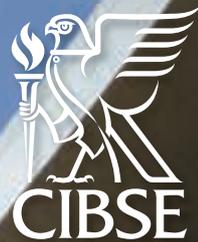


CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

March 2014

AID FOR BANGLADESH

CIBSE engineer's mission to improve garment factory conditions

HOT FROM NEW YORK

Highlights from ASHRAE Winter Conference

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SPECIAL SUPPLEMENTS



Resource efficiency
How engineers can help reduce the whole-life environmental footprint of buildings

2014 Building Performance Awards

Details of all the winners at CIBSE's prestigious annual event

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Action aid

We're barely two months into 2014, but we've already had two of the biggest events in the building services calendar. The ASHRAE Winter Conference in New York offered us plenty to ponder, while the annual CIBSE Building Performance Awards at the Grosvenor House Hotel gave the industry 15 very good reasons to celebrate (see the Awards supplement for information on all the category winners).

The big winners at the awards were M&S and Sustainable Design Solutions (SDS), which together won New Build Project of the Year (value over £10m) for their work delivering the M&S Cheshire Oaks store, and took the title of overall Carbon Champion. Monitoring proves the services concepts were successfully designed, installed and maintained. M&S and SDS offer plenty of useful lessons for clients wanting to ensure energy reductions are real and lasting. Turn to page 34 to find out how M&S intends to roll out the design principles across the rest of its estate and cut carbon by 40% by 2015 from 2006/7 levels.

There was plenty of innovation and research on show at seminars during the ASHRAE Winter Conference, including a look at the effects air-tight homes can have on indoor air quality, and low impact design trends in Africa. The 2013 winner of the Ken Dale Travel Bursary, Kayley Lockhead, showed how biogas was being used in villages to help replace kerosene as a fuel.

One country that is benefiting from the expertise of a CIBSE engineer is Bangladesh. Ramboll's Farah Naz has been working with well-known fashion brands to help improve conditions for garment factory workers. Our feature on page 48 reveals the true cost of our £2 T-shirts, with workers in the machine rooms subjected to temperatures of up to 40°C. Naz says the factories can be vastly improved using simple passive strategies, such as extensive use of daylighting – hopefully workers will soon be reaping the benefits of her work.

Back in the UK, we have been preoccupied by flooding. A BBC analysis of media coverage from previous floods found the same recurring theme – a lack of planning. CIBSE is among those institutions calling for government to change its approach to water management and rethink the way it manages, stores and distributes water (see page 12). We now need to see our politicians take the necessary long-term view.

Alex Smith, editor
asmith@cibsejournal.com



In brief

DECC LAUNCHES RHI 'ROADSHOW'

The Department of Energy & Climate Change (DECC) has kickstarted a national awareness campaign to alert consumers and installers to the opportunities offered by the domestic Renewable Heat Incentive (RHI), which gets under way in April.

The 'Roadshow' will visit Ecobuild and events in the Midlands, Scotland, Wales, the North of England and South West.

DECC will be showcasing the 'whole house offer' available under the RHI, in tandem with the Green Deal.

BALFOUR BEATTY'S 4D BIM AT SHEFFIELD HALLAM

Balfour Beatty will use building information modelling (BIM) to create a '4D' design for Sheffield Hallam University's new £23m Institute of Education.

The BIM model will include a time schedule and will provide a basis for a building management system. Balfour Beatty Engineering Services will deliver the mechanical and electrical services package, including the data centre and solar panels.

The two-block, seven-storey building is due to be completed in autumn 2015.

ENERGY COSTS FORCE PEAK-TIME SHUTDOWNS

Some of Britain's heavy manufacturers shut down their operation during peak times because of high energy costs. Executives claim this is happening because of the rules of Britain's power market.

The biggest electricity users are not charged according to annual consumption; instead, bills are calculated according to power consumed by the 100,000 heaviest users during three undisclosed half-hour periods of peak demand between November and February.

Tony Pedder, chairman of Sheffield Forgemasters, said: 'It can cost us £27 to boil the kettle. We end up telling our workers to sit in the mess room together to keep warm because we can't afford to keep going.'

BIM is key to international markets, reports survey

● Lack of common standards could hamper adoption of BIM on international projects

UK consultants who do not adopt building information modelling (BIM) could struggle to secure overseas work, according to the first International BIM Survey.

In all, 57% of respondents to the survey in New Zealand, and more than 60% in Finland and Canada, reported they were using BIM, compared with 39% in the UK. Usage is increasing rapidly in all these countries with adoption tripling in the three years since NBS launched the UK National BIM Survey.

Almost all respondents, across all countries, said they expected to be using BIM in five years' time.

However, a lack of common standards could hamper

wider adoption of BIM on international projects, according to NBS, which added that the use of Industry Foundation Classes (IFCs), the vendor-neutral format, which allows models to be worked on independently of specific software, would be the crucial next step.

The use of BIM throughout the life-cycle of a building remains in its infancy, with just 2% in New Zealand and only 15% in the UK providing evidence of BIM in the management and maintenance of completed buildings.

'There is still some way to go to reach a universally understood approach to BIM and common standards,' said Adrian Malleson, NBS's Head of Research, Analysis & Forecasting. 'Where BIM is being used, the focus is still very much on design and construction, with use as an operational and management tool for buildings lagging behind.'



A plantroom created in BIM by Cundall for the recently completed Two Snow Hill project in Birmingham

Air conditioning not to blame for online security breach

A massive online credit card fraud, that affected nearly 70 m customers of the Target retail chain, may have originated in a heating and cooling contractor based near Pittsburgh in the US.

However, the contractor has denied that it would have been possible for the cyber criminals to gain access via remote monitoring software used to manage the giant retailer's heating and air conditioning systems.

Computer hackers, who stole millions of customers' credit and debit card numbers from the online retailer, are thought to have first infiltrated the contractor's ordering system to gain access to the wider Target network.

The mechanical services firm said it had been the victim of a serious cyber attack and was co-operating with authorities investigating the security breach that led to details of 40 m credit cards being stolen and offered for sale around the world.

The hackers are thought to have accessed Target's checkout system – used in around 1,800 stores in the US – during the busy pre-Christmas shopping period. As well as credit card details, they also gained personal information, such as emails and home addresses, for millions of other customers.

About 17 m debit and credit cards have been replaced following the attack, at a cost of more than \$170 m.

MARKS & SPENCER TRIUMPHS AT BUILDING PERFORMANCE AWARDS



Marks & Spencer, together with Sustainable Design Solutions, was crowned Carbon Champion at the CIBSE Building Performance Awards last month. The team also scooped the New Build Project of the Year (value over £10m) title after smashing its own carbon reduction targets. For details of all the winners, see our awards brochure and round-up on page 18.

Next year's CIBSE Building Performance Awards will open for entries in June. They are free to enter and can be submitted online using templated entry forms. The deadline for entries is 11 September 2014. To receive the latest news and updates about the awards, sign up for the newsletter at www.cibseawards.org and follow @CIBSEawards on Twitter.

Environment Agency targets F-Gas offenders

● Agency alarmed by number of DIY installations

The Environment Agency's Chemical Compliance Team says it is aggressively pursuing people who breach the European F-Gas Regulation that strictly controls the use of refrigerant gases.

Alarmed by the number of DIY heat pump installations and online auction sites offering air conditioning systems for sale to unregulated buyers, enforcement officer Richard Troup told a seminar that the EA wanted to work more closely with contractors and trade bodies to improve enforcement.

'We can and do get products removed from eBay and other auction sites within hours,' he told the seminar during the ACR Show in Birmingham. 'We are also closely monitoring the sale of imported and second hand equipment.'

The F-Gas Regulation seeks to regulate the use of refrigerant gases with global warming potential, and a key plank of the legislation is attempts to ensure only registered



PHOTOHOUSE/SHUTTERSTOCK

installers handle equipment containing these gases.

'The promotion of DIY installation is under close scrutiny and we have contacted a number of firms who promote products as 'easy to fit' because, if they require the connection of refrigerant pipework, they fall under the Regulation,' said Troup.

The EA said it would act on any reports it receives of potential breaches of the regulation. Troup told the seminar, which was chaired by the B&ES Refrigeration, Air Conditioning and Heat Pump

Group, that there was now an opportunity to remove rogue traders from the sector.

'The industry clearly wanted this regulation and we want to help you create a level playing field for legitimate businesses. You have spent a lot of money making sure you are compliant, so it makes business sense to get rid of those who break the rules.'

EA regulatory specialist Chris Summers added that, simply because there hadn't been any prosecutions so far, did not mean there wouldn't be any in the future.

UK heat deaths set to soar

Thousands more people will die this century because of soaring summer heat in London, the South-East and the Midlands, according to medical researchers.

Deaths from extreme heat are anticipated to rise to more than 3,000 by the 2020s, and to 12,500 a year by the 2080s, unless steps are taken to mitigate the impact of rising temperatures.

The research – from the London School of Hygiene and Tropical Medicine and Public Health England – uncovered a 2.1% increase in the number of deaths for every 1°C rise, alongside a finding that the number of 'hot weather days' will triple by 2080.

Currently about 41,000 people die from winter causes in the UK every year and 2,000 as a result of summer overheating. The authors predicted that – without adaptation – the number of heat-related deaths will increase by 66% in the 2020s, 257% by the 2050s and 535% by the 2080s.

DEC benchmarks are 'generous'

A report by researchers at University College London (UCL) into Display Energy Certificates (DECs) for public buildings, lodged between 2008 and mid-2012, shows that more than half of those lodged in 12 of the 14 categories are rated D or better. The researchers, Sung-Min Hong and Philip Steadman, suggest this proves that the benchmarks are 'generous' and need to be revised.

The work was carried out for CIBSE's Benchmarks Committee and looked at 73,160 DECs for 31,802 buildings. Comparisons were made against the CIBSE TM46 energy benchmarks, and the statistics were compared with findings of an earlier report to CIBSE by Bruhns, Jones and Cohen (2011) on DECs deposited before 2010.

Rates of compliance with the scheme were also estimated, and the classification of building types used by TM46 examined. The report can be accessed at www.bartlett.ucl.ac.uk

FMs lack energy efficiency tools

Facilities managers are keen to improve the energy performance of their buildings, but lack the necessary tools, according to a survey carried out by the British Institute of Facilities Management (BIFM) and the National Energy Foundation (NEF).

In particular, they are hampered by a lack of access to metering and monitoring that could help them to establish accurate baselines and track performance. As a result, they are pessimistic about their ability to make significant energy efficiencies.

The survey showed that 90% of respondents knew their annual energy costs, but only half knew how the buildings were performing compared to design, and nearly a third failed to compare performance.

Three-quarters of respondents said they were working towards a relative-percentage energy reduction target, but there were 'mixed levels of confidence' about achieving them.

CIBSE engineer advising high street brands on Bangladesh

● Drive to improve garment factory conditions

A British building services engineer is working with major fashion brands to try to improve the stifling working conditions in Bangladeshi garment factories.

Farah Naz, of Ramboll, is working with high street names and the International Labour Organization to establish guidelines for safe and comfortable factory conditions in Bangladesh. Factory building regulations were issued in the country in 1976, but these have never been updated.

Naz took on the challenge after conducting a study into the thermal comfort of workers in a Dhaka factory in 2007.

During weeks of monitoring the building, she discovered that workers were sewing and ironing in



temperatures of up to 40°C.

She said: 'We shouldn't stop these factories being built – it's not a good business proposition and it's not a good humanistic proposition. But what we should be doing is making these factories more health and safety orientated, with better working conditions, so

that we don't feel guilty when we buy a £2 T-shirt.'

Naz said that Bangladeshi law was too difficult to influence and that fashion brands needed to push this agenda forward.

'At the moment, they're focusing on fire safety and structural analysis – which is good – but looking at health and wellbeing is just as important.

'This can't be achieved until they [the brands] understand why it's important,' she said.

Over the next few years, Naz will also be working with architects and engineers in Bangladesh to raise awareness of the issue.

There are currently 8,000 garment factories in Bangladesh – with 800 crammed into Dhaka alone – and a further 1,000 are planned by 2015.

Read more in 'Too close for comfort' on page 48.



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DECC's figures undermine Green Deal claims

● Study shows Green Deal delivers less than half of the savings claimed

A long-term study by the Department of Energy & Climate Change (DECC) into gas and electricity consumption appears to further undermine confidence in the Green Deal.

Figures from the National Energy Efficiency Data-Framework (Need) show that many people would actually lose money by taking out a Green Deal loan to make home energy improvements because the measures deliver less than half of the savings that have been claimed.

According to the survey of 21,000 homes, a new boiler will typically save a household about £70 a year, while loft insulation will save it only £15. The government is still claiming that a new boiler could reduce bills by up to £310 and loft insulation by £180.

The Energy Saving Trust (EST) is expected to reduce its claims for potential savings under the Green Deal as a result of DECC's research, which also revealed that, on average, a new boiler will cut gas consumption by 9.2%, loft insulation by 1.7% and cavity-wall insulation by 7.8%.

Chris Goodall, author of the Carbon Commentary blog linked to the *Guardian*



newspaper, claims that if all three measures were installed in a house in the same year, the typical energy saving would be 3,600kWh – which equates to £139.46 at last year's prices, not £270 as claimed by the EST. The EST estimates that it would cost £3,050 to fit all three measures and the Green Deal charges interest of 8% on repayments.

Goodall also claims that gas consumption

actually rose in some properties after having the energy saving measures fitted because of poor workmanship or changes in occupant behaviour.

'If the research arm of DECC knows the true figure for the likely cost savings from energy efficiency measures, why are other parts of government continuing to promulgate much larger figures in order to get householders to take out Green Deals?' he asked.

Fins to fix 'Walkie-Scorchie'

Land Securities and Canary Wharf Group – the owners of the 'Walkie-Talkie' building under construction in the City of London – have applied for planning permission to install aluminium brise soleil to overcome the problem of solar rays deflecting off its eye-catching curved façade.

The building hit the headlines last year when parts of a car, parked opposite the building, were melted by the extreme heat created by deflected solar rays. The rays were also said to have blistered paintwork, started fires and caused tiles to fall off nearby buildings.

Since then, the glazing has been covered by a temporary scaffolding shield, which will have to remain in place throughout this summer.



The brise soleil would cover 31 floors of the building, from level three to 34, and will take six months to install.

The £200m building, at 20 Fenchurch Street, was nicknamed the Walkie-Scorchie when it last hit the headlines.

EU backs 40% reduction in energy use by 2030

The European Parliament appears to be moving towards setting a binding target for EU member states to improve energy efficiency by 40% by 2030.

In a plenary vote, it supported the findings of the ITRE-ENVI Report, which calls for legally binding targets to underpin the ongoing 2030 climate and energy discussions, with a particular emphasis on buildings.

The European Alliance of Companies for Energy Efficiency in Buildings (EuroACE) supported the agreement and said that legislation would be essential.

'Unlocking the available cost-effective energy-savings potential in sectors like buildings, through a binding target and a sectoral target for buildings, is a no-brainer,' said EuroACE secretary-general Adrian Joyce.

He said his organisation would support the Commission

'as it assesses the need for bold legislation to drive the demand for further energy efficiency in this summer's efficiency review'.

In its 2030 Climate and Energy Package, the EC's impact assessment outlined the economic argument for setting ambitious legislation for energy efficiency. 'Higher efforts geared towards energy efficiency and renewable energy (beyond what is needed to achieve a GHG target) would result in higher benefits relating to improvements in fuel efficiency, security of supply, reduction of the negative trade balance for fossil fuels, environmental impacts and health.'

Evidence-based research from the Fraunhofer Report had already demonstrated that, without a binding energy efficiency target, the EU will not achieve energy savings beyond the 'business as usual' scenario.

Heat networks get funding boost

Local authorities are set to receive support from a £7m fund to set up district heating schemes.

In all, 26 councils will receive between £15,000 and £250,000 from an initial £1.9m funding round administered by the government's Heat Networks Delivery Unit (HNDU) to help get projects off the ground. The money can be used to finance feasibility studies and business plans for the development of low carbon heat networks.

The UK District Energy Association (ukDEA) welcomed the funding. It said that around 14% of the UK's heat demand could be met by heat networks by 2030.

The rest of the £7m will be handed out to councils, that make successful applications for support, in stages up to March 2015.

Professor Colin Blakemore gives SLL lecture

A professor of neuroscience and philosophy has given lighters an insightful talk on the way our brains perceive the visual world.

Professor Colin Blakemore spoke at this year's Trotter-Patterson Lecture, hosted by the Society of Light and Lighting.

Blakemore said our visual experiences were limited. 'You can make assumptions of what you're looking at, but the image is not providing secure information about the nature of the world,' he said.

The professor spoke at the Bishopsgate Institute in London.

After asking the audience to track moving objects that changed colour on the screen, Blakemore deduced that we have no visual past because when our vision jumps – even by half a degree – we find it difficult to detect change.

'That's why witness testimonies are incredibly unreliable,' he said.

'Colour is an optional extra in our visual experience. We may think it's essential to recognise what things are – but colour is added to the basic processes of analysing shapes and forms,' he said.

WILMOTT DIXON WINS ZERO CARBON BICESTER CONTRACT



Willmott Dixon will be the main contractor on the first phase of North West Bicester. The construction company has been appointed by housing provider A2Dominion to build the first 94 of 393 zero-carbon homes planned for Oxfordshire. Project director Steve

Hornblow said: 'Not only does Willmott Dixon share our commitment to quality results, but the company has experience in building sustainable projects, meeting set environmental targets and delivering local labour opportunities.'

Institution calls for rethink on UK flood management

● Experts call for government summit to discuss flooding

CIBSE president George Adams joined Landscape Institute president Sue Illman in calling for a government summit to discuss long-term planning to avoid further flooding devastation in the UK.

In an open letter to Prime Minister David Cameron, Illman urged a complete rethink to the way the country manages, stores and distributes its water, and its plans to make both the natural and the built environments more resilient.

