

■ Energy efficiency

Comfort and efficiency: the best of both worlds

Optimal interior temperature control can be achieved without compromising energy efficiency targets, writes Rex Murden, managing director of Aermec UK

WE ARE ALL aware of the effects of high energy costs on the profitability of businesses, large and small, no matter which fuel they rely on. Pundits are warning that the days of cheap energy may be over for some time – perhaps for ever.

This can lead to tough choices for businesses. We all know that a comfortable working environment is good for staff, visitors and customers alike, but is air conditioning an environmentally unsustainable luxury?

Of course, those who know about modern HVAC systems appreciate that air conditioning can be much more energy efficient than often believed. Renewable and sustainable energy sources, coupled with ever-improving technologies, can create an optimal internal climate that needn't cost the earth. Recent large-scale projects have demonstrated just what can be achieved by using innovative solutions to help meet today's stringent energy targets.

Free cooling technology has been available for a number of years, and continues to offer significant energy efficiency benefits to modern renovations. The London & Regional redevelopment of 55 Baker Street – the former Marks & Spencer headquarters building – had clear energy-saving aspirations

from the outset. But at one million square feet, the specification for the high-occupancy, mixed-use development was to make high demands on the air conditioning systems. Superior cooling efficiency levels were specified for standard operating conditions and stringent energy efficiency criteria had to be met; all within a low-noise environment.

Free cooling provided the answer. Following a comprehensive review of the alternative energy source systems on the market, Aermec NSB Stepless Air Cooled Screw Compressor water chillers were recommended as the optimum solution.

Widely used across Europe, Aermec air-cooled chillers have inherent design strengths which make them among the most efficient and reliable free-cooling chillers on the market. The majority of conventional free-cooling chillers operate in two modes only – either with compressors or with free cooling. By using electronic expansion valves and sectionalised condenser coils, the Aermec free-cooling system can operate in a third mode with free cooling and compressors running at reduced capacity.

The system provides more than 9MW of cooling power at 32°C ambient temperature. The free-cooling refrigerant chillers deliver energy efficiency ratios up to 15



The former Marks & Spencer HQ uses Aermec free-cooling chillers

times greater than traditional compressor-only chillers by exploiting favourable weather conditions. As the ambient temperature decreases, the free-cooling coil takes an increasing cooling load away from the compressors. The resulting reduced dependence on mechanical cooling saves significant amounts of energy and cuts CO₂ emissions. Payback period for the Baker Street installation is calculated at just two to three years, with ongoing cost benefits thereafter in reduced energy usage. Annual energy savings vary according to internal building loads and ambient conditions but are generally in the order of 20-60%.

Geothermal is widely believed to be the rising star in HVAC industry. With a strong corporate commitment to reducing carbon emissions, home furnishing retail giant IKEA has put its money where its mouth is with store developments that demonstrate the dramatic energy savings that can be achieved with modern geothermal systems.

As IKEA's first city centre development, the new Coventry store was designed with energy efficiency as a commercial and ethical imperative.

The solution was the design and installation of a geothermal or ground source system which would provide all of the building's heating, air-conditioning and hot-water requirements – 1,500kW of heating

or cooling, together with 300kW of hot water for washing facilities. This represents a major step forward for ground source systems in the UK, which are usually designed to provide only part of the heating and cooling for any building with the remainder provided by traditional fossil fuel-powered systems.

Eight pairs of Aermec water-to-water heat pumps were installed at the IKEA site. Each of the heat pumps can operate in either heating or cooling mode, depending on the individual requirements of different parts of the building.

Other renewable energy sources such as wind or solar have achieved a lot of publicity in the media – but the advantage of ground source energy is that it is constant and predictable. Pumped by submersible pumps in four wells on the IKEA site, the water reaches the surface at a constant 12°C at 20 litres per second.

Ground water is pumped to the surface to cool and heat the building using extremely small amounts of power.

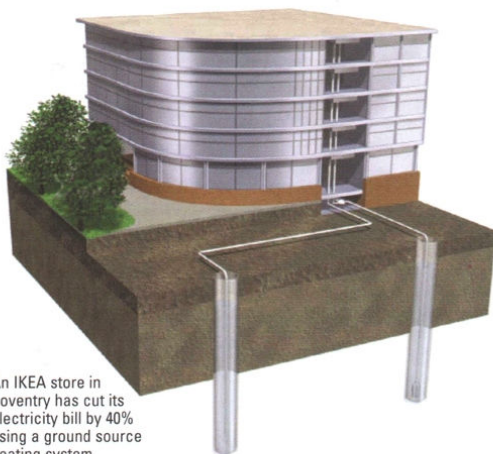
The Aermec water-to-water heat pumps then convert this to either 50°C for heating through the air conditioning coils or 6°C for use in the air-conditioning cooling coils, depending on the season.

A further supply at 60°C is provided for hot-water washing facilities. The coefficient of performance (COP) for the system is calculated to be between 3.5 and 4; this compared with a typical COP of 0.95 to 0.98 for a modern condensing gas-fired boiler.

As a result of using this ground-source heating system, the IKEA store uses no gas whatsoever, and electricity costs have been cut by around 40% compared with a traditional HVAC solution.

So, with good planning and the right equipment you can have it both ways – high comfort levels and energy efficiency. And things will continue to improve. Aermec and other innovators in the field are continuing to invest in improving technologies so the future for HVAC looks even more energy efficient than today.

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An IKEA store in Coventry has cut its electricity bill by 40% using a ground source heating system