

Special report

Energy-efficient buildings

Building for the future: how to boost efficiency

Whether designing new builds or retrofitting existing stock, there remains huge untapped energy-saving potential for our buildings

H&V News recently reported that more than 30 organisations, including the UK Green Building Council, had issued a joint statement urging the government to set a minimum energy-efficiency standard for private rented homes.

It was expected that regulations would be laid in parliament in late 2013 or early 2014, but a public consultation is still yet to be published. Despite the slow activity for private rented homes, it has been decided that before 5 December 2015 every large enterprise in the UK will, by law, have to undertake an energy audit.

It is estimated that 7,300 large UK enterprises occupying between 170,000 and 200,000 buildings (of which 8,000 to 10,000 are industrial plants) will be covered by the legislation – representing around a third of the country's total energy demand.

According to ebm-papst head of sustainable technology Helen McHugh, a recent retrofit and refurbishment seminar saw many leading FMs, energy managers and engineers from across the UK agreeing that companies ignore the importance of retrofitting energy-saving equipment at their peril.

Ms McHugh says UK firms need to upgrade the facilities they already have instead of chasing carbon-neutral, eco-friendly new-builds. "We're still going to be using the majority of our older buildings for decades to come –

90% of the buildings we will have in 2050, the date the EU has earmarked for its major emissions targets, are already here and in use," she says.

"Our speakers had case studies of how retrofitting modern energy-efficient appliances could save businesses energy and money."

Other topics debated at the seminar included the threat of a looming national energy crunch, the responsibility of big businesses to undertake basic energy-saving measures, and the possibility of linking building services appliances over the internet to manage them better.

Going natural

According to GDL Air Systems marketing manager Laura Henderson, harnessing natural wind power and temperature buoyancy to ventilate buildings significantly reduces energy consumption that would have been used to operate a more traditional mechanical arrangement.

She says incorporating CO₂ sensors within a natural ventilation system will prevent wastage of energy in buildings where occupancy varies during the day.

For example, Ms Henderson says that by incorporating CO₂ monitoring throughout a school classroom, the ventilation rate can be designed in each area to be dependent on the occupancy within the room.

"In summer, ventilation rates



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Helen McHugh, ebm-papst

will be controlled by temperature sensors, but lower winter ventilation rates will be controlled by CO₂ sensors," she says.

"This limits the fresh air entering the building in order to maintain the internal temperature. There are numerous options to allow for the most effective airflow throughout the building."

Ms Henderson says operating theatres also need to be mechanically ventilated so that outside air cannot bring potential pollutants into this type of environment.

However, a mixed-mode systems approach when designing the ventilation system can be used to minimise the cost of ▶

Special report

Energy-efficient buildings (continued)

► a mechanical arrangement by using natural ventilation where possible, while solar-powered systems can also reduce energy demand where power-assisted fans are required, she adds.

March of technology

IES managing director Don McLean says over the next 10 years building simulation will become more sophisticated.

“The gap between design and operational performance will diminish due to the introduction of ‘smart’ technology that will start to change our buildings,” he says.

“Consider how the phone and car have been transformed over the past 10 years, with both utilising technology to the benefit of users.

“Buildings, on the other hand, have had relatively little technical advancement over the same period, resulting in many buildings performing poorly relative to what is possible.”

Mr McLean claims that while it can be reasonably argued that buildings are more complex and do not have many of the advantages of mass production available to phones and cars, the industry should make better use of technology.

He says this is where building simulation is moving in the near future, in that it will coexist with smart technology.

“Buildings will have an operational model, which will be calibrated with the building in real time. This model will play a key role in reducing energy consumption and carbon emissions,” he says.

As more complex and specialised energy-efficient equipment and systems are employed in buildings to reduce energy and carbon emissions, there could be a greater need for building simulation to facilitate both the design and operation of these.

Mr McLean says: “The operational model will work to gather



information from low-cost and more accurate sensors and smart meters, which will provide real-time information to the model, such as small power load information, occupant positions in the building and individual occupant preferences.

“There will also be continuous optimising of building operating using cloud facilities to ensure the operational model is as accurate as possible to ensure continuous optimisation of the building.”

According to Mr McLean, buildings controlled by operational models will be aggregated to operate simultaneously to form communities that will be much more energy-efficient and will interact with other communities, as well as with utilities, to minimise energy and water consumption and waste.

He argues that building simulation use will evolve as a key component in both the design and operation of extremely low-

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Laura Henderson,
GDL Air Systems

energy buildings, and ultimately of our smarter buildings and, more importantly, smarter cities.

Commercial focus?

Hamworthy Heating southern regional sales manager Stuart Turner says more attention should be paid to the boiler plant in commercial buildings, as gas costs can represent as much as 90-95% of the whole-life costs. He argues that this will help save energy and reduce carbon emissions.