The letter said that water management techniques could have helped prevent the effect of flooding on villages and towns. 'In the long term, the management of water requires a clear strategy.'

Illman also warned against dredging as a universal panacea for the problems, as it may



increase flooding to towns downstream. She called for proper exploration of how forestry, land management and soft-engineered flood alleviation schemes can hold back water in the upper reaches of rivers, and work alongside a dredging programme in the lower section.

CIBSE technical director Hywel Davies said: 'It is essential that we look at how better to protect homes and business properties, not only from more extreme rainfall and winds, but also during heatwaves and droughts.'

Terry Nash, director of the UK Water Harvesting Association, said it was imperative the government dealt with flooding in combination with drought.

He said dredging rivers and raising river banks could be counter-productive if the country faced drought and, therefore, crop failure later down the line.

An average family of four could save about 50 litres of water per person per day using a surface water management solution, said Nash.

He added: 'The government and the building industry have got to get their heads around this simple proposition, rather than do what they've always done – panic about the floods.'

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Lateset guides focus on public health and climate projections

● Guide G and Probabilistic Climate Profiles now available in the Knowledge Portal

The ever-popular CIBSE Knowledge Portal recently added two important releases to its extensive catalogue.

The updated *Guide G: Public Health and Plumbing Engineering* was produced in collaboration with the Chartered Institute of Plumbing and Heating Engineering (CIPHE). This new publication has been updated to reflect recent changes to UK water and sanitation standards, including developments in codes overseas.

It provides guidance to public health designers and installers, as well as architects and authorities that – while not directly concerned with public health engineering – need to understand the advice offered to them by specialists. Together with TM13, the guide complements the Health and Safety Executive's revised Approved Code of Practice L8 on the control of legionella bacteria in water systems.

Paul Angus, chair of the Guide G steering group, and hydraulic and fire associate director at Engineers for Building Services, said: 'The modern public health design engineer has a significant role to play, not only in reducing the consumption of water and energy, but also in looking at the wider environmental impact of the systems designed



ProCliPs look at future-proofing buildings against the impact of climate change

and materials specified. The chapter on conservation and sustainability is a useful overview of advice on such matters.'

The second release, *Probabilistic Climate Profiles (ProCliPs) – The effective use of climate projections in building design* addresses the adaptation and future-proofing of buildings

to mitigate the impacts of climate change using the UKCIPOg climate projections.

Future weather data for building simulation and design is highly complex, and could require a lot of additional resources in performance analysis during the design stage. The ProCliPs provide a simple way of presenting climate projections and their impact on individual

locations. They also provide a methodology for selecting future weather files appropriate to the project and help in interpreting the results.

ProCliPs are already used by a number of organisations at design stage, aiding the communication of climate uncertainty to the design team and the client. Modellers find the profiles viable for selecting weather files appropriate for the performance analysis of building solutions.

Both guides are available now at www.cibseknowledgeportal.co.uk

Look out for the Knowledge Portal special in next month's CIBSE news.

Society AGM

The Society of Light and Lighting (SLL) AGM will be held at the National Maritime Museum on 29 May 2014, and will be followed by an awards ceremony. SLL is looking for enthusiastic volunteers to help play a part in developing the way the society runs events and presents itself to the outside world. To get involved or attend the AGM, contact SLL@cibse.org, or meet the team at one of the events.

Which CIBSE region are you in?



There are 16 CIBSE regions within the UK, each of which has a committee of volunteer members arranging regular technical and social events. If you don't know which region you are in, get in touch with us at membership@cibse.org to find out how you can get involved.

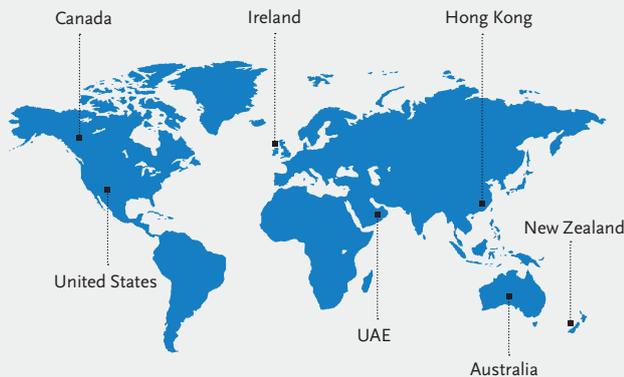
CIBSE also has three international regional committees operating in Hong Kong, Australia/NZ and the Republic of Ireland, and is developing membership in Canada, Qatar, UAE, Sri Lanka, Singapore and China.

For more on the regions visit <http://bit.ly/Oa3kHF>

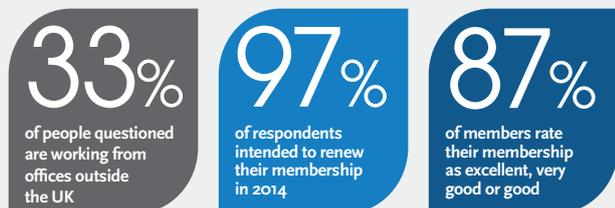
IN NUMBERS CIBSE MEMBERS SURVEY

Key facts from the 2013 membership survey

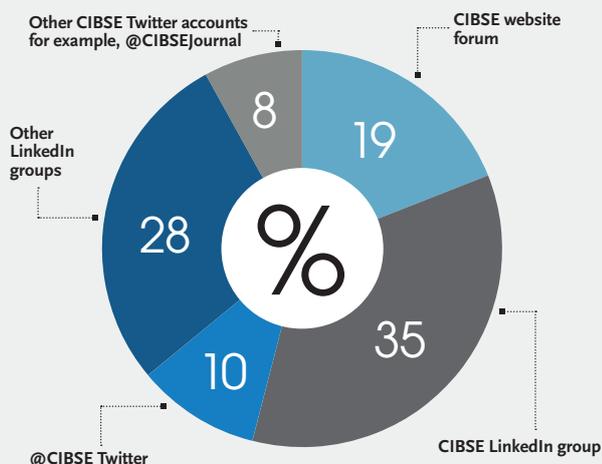
Key locations of overseas members



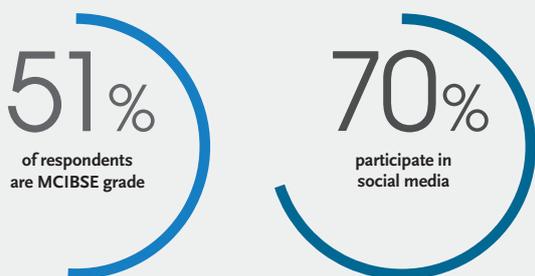
Quick facts



Top 5 CIBSE social media platforms



Top 5 member benefits



PHEX+

The Plumbing & Heating Exhibition
Alexandra Palace
20 & 21 May 2014

DOMESTIC AND COMMERCIAL HEATING ALL UNDER ONE ROOF

NEW FREE CPD ACCREDITED SEMINARS

FREE MERCHANT TRAVEL AND FREE PARKING

90% OF THE UK'S BOILER MANUFACTURERS IN ONE PLACE

FREE ENTRY

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- + **ALL UNDER ONE ROOF.** Meet the major manufacturers on the same day in the same place
- + **NEW FREE SEMINARS.** The PHEX+ seminars cover everything from policy to best practice
- + **TRAVEL.** Local merchants will be organising coaches, there is a free shuttle bus service AND free parking
- + **CPD ACCREDITATION** – Manufacturer led sessions will count towards your training and development
- + **DISCOUNTS & GIVEAWAYS.** Many of the exhibitors are offering discounts unique to PHEX+
- + **MORE BOILER MANUFACTURERS.** Your opportunity to compare products and prices and negotiate the best deals
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Register today. PHEX+ is FREE to attend and with so many benefits for your organisation, don't be left behind.

Register FREE today by visiting www.phexshow.co.uk

Media partners: **HVP** **builders' merchants** **NEWS** **LGN**

Talented lighters invited to enter Young Lighter of the Year 2014

The Society of Light and Lighting is celebrating its 20th year of the prestigious Young Lighter of the Year competition.

The event serves to actively promote the younger element in the lighting profession, providing a unique platform for young lighters, whether society members or not.

Entries are open to all young lighters working in light, design, architecture, manufacturing, research, healthcare or studying a lighting-related educational course.

Previous winners include Seda Kacel, Christopher Knowlton, Sabine De Schutter and Rachael Nicholls.

All entrants should be under 30 years of age at the 8 May 2014 deadline. The shortlist will be announced on 5 June and finalists will present at the LuxLive exhibition on 20 November, with the overall winner being crowned at the LUX Awards later that evening.

For more details visit www.sll.org.uk



Hoare Lea's Rachael Nicholls was 2013 Young Lighter of the Year

BSERT publishes March research papers

CIBSE's peer-reviewed journal, which carries research relevant to today's built environment, has published its latest issue.

The March edition of *Building Services Engineering Research & Technology* (BSERT) published in partnership with SAGE, includes the following papers:

- *Adaptive thermal comfort model for air-conditioned hospitals in Malaysia*, Yau
 - *Evaluation of airflow pattern in wind-driven, naturally ventilated atrium buildings: measurement and simulation*, Ai
 - *Limitations of the CIBSE design summer year approach for delivering representative near-extreme summer weather conditions*, Jentsch
 - *Influence of display cabinet cooling on performance of supermarket buildings*, Hill
 - *Neural predictive control for single-speed ground-source heat pumps connected to a floor-heating system for typical French dwelling*, Salque
- Free access to BSERT is available as a membership benefit at <http://bit.ly/1cpruq1>

President's Prize 2014: Applications open for Undergraduate Award

Applications are open for the President's Prize 2014: The CIBSE Undergraduate Award.

The award, sponsored by Hays Building Services, is open to all final-year building services engineering (or related) BSc, BEng and MEng CIBSE student members in the UK and internationally.

Entrants are required to submit a 2,000-word synopsis of their final-year project, showing evidence of excellent understanding and knowledge in building services engineering, science and design, as well as originality and high-quality visual information.

The winner will receive £500

and a trophy and two runners-up will receive £100 each. The awards are presented at the President's Awards Dinner in October 2014 in London.

For more information and to download your application form, visit www.cibse.org/undergradaward Closing date for entries is Friday, 25 July, 2014.

Up to £4,000 available in this year's Ken Dale Travel Bursary

The Ken Dale Travel Bursary is now open for applications.

Established by CIBSE to commemorate Ken Dale's contribution to the Institution and the building services profession, the bursary makes £1,500-£4,000 available to a CIBSE member in the developmental stage of his or her career.

Winners of the award spend three to four weeks outside their own country researching aspects connected to their field of work and then present their findings to the CIBSE Board.

CIBSE encourages applicants to engage in research that supports CIBSE's concern for the environment and provides benefit

for their employer, clients and the profession overall.

Full details of the bursary and information on how to apply is at www.cibse.org/bursaries The deadline for applications is Friday, 18 April 2014.

See page 47 for work on renewables in Africa by previous winner Kayley Lockhead.



ENERGY

e is here. The ecocirc XL, new from Lowara. It's everything you need in a large wet rotor circulator and nothing you don't. The purposefully engineered, easy-to-install **ecocirc XL** is designed with simplicity and efficiency in mind. With a wide range of sizes and large coverage of flow curve, the **ecocirc XL** fits seamlessly into virtually any environment. This is your opportunity to create a more energy-efficient system. This is the power of **e**.

Learn more at lowara.com/ecocircxl.



Winners with their awards at the Grosvenor House Hotel, London

SETTING THE STANDARD

Leading energy performers were celebrated at last month's CIBSE Building Performance Awards 2014.

Liza Young reports on the stories from the night

Marks & Spencer and Sustainable Design Solutions lifted the Carbon Champion trophy at the CIBSE Building Performance Awards 2014, thanks to their efforts to reduce carbon emissions and energy consumption at the retailer's pioneering low-carbon Cheshire Oaks store in Ellesmere Port.

They also won the New Build Project of the Year (value over £10m) award, after smashing the retail giant's own targets for the store, with carbon and energy reductions of 44% and 43%, respectively.

Munish Datta, M&S head of sustainability strategy, said: 'Cheshire Oaks represents the very best of M&S and we are delighted

to have been recognised by CIBSE for its performance.'

He added: 'It feels brilliant and very humbling because it's quite an accolade to win a CIBSE award, and a great compliment for all the hard work that's gone into not just designing and building but, more importantly, operating that store.'

'This win is incredibly motivating – it encourages you to do more and do better. It's a great way to benchmark ourselves against other great projects. All the shortlisted projects were fantastic, so to come out as a winner against some really stiff competition is great.'

Datta said the award wasn't just about recognising the point up to cutting the ribbon

and opening the Cheshire Oaks store. 'We don't build buildings just from a design or construction point of view; we build buildings to be in and enjoy. These awards recognise that. They recognise buildings that perform as they were designed to perform and for user comfort – and for our industry – retail-user comfort is incredibly important.'

Datta said that after setting some really lofty targets for Cheshire Oaks to be 34% more energy efficient than a peer store, he was delighted when it reached 44% at the end of year one.

He said among the lessons learned from Cheshire Oaks – in a new-build scenario – were to make the building as airtight as possible, use materials in an intelligent way, and reduce energy demand through displacement ventilation, earth ducts and natural light. But, added Datta: 'The biggest lesson we've learned from it is to make sure



John Sergeant hosted the awards



Marks & Spencer and Sustainable Design Solutions scooped two awards

buildings are loved by the people that they are built for.'

He said that on the back of that success, M&S retrofitted the most successful elements of Cheshire Oaks – the green wall, LED lighting, heat-reclaim system and refrigeration – into four Simply Food stores last year. The retailer will now focus on improving the rest of its estate.

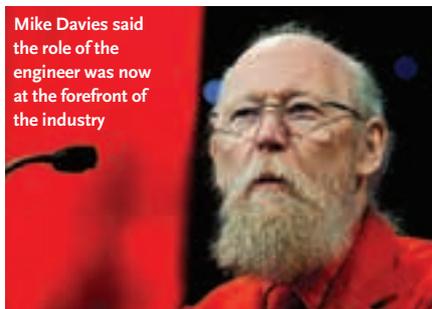
There were 15 categories at this year's CIBSE awards, ranging from Client of the Year and Refurbishment Project of the Year to Building Operation Award and Energy Saving Product of the Year.

The judges said the standard of submissions was very high and they were pleased with the number of entries that provided real-life performance data. In fact, they were so impressed by ChapmanBDSP's 'one-of-a-kind' project – the London 2012 Velodrome – that they created the Judges' Special Engineering Award to commend the entry.

Other notable winners included Atelier Ten's Gardens by the Bay, in Singapore, which took the International Project of the Year title, and British Land's double in the Client Energy Management and Building Operation categories.

The event, held on 11 February at the Grosvenor House Hotel in London, was hosted by journalist and TV personality John Sergeant, who said all the entries

Mike Davies said the role of the engineer was now at the forefront of the industry



demonstrated engineering excellence in the built environment.

CIBSE president George Adams thanked everyone who had entered the awards for their time and effort. 'If it wasn't for them, we wouldn't have an awards ceremony,' he said. 'These awards showcase achievement in the industry, from innovation in refurbishment and energy efficiency to developing the products and systems that support them.'

'Building performance and sustainability are at the heart of everything that CIBSE is striving for in our industry. The awards celebrate the outstanding accomplishments and contributions that show how our industry can reach best practice.'

More on Mike Davies' speech and the Gardens by the Bay project is on the app at www.cibsejournal.com/app or via web browser at www.cibsejournal.com 



WINNERS AT A GLANCE

- **BREEAM Accredited Professional, BRE Group Training** – Training for Building Performance Award
- **British Land (portfolio), British Land** – Client Energy Management Award
- **XBOXER XBC heat-recovery range, Nuaire** – Energy Saving Product of the Year
- **Norland and EE** – Collaborative Working Award
- **Exchange House, Broadgate, City of London, British Land/Broadgate Estates** – Building Operation Award
- **Montgomery Primary School, Exeter, Hamson|PA** – New Build Project of the Year (value up to £10m)
- **Marks & Spencer, Cheshire Oaks, Ellesmere Port, Sustainable Design Solutions/Marks & Spencer** – New Build Project of the Year (value over £10m)
- **Gardens by the Bay, Marina Bay, Singapore, Atelier Ten** – International Project of the Year
- **Hollywood House, Woking, M&G Real Estate** – Refurbishment Project of the Year (value up to £5m)
- **HVAC roof infrastructure, Harrods, Knightsbridge, London, Harrods** – Refurbishment Project of the Year (value over £5m)
- **BBC nominated by Arup** – Client of the Year
- **Beverley Clifton Morris** – Building Services Consultancy of the Year (up to 100 employees)
- **Max Fordham** – Building Services Consultancy of the Year (over 100 employees)
- **Velodrome London 2012 Olympics, ChapmanBDSP** – Judges' Special Engineering Award
- **Marks & Spencer, Cheshire Oaks, Ellesmere Port, Sustainable Design Solutions/Marks & Spencer** – Carbon Champion



WATCH NOW

Watch the winners' reactions after receiving their awards at www.cibsejournal.com



ASHRAE PRESIDENT HITS RIGHT NOTES ON IAQ

Indoor air quality standards have fallen behind during a period of heavy investment in energy efficiency. Engineers attending the ASHRAE Winter Conference in New York sought to redress the balance, reports **Ewen Rose**

“There has been an enormous amount spent on energy conservation and outdoor air pollution – but almost nothing on IAQ” *Bill Bahnfleth*

Tinkling the keys of a grand piano on the 45th floor of the New York Hilton, ASHRAE president Bill Bahnfleth is clearly a man in his element.

Playing to ASHRAE members and guests in the lavish presidential suite – and former apartment of hotel legend Conrad Hilton – he could reflect on what executive vice-president Jeff Littleton had earlier dubbed ‘a pivotal, possibly historic meeting’ of the Society.

