

NEW HIGH EFFICIENCY HYBRID HEAT PUMP CHILLER CHOSEN FOR NORTHBROOK COLLEGE

A new type of hybrid heat pump chiller is supplying high efficiency, low carbon cooling and heating for a state-of-the-art refurbishment project at Northbrook College's West Durrington Campus.

The £6.6m project, carried out by main contractor Morgan Sindall, is designed to transform the college's West Durrington campus, with the addition of a new three-storey learning centre and entrance area with exhibition space, high-tech library, seminar rooms and a refectory. The staged project also includes a new drama block.

Simultaneous chilled and hot water

The Rhoss EXP TXAETY 4200 heat pump chiller, supplied by Klima-Therm and installed by Maybourne & Russell, was chosen for its ability to deliver low energy simultaneous chilled and hot water for use in air conditioning, heating and domestic hot water supplies.

The project achieved a Building Research Establishment Environmental Assessment Methodology (BREEAM) rating of Excellent. Windows, floors, roof and walls of the new building are highly insulated to minimise energy loss in the winter and reject heat gain in the summer. The roof contains photovoltaic panels to convert sunlight into electricity.

M&E consultant HamsonJPA chose the Rhoss EXP heat pump chiller because of the significant potential energy savings that could be delivered. Analysis of load profiles for the new building suggested it offered an ideal solution, as much of the year there will be a simultaneous requirement for heating and cooling.

Core technologies

It combines three core technologies: a high efficiency heat pump based chiller, an energy and heat recovery system, and an advanced control system that regulates and optimises the functioning of the combined system across a building to deliver the lowest possible energy usage while delivering set conditions.

The system design, with contributions by MLM in Ashford, Kent, incorporated a hot water buffer vessel, also acting as a low loss header between the chiller's primary circuit and the building secondary circuit. The configuration is designed to eliminate the possibility of compressor short cycling. This approach was also taken on the chilled water side.

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Smart controls

Onboard intelligent controls on the Rhoss EXP machine ensure it delivers the precise amount of heating and cooling required to meet current building demand, all without BMS intervention.

Temperature sensors across the evaporator and hot water production heat exchanger enable the chiller to sense if a load is required.

When there is demand for cooling only or heating only, the air-cooled condenser section of the chiller is used to reject or absorb heat as required, ensuring optimum efficiency in all modes.

Unlike other systems, the Rhoss EXP chiller has individual heat exchangers for chilled and hot water production, which connect separately to their relevant pipework circuits. This improves efficiency and performance, and simplifies installation and system control.

Among the first units of its kind to be installed in the UK, the system at Northbrook College is equipped with integral pumps, making it even simpler to install.

Highest efficiency

Andrew Latus, who headed the project for Klima-Therm said: "The building design and diverse use lends itself perfectly to EXP technology, as it delivers its highest efficiency when operating in simultaneous heating and chilled water mode. As this is the default condition for the building for the majority of the time, the system delivers exceptional efficiency and significantly lower running costs than competing systems."

Requirements delivered

Tony Farhall, who headed up the project for Maybourne & Russell, said: "We worked closely with Klima-Therm, our consultants and the client to ensure the requirements of the project brief were delivered. EXP offers a good solution in situations where there is a simultaneous demand for cooling and hot water, and particularly in a building where there is significant potential for internal heat recovery."

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Features of EXP hybrid heat pump chiller

- **Compressor:** hermetic scroll type, complete with thermal protection and crankcase heater.
- **Electronic expansion valve:** for improved efficiency and control.
- **Main and secondary heat exchangers:** cross-flow stainless steel plate exchangers, complete with anti-freeze heater, closed cell polyurethane foam insulation and water flow differential pressure switch.
- **Air side heat exchanger:** finned coil with copper pipes and aluminium fins.
- **Fans:** electric axial fans with EC motor with continuous adjustment of the rotation speed, equipped with internal thermal protection.
- **Control:** microprocessor electronic control with Adaptive Function Plus logic.
- **Structure:** galvanised painted sheet steel, with polyester powder coating.

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Attractive pay-back

Capital costs for the EXP system may be slightly higher than for a traditional chiller / boiler solution due to the more sophisticated technology. However, due to the energy and carbon savings, payback time is very attractive; typically between 18 months and two years.