



Ken Koty

## Ken's Korner

### DATA CENTER ENERGY EFFICIENCY LOOKING FOR IMPROVEMENTS

Huge gains have been made over the past few years to improve energy efficiencies. Implementing best practices such as preventing airflow bypass, installing blanking panels, sealing openings in the raised floor, and utilizing hot-cold aisle configurations have helped many data centers lower their energy consumption. Lowering a data center's PUE and achieving the next big gain in efficiency will take a little more work. Following are a few things to consider when considering energy inefficiency and how to address it.

#### CAUSES OF ENERGY INEFFICIENCY

- Improper placement of A/C CRAC & CRAH units, in relation to racks and cabinets can directly impact their efficiency.
- By not using the closest PDU/RPP's, long power feeds to server's waste energy.
- Dirty cooling equipment such as cooling towers, heat exchangers, A-Coils and air filters, cuts into the equipment's efficiency.
- Loose or misaligned A/C unit belts and pulleys.
- Open raised floor cutouts, both cable cutouts and other raised floor penetrations, including PDU's and RPP's, effects cooling efficiency.
- Air dams and other airflow obstructions, under raised floors.
- Poor cable management under your raised floor.
- Old equipment with low efficiency ratings.
- Continued use of inactive or idled servers that should be shut down or removed from the data center.
- Work with IT to identify and remove inactive and unneeded servers and applications. Memory may be cheap, but energy costs aren't.
- Look at all existing equipment in your site to determine which pieces are the oldest and least efficient. When replacing equipment consider replacing the least efficient equipment first.
- It may be possible to consolidate several older servers into one newer model and experience considerable energy savings.

#### IDENTIFYING ENERGY INEFFICIENCY

- What is your site PUE, you need to know what is your site power factor is.
- Know the power efficiency of your equipment. Not knowing the current power consumption of your site, makes it difficult to make energy efficiency improvements.
- Use Amp meters to measure the power equipment draws, use this to identify the least efficient equipment.
- Voltage meters, if you have long power feeds (over 100') you will probably have voltage drop which in turn costs more to power your equipment.
- What is the sensible cooling rating of you're A/C equipment compared to the advertised ton rating the vendors are telling you. Different brands can have a higher sensible cooling capacity rating than their competitors same sized units. Sensible cooling is the actual work they do.
- Sometimes something as simple as walking the raised floor will identify hot spots which may indicate poor underfloor cable management, or air leaks in raised floor cutouts.
- If you use under floor cooling check for cable dams, uncovered cutouts, and the utilization of hot/cold isle concept.
- Hire a professional vendor to do an energy evaluation of the site. In some cases server equipment vendors will provide this service at no cost to you.
- Perform a server audit to identify any inactive or underutilized servers for removal.
- Small portable anemometers and thermometers are cheap and easy to use, and are perfect for the budget constrained data center. Simply move around and record temperatures and airflow throughout the data center. Mark your readings on a map of the data center and begin to seal openings in the floor, move perforated tiles to balance airflow and temperature.

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## DATA CENTER ENERGY EFFICIENCY

### LOOKING FOR IMPROVEMENTS (CON'T)

#### ADDRESSING ENERGY EFFICIENCY

- Utilizing hot/cold aisles, improves cooling capacity and reduces energy consumption.
- Stricter cable management, both power and IT cables to eliminate airflow obstructions.
- Better facility infrastructure maintenance programs keep equipment running at peak efficiency.
- Using brush grommets to seal raised floor cable cutouts and installing blanking panels in server cabinets helps to limit airflow bypass improving cooling efficiencies.
- Pressuring vendors to build higher efficiency equipment, both facilities and IT.
- Invest in the high-efficiency transformers in PDU's and High-efficiency UPS systems. They'll pay for themselves with long term energy savings and a longer service life.
- 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.
- Even if you are considering replacing old cooling systems with newer equipment that may have greater efficiency and increased capacity, without taking basic steps to eliminate airflow problems and improve airflow, there will continue to be energy wasted in the creation and distribution of cold air.
- Utilize power monitoring systems to better understand and manage loads helps to understand and address energy efficiency opportunities.
- Ask vendors to provide servers prior to purchasing them for testing and load comparing purposes. If different brands will do the required work for your company, why not purchase the one that uses the least power. Remember more power consumption also equates to higher cooling requirements.

**Much of the gains in data center efficiency in recent years have begun by simply following best practice guidelines.**

- Perform all the proper maintenance on the components of your cooling systems to make sure it operates at peak capacity and efficiency. Replacing filters, cleaning coils, keep belts aligned are just a couple of tricks that will give you big gains in energy efficiency over a years' time.
- For more complex solutions to saving energy, you might 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.
- There are several simple upgrades designed to improve cooling efficiencies in a data center, such as better quality perforated floor tiles to improve air distribution. Install blanking panels, and seal underfloor cable and pipe penetrations with brushed grommets.
- Advanced upgrades might include installing an energy monitoring and control system. Installing barriers or curtains for hot/cold aisle isolation, install side panels to racks and cabinets to control airflow.
- If you are considering raising your data center temperature, be careful that raising the overall temp doesn't result in hot spots leading to equipment failure. Having the ability to measure and record over a period of time the temperature at the server inlet is ideal, without that you might want to raise the temp only slightly.
- Consider CRAC/CRAH units with free cooling option if your data center is in a cooler climate, this could save you a considerable amount on your utility bill.

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