Bahnfleth reminded the 2,800 delegates at the 2014 ASHRAE Winter Meeting that New York – and its high-rise buildings, in particular – would not have been possible without the pioneering work of the heating, ventilation, air-conditioning and refrigeration (HVACR) engineers who founded the Society some 119 years earlier.

When those first 75 members met, on January 20 1895, just five blocks away from the Hilton, they had a number of concerns – including whether they should be paid for drawing up engineering designs for architects (some things never change).

Today, ASHRAE has 54,000 members worldwide, but Bahnfleth reflected that the goals remain exactly the same.



Iconic: New York's yellow cabs battle against inclement conditions created by winter storm Janus, below. And above, delegates listen intently to the conference presentations



Humanity

'ASHRAE was not founded to promote the welfare of engineers, but to serve humanity. What we do may sometimes seem mundane, but it actually makes our civilisation possible.' He urged delegates to think of all the things that would not occur without climate control.

While the focus of previous meetings has been on energy conservation, there was a noticeable shift towards indoor air quality (IAQ) in New York. The Indoor Environmental Quality (IEQ) Alliance – an international initiative aimed at fostering co-operation across a range of professions – had its first meeting during the conference.

Bahnfleth said the 'bar had been set too low' on IAQ. 'There has been an enormous amount spent on energy conservation and outdoor air pollution – but almost nothing on IAQ. He added that there had never been a concerted effort to get the government to focus on the issue.

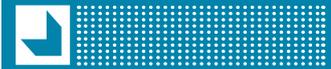
'As far as politicians are concerned, it seems that air ceases to exist the moment it enters a building,' he told *CIBSE Journal*. 'There is no IAQ legislation pending, or

even planned – or has ever been planned. As a result, the only measurement is what is acceptable, which means it is OK if no-one is getting ill and if people are not unhappy.'

The industry had 'taken half of the energy out of buildings,' partly through ASHRAE's 90.1 Standard for energy efficiency, but 'we are still doing more or less the same things about IAQ', said Bahnfleth. 'We need to take what we already know and turn that into best practice and professional standards.'

The availability of cheap energy in the shape of shale gas has also moved the goalposts for the building engineering community in the US. Bahnfleth said shale gas was being used by some as a 'convenient excuse for reducing emphasis on energy conservation', and it did have a role to play in helping the US move away from 'dirtier fuels like coal... but it should not undercut efforts to develop renewables'.

CIBSE president George Adams gave a number of presentations during the event. He said shale gas would have its time and 'will play a role in helping us move away from more environmentally damaging fuels'.



JANUS' UNWELCOME APPEARANCE

The Polar Vortex was up to its tricks again during the meeting and winter storm Janus swept in to deposit 10 inches of snow on the city. The frigid weather that pushed the temperature as low as -13°C decided to take hold just as the AHR Expo, which runs in tandem with the ASHRAE meeting, was opening.

'We were obviously very concerned when the weather forecast predicted there would be a snowstorm on opening day and Arctic cold the last two days of the show,' said Clay Stevens, president of International Exposition Company, which produces and manages the AHR Expo.

However, more than 61,000 people drawn from 130 countries visited the Javits Centre to see products displayed by 1,900 exhibitors – record numbers.

Nonetheless, Stevens felt the numbers would have been even more satisfying if Janus had stayed away.





➤ However, he urged the industry to look further into the future to reduce our dependence on fossil fuels.

'Of our remaining coal, gas and oil reserves 70% will have to stay in the ground,' said Adams, who also called for a 5th International Law making it illegal to damage or destroy parts of the eco-system. He said it was 'incredible that there is currently no legal protection for the environment'.

Relaxed

ASHRAE and CIBSE continue to collaborate on a system of energy labelling to help governments all over the world control building energy use.

Progress on this has been slow in the US, but during the New York meeting it was announced that the accreditation process to allow engineers to carry out the Building

Energy Quotient (BEQ) labelling assessments was being relaxed.

Currently, in the whole of the US, just 500 professionals meet the criteria and this is holding back expansion of the system. In future, more individuals with professional engineering qualifications will be deemed to satisfy the criteria.

The Society's president-elect Tom Phoenix said the US had much to learn from Europe, which, he said, was 'much further along the road'. He urged the US industry to use the European experience to 'develop a common approach' that could then be used globally.

CIBSE chief executive Stephen Matthews called for the two bodies to take the lead on this initiative. 'If we don't work together to develop global building labels, someone else will – and not necessarily the right people,' he said. **CJ**



GRADUATE INSPIRED

CIBSE ASHRAE Graduate of the Year William Holley was a VIP guest at the meeting and came away buzzing from the experience: 'It's inspiring. Everyone seems so enthusiastic about what they are doing and really keen to involve you. Also, because of ASHRAE's broad membership, you get a chance to discuss design issues with manufacturers and suppliers, as well as designers – I rarely get that opportunity in the UK.'

'I believe sharing the views of other professions about the design process, and working more closely together, will be key factors in tackling some of the issues facing the building services profession.'



Optimism high in US market

Seventy-nine percent of respondents to an ASHRAE/AHR survey held on the eve of the meeting said their prospects for business this year were either 'excellent' (19%) or 'good' (60%). The rest said prospects were 'fair'.

In all, 70% of respondents said business had been better in 2013 than in 2012.

Meanwhile, 90% of US manufacturers said sales would increase this year, with 32% anticipating increases of more than 10%.

Two-thirds of respondents said they were planning to unveil new products at the expo, and more than half said they would launch products that improved energy efficiency.



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BOSCH
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Your letters



The value of good lighting

LI CHAOSHU / SHUTTERSTOCK

Rapid climate change is primarily caused by the excessive combustion of fossil fuels. Therefore, if we are to mitigate climate change, we must reduce the amount of fossil fuels we burn. Put simply, we must aim to keep as much fossil fuel in the ground as possible. So, finding new, clever ways to extract more fossil fuels is counter-productive. Mr Cameron promised to lead the 'greenest government ever'; in my efforts to resolve this statement with his declaration that we should be 'going all out for shale', I am forced to conclude that he is irrational.

I understand that fracking may bring about a short-term reduction in gas prices. But a longer-term solution is to reduce our need for gas by insulating buildings more effectively. Insulated buildings stay warm. So when gas prices go up, the effect on our ability to heat our buildings is minimised.

The article about fracking in the February edition seems to muddy the waters somewhat (forgive the pun) regarding the effects of fracking on water. The article seems to be trying to allay fears that fracking will use a lot of water. The real concern here is that fracking will pollute groundwater with the toxic chemicals used in the fracking process. I have not heard of anyone discussing a water-consumption issue before.

I did enjoy the picture that accompanied the article, though: two nodding donkeys. The one in the foreground is nodding compliantly at the energy companies that want to pillage our planet for profit.

Ewan Jones, MCIBSE, Leeds

.....

The Journal's readers discuss value engineering, what constitutes a 'rational' response to fracking, and problematic CHP connections

.....

Benefit analysis

It is high time to put value back into engineering, as David Fitzpatrick argues in the January issue of *CIBSE Journal*. As Mr Fitzpatrick says, value engineering is currently all about cost reduction. Assuming value can be defined as the ratio of benefits to costs, reducing costs does increase value. The value ratio can also be increased by increasing the benefits. But here's the rub – we don't measure benefits in building services. We meet recommended standards and, by doing so, we implicitly hold the benefits constant while we reduce cost. So, in fact, the only way to increase value is to decrease cost.

In lighting, we are trying to develop benefit metrics that, by definition, can be measured. If the benefit can be measured, it can be engineered. But this means we have to go beyond the standards by specifying the benefits and then engineering them.

So, to extend Mr Fitzpatrick's argument, value engineering is presently synonymous with 'cost reduction while meeting the standard', and this approach to building services will not change until we formally come to grips with measuring the numerator of the value proposition for buildings. Only then will value engineering maximise value.

Mark S Rea, PhD, FSLL, director of the Lighting Research Center and professor of architecture and cognitive sciences at Rensselaer Polytechnic Institute. Rea is the author of Value Metrics for Better Lighting, which looks at how the effective use of light can benefit society and the environment

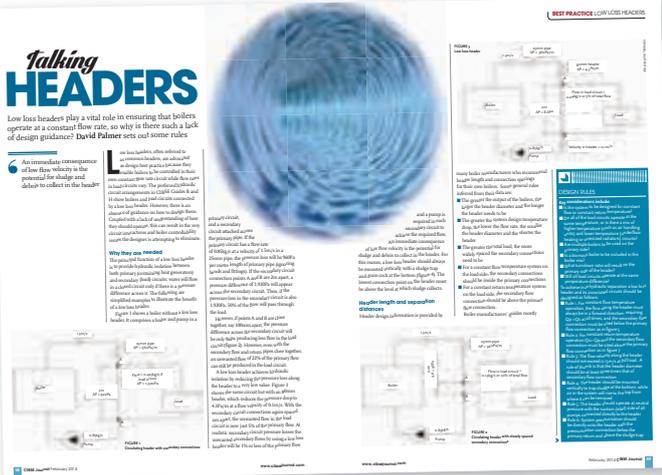
Fracked off

I am deeply offended that, as someone who has expressed their opposition to fracking, David Cameron has dubbed me 'irrational'. My objections to fracking are purely rational:

 I am deeply offended that David Cameron has dubbed me 'irrational' for my opposition to fracking



WPAPOOL / GETTY IMAGES



Critical connections

In response to David Palmer's 'Talking headers' article in the February 2014 issue of the *CIBSE Journal*, I have the following observations, primarily concerning CHP connection. CHP systems are less tolerant of temperature increase than boilers – particularly when used with 82 C design-flow systems – due to engine-cooling limitations.

Most headers are installed with system F&R connections from the header, as Figure 8 (without the NRVs) in the article. If the system flow Qs is 30% > than the primary heat-source flow Qp, system 3 will short circuit the heat source by recirculation down the header.

I therefore believe the heat-source F&R connections should be at the centre of the header, to achieve a common mixed condition. The arrangement shown in Figure 5 & 6 avoids this by ensuring a common mixed condition to and from the systems to the header.

However, the 30% imbalance suggested with Qs 30% > Qp, can cause problems where CHP systems are connected and system dT and return temperature are critical. The recirculation along the header could require increased primary heat-source temperatures, to achieve the required system-flow temperature, above CHP maxima for full heat recovery.

Conversely, if Qp is > Qs, as often occurs due to variable system flow as control valves

close down, constant primary flow involves short circuit of flow temperature to the heat-source inlet, resulting in return (inlet) CHP temperatures above the maximum for heat recovery.

For relatively small CHP heat supply, this problem could be avoided by installing the CHP in a series shunt line off the common system return, before the header connection.

The pre-heating of the return may compromise condensing boiler performance, but the boilers will have a less significant top-up/back-up role. Otherwise, careful design and flow control may be required to ensure that Qp and Qs are matched to minimise recirculation impact.

David Hague, Cogen Solution

David Palmer replies: The article 'Talking headers' is the first of two articles on header design focused on the connection of boilers to headers. The second article will cover the more complex matter of connecting biomass boilers, other renewables sources and CHP units to headers. The matter raised by David Hughes will be addressed in the next article.

CIBSE Journal welcomes readers' input, whether it be letters, opinions, news stories, events listings, humorous items, or ideas and proposals for articles. Please send all material for possible publication to: editor@cibsejournal.com, or write to Alex Smith, editor, *CIBSE Journal*, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters.

BREATHE EASY - HEALTHY BUILDINGS CAN BE EFFICIENT



Indoor air quality has been neglected in our push for energy-saving buildings, but Ruskin's David Fitzpatrick says they are not incompatible goals

At the ASHRAE winter Conference in New York (see page 20), the society's president, Bill Bahnfleth, highlighted the fact that the focus on energy efficiency had distracted the industry from its other major responsibility to provide a high standard of indoor air quality (IAQ).

In the rush to plug fabric leaks and minimise heat losses, IAQ has been left behind. As Bahnfleth said: 'We have halved the energy consumption of buildings... but are still doing more or less the same things with IAQ'. He also noted that, in the US, no legislation is planned in this area, despite governments, worldwide, regularly acting to tackle pollution of outside air. For politicians, air becomes invisible as soon as it enters a building.

Improved energy standards under Part L of the Building Regulations have made buildings increasingly airtight, which means they need a higher level of ventilation. While this is clearly stated in Part F of the regulations, many buildings fall short of the required standards.

BSRIA reports that 89% of the 10,000 air-tightness tests it has carried out met the standards set by Part L, proving that building airtightness standards have risen to meet the energy challenge. However, it has also measured serious problems with the quality of mechanical ventilation with heat recovery (MVHR) systems designed to deliver the required number of air changes

to an occupied space without compromising the energy-saving design. It poses the question: 'Are we ventilating right?' Or are we suffocating occupants in order to reduce our energy bills?

Building ventilation systems should meet the basic brief of reducing overheating and maintaining good IAQ all year round without increasing operating and capital costs – or driving up carbon emissions.

Developments in the design of natural ventilation systems, in particular, mean it is possible to significantly reduce life-cycle costs

while improving the IAQ. However, it does require some extra effort and installers must be trained to regard the ventilation as an integral part of the whole building.

That effort will pay dividends because there is strong evidence that naturally ventilated buildings have lower levels of airborne contaminants.

We don't have to choose; we can produce healthier buildings that are also cheaper to run. See Nigel Ingram on MVHR – page 30.

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Feedback

This month, the CIBSE LinkedIn group talks about monitoring M&E systems and whether energy-intensive buildings can be efficient



Steve Munn makes the case for real-time monitoring of M&E systems and data storage over their entire lifetime

Lee P

I have a belief that maintenance contracts of many FM companies incentivise plant failure, as unscheduled replacement gives an opportunity to load the costs due to urgent need on the basis that the margins on the tender for the ongoing management were tight.

I also believe that the people on the ground are not incentivised to consistently and continuously maintain equipment as per manufacturers' recommendations.

It seems to me its always about 'bare minimum to keep it ticking along' and I think its something endemic in the commercial arrangements rather than down to a culture of the technicians who 'do the box ticking'.

Andrew Wolstenholme

Maintenance is about controlled depreciation of the asset. If you

don't know how long the kit will last, how do you plan for the capital cost of replacement?

Tenants keep everything going as they don't see why they should cop for their predecessors' neglect, so it becomes a game of musical chairs. I can understand the landlord/tenant reluctance, but there's no excuse for the owner not to look after their asset.

Eric Asquith

Surely the answer here is to use a company that has all the qualifications and health and safety packages, and is honest and reliable, and has a passion for knowing that what they do will be done correctly and professionally! Yes, before you decry those sentiments, there are companies that still hold this code of honour, but it is so easy for building owners and their procurement chain to look at low-cost solutions.

Until we can get back to a code of practice that allows companies to be paid their worth and the bond of trust to be reinstalled between the building owner, consultant and contractor, there will be more cases of malpractice reported.

R. Daniel Davies

A more holistic/diagnostic approach is needed, monitoring a range of parameters over the lifetime of the system. Remote sensing/monitoring and data logging would reduce the need for frequent and costly site visits. The challenge with this approach is how to

achieve continuity of data and records when responsibility for management will probably pass through a number of hands. Possibly one way to achieve this continuity would be for the building owners to require such a level of service from their contractors as part of the drive for sustainable buildings.

Buro Happold's new energy-use benchmark has sparked a debate about whether a building that uses more energy can be more efficient

Tim Jones

This proposition comes across like an 80s 'greed is good' philosophy – eventually leading to US CEOs demonstrating their financial muscle with how grossly inefficient the HVAC systems are. My view is contrary to this: companies which have great wealth should show leadership and inspire good design. Buro Happold appears to believe that the amount of carbon loading a company may impose on the ecosystem should be linked to its share price. Strange concept.

John Taylor

I'm completely amazed by this article (ow.ly/rNof1). Surely the suggestion is that it is OK for me to use twice as much energy as somebody in the next building because I earn twice as much money, even though we still each only need to heat and cool the same amount of space.

Dan Widdon

The principle of conserving energy is based on the resource constraints inherent within the fossil- and nuclear-fuel-dominated energy systems we're all familiar with. Buro Happold's 'it's OK to use more if we deliver proportionately more economic gain' model completely ignores the environmental impacts of resource depletion and skews the energy efficiency debate in favour of corporations that don't know their employees' names.

Phil Dodd

Excuse my ignorance, but what's the point? Is this being done so that huge corporations that have massive air-conditioned offices and consume vast amounts of energy can say: 'Oh we are green really, because the kg of CO₂ we produce, divided by the \$ per head we generate, is much smaller than other commercial buildings.' How does this work for a museum that generates very little revenue, but adds a huge amount of cultural value? This has a long way to go before it becomes accepted outside of Buro Happold.

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FORWARD GUIDANCE?

The Governor of the Bank of England has been providing clarity over the future of monetary policy. **Hywel Davies** argues for more forward guidance on regulations affecting buildings

Since becoming Governor of the Bank of England, Mark Carney has sought to provide clarity to financial markets about the future direction of monetary policy, primarily through his ‘forward guidance’. The argument for this is that uncertainty increases market risk and costs.

The construction and property sectors face significant policy developments over the next seven years, accompanied by considerable policy uncertainty, even ignorance. The 2013 Building Regulations come into force on 6 April. Government says it is committed to zero carbon homes from 2016. But the transitional arrangements will allow developers to continue building to the 2010 Regulations well into 2015.

We also have the ongoing Housing Standards Review. The Prime Minister told the Federation of Small Businesses that the government intends to ‘help housebuilders by cutting down 100 overlapping and confusing standards applied to new homes to less than 10 – these reforms are estimated to save £60m per year for home builders, equivalent to about £500 for every new home built’.

What this means for Regulations is not just uncertain, but totally opaque. Communities Secretary Eric Pickles has already consulted on ‘winding down’ the Code for Sustainable Homes, as well as doing away with ‘secured by design’ and ‘lifetime homes’. And Mr Pickles wants to stop planning bodies setting local technical standards above the minimum for health, safety and energy conservation in Building Regulations.

