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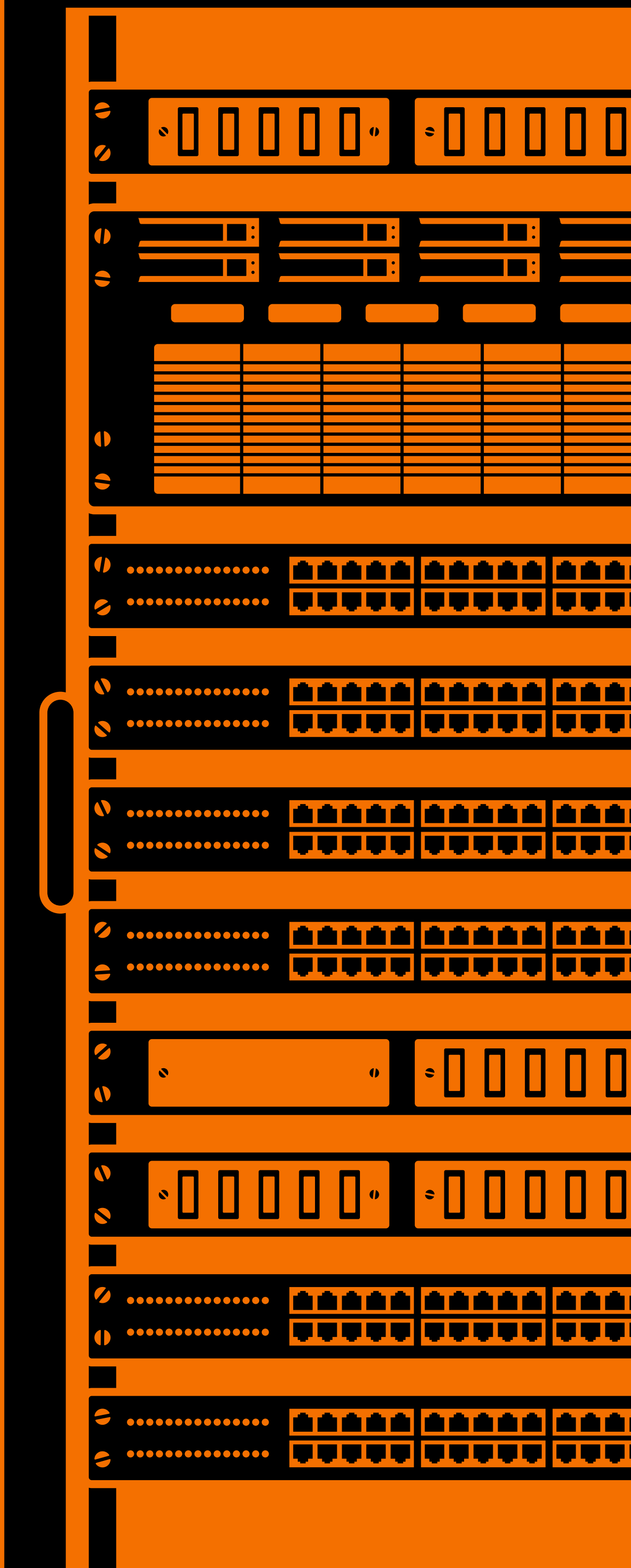

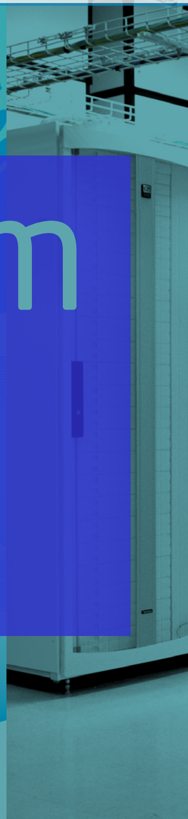

Coming in from the cold

Luca Rozzoni of Chatsworth Products (CPI) explains why understanding data centre cooling and climate management is so important

Data centres are rapidly increasing in density, with many racks surpassing 5kW, so cooling has become one of the most significant considerations. As one of the biggest consumers of power, increasing cooling efficiencies can provide real cost savings and data centre owners and managers are therefore taking a much closer look at ways to improve their efficiency. They are also realising the need to not only incorporate cooling considerations earlier into a facility's design process but also to invest in smart, automated ways to configure and operate their cooling.

GUIDING LIGHT

The environmental operating conditions of data centres worldwide have long been guided by recommendations made by The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Whilst the guidelines continue to be updated as the data centre industry and its technologies evolve, monitoring cooling through tracking inlet temperature against the ASHRAE guidelines, as well as the latest equipment specifications, is important.

ASHRAE originally recommended that the device inlet be between 18-27°C and 20-80 per cent relative humidity. Other experts recommended an even lower limit than 27°C to allow for variable conditions and to compensate for any inaccuracies of

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temperature sensor or controls systems. These guidelines are based on server inlet temperatures, as opposed to internal server or room temperatures or server exhaust temperatures.

