



Ken Koty

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MAXIMIZING POWER EFFICIENCIES

Energy inefficiencies cost data centers money on two fronts. The use of energy costs money and the inefficient use of energy requires more energy and thus more money. One of the biggest by-products of inefficient energy use is heat generation. Heat that needs to be eliminated through cooling, results in increased energy consumption and again more money.

Take steps to improve the efficiency of power consumption in a data center. Following are a few simple ideas that could save your data center a lot of money.

Infrastructure

- Implementing a few best practices like preventing airflow bypass can help many data centers lower their energy consumption.
- The loss of underfloor air pressure and the mixing of hot and cold air, forcing cooling equipment to work harder and longer to maintain optimal cooling temps is the biggest contributor to inefficient energy usage. Sealing all openings in a raised floor, including cable cutouts underneath cabinets and openings around building columns and any gaps along the walls at the perimeter of the building should be the number one priority for any data center looking to improve energy efficiency.
- Easy fixes like hot/cold aisle configurations and containment systems, airflow management best practices like blanking panels and brushed grommets are all making existing cooling equipment more energy efficient.
- Installing barriers or curtains for hot/cold aisle isolation, install side panels to racks and cabinets to control airflow.
- Utilize better quality perforated floor tiles to improve air distribution. Install blanking panels, and seal underfloor cable and pipe penetrations with brushed grommets.
- If you're not utilizing virtualization at least consider decommission unused "Zombie" servers or consolidate lightly used servers to help decrease power consumption.
- Improving your cooling equipment efficiency can take several forms including, installing a drop ceiling to duct hot air away from the electrical equipment. You can also consider creating an overhead return hot-air plenum and extending CRAC air intakes into the overhead hot-air return plenum.
- Even simple things like powering your servers from the closest PDU/RPP's the longer the runs the more voltage drop you will experience and in a large site this can add up to lowering your efficiency rating in your data center which in turn will affect your operating costs.

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Ken Koty, former data center facilities manager with over 30 years of hands-on experience shares management practices that made him a 12 year award recipient for continuous uptime from the Uptime Institute. PDU Cables does not guarantee the results of outcomes by using information contained in this document.



Getting the most energy efficiency out of new equipment should be the goal of every data center. Accomplishing that goal often starts proper evaluation and purchase of the most energy efficient equipment available.

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Equipment

- As the largest consumer of electricity, IT equipment is typically refreshed and replaced every two-to-three years, much more frequently than infrastructure systems. Purchasing more energy efficient IT equipment and utilizing virtualization could save a significant amount of energy over the life of the equipment.
- When purchasing your servers it pays to get the most energy efficient equipment. A high efficiency server can save as much as \$450.00 over its useful life. Three to four years is typical. If you take into consideration the number of servers you have in your data center this can add up to a large savings to your company. These servers should have more efficient power supplies, better DC voltage regulators this will also mean less heat which will reduce your cooling costs. Set up a test station and ask vendors to provide server to test to see which one is the most energy efficient and still was able to do the job required. Take amp probe readings to measure energy consumption as the tests are being performed. Calculate the energy savings compared to the cost differential of the different pieces of equipment.
- When purchasing UPS systems do not buy oversized systems, typically UPS manufacturers rate the efficiency of their systems at or near 100% capacity. If you are using a parallel system at N+1 or N+2 you are probably running each module at 40% load or less. This will greatly decrease the efficiency of your system. You may want to consider purchasing a modular type system that can be added on to as your load increases. When purchasing UPS systems the biggest thing is to look for is a system that is rated at 95% efficiency, even a gain as little as 5% can save you thousands of dollars a year in electrical costs.
- If you had a 15,000 square foot data center operating at 100W/ per square foot you can save as much as \$90,000 annually in electrical costs using the higher efficient system. (Based on 10 cents per KW hour)
- I would recommend buying the most efficient PDU systems on the market. (I'm referring to the large PDU's that are used to provide branch circuits to your server cabinets)
- Consider changing to more efficient electronically commutated motor (ECM), or variable frequency drive (VFD) fans for CRAC units that generate an energy savings related to the air handling and associated chiller plant equipment. The use of the fan speed control system could also add additional savings for air handling and chiller equipment.

Maintenance & Monitoring

- Don't ignore the energy efficiency of the equipment on hand. It may be an important part of your data centers energy consumption for years to come and without proper maintenance it can be losing efficiency daily.
- Equipment's long efficient life depends on frequent inspections, testing and preventative maintenance programs to ensure everything is working at peak performance levels. Dry bearings; worn belts, clogged filters, and contaminant build up all lead to reduced power usage efficiency and a shortened life. With equipment that runs 24x7 small gains in efficiency, while not noticeable day-to-day or week-to-week add up to significant dollar savings over the course of a year.
- Checking loads on your UPS system, remember most UPS systems run much more efficient when loaded at or near capacity.
- A good maintenance program for your cooling equipment includes keeping filters changed, clean cooling coils to achieve the maximum efficiency out of your CRAC/CRAH equipment, have a proper chemical program for cooling towers along with a good cleaning program. Checking blower motors for cleanliness and proper belt tension and alignment.
- Look at your electrical bill or check with the utility provider for your power factor. Most electrical providers require at least 95% power factor and will charge a penalty fee if below this number. If you are below the utility required power factor, consider adding your own capacitor banks to the service within the site. Using auto correcting capacitor banks can help set the desired power factor and save you money. A higher power factor will also increase your systems branch capacity. Lower power factors can lead to excessive voltage drops, overheating, and premature failure of motors and other inductive equipment.

Remember when buying newer energy efficient cooling systems with increased capacity, without taking basic steps to eliminate airflow problems there will continue to be energy wasted in the creation and distribution of cold air.

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