These proposals are believed to have received 750 responses. The Environmental Audit Committee called on Mr Pickles not to ‘demolish the Code’. While large parts of the Code have been overtaken by Building Regulations – notably for energy –

others have not. And the only reason why Regulations have overtaken those aspects of the Code is because the Code drove innovation around those aspects, so it is now possible to add them to Part L without burdening housebuilders!

And what about the impact of dropping ‘secured by design’ on insurance premiums? How much of the £500 saved by developers will be passed on to buyers, and how much will then go on increased insurance premiums? It is also unclear how these proposals affect local rules relating to flood protection. Will these be outlawed? Given the current problems in England, that seems unwise. But the upshot of all this is great uncertainty about the future shape of Building Regulations.

EU View

As well as our zero carbon policy, we have the EU policy on ‘nearly zero energy’ buildings, which are required from 2020 (2018 in the public sector). This relates not just to new buildings, but also to ‘major refurbishment’. We do not know how the UK will define ‘nearly zero energy’, nor whether it is the same as zero carbon. Article 5 of the 2012 Energy Efficiency Directive requires that 3% of public buildings be renovated each year from 1 January 2014. It is unclear how this is being done.

Article 8 of the Directive requires large enterprises to undertake an energy audit of their buildings, transport and processes every four years. In the UK this is called the ‘Energy Savings Opportunity Scheme’ (ESOS), and not only requires large enterprises to assess the energy they use, but to consider how to improve their energy performance, including that of their buildings.

We have been consulted on ESOS, and are awaiting regulations, guidance and scheme rules, which we anticipate in May. This will show how ESOS sits alongside reporting



What this actually means for the Regulations is not just uncertain, but totally opaque

requirements under the Carbon Reduction Commitment, Greenhouse Gas reporting, and existing energy certification rules.

Minimum Energy Performance Standards

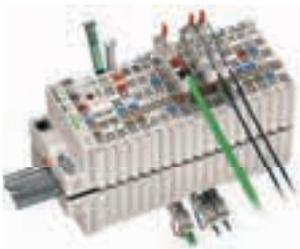
The 2011 Energy Act requires regulations to introduce Minimum Energy Performance Standards (MEPS) for homes from April 2016, and from April 2018 for non-domestic buildings. These are expected to apply to the sale or rent of buildings having an F or G-rated EPC. It is proposed that such buildings will have to be brought up to an E Rating before being sold or let. This obviously has a potential impact on the value of properties. Expect a consultation soon.

All this adds up to major uncertainty: no clarity over the direction of Building Regulations, no indication of what ‘nearly zero energy’ might mean, and limited visibility of MEPS. Will there be changes to Building Regulations in 2016 for zero carbon homes? Or will that be pushed back to 2019, nearer to the EU requirement for ‘nearly zero carbon’ from 2020? And far too few people are aware of ESOS and what it might mean for the large enterprises it affects.

The Bank of England’s Forward Guidance aims to provide a degree of certainty about the UK monetary policy framework for the foreseeable future. Given the role of non-domestic property in the investment portfolios of most major asset management and pension funds, the argument for some degree of certainty over the regulations relating to the construction, refurbishment and ongoing commercial value of the property in those portfolios is just as pressing. The financial sector needs this certainty just as much as the construction and property sectors.

● **HYWEL DAVIES** is technical director at CIBSE www.cibse.org

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VENTING FRUSTRATION: THE MVHR EXPERIENCE SO FAR



Although a low carbon solution, MVHR is a complex system that can be costly if wrongly installed. **Nigel Ingram** explains the pros and cons

As we strive to build energy-efficient, relatively airtight homes, the question of how to ventilate them effectively continues to be a challenge faced by many British housing developers. Mechanical Ventilation Heat Recovery (MVHR) has become a commonplace solution, with around 25% of new homes having it installed. At the Joseph Rowntree Housing Trust (JRHT), the system has been used in the first phase (tendered in 2010) of 64 homes at Derwenthorpe, a sustainable community being developed on the outskirts of York.

Looked at on paper, why wouldn't you use it? The system brings benefits – low energy performance, both for the resident through a reduced energy bill, and for the developer by helping to reach higher levels of the Code for Sustainable Homes. Combined with its ability to provide a healthier indoor environment in the home, the technology would appear to be a mainstream solution.

We considered its pros and cons through building and commissioning two prototypes – known as the TAP scheme² – for Derwenthorpe in 2009, and monitored them in 2010/11. It was

then recognised that the M&E supply chain delivering this system had 'kinks' in it, and we were about to embark on 64 homes with a commercial housing developer.

The necessity of MVHR at Derwenthorpe was based on the effect of 'thermos flask' principles, combining a fabric-first approach with a low air-permeability target of 3.0 m³/(h.m²) or below. At this level of airtightness, MVHR was considered essential to achieve healthy ventilation rates.

The challenge of installing MVHR became apparent early on in the first phase, with the large volumetric properties at Derwenthorpe requiring many ducts. This led to coordination issues in the floor void, and the complexities of trades working around each other. Using small duct sizes, proposed at the design stage, with small MVHR units, caused the fans to operate at above acceptable noise levels.

Combining this with relative industry inexperience of these challenges – in terms of setting the system up through balancing air flows in the commissioning process – meant we were left with variable outcomes on

A relative inexperience of the industry to these challenges meant we were left with variable outcomes

quality of work. We strived to put this right through re-commissioning and, in some cases, replacement of MVHR units.

The cost of these additional works, the time it took, and the disturbance to residents, made us less confident about its suitability for a further 425 homes being commissioned at Derwenthorpe.

To overcome this, for the future phases we set a relaxed air-permeability level of 4.0 m³/(h.m²), still better than current Building Regulations, but at a level which meant that MVHR was not an essential requirement. When developer David Wilson Homes was appointed for the remainder of the development, it chose to incorporate a mechanical extract ventilation system (MEV). This created a simpler system and is expected to make the process easier, quicker, cheaper and less risky.

But let's not forget the benefits that MVHR can bring in delivering carbon savings and improving indoor air quality. That's why at Derwenthorpe we have commissioned the Building Research Establishment (BRE) to monitor the MVHR systems, assessing the energy efficiency, indoor air quality and, most importantly, the residents' perception, with findings to be published in 2015. There are many other challenges around the coordination of works on site – from installation to commissioning – that are critical to the success of MVHR systems. JRF research will support the NHBC in formulating a set of rigorous standards for MVHR design and installation.

For now, we continue to install MEV systems at Derwenthorpe. But if BRE, NHBC and others can help overcome the issues faced in the first phase, then MVHR could become a practical solution once again.

References

- 1 NHBC 2013
- 2 <http://www.jrf.org.uk/sites/files/jrf/energy-efficient-homes-report.pdf>

● **NIGEL INGRAM** is director of development at the Joseph Rowntree Housing Trust



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BEWARE THE RACE FOR SHALE GAS



Not only will the race for shale gas be long and difficult, it also poses a threat to improving energy efficiency and meeting renewables targets, warns **Alan O'Brien**



BRANDI SOKOLOFF / SHUTTERSTOCK

The topic of shale gas exploration is very much in the news at the moment, but it is clear that the anticipated benefits for business, the economy and consumers will not be realised for some considerable time. In the meantime, there is a real danger that this focus on shale gas will result in the government taking its eye off the ball when it comes to energy efficiency and renewable energy.

So, while the Prime Minister is being very bullish about creating thousands of jobs and adding billions of pounds to the economy, he runs the risk of cutting off his nose to spite his face.

In the past, gas was seen as a bridge to renewables. Now, with the UK's commitment to shale exploration, gas is being described as a 'destination' fuel. Given the right market dynamics and conditions, this could leave the government's 2020 renewables target completely stranded.

In offering this 'lifeline' to many more years of gas availability, the prospect of shale gas could also dilute efforts to minimise fossil-fuel use through improved energy efficiency.

False expectations?

The government hopes that cheap energy from shale will boost the economy on a scale seen in the US, where fracking has played a major part in its economic recovery. However, there is no guarantee that shale gas will deliver on these expectations in the UK.

As Fatih Birol, chief economist and International Energy Agency director of global energy economics, commented in the *Daily Telegraph* (30 January): 'The UK has significant shale gas resources but people shouldn't expect a US-scale energy revolution in the UK – the conditions are not as favourable as in the US.' His comments came after energy minister Michael Fallon unveiled a raft of incentives designed to encourage shale gas fracking across the country.

A major stumbling block results from the 'spot prices' in the international wholesale gas market. Whichever way you look at it, the UK cannot ringfence itself from wider international market conditions. And, in my view, other countries with large shale reserves – such as France

and Poland – will also need to drill, if supplies are to significantly swell and influence international wholesale spot prices.

Consequently, international gas prices could become an additional threat to the commercialisation of UK shale. If Europe's leading gas exporters lower natural gas prices, expensive shale exploration could end up in limbo, becoming less cost-effective, further reducing investors' appetite and confidence.

Furthermore, companies involved in shale gas exploration face formidable challenges from within their own industry, local communities and environmental groups. There are also clear environmental risks, which may be overplayed and exploited to generate public concern and kill it at conception.

Despite this, the lure of dividends, the prospect of boosting the economy, profit-sharing for communities and local authority tax breaks would all appear to make the dash for shale gas inevitable.

However, we believe the government is missing a trick. What has been – and still is – the most overlooked and underrated sector in the energy diversification debate is energy efficiency. The energy that we don't use now is effectively a carbon-neutral source of energy that will be available to us in the future.

Frankly, I can't see how the government will meet its long-established commitment to reduced carbon emissions and lower gas prices if the UK is to forge ahead with a shale programme. Rather than focusing solely on shale gas, therefore, I would like to see the government continuing to invest in renewable energy sources and energy-efficiency measures that will reduce our consumption of fossil fuels. Then, if shale gas *does* deliver the benefits the government anticipates, that's an added bonus.

While the Prime Minister is being very bullish about creating thousands of jobs, he runs the risk of cutting off his nose to spite his face

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THE A TEAM

Marks & Spencer, together with Sustainable Design Solutions, was crowned Carbon Champions at this year's CIBSE Building Performance Awards, with the Cheshire Oaks store also winning one of the New Build categories. **Andrew Brister** finds out what's in store as M&S applies some retail therapy across the estate

Cheshire Oaks is the latest manifestation of M&S's ambition to be the world's most sustainable major retailer by 2015

Cheshire Oaks is not just any store. The latest of Marks & Spencer's Sustainable Learning Stores grabbed the gong for New Build Project of the Year (value over £10m) at this year's CIBSE Building Performance Awards. The retailer and the scheme's building services engineer, Sustainable Design Solutions (SDS), also claimed the Carbon Champion of the Year accolade for M&S's most sustainable, and energy-efficient store to date.

Cheshire Oaks is the latest

manifestation of M&S's ambition to be the world's most sustainable major retailer by 2015. Driving change throughout the organisation via its Plan A strategy, the company is working with its customers and suppliers to combat climate change, reduce waste, use sustainable raw materials, trade ethically, and help customers to lead healthier lifestyles.

When I catch up with Munish Datta, head of facilities management and Plan A at Marks & Spencer, he is still buzzing from the double victory. 'It's a terrific



compliment to all the hard work that goes on,' says Datta, 'and it motivates us to keep on pushing ourselves.' And push on the Plan A team must, as it aims to hit the target of reducing energy use across its estate by 40% by 2015, when compared with 2006/7.

'We are on track and I'm confident that we'll hit the 40% target,' predicts Datta. The Plan A report for 2013 shows that M&S has so far achieved a 31% improvement in overall energy efficiency per square foot as against 2006/07, after making adjustments for differences in

the weather from year to year. Carbon emissions have fallen by 23% compared with 2006/07 – a reduction of more than 160,000 tonnes a year or 37% per square foot of stores, distribution centres and offices.

Merseyside's Cheshire Oaks (see panel on page 37) is smashing targets and informing the Plan A team on its strategies for new building and, most importantly, improving its existing stores. 'The feedback from Cheshire Oaks is allowing us to understand what works and to repeat our successes,' says



PROJECT TEAM

- **Building services engineer:** Sustainable Design Solutions
- **Building owner:** Marks & Spencer
- **Building occupier:** Marks & Spencer
- **Quantity surveyor:** Gleeds
- **Architect:** Aukett Fitzroy Robinson
- **Contractor:** Simons Group



**SDS ACHIEVES
RETAIL BUY-IN**

Joint winner with M&S for Cheshire Oaks at the Building Performance Awards was M&E consultant Sustainable Design Solutions (SDS). Director Martin Donlon first worked with M&S on the design for its store at the MetroCentre in Gateshead and now boasts a 30-year relationship with the retailer. ‘We set up SDS partly off the back of that relationship, and SDS specialises in the retail sector, offering a bespoke service to clients.’

SDS was M&E consultant at the earlier Sustainable Learning Store at Ecclesall Road, Sheffield and was able to learn lessons for Cheshire Oaks. ‘It was clear that if we were to deliver an efficient, low energy store, we had to attack the lighting,’ says Donlon. ‘There’s large amounts of glazing and north lights which, when coupled with simple, efficient daylight-controlled artificial lighting, reduces the overall load.’

The HVAC load at Cheshire Oaks is also exceptionally low. ‘The space lent itself to displacement ventilation and, with free cooling, we can supply air at 18-19°C without mechanical cooling for large parts of the year,’ says Donlon.

In addition to new builds like Cheshire Oaks, SDS is involved in refurbishments and modernisation for M&S, as well as energy reduction initiatives, and supports work across Europe.

➤ Datta. ‘We take what works and feed that into our specification, both for new stores and into our existing estate, which accounts for 90% of our energy and provides the biggest challenge. Building energy efficiency into a new store is easier than improving an existing one.’

Applying learnings

With around 700 stores up and down the country – some under the Simply Food banner, and some offering the full line, including clothing – this is no small feat. It compares with a new build programme over the next 12 months of some five to 10 full-line stores and 20-30 food-only outlets. The lessons learnt from Cheshire Oaks – and from its predecessors at Ecclesall Road, Sheffield, and London’s Stratford City – are being applied to four existing Simply Food stores: Slough Bath Road, Heswall, Oswestry and Epping. Again, the best energy-saving approaches can then be rolled out more widely. ‘We’ve chosen Simply Food stores because they are the most energy-intensive; refrigeration, for example, is a big energy load for food retailers,’ says Datta.

These buildings vary in age and type, so adding sustainable features is not straightforward. M&S is aiming to deliver up to 40% savings in energy through introducing features that include: 100% LED lighting on the sales floors; reusing waste heat from refrigeration systems; using living green walls to help insulate the building, encourage biodiversity and

filter pollution; and harvesting rainwater to irrigate the living walls.

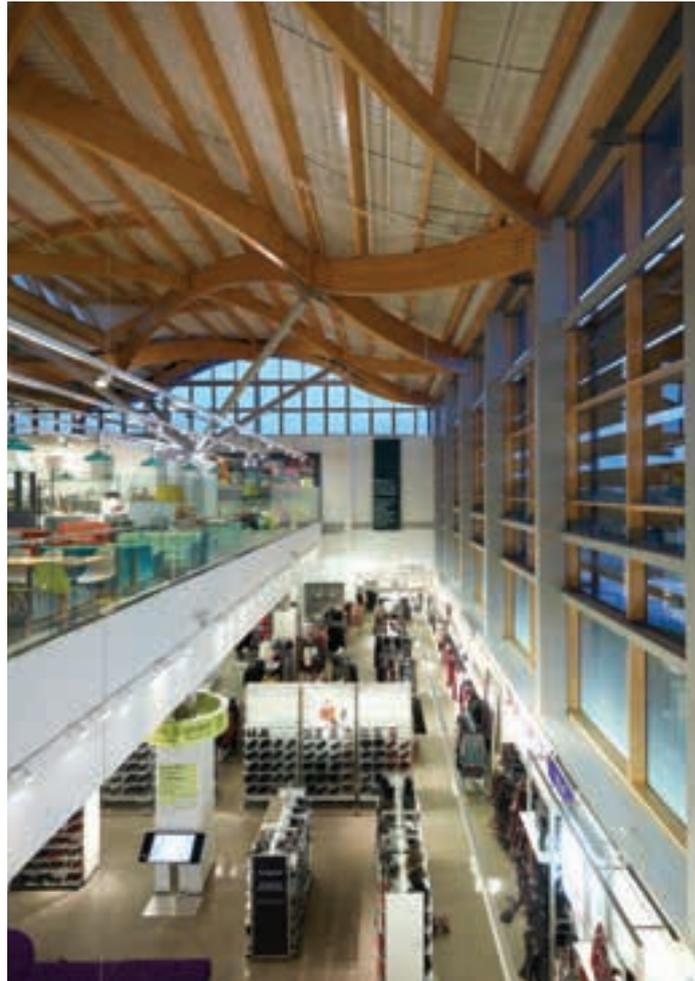
‘We are looking for technologies that can be easily retrofitted,’ says Datta. ‘Lighting is the big opportunity for saving energy in retail – from the small corner shop to the national retailer. I’d say lighting probably accounts for some 30-40% of most retailers’ energy load. Get this right and you will see immediate benefits, with paybacks as low as two to three years for changing to LEDs for front of house lighting, for example. Back of house may be a tad longer.’

M&S’s next step is to look at heating and cooling. ‘In existing stores, it’s really important for us to make sure the plant is running efficiently, and that it’s only working when it needs to. We also look at the life of the plant and whether replacement will have a financial as well as a carbon benefit,’ says Datta. ‘Refrigeration is a big challenge. We seek to minimise energy use by ensuring there’s no leakage of cold air from cabinets by using night blinds, and by investing in detection technology, that there is no leakage of the refrigerant gases.’

