliminating Computer Room Hotspots** is available at **www.koldlok.com**