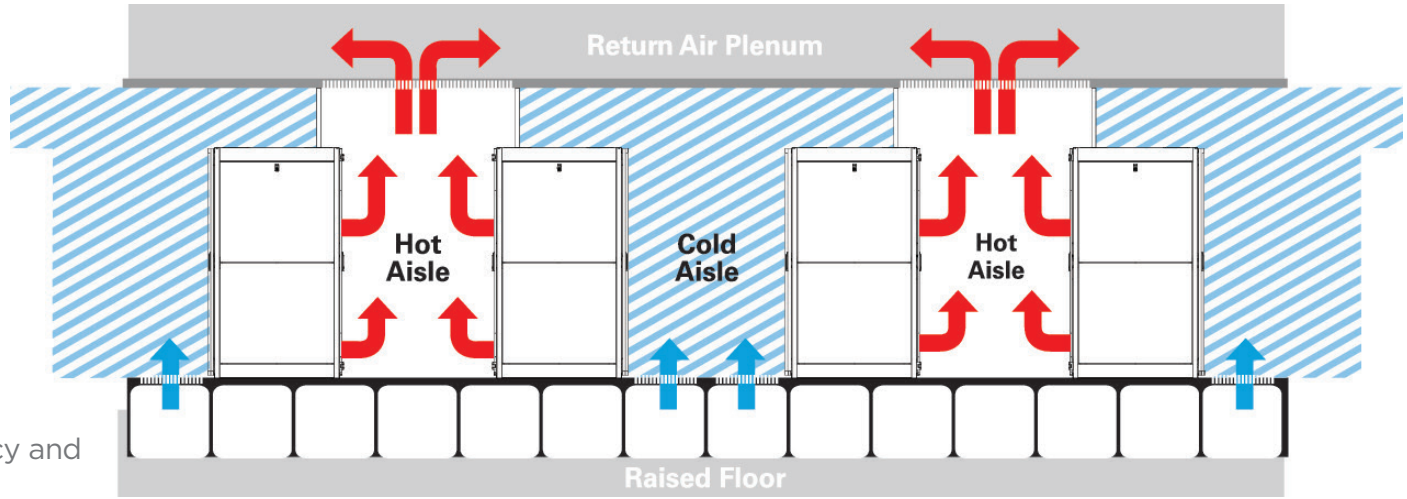
COOLING AND CLIMATE MANAGEMENT

Temperature gauge



Luca Rozzoni of Chatsworth Products (CPI) explains why it is vital to be aware of the new thermal management strategies and intelligent technologies that can proactively create efficiency and impact data centre optimisation

The rapid growth of cloud computing and the further evolution of the Internet of Things (IoT) are pushing the boundaries of modern enterprise data centres to provide uninterrupted service of the highest quality. Data centre operators therefore need to be more proactive than ever, reshaping their strategies to allow for greater capacity and expansion across the various areas of the IT infrastructure.

> 'New kinds of cooling technologies and power systems aim to create an even healthier data centre ecosystem capable of evolving with new trends and meeting and protecting the needs of a quickly evolving business model.'

COOL IT DOWN

Power usage, space and the right data centre design are still major concerns for data centre operators, according to a recent Data Centre Market Insights report. In each case, roughly 40 per cent responded that they are trying to improve everything from data centre capacity to better utilisation of infrastructure resources.

Cooling energy inefficiencies expose the data centre to poor separation of hot and cold air (causing loss of cooling effectiveness), air leaking through cabinets (allowing hot air circulation back into equipment inlets instead of flowing into the CRAC units) and airflow obstructions (that constrict cooling airflow).

As rack heat densities approach and increase above 5kW, holistic cooling optimisation technologies are able to offer approaches such as containment systems, cabinets with enhanced sealing features and energy efficient computer room layouts.

In a data centre where the cabinets function as a complete isolation barrier between supply air and return air, higher cooling efficiency can be achieved. Once there is no longer any dependency on how much air can be pushed through a single perforated floor tile, the access floor can be eliminated altogether. The room can then be flooded with high volumes of cold air through wall grates or from overhead, eliminating unnecessary expenditure for installation and maintenance of raised floor systems.

AIR APPARENT

Because of the traditional dependencies on air delivered through proximate perforated access floor tiles, cooling capacity provisioning formulas have had to plan for providing adequate air to the lowest airflow spot in a room, resulting in typically 200-300 per cent over-provisioning and huge amounts of wasted bypass air.

Adopting a method such as the ducted exhaust system, where every bit of cold air produced by the HVAC system goes through the active equipment, means there is no longer a need for that over-provisioning and, therefore, no more waste.

New types of aisle containment systems also address thermal management by improving data centre operational efficiency and reclaiming lost power. It's critical to ensure that airflow is well controlled and that hot/cold aisle containment is in place. Efficient aisle control, as well as good environmental management, can ensure a data centre remains environmentally friendly.

