

GREEN DATA CENTRES AND CABLING CHOICES

With energy efficiency seen as the dominant characteristic of a green data centre, the adoption of new cabling technologies can ensure adherence to the EU Code of Conduct for Data Centres and enable organisations to realise significant OpEx savings long-term. Brand-Rex R & D Manager, Ken Hodge discusses how an informed choice of cabling can keep data centres cool.

Data centre energy consumption in Western European is projected to increase from 56 TWh per year in 2007, to 104 TWh per year by 2020¹. This not only poses a problem for EU energy and environmental policies, but directly impacts the bottom line of any organisation operating a data centre.

Historically, data centres have been designed with large tolerances to accommodate future expansion, while most run large quantities of redundant power and cooling systems to provide higher levels of reliability. The associated costs were considered a negligible risk to business performance, but rising energy bills have become a mitigating factor in overall cost of ownership.

EU's 'green data centre initiative

Published in October 2008 by the EC's Institute for Energy, the 'Code of Conduct on Data Centres Energy Efficiency (Version 1.0)' aims to stimulate a reduction in energy consumption by improving understanding of energy demand, raising awareness, and recommending energy efficient best practice and targets. Covering existing and new data centres, it embraces two main areas:

- **IT Load** – the consumption efficiency of IT equipment
- **Facilities Load** – the mechanical and electrical systems supporting the IT electrical load, such as cooling and air-conditioning systems

Currently a voluntary initiative, participants are expected to abide by a set of agreed commitments. However, the Best Practices advocated are pertinent to any organisation looking to attain energy efficiencies.

The cabling connection

Cooling the data centre represents the largest energy loss, thus any reductions in power and cooling have magnified effects at the utility energy supply. Providing clear airflow pathways in the raised floor, suspended ceiling, or both, can significantly reduce the energy used in circulating chilled air.

Cabling and cable trays can obstruct airflow and create turbulence, increasing the resistance and energy requirements of air movement. Choice of cabling is therefore critical when specifying new data centre equipment. 3D computational fluid dynamics (CFD) modelling is commonly used to thermally model the data centre. Figure 1 represents a typical small data centre of 1,000sq ft with a 2ft raised floor and perforated tiles positioned in front of the server racks. The CFD simulation outputs include rack and room temperatures; the pressure, volume and flow rates of air above and below the floor; and the estimated cooling capacity per tile.

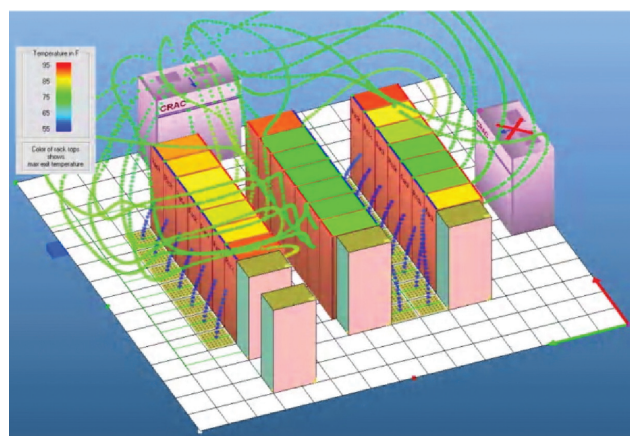


Figure 1: CFD simulation depicting airflow, rack and room temperatures.

In this example, we show that small reductions in the outside diameter of under-floor cabling can result in vast improvements in airflow to the server racks. The data centre houses a number of 3kW server racks, with each rack having 100 cable connections. The rate of airflow through the perforated tiles, without any cables deployed under floor, is estimated at 382 to 431 cubic feet per minute (CFM), per tile. When traditional cabling is added in trays under the floor, airflow is reduced to 391 to 424CFM with 7.2mm Outside Diameter (OD) cables, and falls to 361 to 392CFM using 8.5mm OD cabling.

Effectively, traditional cabling causes a 10% or more reduction in cooling airflow rates. However, by deploying next-generation, miniaturised cabling (5.5mm OD), the airflow stands at 381 to 437CFM, thus negating the reduction in airflow and resulting in a significant ongoing saving in cooling/energy costs.

Clearing the path to optimal data centre efficiency

There are now a number of miniaturised cabling solutions developed specifically for use in data centres. Featuring smaller diameters, improved flexibility and lower weight, these 'Microcables' not only reduce the space required in pathways for direct savings in energy costs, but are also ideal for use in high-density cross-connects and other areas of cable congestion – as found in the SANs.

CFD modelling is an expensive tool and is not always employed when designing and operating a data centre. The Best Practices set out within the EU's Code of Conduct provide an effective alternative, while the use of miniaturised cabling helps keep pathways clear and reduces long-term cooling costs.

1. This is based upon the Draft UK Market Transformation Programme European Enterprise Server installed base model, and assumes an upper bound ratio of 1:2 between electricity consumed by the server equipment within the data centre or server room, against that consumed by cooling equipment and through power losses.