When evaluating the choices available for a refurbishment or new-build project, Mr Turner argues it is vital that both the capital and operational costs are measured to provide the most efficient and economical solution.

The government is backing this principle with its Soft Landings Framework and the introduction of PAS 1192-3, a new BIM specification that focuses on the information management requirements during the operational phase of assets.

It recognises that operating and maintaining buildings can represent a large percentage of the whole-life costs and operational savings can pay back any upfront premium in construction expenses in just a few years.

Mr Turner says the industry can no longer focus on the acquisition cost of a product but needs to focus on the benefits that can be sought over its lifetime.

“We have seen that by upgrading boiler plant from atmospheric to condensing boilers, a 35% reduction in gas consumption can be achieved, which also has a corresponding effect on carbon emissions,” he adds.

Read the instructions

Vulcana Gas Appliance managing director Martin Emmerson says his company has seen a growing number of calls from engineers with heater issues that could have been dealt with promptly on site had they read the installation or servicing manuals properly. ►



Special report

Energy-efficient buildings (continued)

► He argues that rushing through the installation of a new gas heater or an annual maintenance review without referencing the appropriate instructions may save you a few seconds, but could have long-term environmental and cost implications.

He warns engineers not to get caught out because they have completed hundreds of installations before and think they know what they are doing, as no two gas heater installations are the same.

Mr Emmerson says it is up to the engineers to ensure they are as informed and up to date as possible with regards to the servicing and installation requirements of any given heater.

“There are no excuses anymore, since most manuals are available online. Don’t just throw them away once installation is complete either; there’s always a place for manuals and leaving them on site or in the toolbox offers an easy reference point for future maintenance work,” he says.

Hand in hand

According to Remeha Commercial managing director Mark Northcott, in order for a building to be energy-efficient, the industry needs to consider not only its design but its operation if it is to avoid an energy performance gap.

He argues that effective system design and efficient use of the services are therefore key criteria for increased energy efficiency.

Mr Northcott says the first step is maximum efficiency. For heating in existing buildings, adding onto a high-efficiency condensing boiler either passive energy-saving technologies such as flue gas heat recovery or a complementary LZCT such as

gas absorption heat pumps would result in higher effective use of the energy input, maximising the building’s savings potential.

The second step, he says, is to consider how efficiently energy is used: adding a weather compensation or sequential control would allow the boiler to operate at its highest efficiency, while zoned temperature and time controls enable energy-saving operation.

Cylindrical potential

Worcester, Bosch Group director of marketing and technical support Martyn Bridges highlights the hot water storage cylinder’s potential to make an impact on energy-saving performance.

“Since the introduction of the combi boiler, there’s been a shift in domestic heating system design and there’s been a move away from traditional stored hot water and cylinder arrangements to space-saving solutions,” he says.

“That said, over the last couple of years we have seen a resurgence in demand for regular and system boilers, particularly among homeowners with larger properties and multiple bathrooms.

“Achieving maximum energy-efficiency for a property can be demanding and the hot water storage cylinder has an understated yet potentially large role to play here, which is perhaps why the industry is experiencing increased demand for them.”

Mr Bridges says that as adoption of renewable technologies becomes more widespread, the company expects to see a greater emphasis on hot water storage solutions within the home.

“The benefits of taking a hybrid approach to heating and hot water have been known for

“We have seen that upgrading boiler plant to condensing boilers can lead to a 35% cut in gas consumption”

Stuart Turner,
Hamworthy Heating



some time, yet now, with the advent of government-funded schemes, homeowners have stronger incentives than ever to choose renewables,” he adds.

System evolution

Mr Bridges says modern hot water cylinders are very different to those produced years ago, when it wasn’t unusual to find cylinders installed in people’s properties that were finished in raw copper, with no insulation or just an insulation jacket to prevent heat loss.

In contrast, he says today’s generation of cylinders are leaving the factory with insulation built into the product composition and a casing structure developed to maximise heat retention.

Many of the latest cylinders on the market have been designed to comply with the ErP directive, which dictates a maximum heat-loss of around no more than 2 kW per day, ensuring households benefit from high efficiency and potential cost savings.

Mr Bridges said it is a huge positive that today’s technology offers such improved performance.

He concludes that with the Renewable Heat Incentive and the Green Deal coming to the fore in the next few months and the continued presence of stored water systems, this year has the potential to be one of the most significant for the cylinders market and the industry needs to ensure this isn’t a technology which is seen as “out of sight, out of mind”.



“With government-funded schemes, owners have stronger incentives than ever to choose renewables”

Martyn Bridges, Worcester, Bosch Group