Search Search

Main Menu
Home
Register
Data Centre World
In the Next Issue

News
News Items

Features
Case Studies
Cloud
Connectivity
Cooling
Design
Facilities
Managed Services
Management
Outsourcing
Power Management
People
Security
Storage
Servers/Hardware
Virtualisation
General Features

Resources
Articles
Jobs
Whitepapers
Events

Switch hitter

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DCM finds out about a UK bank that has switched to a new cooling technology

One of the UK's leading banks has chosen a new type of cooling technology for its latest generation of data centres, currently under construction in various locations in the UK.

It uses a new type of ultra-efficient chiller based on virtually friction-free magnetic bearings.

The Turbomiser chiller is claimed to use 30 to 50 per cent less energy than conventional screw or reciprocating chillers. Its designers claim that it is "probably the most efficient HFC refrigerant-based chiller in the world." The technology is claimed to cut data centre cooling costs by between one third and a half, while reducing carbon emissions by the same amount. On some applications, this can cut pay-back time to less than a year.

A first generation version of the Turbomiser chiller installed recently at The Dorchester in London is reported to be saving the hotel £10,000 a month in energy costs. The Turbomiser II being installed in the new data centres is said to be more efficient still.

The chiller is the fruit of a five-year development programme by Italian manufacturer Geoclima and UK cooling specialists Klima-Therm and Cool-Therm.

The system is able to achieve an Energy Efficiency Ratio (EER) of 10 and above without the need for additional free-cooling circuits and expensive glycol. This saves both on initial capital cost and ongoing pump energy.

Key design features include:

- Inverter-controlled Turbocor compressors equipped with low-friction oil-less magnetic bearings, whose output can be precisely matched to load;
- Micro-channel aluminium condensers, that reduce refrigerant charge while increasing the effectiveness of heat exchange;
- Total immersion evaporators that ensure optimum energy transfer between refrigerant and water;
- Use of a liquid refrigerant pump to deliver free-cooling without the need for glycol, that significantly increases thermodynamic efficiency across the chiller's operating range.

A key to the design is that, unlike standard chillers whose head pressure is fixed, the Turbomiser constantly self-regulates and optimises its performance in response to ambient conditions and load.

This is achieved with the use of high-efficency variable speed EC fans and a 1kW liquid pump system, under the control of specially-developed electronics. This effectively increases capacity at all condensing temperatures, but has greatest effect at lower temperatures. As a result, it can deliver cooling output many times more efficiently than a compressor.

Tim Mitchell, who heads up the data centre project for Klima-Therm in the UK, says: "The result is that the Turbomiser can operate extremely efficiently at part load conditions, which – in the UK – is the majority of the time. Data centres, with their steady base load, are ideal applications for this approach, and can reap the maximum benefit from the energy savings."

Another key to the chiller's low energy consumption is that compressors do not have to run constantly to maintain a fixed head pressure. By using the liquid pump system at lower ambient temperatures, the compressor(s) can be switched off, while the liquid pump circulates refrigerant around the system.

This glycol-free alternative to conventional free-cooling is highly efficient, and dramatically reduces energy consumption while maintaining refrigeration performance.

A secondary benefit of reduced compressor run-time is extended plant life and improved reliability. With the low-power liquid pump taking the load, compressors do not have to work so hard or for so long, reducing wear and the likelihood of breakdown.

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