DOWN THE AISLE

Aisle containment can improve airflow and cooling efficiency by as much as 10 per cent, according to Gartner. Cold aisle containment can reduce fan energy by 20-35 per cent, and deliver 20 per cent energy savings from the chiller, all while paying for itself in about two years, according to PG&E.

Using technologies around aisle containment provides physical separation of cold air and hot exhaust air by enclosing the hot or cold aisle or ducting hot air away

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from cabinets with 'chimneys' to facilitate a cool air supply to equipment air intakes at the desired, uniform temperature. Hot aisle containment or ducted cabinets provide similar results. However, regardless of the solution chosen, it must provide a strong seal to minimise leakage, allow the pressure difference between the open and enclosed space to be minimised and therefore the cooling system to be adjusted for optimal performance at the lowest cost.

In airflow management, the separation of hot and cold air within the server room is the first critical step to maximising cooling system efficiency. Once airflows are separated, there is a wide range of adjustments to cooling systems that provide savings from reduced operating cost and increased efficiencies. Likewise, airflow management increases free cooling hours.

COMING TO TERMS

What do we mean by the term free cooling? Gartner defines free cooling as any technique used to reduce the energy consumed by cooling systems or the time that the cooling units run by using the outside temperature of air or water to cool the data centre or other facilities. Free cooling helps save energy and is now virtually mandated by the requirements of ASHRAE 90.1 – 20105.

Generally, it comes from the use of air-side and water-side economisers. Air-side economisers work in two ways. Mainly, they use direct fresh air cooling by filtering (and possibly adjusting the humidity of) outside air, which is piped in to cool the data centre. In cold climates, it may even be warmed by the hot air being expelled, so as not to be too cold. Air-side economisers can also work without bringing direct air into the data centre, but by heat transference from warmer inside air to cooler outside air.

MEASURED APPROACH

A modern best practice approach to cooling and climate management will also take in additional considerations such as measuring environmental variables and better monitoring of both power and cooling.

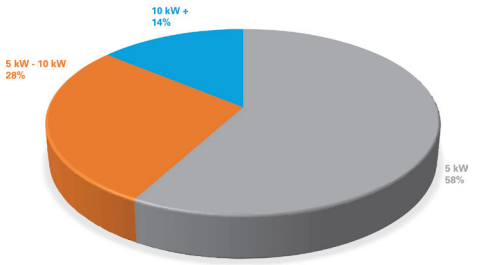
Keeping track of environment variables will help create a more efficient rack design. Some servers will generate more heat, while others may need more power. By seeing what system is taking up which resources, administrators can better position their environment for optimal use.

It's important to work with solutions that can provide the ability to look into the thermal and environmental performance of an infrastructure. Using such tools, an organisation can make better decisions on how to build a rack infrastructure. It is also advisable to work with technologies that help to give options around environmental enclosures, efficient network and server cabinets and even designs supporting seismic protection. All of this will improve data centre efficiency, resiliency and redundancy.

POWER MONITORING

Increasing pressure to operate efficiently in order to reduce costs and increase IT capacity have introduced a new way of thinking on how power is being generated, designed, and managed in the data centre. The past 10 years have seen a dramatic shift in the role of the data centre, moving from being a pure cost to a source of revenue. Operating a facility that can scale in real time based on business requirements requires smarter capital investment.

AVERAGE RACK DENSITY/ POWER CONSUMPTION



Therefore, it is good practice to always monitor power consumption rates. The idea here is not only to know how much power is being used but also to make the environment more efficient. It's important to look for ways to save on power based on actual requirements. For example, certain power heavy racks may need to be distributed more efficiently, thus saving on power consumption and costs. Also, as space becomes a concern, it's essential to look for systems that can support space conscious upgrade cycles as well as equipment that is capable of higher heat/power densities but still uses the same amount of space.

By increasing the efficiency of the hardware throughout the power chain, it is possible to reduce operating expenses. This optimisation can be achieved by using scalable, modular systems that will allow for growth, as IT needs dictate. Capturing data at different points along the power's path will provide the necessary information to tune the system for optimisation and will make sure space is being used effectively.

COOLING MONITORING

Much like power, keeping an eye on cooling is important. Tracking inlet temperature against ASHRAE guidelines and evolving equipment specifications is key. Ensuring that IT systems are running optimally will revolve around how well the environment variables are controlled. New kinds of cooling technologies and power systems aim to create an even healthier data centre ecosystem capable of evolving with new trends and meeting and protecting the needs of a quickly evolving business model.

Adopting not only the latest technologies but an overall best practice approach significantly improves efficiency, resiliency and redundancy, ensuring a data centre is prepared for the increasing future demands that it is certainly going to face. ❑

LUCA ROZZONI

Luca Rozzoni joined Chatsworth Products (CPI) in 2015 as European business development manager. In this role, Rozzoni is responsible for identifying and developing products and solutions that will enable CPI to further meet the needs of its customers in Europe. Rozzoni studied Electronic and Electro-technic Engineering at the Istituto Tecnico Paleocapa and also holds a business degree in strategy development and implementation. He is also a BICSI Registered Communications Distribution Designer (RCDD).