In food stores, as much as 90% of the



M&S has maximised natural light throughout the store



energy load is attributable to refrigeration. Plan A has so far seen a cut in CO₂ emissions from refrigeration by 60% thanks to fewer leaks and less harmful gases. ‘Obviously, HCFC gases like R22 are being phased out, but we are also committed to moving away from less harmful HFC gases by 2030.

‘All new stores and major refurbishments now use CO₂ as a refrigerant – with huge carbon benefits from its lower global warming potential as well as energy benefits.’ M&S is exploring issues such as



Mighty Oaks

Winner of both the New Build Project of the Year (value over £10m) and Carbon Champion awards at this year’s CIBSE Building Performance Awards, the judges felt that: ‘Marks & Spencer’s Cheshire Oaks store demonstrates what the private sector can achieve on a voluntary basis.’

Cheshire Oaks is the latest of Marks & Spencer’s Sustainable Learning Stores. Among its many low energy features are:

- The building is partly sunk into the ground with earth mounding around the perimeter to help keep a stable temperature by improving the building’s insulation
- Free cooling air is delivered to sales floors via displacement air columns and below-ground air distribution ducts
- A biomass boiler plant – combined with the reclaimed heat from the food refrigeration system – is predicted to deliver approximately 70% of the store’s heating demand
- Use of natural daylight and LED lighting – M&S has maximised natural light throughout the store, and sales floor lighting has automated daylight control that dims the lamps when possible

- A carbon manager is employed to undertake a life-cycle evaluation of Cheshire Oaks, as well as quantify total carbon reduction
- All electricity is provided via a green electricity supply contract.

M&S targeted carbon reductions of 34% and energy reductions of 29% when compared with a benchmark store. Monitoring of the building under the Technology Strategy Board’s Building Performance Evaluation programme has found it to be 42% more energy efficient, with 40% lower carbon emissions per square foot. The use of highly innovative building materials, such as hempcrete, and its exceptional airtightness (70% better than required by Building Regulations) has resulted in the store using 60% less heating fuel than predicted. HVAC consumption is also some 14% of the total electrical consumption.

The evaluation from Faithful & Gould said: ‘From our independent assessment, it genuinely stands out as the best building – both in terms of its energy performance and user satisfaction – from the many we have seen. It should be viewed as a template for others in the industry to emulate.’



Green living walls help insulate the building, encourage biodiversity and filter pollution

doors on fridges, where improvements in energy use have to be balanced against the customers' ability to select a product.

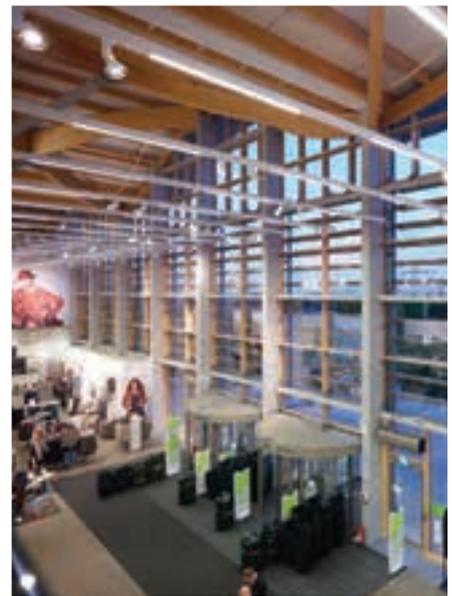
There is, however, one technology that Datta places above all others: 'Smart people are the best technology in any store,' he says. M&S invests a lot of time getting this aspect right. 'It's critical that people understand the technology that's in their building. At Cheshire Oaks, in addition to the usual handover exercises we carried out, we spent half-a-day with the 600 members of staff, explaining the building, how it works and why it works that way. It was a really powerful experience.' The fact that the building scores among the highest M&S stores for employee satisfaction is surely no coincidence.

While Datta admits that there was a cost premium for Cheshire Oaks over earlier stores, he argues: 'It was very much a one-off, and was tendered four years ago when some of the technologies we were looking at were still in their infancy so – if we were to do it again – it would be cost neutral.'

Unlike Cheshire Oaks, most M&S stores tend to be in large shopping centres or retail parks and are leased from landlords.

'More collaboration is key,' says Datta, 'and we've introduced a green lease policy to push standards.' Looking to improve the sustainability of existing commercial building stock, M&S reached agreement with retail landlords to retrofit green clauses to the leases of existing M&S stores. The clauses – whether in new leases or retrofit agreements – facilitate the sharing of data such as gas, electricity and water usage in M&S-occupied buildings to inspire both landlord and tenant to make carbon reductions. It also encourages a joint approach to investment in building technology – such as biomass boilers, LED lighting and rainwater harvesting to reduce building impacts and further cut costs.

Datta also joins his peers on various government and retail action groups on energy issues, and supports the Close the Door campaign encouraging retailers to keep their doors closed. As the CIBSE Awards judges said: 'The commercial relevance of what they've done and the impact in the property sector is hugely impressive and significant.' It's not just any one store, it's all across the M&S estate and very much beyond, too. **CJ**



I'd say lighting probably accounts for some 30-40% of most retailers' energy load. Get this right and you will see immediate benefits
Munish Datta

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IN THE DARK

The complexity of modelling light means that synergies between BIM and lighting design are not straightforward. **Jill Entwistle** speaks to leading engineers about the benefits – or otherwise – of embracing the concept

As a representative of smaller practices, I am very concerned with the future of lighting design in a BIM world
Kevan Shaw

On the face of it, Building Information Modelling (BIM) is a good idea and, with the government requiring it be used on its projects from 2016, somewhat inevitable. Any strategy that helps to get people singing from the same hymn sheet throughout the construction process would seem a positive move.

However, such is the complexity of the process – with disparate disciplines, working methods and scales of operation – that knitting them all together around the 3D modelling concept is clearly easier said than done. That,

at least, is the message that is emerging from the professional lighting design fraternity. No one is dismissing the idea, but concerns are being expressed about the practicalities on a number of levels.

One of the issues that has been raised is about the software used for the 3D modelling. At the moment this is primarily Autodesk Revit.

‘Having a dominant software house in any industry is a problem as, once you’re in, you are tied in by default and it almost becomes too expensive to leave,’ says Andrew Bissell of Cundall Light4. ‘Revit is close to achieving that where M&E BIM is concerned.

‘For any company, the cost – of training, of high-spec PCs, of document management and of staff who only do BIM – is high. If there is no software competition, that cost will only increase. That can’t be allowed to happen. The standards for BIM should be robust enough that files can be shared across platforms and across different BIM software. I would question whether that is happening.’

While independent lighting designers are working on large, international projects, they are generally small-scale operations, as are the lighting departments within M&E and multidisciplinary consultants. However, the latter have more resources and recourse to in-house expertise.



Cundall Light4 visualisations (top) built in CAD with the Radiance simulation tool providing analysis and images

Since all the information is shared, it is very easy to spec bust. A lighting supplier for one part of the building could, for example, substitute their luminaires for another manufacturer used elsewhere. Cheapy Lighting Ltd, whose fittings are in the WCs, could replace the Zumtobel ones in the main office. Only the sharp-eyed would spot it

Alan Tulla, former SLL president

‘Small companies may well have to outsource their BIM work and, if they do not offer BIM, they may well be excluded from some projects,’ says Bissell.

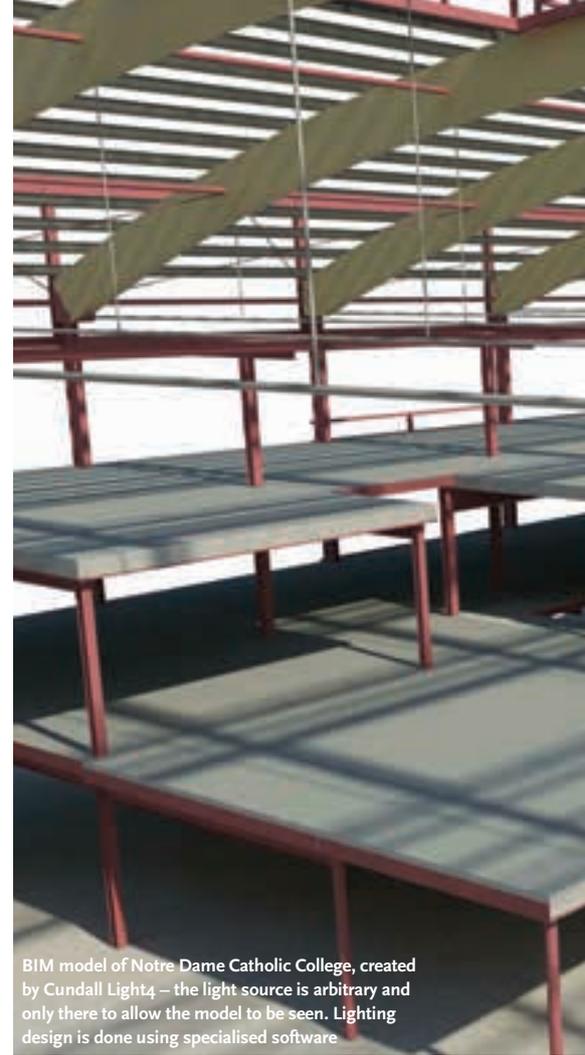
This is the concern of independent lighting designer Kevan Shaw of KSLD. ‘As a representative of smaller practices, I am very concerned with the future of lighting design in a BIM world. Although the Cobie structure can be coped with without a Revit seat, I absolutely expect the project managers and contractors to insist that all the consultants have live Revit access to the project model.

‘The cost for lighting designers is threefold – the software and relevant hardware, the training, and the additional work needed in the design process to keep lighting information up-to-date in the model, particularly at a time when fees are under significant downward pressure.’

Shaw is also concerned that the dominance of Revit software will affect specification. ‘I believe we will also have trouble with specification of lighting products for which a Revit-compatible model does not exist,’ he says. ‘This limits what we do and our independence in specifying the right product – and even custom products. We cannot be expected to do this modelling ourselves, certainly not without considerable extra fees.’

Spec busting could also be taken to a whole new level, says independent lighting consultant and former SLL president Alan Tulla. ‘Since all the information is shared, it is very easy to spec bust,’ he says. ‘In fact, a lighting supplier for one part of the building could substitute their luminaires for another manufacturer used elsewhere. Cheapy Lighting Ltd, whose fittings are in the WCs, could replace the Zumtobel ones in the main office. Only the sharp-eyed would spot it.’

Bissell believes that can be resolved, though lighting professionals will have to take



BIM model of Notre Dame Catholic College, created by Cundall Light4 – the light source is arbitrary and only there to allow the model to be seen. Lighting design is done using specialised software

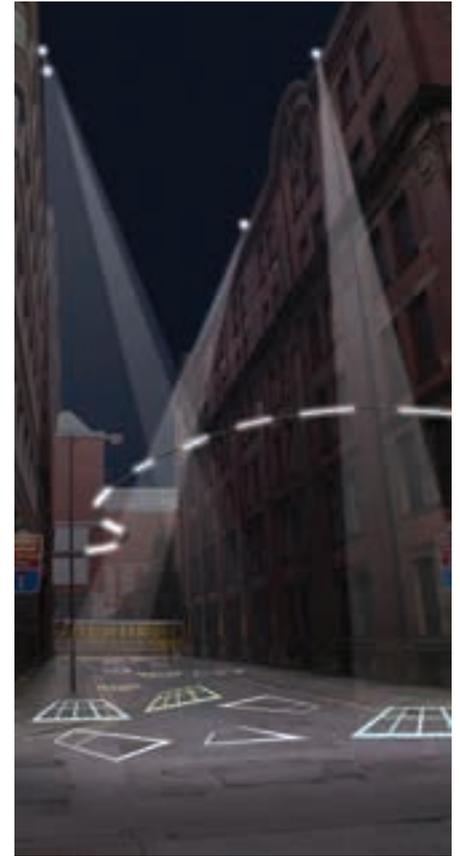
appropriate measures. ‘There will be a need for lighting designers to have a robust system in place such that they record the lighting design information they issued – essentially, a piece of software that takes a snapshot of the live model at a particular time. In many ways, that is no different to knowing where you PDF an issue and record it in your issue folder.’

Bissell also highlights another concern.

‘We typically – like most, I assume – complete our electric lighting design work in a number of phases. Early on we put forward sketches, precedent images and occasionally 3D renders or architect-adjusted renders. BIM is too slow for this process. We need to put forward the ideas long ahead of when a BIM model is ready to produce images.’

Bissell says he can see BIM offering an opportunity to render the scene and show a client what they are going to get with more accuracy, which would be a benefit. ‘However, two caveats would be: the quality of the render package; and the quality of the person producing the render – will they have the knowledge and experience to adjust the lighting parameters to give the most realistic view of the space? I still see a need to produce sketches and then move into BIM for the tender process.’

Daylighting is a slightly different proposition as the daylight design needs to feed into the BIM model in terms of areas



such as windows, wall thickness, shading and so on, says Bissell. ‘However, to feed into the BIM, you need to have completed your strategy by hand, and already have completed some check calculations with a separate model. So again, we still need to design ahead of putting information into the BIM.’ Tulla also raised the issue of the size of files involved. ‘The complete files are massive. There is a basic level showing where all the building services go, but this doesn’t tell you much – you don’t know what the space looks like and you can’t do renderings because there is no photometric data attached to the luminaire.’

‘Once you get to the second level – where all the technical characteristics of the equipment are included – you get weighed down with data. There are ways around it by only using selected layers, but this nullifies the whole point of a totally integrated BIM file.’

Shaw foresees that BIM could have repercussions at the installation stage. ‘Another concern I have is that the whole coordination piece only works if the workmen physically installing on site actually install stuff as shown in the model. Are we really expecting the guys on the tools to look at the model to know where to take their fixings, how tight to soffits to hang ducts, and have the ceiling grids hung exactly where they are drawn?’

‘More often than not, the existing paper drawings are not consulted; neither are

manufacturer’s instructions – hence the problems we experience at present. How do we see this part of the BIM process working?’

Perhaps one of the most fundamental reservations concerns the actual definition of the lighting design function itself, says Bissell. ‘The people who are Revit-proficient may believe they can do the lighting design. This has been a problem for daylight design – daylight factors – for a good few years now with some engineers thinking design is just about pressing buttons. It seems to be heading that way with climate-based daylight modelling (CBDM) with some just wanting a process and a series of buttons to press.’

‘BIM is likely to introduce a whole new group of people to lighting through a simple button-press process. Software can be, and indeed should be, a very positive and productive tool, but it has to be used by people educated in that subject – and, more importantly, by people who care passionately about that subject.’ CJ



BIM by demand

‘The Government Construction Strategy (GCS) requires that: government will require fully collaborative 3D BIM (with all project and asset information, documentation and data being electronic) as a minimum by 2016 [BIM



Image (top) created in Photoshop and Dialux. The room was created using CAD and Radiance by Cundall Light4

Level 2]. This refers to all centrally procured government projects as outlined in the GCS, including new build and retained estate, vertical and linear.’

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FOUR FROM THE FLOOR

The ASHRAE Winter Conference had plenty of examples of innovative engineering for technical editor **Tim Dwyer** to get his teeth into. Here are his highlights



Indoor air quality in airtight homes

Andy Persily from the US National Institute of Standards and Technology (NIST) considered indoor air quality (IAQ) in a zero energy home by discussing the construction and testing of the purpose built 'net zero energy residential test facility (NZERTF)' at NIST.

This impressive four-bedroom timber-framed house was built under the close supervision of scientists from NIST. Persily showed that to ensure good airtightness, regular briefings were required of the complete contracting team so that they understood the importance of preserving the integrity of a complete air barrier by maintaining high standards of workmanship in areas such as sealing around 'interfaces' (windows and at junctions of surfaces).

The resulting 260 m² house (with 150 m² basement) achieved an airtightness of 0.5 air changes per hour (at 50 Pa pressurisation). The

building was mechanically ventilated using a heat recovery ventilation system. ASHRAE Standard 62.2 requires 39 l.s⁻¹ of fresh air for a home of this size but, due to the control limitations of the HRV unit, the system actually supplied 47 l.s⁻¹.

The project team noticed that the filter became blocked very quickly following construction and questioned how likely it would be for a normal householder to have discovered the partially obstructed filter. The filter also suffered from regular clogging with a white powder – the cause was finally traced to the dust produced by the ultrasonic humidifiers that were being used to simulate the moisture production of the home's imaginary family. A deionisation unit in the water supply significantly reduced this problem.

The first results collected over the summer of 2013 showed a clear trend for increased

chemicals in the indoor air as the outdoor temperatures rose. Careful design and selection of materials and fixing methods (minimising the use of glues and preferring mechanical fixings) have contributed to formaldehyde levels below 10 micro g.m⁻³.

The team continue to monitor comfort levels and 12 VOCs including toluene, ethylene glycol and formaldehyde. By carefully monitoring IAQ, and having detailed knowledge of the construction methods, they are attempting to establish the key sources of contaminants so future designs can be improved.

The goal is to produce specifications that may practically be used by architects to reduce the deleterious impact of building materials and techniques on IAQ. The project website www.nist.gov/el/nzertf/ contains extensive details of the project, including full plans of the house.



NIST tested the build up of VOCs in an airtight home

UNITED STATES GOVERNMENT WORK



'Low impact' building design in Africa

In a session on sustainable development in Africa, Dunstan Macauley of TAI Engineers looked at how the traditional designs of African buildings and the historic technologies coupled with modern construction techniques can steer the development of future buildings with less environmental impact. He identified that this was a critical period as the next quarter century will see extensive growth in African consumption. Currently the largest proportion of African energy is used in industry, with very little residential and even smaller commercial energy use.

The African 'middle class' is expected to double in the next 20 years, and with its exploitation of massive African natural resources is also predicted to soar, with the

accompanying CO₂ emissions. Current building trends largely follow 'western' design styles that are not necessarily appropriate for the climate. Dunstan showed examples of indigenous building techniques, including adobe construction, double-skin façades, natural ventilation, careful orientation, shading and vegetation solar control.

