

Patch The Holes

Improve Energy Efficiency In Legacy Data Centers

LIFE WOULD BE GRAND if every company could afford state-of-the-art data center space stocked with energy-efficient equipment. Countless companies, however, must get by with legacy cooling and power equipment situated in space that's far from optimal energy-wise. Jim Hall, Staco Energy (www.stacoenergy.com) marketing manager, says a surprisingly large number of small businesses' network closets are literally closets in which IT equipment resides with cleaning supplies, toilet paper, pens, paper clips, and stored holiday decorations. Even in such circumstances there are means of improving energy efficiency in legacy data centers, as the following tips detail.

✓ *Consult What's Available*

Scores of resources are available from which to acquire suggestions for improving legacy data center energy efficiency, including The Green Grid's (www.thegreengrid.org) "Datacenter Maturity Model." John Stanley, analyst for datacenter technologies and eco-efficient IT at 451 Research, says The Uptime Institute offers papers (uptimeinstitute.com/publications) and efficiency case studies from the Green Enterprise IT Awards program (symposium.uptimeinstitute.com/geit-awards), which can also be helpful.

Anu Elizabeth Cherian, Frost & Sullivan senior industry analyst, suggests approaching OEMs for advice, especially UPS and HVAC manufacturers; while Konkana Khaund, Frost & Sullivan building technologies industry manager, points to the Department of Energy's Federal Energy Management Program (www1.eere.energy.gov). "They publish a number of best practice guides on building and maintaining energy-efficient data centers," she says, including guides focused on design elements that require conceptual planning and layout considerations to plan for efficiencies from the beginning. The DOE also provides guides for existing data centers, she says, as does Lawrence Berkeley Labs and ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).

✓ *Pull The Plug*

Companies can save considerable resources by addressing any number of server-related issues. For example, Robert Faulkner, Server Technology (www.servertech.com) sales engineer, says, "Turn off what is no longer used. Many legacy data centers have servers running with obsolete applications." Comatose servers, meanwhile, are those plugged in and turned on but not doing useful business and needlessly consuming power, cooling, and space resources, Stanley says. Elsewhere, Hall says replacing legacy servers with Energy Star-rated gear is an option.

Virtualization is a frequently recommended solution to achieve better energy efficiency. "The biggest concern with older equipment is the performance per watt is low," Faulkner says. Thus, it's critical to know the actual work the server is doing and power being dissipated, he says. "Virtualization has been a great way to optimize that performance per watt by packing the workload of several servers into one high-efficiency server; however,

Best Tip For Quick Results:

✓ *Raise The Temp*

"The data center doesn't need to be a meat locker," says John Stanley, 451 Research analyst. "Make sure the temperature set points on computer room air conditioning units are reasonable," he says. Frost & Sullivan's Konkana Khaund suggests referring to ASHRAE TC (technical committee) 9.9's "Thermal Guidelines for Data Processing Environments—Expanded Data Center Classes and Usage Guidance," which includes insights into optimal thermal range conditions at server inlets and configuration recommendations for existing legacy systems. Raising the temperature, says Server Technology's John Faulkner, can produce the quickest results for improving energy efficiency.

Best Renovation Tip:

✓ *Use White For More Light*

Logicalis states that using white cabinets, walls, floors, and ceilings in the data center—something doable during renovation projects—helps reflect heat and direct hot air to returns more easily. IT will find it easier to see inside cabinets and elsewhere, meaning less additional lighting required.

this typically means purchasing new equipment," Faulkner says. "The next question becomes, 'What is the ROI?' Quite often, the power cost savings of the virtualization switchover will pay for itself in a matter of months." When moving to virtualization, Stanley cautions to not impact application availability or SLAs.

✓ *Retrofit & Monitor*

Often, the best or only solution to enhance energy efficiency of legacy equipment is replacing it to acquire the latest features and functionalities, Cherian says. In other cases, retrofitting equipment with monitoring and measurement systems may be possible. Faulkner says monitoring and measuring every practical point for power and temperature "allows for understanding the effects of change in the data center and provides means to prove what changes are worth the cost."

Khaund says retrofitting mechanical systems, such as CRAC unit supply fan motors, chillers, etc., that operate on constant volume to variable frequency drives is an option. "Systems integration and bringing all mechanical systems under the purview of the building automation system for complete visibility and synchronized control and management is very important," she says. "Disparate mechanical systems lend to major operational and energy inefficiencies that can be avoided with proper integration of systems, controls, and devices." Doing so also helps conduct predictive energy management and fault detection and diagnostics, she says, thus

making sure other data center energy hogs, such as lighting, perform optimally and don't add to inefficiencies.

✓ *Cooling & Airflow*

According to IT solutions provider Logicalis (www.logicalis.com), cooling is responsible for as much as 40% of power costs in a typical midsized data center. Improving airflow is one of the easiest ways

to improve a company's power usage bottom line. Among the company's airflow-enhancing tips are blocking all unused rack space and areas between racks and outer cabinet shells. Also, check that raised floors are clear to enable maximum airflow, use adjusting cabinets or enclosures for legacy equipment that's not front-to-back cooled in order to route side-to-side airflow in such a pattern, and use containment to keep return air separate from ambient room temperatures.

"Hot air mixing with cold air is a terrible drain on efficiency," Faulkner says. "Make sure to keep them separate." One problem with implementing hot aisle/cold aisle containment, he says, is older buildings often have low ceilings, old power and cooling infrastructure, and lower weight limitations that can keep necessary ducting from fitting. Khaund, meanwhile, says that the success of a hot aisle/cold aisle implementation in a legacy data center varies case by case; factors such as the number of perforated tiles channeling cold air from the under floor plenum into the cold aisle must be considered when attempting to optimize performance.

Stanley says hot aisle/cold aisle arrangements "are usually good practice regardless of the age of the site," but in existing sites "it's difficult or impossible to shut things down and rearrange the racks." Still, implementing an arrangement without a rack reconfiguration is potentially possible. "It doesn't have to be pretty," he says, but "cooling equipment and set points should be monitored and, if necessary, adjusted after the change." Overall, he says, optimize airflow so cold air is directed at equipment that needs it "rather than leaking out through gaps in the raised floor or mixing with hot air." Maintenance-wise, check for clogged filters, slipping belts, stuck valves, etc., that reduce the unit's efficiency. Most efficiency improvements, he says, come from the cooling side because "you have degradation of heat-removal ability over time with buildup and general fouling of heat transfer surfaces. Really, it comes down to adherence to maintenance plans." 

BONUS TIPS:

✓ *Make It Count*

John Stanley, 451 Research analyst, says to make certain adjacent cooling units aren't fighting each other so that "one unit is not humidifying while the other is dehumidifying," which can happen due to problems with the units' humidity sensors or settings.

✓ *Professionals Can Help*

Robert Faulkner, Server Technology sales engineer, says that while each company must determine what it considers a "cost-effective" measure, seeking professional help is one possibility. "A professional audit of the data center is a good first start, as this will allow for ranking of possible improvements relative to implementation costs and ROI," he says.