**Energy efficiency demands are driving ever more sophistication in both HVAC and building energy management systems. Steed Webzell explains**

# Blowing hot

With extreme weather increasingly common in the UK, keeping buildings at optimum temperatures is driving HVAC (heating, ventilating and air conditioning) systems harder. Yet BEMS (building energy management systems), designed to optimise the operation of heating and cooling plant, among other building equipment, are still rarely installed.

For plant engineers tasked with specifying, installing, commissioning and maintaining such equipment, it's all about making informed choices. And, as Siemens Building Technologies division marketing manager Ian Ellis says, that requires engineering skill, but also a good understanding of these increasingly sophisticated technologies – and specifically the power and nature of BEMS.

"HVAC systems are often in operation all day, every day, regardless of whether or not they are required," he says. "But energy accounts for around 40% of many sites' overall operational costs and so these systems should be key targets for companies looking to reduce energy consumption. And the starting point for any energy efficiency drive is to know where and how HVAC systems are using energy – which is where BEMS come into their own."

To help sites monitor and manage energy, Ellis suggests a good starting point is its Desigo Insight system. This provides managers with energy reports for monthly evaluation. "Once a site understands where and how energy is being used, BEMS can be configured to integrate and manage different energy consuming systems," he explains.

For many, this is about nothing more complicated than installing temperature and area occupancy sensors, so that the BEMS can ensure building areas are not heated or cooled unnecessarily. His only caveat: "It is vital that accurate parameters are established for the system, so that heat and light settings are appropriate for the environment, time of day and occupancy."

And it's not just accurate system configuration that's required: staff involvement and knowledge are also fundamental for any BEMS to be successful in the long term. Anyone responsible for the operation of such a system should receive a meaningful handover and thorough training from the installer, if they are to achieve optimum performance, advises Ellis. Cutting corners here will mean missed savings, he warns.

Step back a minute: Gary Dowsett, director at Ener-G Controls, says that too many facilities managers overlook BEMS completely in their energy efficiency plans. Why? Because they believe them to be expensive and complex technologies, aimed only at big companies – with high costs attached to everything, from installation to operation and maintenance. "Such thinking sets back energy efficiency since, in fact, BEMS are among the quickest and most effective methods of driving down energy cost and consumption," he states.

Dowsett insists that, because its next generation E-Magine BEMS is a pre-engineered, pre-configured, cloud (externally hosted computer) based system, an approved technician can perform an installation quickly and inexpensively. Ener-G can then undertake commissioning remotely, and provide ongoing support and maintenance services.

## Embedded intelligence

That's important: "Using embedded intelligence, we've designed out human shortcomings that have, historically, prevented many traditional BEMS from delivering on their projected cost and carbon savings," he explains.

He points, for example, to the fact that, although there are recommended control strategies from CIBSE and BSRIA, these are not always adhered to. But, because E-Magine is pre-configured, the system does not rely on individual plant engineer's skills. Equally, he cites E-Magine's tamper-proof controls, which deal with the 'twitchy finger' syndrome, where users adjust settings and gradually erode any energy efficiency benefits. The net result is that this system's intelligent self-adaptive optimisation strategies aren't prevented from achieving their goals.

So much for operations: legislation is also set to get tougher on the energy performance of all buildings. According to the Carbon Trust, heating and hot water can account for 60% of a building's

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energy consumption. Not only does that have an impact on fuel bills; it must also be considered when examining the emissions levels of both new and existing buildings. Hence, for new-build, the concerns over ensuring compliance with Part L and Part F of Building Regulations, as well as the renewable planning requirements of local government. Similarly, with around 75% of existing buildings likely to be in use for the next 50 years, the focus here is on how to convert these sustainably to low carbon.

This is where a new variant of an old technology holds out hope, according to Mitsubishi Electric's marketing communications manager Graham Temple. "We've taken proven heat pump technology and developed a reliable heating-only system that will provide all of a building's heating and hot water needs," he explains.

Mitsubishi's CAHV Commercial Ecodan is a monobloc air source heat pump system that can work independently of, or in conjunction with, other energy-related technologies. Temple says it's suitable for both new-build and retrofit, and will provide anything from 43kW (at -3°C) up to 688kW of heating and hot water.

Heat pumps are recognised as renewable by both UK and EU governments, because they harvest free energy from the ground and air. At 'standard' conditions of 7°C, the CAHV heat pump achieves a COP (coefficient of performance) of 4.13 at a flow temperature of 35°C (independently tested at BSRIA to EN14511).

Furthermore, in developing this unit, Mitsubishi Electric has tackled one of the known limits of air source heat pumps – the defrost cycle – so that capacities can be maintained and reliable heating guaranteed. This has been achieved by building in two separate refrigerant circuits, which allow one side of the unit to stop working, while the other continues. PE

**Above: Siemens Building Technologies Divison marketing manager Ian Ellis**
**Left: Gary Dowsett, director at Ener-G Controls**

## Insulate to accumulate

Historically, there has been little change to the products, systems and installation methods used to insulate HVAC plant. However, the introduction of increasingly tighter thermal and environmental regulations will change that. Plant engineers will need to ensure that the systems and installation methods they use meet increasingly stringent requirements to deliver long-term performance improvements and energy savings.

Michael Hunter, technical manager at Saint-Gobain Isover, explains how plants can benefit from pipe insulation under Enhanced Capital Allowance (ECA). "Managed by the Carbon Trust on behalf of DECC [the Department of Energy and Climate Change], ECAs were developed to incentivise investments in energy-saving plant and machinery. Businesses are able to claim 100% tax relief on plant or machinery specified in the Energy Technology List."

HVAC and process pipework insulation is currently recognised under the ECA scheme, due to the clear thermal and energy benefits. ECA covers categories including refrigeration, chilled water and process pipework, as well as non-domestic heating and hot water services. This gives plants the opportunity to offset considerable capital expenditure against the costs of pipe insulation, providing it meets the thickness prescribed under BS 5422 (2009).