He showed examples of modern schools, where traditional applications of techniques such as high-pitched roofs and skylights/openings helped promote natural ventilation, while maintaining moderate internal temperatures. He was clear that the input of international professional skills was needed to enable real opportunity for sustainable development in Africa.



Renewable biogas in Africa

A presentation on renewables in Africa was given by NG Bailey's Kayley Lockhead, the winner of a CIBSE Ken Dale Travel Bursary in 2013. Lockhead highlighted both current and future energy, challenges in Africa, where a population of 1bn is likely to double within the next 35 years.

Lockhead said that while many Africans had leap-frogged the evolution of communications technology with the massive uptake of mobile phones, the continent had the least reliable grid electricity in the world. She also highlighted the reliance on kerosene for lighting by millions of Africans. Traditionally the affordable way of providing light for things like children's homework, this can lead to devastating fires and severe health problems from fumes.

She considered a number of renewable energy solutions, many being developments of extant

African methods such as biomass, biogas, micro-hydro and charcoal production. She highlighted the local production of biogas using small biodigester systems fed by household and animal waste. These could be built with a 15 to 20 year life using local skills and materials for about £3,600. They could supply energy for a household (cooking, lighting and potentially refrigeration) as well as provide a slurry that would fertilize the land that would – in part – be recycled to create more biogas. Apart from providing a source of energy this reduces methane that would otherwise be released into the environment.

Kayleys' Ken Dale report is available from the CIBSE web site at bit.ly/1e58eua

See Lockhead's drawing of a biolatrone on the web optimised version of at cibsejournal.com



Software for apps

Richard Sydowski of the Center for Energy and Environment, Minneapolis, looked at software developments for smartphones and tablets.

He said that for building professionals it may not be possible for apps to be continuously connected to the net (for example in plantrooms) but that users would want to be able to upload/update data on return to an office.

He illustrated the potential of using an app to assess a domestic building asset rating and highlighted attributes that were important when designing the usability of such a survey app:

- Common user-interface on phones/tablets
- Scalable user interface for different size devices
- Simple user input – tick boxes or select lists
- Ability to include photos or sketches
- Allowing user to follow a nonlinear workflow
- Integration with existing apps to utilise best available resources
- Opportunity to display output quickly

Sydowski said there were plenty of software tools and standard protocols to assist developers but cautioned that significant investment in training was required to produce a meaningful app: he said it had taken 18 months to develop the skills in his small organisation. An evaluation of the development of the app as part of the Home Energy Score Project can be downloaded from mncee.org



Biodigester system at community school run by the Good Sheppard Community on Homia Road in Uganda





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TOO CLOSE FOR COMFORT

It's almost a year since the world's attention turned to the welfare of garment-workers in Bangladesh after the collapse of Rana Plaza killed more than 1,100 people. London-based building services engineer **Farah Naz** is working with high street fashion brands to create a better working environment for these factory employees, as **Liza Young** reports

Before 24 April 2013, few people in the West probably gave much thought to the workers who make the bargain-price clothes for sale in many high street stores. But then the eight-storey Rana Plaza garment factory in Bangladesh collapsed, killing 1,100 people. It took one of the world's worst industrial disasters for people to sit up and take note of the conditions that these workers endure to earn their daily wage.

Most factory employees in Bangladesh work 12-hour shifts in temperatures that can reach as high as 40°C. Officially, they aren't permitted to work more than 12 hours a day, six days a week; unofficially, they can be working for between 12 and 24 hours a day. All for about £8 a month (roughly 26p per day) – or three cups of Starbucks coffee.

Why? Because we all love a bargain and high street brands are attracted by the

low costs. Bangladesh is now the second-largest exporter of cheap clothes made for Western markets after China. The solution to improving life for garment workers is not simply to shut down their workplaces, says Farah Naz, senior engineer at Ramboll, who is working with fashion brands to establish guidelines for factory building in Bangladesh.

'Garment factories are the lifeline of the country and a very important part of the Bangladeshi economy,' she says.

'Many people lose their land because of river flooding and the only option they have for a better lifestyle is to work in a factory. Socially, that gives women freedom to earn money and give back to their families – to raise their children and not rely on their husband or family to support them.'

Garment factories have been operating in Bangladesh since the 1970s, and the first



factory building regulations were issued in 1976, after the end of the Bangladesh Liberation War in December 1971. These regulations have never been updated.

'The country was very new and young, and didn't know how to deal with this factory culture. Nobody knew that it could become something really big,' says Naz, who analysed the thermal environment at a garment factory in Dhaka for her Master's dissertation at the Architectural Association.

There are currently 8,000 garment factories in Bangladesh, with 800 crammed into Dhaka city. According to the British Bangladesh Chamber of Commerce, 1,000 more are to be built by 2015 – a rate of 38 factories a month.

'Factories are very positive for the country, and closing them is not going to help,' says Naz. 'What we need to do is create more liveable conditions, so when you go to

Primark and buy a £2 T-shirt, somebody's life isn't being diminished for it.'

A typical Bangladeshi factory has raw materials entering on the top floor, with cutting and preparation on the floor directly below. The sewing and ironing floors come next; and the quality and light-check area is underneath these. The garments are packaged and shipped on the ground floor.

Naz, who monitored a Dhaka factory in 2007, says overheating was an issue in the sewing and ironing areas. The sewing-space temperature varied between 26°C and 39°C (see Figure 1), but the highest temperature Naz recorded on the ironing floor was 40°C, caused by intense lighting, the steam emanating from huge hovercraft-like ironing machines and the workers' body heat.

Bangladesh has a high-moisture climate and, in the peak of summer, the relative



BLOOMBERG / GETTY IMAGES



DESIGN HURDLES

Part of the problem with the state of factories in Bangladesh is that little thought is put into their design. 'Many architects think designing factories devalues their name,' says Naz.

Factories are built as shell and core, and no thought is ever given to services at the design stage, says Naz. In fact, electrical services and lighting are put in by architects, not engineers.

'It's normal in the UK to understand how architecture and engineering affect health and wellbeing, but, in that region, that's not normal thinking.

'It's all about perceptions. People don't actually realise how important building services engineers are. So I'm experiencing that age-old psychology again – where it's always the structural safety and fire protection that are important.

'I actually had to explain to them what building services was, because it's just taken for granted.'

Bangladesh is situated in an earthquake and cyclone zone, and it has a lot of water – rivers and canals – so buildings need to have proper foundations.

'Geological surveys need to be carried out before building a factory, but most of these never get done because engineers never get involved – they're never even asked, says Naz.'

In many cases, 10- to 12-storey factories go up with inadequate foundations, and with no load analysis, says Naz. 'So these factories get all this machinery, which is never accounted for.'

humidity reaches 80-90%. With limited air changes taking place inside the factories, the working conditions for employees can become extremely uncomfortable.

Extract or ceiling fans provide minimal ventilation, but they must be kept on a low setting to avoid disturbing loose fibres. Even evaporative cooling has to be kept to a minimum because it causes needles to rust more quickly and, therefore, no longer function efficiently.

To keep cool, workers drink a lot of water and eat foods that are rich in potassium. During their one-hour lunch break, all of the lights are switched off, reducing the internal temperature by up to four degrees.

Empirical studies have shown that high heat generated by machinery, lighting and human bodies – coupled with inadequate ventilation – can cause short- and long-term illnesses that have an adverse affect on a worker's life expectancy.¹

In fact, factory staff will only be able to work for a maximum of 10 years before they are forced to give up work for good. 'The factory workers know that,' says Naz. 'They come to work in the factories knowing that, after 10 years, their body will completely shut down.

'So, within that time, they have to save enough money to buy land, to feed their families and ensure their children get a proper education, because they know, after 10 years, they will not be able to work again.'

Physical symptoms caused by prolonged factory work in high temperatures include headaches, weakness, dizziness, heart and lung issues, eye and joint pain, disturbed water and electrolyte balance, fatigue and threat of exhaustion.

Some factories fail to provide even the most basic of facilities – such as a toilet – for women. So despite having to keep hydrated in a hot working environment, women are unable to go to the toilet for up to 12 hours.

'Holding their urine for such a long time affects their gall bladders and their reproductive capabilities, so many women who come there to work may not be able to bear a child in the future – and it's a real social statement not to have a child in a country like that,' says Naz.

Adaptive comfort

'In western countries, our comfort band might be between 20°C and 30°C, whereas people in hotter climates can tolerate temperatures between 32°C and 34°C,' says Naz.

When conducting her study in Dhaka, Naz discovered that airflow eased conditions for workers. She found that when internal temperatures were between 28°C and 34°C, with a wind speed above 0.5m/sec, 55% of the people surveyed rated conditions as acceptable.

But when temperatures reached 35°C to 37°C, and the wind speed dropped below 0.5m/sec, 75% of people reported



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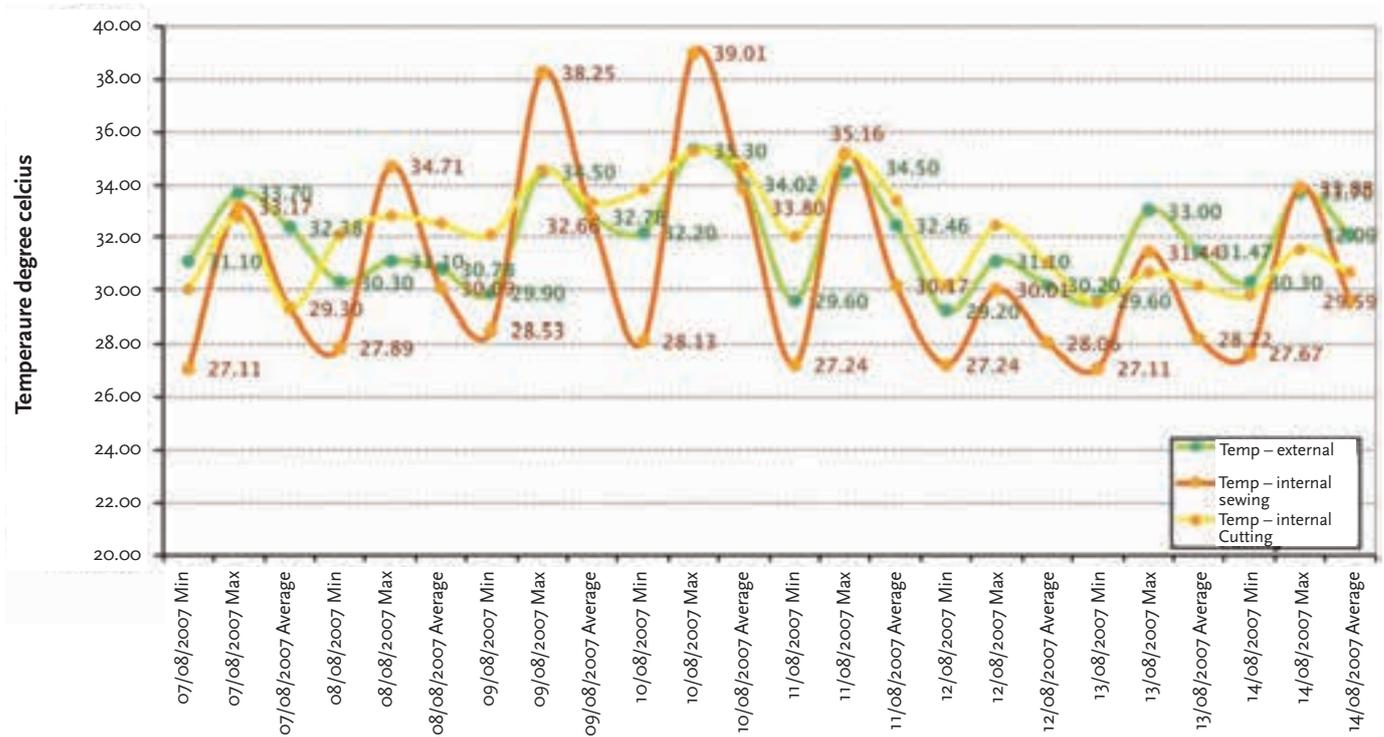


Figure 1: Temperature fluctuation – August 7 to Aug 14, 2007

unacceptable conditions. Naz says this data corresponds with empirical studies that show people are more adaptable to higher temperatures in hot climates.²

For sewing and ironing spaces, Naz identified the comfort temperature to be between 20°C and 32°C, with upper limits of 34°C. To try to come up with a possible solution to overheating, Naz looked at the structure and thermal mass of a Dhaka factory.

Fabric focus

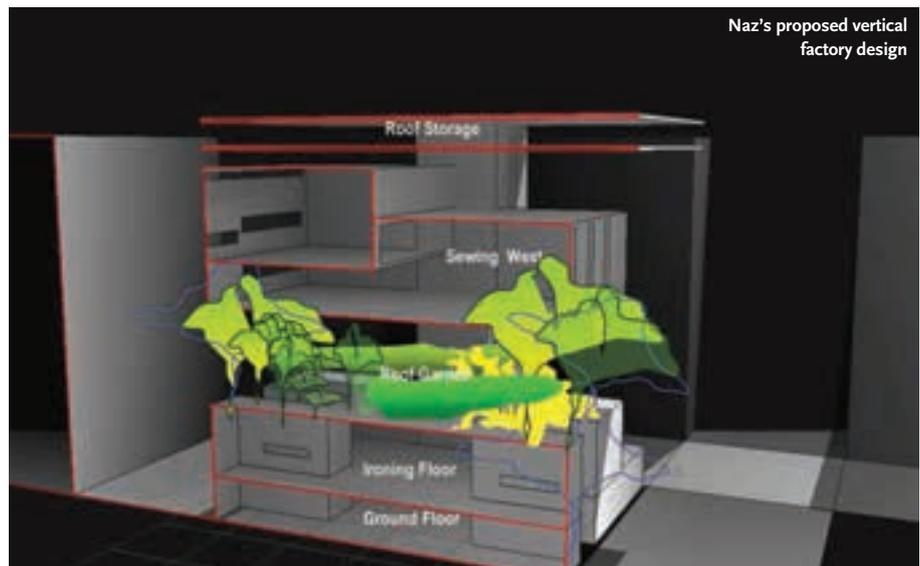
Typically, factories in Bangladesh are built using sandlime brick. When tested, this produced higher internal temperatures than materials with a heavier thermal mass, such as concrete or TermoDeck hollow core – a concrete slab with built-in pipes for running water or air.

‘It’s important to get the passive strategies right from the very beginning,’ says Naz.

Lighting was another huge contributor to the factory’s high internal temperatures and was its biggest source of energy consumption. But compared with grey London’s 5,000 lux, the illumination level of natural light in Bangladesh is 15,000 lux, which provides an ample light source.

‘If factories are not particularly deep-plan, why can’t we use natural daylight?’ says Naz. ‘When I experimented with that, I found that 50% of natural daylight could be used.’

This would also reduce load-shedding [the shutdown of electric power when demand



Naz's proposed vertical factory design

becomes greater than supply] and ease the burden on Bangladesh’s busy grid, says Naz.

The close proximity of buildings in Bangladesh creates a lot of shade. ‘There’s no concept of solar glass in Bangladesh, but the buildings are very close to each other – so overshadowing actually works positively.’

Mechanical ventilation with heat recovery was ruled out from the start, says Naz. ‘It’s very expensive, and the concept and the systems aren’t there. I can’t use a western-world solution in a country like Bangladesh.’

‘The way to cool the space is to run air through it, either by natural means or by different passive measures, or to use the fabric

There are 400-year-old palaces in Dhaka that don’t have a mechanical ventilation system, but they have thick walls, so the thermal mass is creating the comfort temperature

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Naz suggests a green space between the sewing and ironing areas to prevent heat transfer between floors, and to provide a relaxing, natural environment for the workers



CONDUCTING INTERVIEWS

Before she could conduct her questionnaire with the workers, FaraNaz had to don traditional dress, cover her hair and go to the factory every day for 10 days.

'There are a lot of social issues, so I couldn't just go and talk to them because they were fearful of losing their jobs by criticising the owner,' she says.

'It was very hard to get permission to go into a factory because I am a woman and they don't know what you're doing.'

After setting up her monitoring equipment, Naz was gradually accepted by the workers, who agreed to talk to her about improving conditions in the factories. She carried out the survey in groups.

'Many of them are illiterate, so someone had to help them understand what the answers were, and how they feel, and I think they started thinking consciously.'

of the building in a positive way so that the building doesn't heat up.

'There are 400-year-old palaces in Dhaka that don't have a mechanical ventilation system, but they have thick walls, so the thermal mass is creating the comfort temperature. And having low-level and high-level windows can create a breeze to flow through. It's a simple strategy – it's not rocket science.'

As well as a double roof, Naz suggests creating a two-storey green space between the sewing and ironing areas to prevent heat transfer between floors, and to provide a relaxing, natural environment for the workers. 'I wanted to come up with simple techniques that actually get adopted,' she says.

Time for action

Naz is currently working with fashion brands and the International Labour Organization (ILO) to try to establish guidelines to create safe and comfortable conditions for garment-factory workers in Bangladesh.

Although the ILO has released guidelines, Naz says these are not climate sensitive. 'Each country has a different climatic zone, so what works for Vietnam might not work for Bangladesh,' she says.

'My view is that we shouldn't stop these factories being built – it's not a good business proposition and it's not a good social proposition. But what we should be doing is making these factories more health and safety orientated, with better working

conditions, so that we don't feel guilty when we buy a £2 T-shirt.'

Naz says the ILO's annual surveys on factory conditions don't have a health and wellbeing section, and factory owners will only spend money if a requirement is made by the ILO.

In the current political condition, Naz says it will be too difficult to influence the law, but the ILO – which is responsible for licencing the factories – could have a bigger impact. 'If the ILO comes up with guidelines that every garment factory has to comply with, that will create a driver,' says Naz.

