DATA CENTRE

SIEMENS

CASE STUDY

Siemens EDA: Award Winning Data Centre Cooling Solution

Siemens Electronic Design Automation (EDA), formerly Mentor Graphics Data Centre, has had a presence in Shannon, Co. Clare for over 20 years. Siemens EDA is currently expanding at this location with the development of its first software R&D division in Ireland.

To enable this expansion, Siemens EDA required a highly energy-efficient data centre cooling solution to work with their new high-density servers. The aim of this project was to expand the Data Centre while maintaining the lowest Power Usage Effectiveness (PUE) possible.

Siemens EDA had an end-of-life DX Unit and Air Handling Unit (AHU) on the roof and wanted to reduce the use of the inefficient AHU. The AHU and ductwork were taking up a large amount of space, and the ductwork was susceptible to leaks and losses.

Sirus designed an award winning solution that comprised the most efficient chillers on the market with intelligent controls to supply chilled water to Rear Door Coolers on the eight high-density server racks within the Data Centre.

The Solution

Sirus supplied, installed and commissioned 2 no. 320kW Air-cooled Magnetic-bearing Compressor Chillers (ENGIE QUANTUM A0325) with integrated free cooling coils providing a total cooling capacity of 640kW. These chillers come with energy meters and fast restart functions specially designed for Data Centre applications. They are built specifically for their energy efficiency and operate using R513 refrigerant, a non-ozone depleting refrigerant based on hydro fluoro-olefin (HFO) with low global warming potential (GWP). The chillers are energy-efficient with an ESEER ~ 5.

This project also involved the installation of 8 high-density Rear Door Coolers, each door capable of cooling 42kW of server heat loads. Sirus also installed a Siemens BMS panel and controls to monitor and control all operations.

In order to minimise piping and losses, Sirus strategically positioned the two chillers directly outside the Whitespace building in line with the rack being retrofitted with the rear door coolers. A plant room was built in between with adequate space for the chillers to operate and to eliminate the chiller's airflow short cycling. The chillers have 5" flow and return piping to allow for future expansion. The flow and return piping was teed off before entering the plant room where the two Grundfos pumps were positioned.

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The Solution (continued)

Also housed in the plant room are the system's new Grundfos pressurization unit and 1,000-litre buffer tank which are required to have ample load for the chiller and system to operate efficiently.

From here, the chilled water is pumped into the Data Centre Whitespace in the 5" pipework before being teed off at each rack to supply chilled water to each rack door. Each door is controlled individually and uses a three-port diverting valve to maintain a constant set temperature which in turn exhausts air via the 5-speed controlled fans back into the data hall at 21°C or less.

Due to the success of this cooling combination in the first installation, Siemens EDA decided to increase their Rear Door Coolers by a further 370kW in stage two of the project.

Sirus proceeded to install 12 more high-density Rear Door Coolers consisting of 4 no. doors, each capable of cooling 42kW of server heat loads, and 8 no. doors, each capable of cooling 25kW of server heat loads. A second 1,000-litre buffer tank was added followed by another 600kW Air-cooled Magnetic-bearing Compressor Chiller.

For testing and commissioning purposes, 48 no. 7 kW heat banks were hired and fitted inside the racks to simulate server heat loads – staging heat loads and drops similar to those of the servers.

The combination of oil-free magnetic-bearing compressor chillers with rear door coolers for data centre server rack cooling at source provided an innovative, sustainable cooling solution for Siemens EDA. At the time of installation, rear door cooling technology was a unique solution for data centres in Ireland.

The Result

In traditional data centres, the whole data hall is cooled, but in this case, the cooling is targeted at the heat source – the server rack. When the air is returned to the room, it is at a setpoint temperature of 18°C. Therefore, standard air handling unit control can be used in the room to provide air changes – this eliminates the issue of various hotspots around the data hall.

Since only the server racks are being cooled, there is no need for hot aisles and cold aisles – this saves on infrastructure. The targeted cooling load improves the chiller load efficiency. Magnetic-bearing chillers work more efficiently at part load, so these and rear-door coolers are the perfect pairing.

The existing AHUs use Direct Expansion (DX) type units as the primary cooling source. These are only partially used now to assist in controlling space temperature. Therefore, **the cooling load has decreased by more than 50%.**

The new system was designed to work at 8-10°C, but post-installation testing was done on higher, closer to satisfactory room temperatures, and found that water at 15°C was sufficient for use in the rear door coolers. This tweaking of the system has **resulted in an extra saving on energy** as it allows the chiller to operate even more efficiently.

The Siemens Desigo CC Building Management System monitors and controls all operations, including the chillers, pumps, pressurization unit and rear door coolers. All temperatures, pressures and alarms are monitored, logged & visible to Siemens EDA at all times. The complete system has recorded a **remarkable average COP of 8.5.**