However, as the data centre industry's knowledge and understanding of operating conditions has developed, ASHRAE has expanded its allowable temperature ranges and encouraged using techniques to reduce the energy consumed by cooling systems, or the time that the cooling units run, by making use of the outside temperature of air or water to cool the data centre. Known as free cooling, this can make real energy savings and is now virtually mandated by the requirements of ASHRAE 90.1 – 20105.

Airside economisers mainly use direct fresh air cooling by filtering outside air and then piping it in to cool the data centre. They can also work without bringing direct air into the data centre, but by heat transference from warmer inside air to cooler outside air.

POWER RANGERS

The Power Usage Effectiveness (PUE) metric – the ratio of power used by a facility compared to the power used by the IT equipment – has also encouraged data centre designs to incorporate outside air economisers and permit a broader temperature range to achieve a lower PUE.

This approach to cooling has demonstrated that IT equipment can operate reliably over a much wider temperature and humidity range than originally thought, and has encouraged more data centres to use PUE to analyse and improve their energy efficiency and look for more innovative cooling systems.

UNLOCKING EFFICIENCIES

Cooling optimisation technologies are key to achieving greater efficiency, resiliency and redundancy, protecting a facility's hardware by ensuring it functions efficiently throughout its total lifespan. However, understanding the different cooling choices and making the right cooling design decisions for a facility depends on a variety of factors beyond budget, such as power density and room size.

Three key considerations when looking at which cooling technology to choose include selecting the most appropriate airflow containment system, sourcing cabinets with enhanced sealing features, and ensuring an energy efficient computer room layout.

• AIRFLOW CONTAINMENT

The physical separation of hot and cold air within the server room is the first stage to maximising cooling system efficiency. Segregating the hot and cold air can improve chiller efficiencies, reduce the total plant cooling capacity, and create more free cooling hours.

This can be achieved by building an enclosure around the hot aisle, known as hot aisle containment; building an enclosure around the cold aisle, known as cold aisle containment; or using a 'chimney' at the top of the cabinet to remove hot exhaust air, known as a vertical exhaust duct.

It is essential that whichever method is used that the solution provides a strong seal to minimise leakage and ensure the pressure difference between the open and enclosed space is minimal. This will allow the cooling system to be adjusted to strengthen performance and lead to greater savings.

Specifying cabinets that provide a complete front/rear seal around equipment and removing constraints around critical airflow design allows higher power and heat densities. Best possible isolation can be achieved with a combination of accessories including blanking filler panels, equipment mounting area perimeter sealing air dams and floor tile cut out brush seal grommets, along with a system to remove the return air from the room into a suspended ceiling return air space.

MEASURE AND MONITOR

Measuring environmental variables and monitoring both power and cooling are also essential in cooling and climate management. Investing in tools that provide the ability to analyse the thermal and environmental performance of the infrastructure is critical in making the right decisions at the design stage regarding the building of the rack infrastructure.

Keeping track of environment variables not only helps to create a more efficient rack design but also enables an administrator to see what system is taking up which resources to ensure optimal performance. By continually monitoring power consumption rates,
it is then possible 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.

If space is a potential future concern for a facility, choosing equipment that is capable of higher heat/power densities but still uses the same amount of space or a system that can support space conscious upgrade cycles will be an important consideration.

THE APPLIANCE OF SCIENCE

Computational fluid dynamics (CFD) modelling or airflow modelling offers a more scientific and comprehensive design approach for simulating the cooling performance of data centres than was ever previously possible.

State-of-the-art CFD techniques used by powerful three dimensional software tools are now applicable to almost any data centre configuration.

Computational simulation can be used for a quick setup of any proposed layout, any desired placement of CRAC units and perforated tiles, and any imagined failure scenario. Supply and exhaust ducts, supplemental cooling units, the heat loads and airflow demands of the racks, and obstructions under and above the raised floor can all be considered.

Performing this type of simulation is much faster and more economical than building an actual layout but the results can provide the flow rate distribution through perforated tiles and rack inlet temperatures, as well as the underlying velocity, pressure and temperature fields.

A CERTIFIABLE CASE

New kinds of cooling technologies and energy efficiency technologies are continuing to emerge and can already help organisations achieve the coveted Leadership in Energy and Environmental Design (LEED) certification or Building Research Establishment Environmental Assessment Method (BREEAM) certification, which is one of the highest efficiency marks a facility can obtain. These efficiency systems can contribute to achieving 12-20 credits in areas such as advanced energy metering, low emitting materials, interior lighting and optimised energy performance. In the long-term, these technologies will be central to creating an even healthier data centre ecosystem, where efficiency and uptime can be further increased whilst operational costs are reduced. ■

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).