Over the next few years, Naz will also work with non-governmental organisations, architects and engineers to raise awareness so they adopt this kind of thinking. 'Big fashion brands can help to push this agenda because it's their workers in these factories. At the moment, they're focusing on fire safety and structural analysis, which is good – but health and wellbeing is just as important. This can't be achieved until they themselves understand why it's important.'

Fashion. Vogue. Style. Call it what you will, some people can't live without it. In Bangladesh, however, being a fashion victim has a deeper meaning – hopefully that definition will soon change. **CJ**

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- 1 Bangladesh Institute of Development Studies, Health status of the garment workers in Bangladesh (2003)
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In this month's section on air conditioning, 8 Solutions looks at cooling in data centres, Daikin explains why clients now seek proven performance and we look at the strict requirements for cooling and air movement in operating theatres. Plus, our CPD looks at the application of advanced variable refrigerant volume (VRV) systems

COLD LOGIC

Data centres are wasting energy by producing far more cooled air than necessary, according to **David Hogg** at 8 Solutions

Despite rising energy costs, data centres are spending an unnecessary amount of money on cooled air to ensure there is no impact on data integrity or even loss of functionality. The IT equipment in a data centre should be kept at a temperature of between 18°C and 27°C¹ degrees in order to run at optimum levels but, according to 8 Solutions, a specialist at increasing efficiency and mitigating against the risk of down-time in critical facilities, many data centres are producing nearly four times more cooled airflow than is needed.

The findings follow a large number of airflow audits that 8 Solutions has undertaken over the past six months, revealing the cooled air excesses of the majority of those audited. This trend is backed by Upsite Technologies², which reported that 45 audits in the US had found data centres were producing 3.9 times the amount of air really needed.

David Hogg, managing director at 8 Solutions, believes not enough is being

done to manage airflow correctly. He explains: 'As new IT equipment is added to data centres, the solution to maintain the correct temperature is usually to increase the cooling by adding further cold supply-air capacity to the environment. But, most data centres have sufficient capacity available – it's simply that a lot of the current cold air is being wasted and, critically, is not being directed to the IT kit.'

Main areas of wasted airflow include:

- Unsealed firewalls, allowing cooled air to escape the room or data centre entirely
- Unsealed cable cutouts, releasing cooled air into inappropriate areas
- Poor management of hot/cold aisles, including having grilles located within the hot aisles, and IT equipment installed in reverse
- Poor delivery of cooled air through the subfloor. Poor cable management causing blockages
- Bypass air circulating back to the AHU without going near the IT kit
- Mixing of cooled and hot air, reducing

the effectiveness of the cooled air

- Incorrect airflow balance between supply (installed capacity) and demand (IT equipment)

Hogg continues: 'With better airflow management, data centres can make average energy savings of £48/m² per annum. A typical 500m² data centre can save £24,000/annum and show an improvement in power usage effectiveness (PUE). This gives a return on investment of between 12-24 months.'

Recent reports by the Uptime Institute³ conclude the same, where average self-reported PUE levels have reduced from 2.5 in 2007 to 1.89 in 2011, and 1.65 in 2013, with airflow optimisation identified as the main contributor. **CJ**

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- 2 <http://blog.upsite.com/>
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THE NEED FOR SPEED

Daikin's Martin Passingham talks to Ewen Rose about its variable heat recovery products, and why clients are looking for products with proven performance



The technical specifications of Daikin's 'new generation' of variable refrigerant volume (VRV) heat recovery products are certainly impressive – not least the use of manufacturing techniques from Formula One racing cars to produce the extremely robust new coil and compressor.

It claims to be 28% more energy efficient than the previous generation of VRV, but Daikin UK's DX product manager, Martin Passingham, believes the challenge for manufacturers goes beyond hardware (and control software) to the education process for consulting engineers and installers.

'We have a big job to do in explaining what is now possible within indoor comfort,' Passingham told *CIBSE Journal* during the recent ACR Show in Birmingham. 'Our business is not about shifting boxes. Our systems have to work – and be seen to work – for 10 to 15 years or more. Our technology has to be able to respond to changes in the environment and end-client needs. 'Our reputation depends on that, and equipment performance is measured against a very long life-cycle.'

Energy efficiency is still not the top motivator for installers when choosing a chiller or VRV system, according to Passingham. Many are looking for ease and speed of installation first, but it is possible to satisfy that need for speed while ensuring the end-client has a system that will meet their needs in the long term, he believes.



Martin Passingham

Flexibility

The challenge facing consulting engineers and installers to deliver improved flexibility into commercial office comfort systems will only increase as the market recovers – and manufacturers can help support that process with training and technical back-up.

'New VRV technology has been designed with this requirement for flexibility in mind, but it does challenge the installation team because they have to think about how the system will be used over a long period of time,' said Passingham.

Close co-operation with FMs and end-clients is still something of a holy grail for the building services sector, and will be increasingly important if sophisticated technology is specified.

'VRV with heat recovery will deliver and we have control software and installation guides to support installation and commissioning. But, to achieve optimum performance, you need a clear idea of occupancy patterns, and so on,' said Passingham.

The VRV configurator software supplied with Daikin's VRV IV is designed to speed installation and commissioning, but it also allows for the management of multiple systems at different sites. The use of lightweight multi-port BS boxes means the system is much easier (and therefore quicker) to install; a mixture of multi- and single-port boxes gives consulting engineers the required flexibility of design.

This modular design means it can be configured to suit most commercial spaces and accommodate changes to internal layouts. The system integrates heating, cooling, ventilation, air curtains and hot water, recovering 'free' heat from areas requiring cooling and using it to warm other areas and provide hot water.

Passingham said it takes established three-pipe heat recovery technology to another level by incorporating variable refrigerant temperature, which gives the impressive 28% efficiency improvement, according to the company's test figures.

By continually adjusting refrigerant temperature to match heating or cooling demand and the outside temperature, less power is needed. An added benefit is that higher refrigerant temperatures prevent cold draughts. The system also continues to provide heating during its defrost cycle, which avoids the drop in indoor temperatures normally associated with this process.

The need to address indoor air quality was also a consideration, and Daikin has designed-in the ability to adjust the mix and volume of fresh air – again depending on occupancy patterns.

Clearly, the potential for the new technology is there, but will the UK market support it?

'Everything we do has to deliver a value, so we can't just build a new product of such high specification that nobody can afford to buy it,' said Passingham. 'The market will support a price premium for improved performance, but only to a certain level.'

'The challenge for the industry is to make sure design, installation and commissioning is of sufficiently high quality that the end user gets the full value of any improvement we build into the technology.' CJ

DRIVING ENERGY EFFICIENCY

Bill Wright, ECA Head of energy solutions says new company obligations will boost the role of building services

We are starting to see the effects of The EU Energy Efficiency Directive, which came in at the end of 2012, on the UK commercial and public energy efficiency markets.

EU Member States are required to implement their own legislation by 5 June 2014 and this is likely to influence the role of building services

professionals, as organisations look to this community to help them meet statutory obligations.

Metering and retrofit

The first requirement is that all consumers should have access to information on their energy use - the job of the UK smart metering programme.

Organisations which are heavy users of energy should have extensive metering installed already, but businesses of all sizes will be encouraged to install energy metering systems, to comply with Building Regulations.

EU states must also establish a long-term strategy for the energy efficiency retrofit of existing commercial buildings. All publicly owned buildings must lead with improvements at a rate of 3% of floor area per year from this year. This is a large and potentially expensive project which should deliver a good deal of work for building services providers.

Audits

Regular energy audits will also be required to identify areas of improvement and document progress, with all 'large businesses' needing an energy audit at least every four years.

The scope and content of these audits, as well as the requisite qualifications for energy auditors, are currently being



agreed; however the first audits will need to be carried out by the end of 2015 so we expect definitive detail very soon.

This pushes energy efficiency up the priority list and could lead to major energy efficiency works by companies, who will have to publish their results and state the steps they are taking to implement recommendations made in the report.

ESCos

Member states are also required to encourage the creation of ESCOs, Energy Services Companies, who work with clients to help them manage their energy usage, reduce costs and comply with legal obligations. This market is very well established in Europe and beginning to take off in the UK.

Many ESCOs provide a complete service, covering all aspects of the company's energy use, including paying bills, acting as a consultant on energy improvements, providing energy efficiency services, maintenance and monitoring new measures. Smaller service companies may get involved providing energy management and implementation services rather than the full finance option.

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Surgical PRECISION

Air purity and infection control are matters of life and death in an operating theatre. **Steve Hunt** explains the key design requirements for ventilation and air movement systems in these highly specialised spaces

Of course, not all air quality considerations relate to infection control and air purity; temperature control is equally vital

In a standard working environment – such as an office or a hotel – the design and installation of a ventilation and air movement system is all about three things: cost, energy efficiency and comfort. In an operating theatre, all of those considerations still apply, but so much more needs to be factored in. The specification has to be incredibly sophisticated to cope with the increased risk of infection and the vulnerability of the patients it serves. What's more, not all operating theatres are the same: increasingly, hospitals allocate specialist procedures – and specialist equipment – to specific theatres. So how should a ventilation and air movement system be designed to cope with these exacting demands?

Under pressure

The varying nature of operating theatres across the UK's hospital estates means that some are more easily upgraded to best-practice standards than others. Already such projects are under significant time constraints, as it is logistically difficult for any hospital to have an operating theatre out of action for even the shortest of refurbishment programmes. For theatre refurbishments, therefore, the building services design must take account of ease and speed of installation, as well as the type of theatre, its location within the building and the design layout. These factors will affect the viability of pressure regimes, and whether the system can be integrated with existing plant services.

Pressure regimes manage the differences in air pressure between the operating theatre, the anaesthesia room and the patient preparation



area. The premise is that the air movement system will create a positive pressure in the operating theatre by feeding more clean air into the space than it is extracting, contributing to infection control. An optimum pressure regime will generate positive pressures of 25Pa in a standard operating theatre, with 20Pa in the anaesthesia room, 5Pa in the patient preparation area and 0Pa in the corridors.

The difficulty for many older hospitals is that pressure regimes are a relatively recent concept, and the design layout may not support their implementation because there is no airtight seal between the different spaces. Even in more modern theatres, pressure



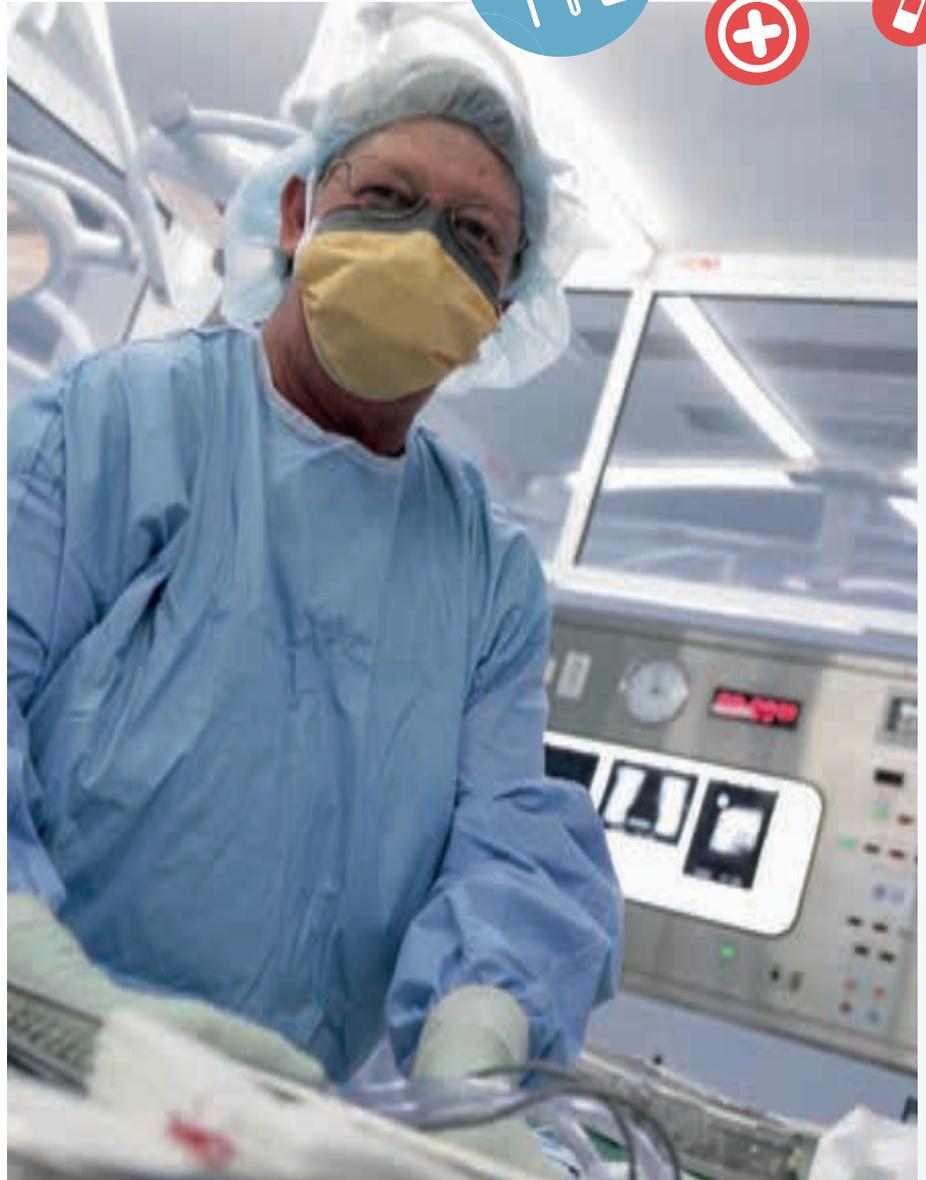


regimes need to be checked and managed as part of the air movement system design process to ensure that positive pressures in the operating theatre and anaesthesia areas aid infection control.

Keeping it ultra-clean

To comply with the air-quality requirements in HTM0301, ventilation systems for standard procedure operating theatres must deliver a minimum of 25 air changes per hour. The volume of clean air circulated by the system must be calculated on the basis of the size of the space. It must also be distributed in a linear circulation from the grille to the floor, as well as balancing the extracted and clean air – to fulfil pressure regime requirements.

For ‘ultra-clean’ theatres, the required air changes per hour leaps up substantially to 500 within a 2.7m zone around the operating table, reflecting an increased risk of infection for certain types of operations. Typically used for orthopaedic procedures that involve deep incisions into the musculoskeletal system, ultra-clean theatres also require high efficiency particulate air filtering to ensure that the air quality is as pure as possible.



The system should be designed to eliminate as many colony-forming units (CFUs) of bacteria from the operating site as possible: a recent installation that we designed ensured that there were fewer than 10 CFUs per cubic metre of air for the first 300mm of air circulating around the wound site, and fewer than 20 CFUs per cubic metre of air for the remainder of the ultra-clean zone.

This ultra-clean zone uses a central air change and filtration canopy, which manages the air-change regime from ceiling to floor. Typically such canopies have a screen that encloses and directs the upper flow of clean air, but a recent ultra-clean installation our

firm undertook included a screen-less canopy, which maximises head room for the surgical team and makes it easier to move around the service pendants.

Staying in control

Of course, not all air-quality considerations in an operating theatre relate to infection control and air purity; temperature control is equally vital, for both the patient – whose core body temperature must remain stable – and the surgeon, who must be comfortable and have maximum dexterity.

Patient and surgeon requirements will change with the individuals, so it is essential



Ventilation systems for standard procedure operating theatres must deliver a minimum of 25 air changes per hour

The medical team must have real-time status information about the ventilation and heating system, so that measures can be taken to alter the settings if required



that the temperature controls are both accessible to the surgeon and can manipulate the temperature accurately to the exact needs of each operation. The system must be capable of responding without delay to any change in the settings.

It is also essential that the medical team has real-time status information about the ventilation and heating system in the operating theatre, so that measures can be taken to alter the settings if required. The surgeon's panel display should include temperature information, ventilation system status and humidity levels, in addition to information about the status of equipment.

A best-practice approach to air quality and temperature in operating theatres takes into account not only a hospital's clinical needs but also its operational requirements. By designing in heat recovery via a heat plate exchanger, the building services specialist

can minimise the level of energy required for the heating system by re-using warm air extracted from the operating theatre via the ventilation system. Another of our recent installations also incorporated inverter speed controls within the ventilation plant to ensure that there is finite control to each fan. This system is connected to a site-wide building management system, ensuring the maintenance teams are instantly alerted in the event of any loss of efficiency.

The big picture

In any environment, the building services installation should be designed in such a way that the site programme is minimised and the most efficient use is made of the available space. In an operating theatre this is even more vital, as the handover date for the project is business critical and the complex network of services and equipment that needs to be installed means that space is at a premium. The installation must also take account of maintenance regimes and access for any repair work, as well as future flexibility – there has to be scope for the space to be further upgraded to take account of advances in technology or new legislative stipulations.

But the complexity of providing a sophisticated heating and ventilation system for a specialist environment should not be used as the excuse for over-complicated installations. There is a real imperative to keep the installation as simple in design layout as it is detailed in terms of accuracy, resilience and HTM compliance. In an operating theatre, air quality is an essential component in achieving successful outcomes, and only by taking a pragmatic and holistic approach can the building services engineer really deliver that important role. **CJ**

STEVE HUNT is managing director of building services engineering specialist Steven Hunt Associates

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Evolving VRV beyond comfort conditioning

This module explores the application of advanced VRV systems

As the technology further matures, variable refrigerant volume (VRV) or variable refrigerant flow (VRF) systems are being applied to a wider range of HVAC services. Although originally designed to provide comfort air conditioning through air-to-air heat pump heating and cooling, they have evolved to encompass heat recovery systems, small (or mini) VRV systems, as well as extensive systems that can function effectively at more extreme ambient conditions – so that VRV can be used in countries with cooler and warmer climates.

This CPD will consider the application of advanced VRV systems that can provide energy and cost-effective domestic hot water, as well as fulfilling their role in comfort conditioning.

VRV systems can now provide heating and cooling to other building services, beyond the demands of direct comfort conditioning requirements. The heat pump 'split system', designed for heating water, was originally developed in the 1980s. By using the hot gas refrigerant (leaving the compressor), passing heat through a plate heat exchanger to a cold water supply, it was possible to heat water more effectively than using direct electrical immersion systems. However, due to the low cost of natural gas and low demand for energy-efficient products during that era, this type of heat pump hot water production system

was not widely adopted, and manufacturing development was held back until demand increased.

As technology evolved and the focus on energy efficiency grew sharper, it became appropriate to re-introduce this technology – but not only as a split system (single indoor unit to single outdoor unit combination), but also on distributed VRV systems. Concurrently, manufacturers were also introducing direct refrigerant connections to coils in air handling units, as a means of heating and cooling ventilation air, using the refrigerant as the working fluid.

Subsequently, there have been many projects that utilise VRV systems that can

control the temperature in ventilation air supplies and hot water systems. However, the success of such integrated systems requires an holistic appreciation of the building and its environment, the system (and its capabilities and practical limitations) and the operational realities. Manufacturers have the ability – and the required components – to meet the opportunities offered by VRV-linked direct refrigerant heat transfer within AHUs and plate heat exchangers, but each application needs to be carefully considered to ascertain the best system selection. Some air-handling applications lend themselves to connection to heat pump systems that are dedicated to looking after the fresh air requirements,

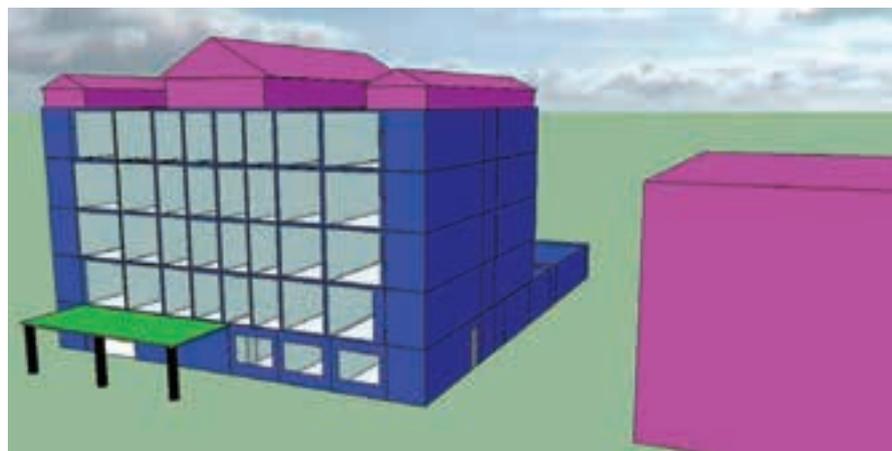


Figure 1: Thermal modelling of hotel

whereas other applications can provide efficient hot water production and, concurrently, provide the space-conditioning requirement by utilising heat recovery technology.

Modelling advanced VRV application to supply 'high temperature' domestic hot water for an example hotel

A good potential application of using a VRV-linked system to provide domestic hot water with high efficiency is in hotels. A thermal model was created to explore a hotel's cooling and domestic hot water requirement to establish what could be reasonably, and effectively, produced by a VRV system. The hotel was based on standard 2002 regulation UK constructions, with facilities on the ground floor for a lobby area, gym, meeting rooms, office, restaurant and kitchen with the four floors of guest rooms above. For this modelling exercise, it was located in Strasbourg, France, a region that has a climate slightly more extreme (both in summer and winter) than London.

The building was analysed using IES VE software in conjunction with a 'plug-in' designed specifically to model the operation of Daikin VRV systems. The model had each space analysed in detail to identify the best possible performance for a heat recovery system. This was a lengthy process, and was undertaken to evaluate the opportunities for the technology, going beyond the requirements of a 'normal' design process. (This in-depth analysis is not yet available commercially.)

The overall (seasonal) performance of a VRV-based system is operationally determined by the heat removed (as cooling) from the building, combined with that produced by the compression cycle being matched by a heating demand. The building's north-facing guest rooms and the lobby area (with constantly opening and closing doors) provided a heat demand, particularly in the mornings, although the majority of the building's air load was for cooling – some areas having significant heat gains, such as the restaurant, meeting rooms and south-facing guest rooms. The internal space and fabric loads were combined with the domestic hot water requirements to provide an annual heating energy requirement of 1,233 MWh and an annual cooling energy requirement of 922 MWh.

This indicated that there was opportunity to transfer available heat usefully around the building. However, the key – and more challenging – task was to provide a realistic and detailed simulation of building operation so that simultaneous heating and cooling loads could be matched to investigate the potential for heat recovery. Heating the domestic hot water can provide an efficient means of

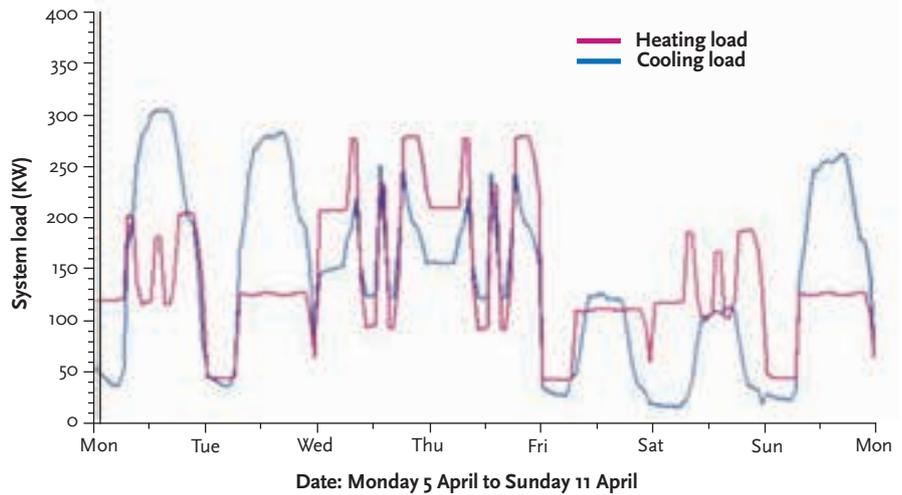


Figure 2: Hotel heating and cooling demands over a week in April

matching the cooling for very little additional energy.

For example, in Figure 2, for a particular week in April there is on average around 80 kW of continuous free capacity available and, at some points, as much as 220 kW of capacity that can be recycled for use elsewhere in the building.

A 'traditional' VRV-based system might well operate with a heat pump VRV system for air temperature control, and a natural gas supply providing the heat required to satisfy the hot water demand.

A development of this system would be to use a (low temperature) VRV hot water system that uses the heat rejected from the building and compressor to raise the domestic water

temperature. Practically, this can raise the water up to a maximum of 55°C, and so this system typically requires additional gas or electric 'top-up' heating to maintain safe temperatures for Legionella control. That type of system was not considered in the comparison modelled in this example.

The more advanced application is a VRV heat recovery system utilising high temperature domestic hot water production via a 'cascade' hot water exchanger. A cascade system uses two vapour compression cycles as shown in Figure 3. A R410a refrigerant circuit has an evaporator in the outdoor unit of the VRV system (section 1), drawing heat from that rejected by the VRV cycle. The compressor increases pressure and

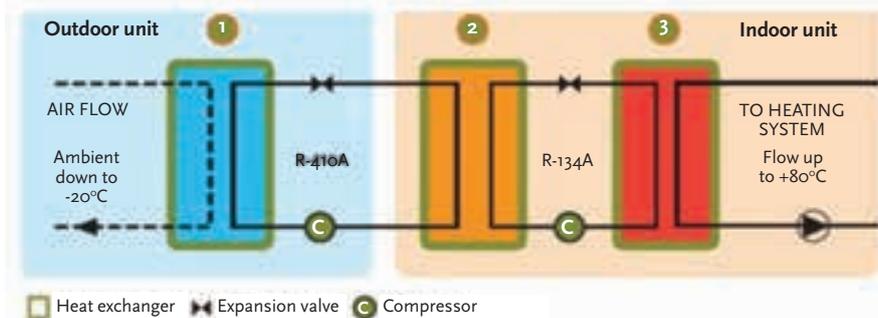


Figure 3: Cascade refrigeration to effectively produce hot water from heat rejected by VRV system

| | Heat pump plus natural gas hot water production (@60°C) | Heat pump with HT hot water production (@60°C) |
|--|---|--|
| Delivered capacity | 1,843 MWh | 1,867 MWh |
| Gas use for hot water heating | 1,101 MWh | No gas used |
| Electricity to power VRV | 151 MWh (@ COP=6) | 272 MWh (@ COP=6.9) |
| Annual cost | £62,208 | £38,544 |
| Tonnes CO ₂ e | 270 | 120 |
| Calculations based on electricity at £0.12 per kWh, 0.430 kg CO ₂ per kWh, and natural gas at £0.04 per kWh, 0.185 kg CO ₂ per kWh | | |

Figure 4: Modelled annual carbon emissions and energy costs

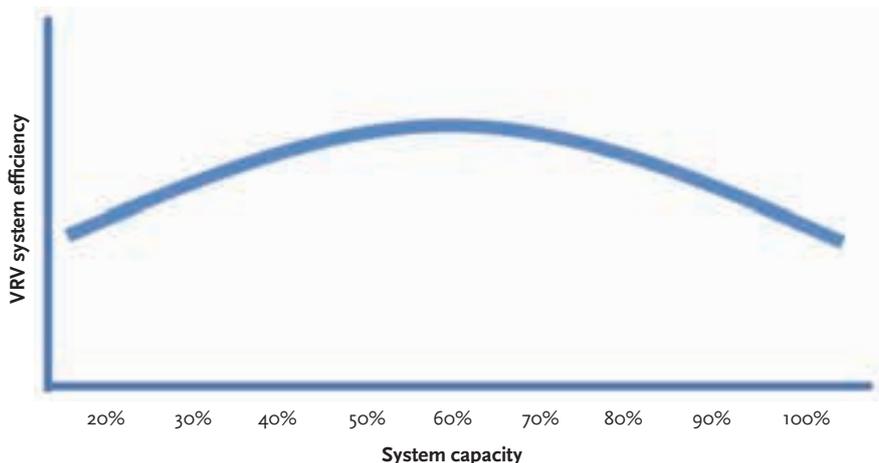


Figure 5: Approximate variation in VRV system efficiency at different loadings

temperature, and the refrigerant subsequently flows to the hot water production unit (section 2). The R410a is condensed, exchanging heat with the evaporator of an R134a refrigerant evaporator. Again, using vapour compression, the temperature of the R134a is increased to (potentially) 80°C, feeding the condenser heat exchanger (section 3) to provide hot water.

For this example model, the system was set to supply heat to provide a hot water flow temperature of 60°C.

The results of the analysis comparing the two types of system, as shown in Figure 4, demonstrate some notable differences. Over the year, the VRV/natural gas system provides a VRV coefficient of performance (COP) of 6, combined with a natural gas heating system effectiveness of 0.9, compared to the VRV/cascade system COP of 6.9. In the cascade system, the modelled VRV yearly output increases to 1,867 MWh (from 906 MWh) because it is providing the heating source for the hot water.

With the more advanced heat recovery systems, there are opportunities to readily employ – at very low additional cost – heating or cooling that would otherwise be rejected. At

such times, this can allow the environmental conditions to be more closely controlled to design conditions, at marginal additional cost, potentially improving comfort and occupier satisfaction. The small increase in delivered capacity in Figure 4 is due to the model providing such a benefit.

The analysis shows a significant difference between the two systems. The selected system is based on a ‘design’ heating condition. However, in reality, this may be exceeded, so the heating performance of the system should also be analysed at extreme winter conditions. Heat pumps are very efficient at producing domestic hot water, but in the case of a hotel, the comfort of guests is a prime requirement and priority. Further simulations at an extreme winter conditions are likely to indicate that there could be a shortfall in heating capacity. One solution could be to increase the capacity of the heat pump system, but by increasing the peak capacity of the system it is likely to reduce the year-round efficiency of the system.

Figure 5 indicates the general relative performance of a VRV system. The optimum performance is between 50-70% capacity and, typically, this is where a properly-sized system

will operate most frequently. However, if an ‘oversized’ system is used (to satisfy extreme heating requirements), it will spend the majority of operational time at a lower capacity and, therefore, at lower efficiency.

In the example, rather than increasing the system maximum capacity to accommodate infrequent high heating loads, it is likely to be more effective to use a bivalent system, with a boiler that is used when high hot water loads and, typically, low outdoor temperatures coincide.

Integrating AHU cooling and heating coils

Traditional methods of cooling and heating the supply air (using separate chillers and boilers, and water-based coils) may be replaced by dedicated VRV system connected coils (carrying ‘refrigerant’) within the air handling unit (AHU). This can eliminate a stage of heat exchange by feeding AHU cooling and heating coils directly with refrigerant, so increasing efficiency. The selection of a VRV system for cooling the supply air relies primarily on the load, but it is important that this load is defined correctly, based on the required on and off coil conditions.

A VRV system can also provide the source of heat for the AHU heating coil. VRV systems are primarily designed for indoor coils – rather than those in an AHU – and so it is particularly important to check the operational range with the manufacturer to ensure that it can meet the design load. Some manufacturers do not recommend using the coils to heat low temperature air (below 10°C) – this will be dependent on the system supplier.

Using VRV equipment as the direct heating/cooling source can provide an efficient application in itself. However, by considering the heating and cooling coils of the AHU systems in conjunction with the coils in the room units can significantly increase the opportunities for heat recovery, as previously waste heat and cooling can be reused elsewhere in the building systems, as shown in Figure 6.

With careful analysis and design, VRV systems can be very effective and efficient at providing air and water temperature control in buildings. As designs become more ambitious in integrating formerly disparate systems, there is a need for more careful analysis and modelling that will rely on closer working relationships between manufacturer, designer and operator to ensure that systems provide seasonal efficiencies that meet expectations.

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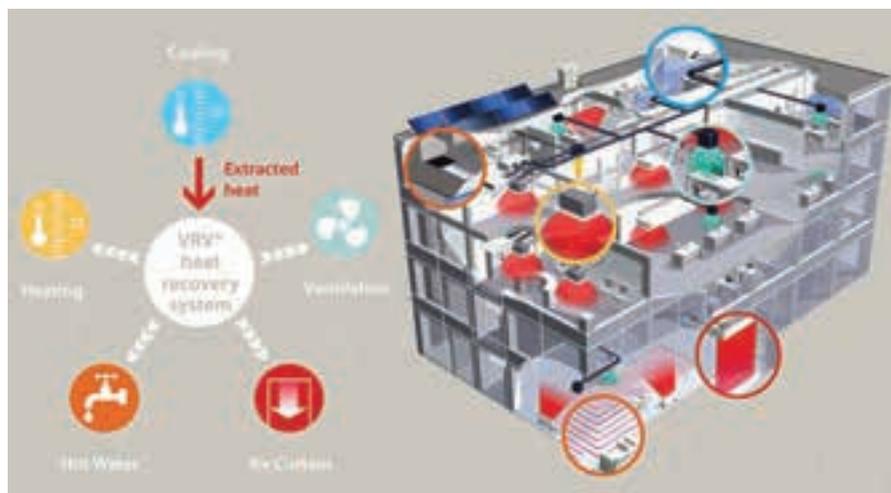


Figure 6: Elements of the building services system recover otherwise wasted heat through the VRV system

Turn over page to complete module ➤

Module 62

March 2014



1. In the model, where was the hotel located?

- A London
- B Paris
- C Strasbourg
- D Milan
- E Berlin

2. What was the approximate maximum cooling demand for the hotel in the period 5-11 April?

- A 150 kW
- B 200 kW
- C 250 kW
- D 300 kW
- E 350 kW

3. In the optimised model of the hotel operation, what theoretical annual CO₂ saving was predicted with the VRV/cascade system, compared to the 'traditional' VRV with gas boiler system?

- A 50 tonnes CO₂e
- B 100 tonnes CO₂e
- C 150 tonnes CO₂e
- D 200 tonnes CO₂e
- E 250 tonnes CO₂e

4. What is the suggested typical optimum point for a VRV system in terms of its operating efficiency?

- A In the lower 20% of its total capacity
- B Between 20% and 50% of its total capacity
- C Between 50% and 70% of its total capacity
- D Between 70% and 90% of its total capacity
- E Above 90% of its total capacity

5. In the example given, what seasonal COP is predicted for the VRV/cascade system?

- A 0.9
- B 1.0
- C 3.9
- D 6.0
- E 6.9

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New Harmer Steel Floor Drains expand Alumasc's comprehensive drainage offer

Alumasc has announced the addition of Harmer's new Stainless Steel Floor Drainage to its already extensive collection of drainage solutions for the construction industry. The new Harmer range comprises high-performance, highly versatile stainless steel floor drains, channel drains, and shower and wet-room drainage, capable of withstanding some of the most demanding applications.

Boasting high-flow performance, high sump volume, excellent corrosion resistance and integral waste baskets, this incredibly robust range is the perfect example of Harmer's commitment to evolving its products to meet the changing needs of the drainage market. Harmer Steel Floor Drainage is available in standard and compact sizes, either as a one- or two-part drain body with vertical or horizontal outlets.

There is a wide choice of grate finishes to suit any application and load requirement, offering ease of installation on a range of different flooring options.

● Call 0174 464 8400 or visit www.harmerdrainage.co.uk

Retrofit PaySmart – pre-payment energy billing for communal heating schemes

Evinox understands the importance of integrating the most suitable energy metering and billing system in a communal heating scheme. The company has launched PaySmart technology, now available as a retrofit system that can be installed in connection with any other manufacturer's heat interface units or communal heating system. Already widely used in our ModuSat communal heating systems for private and social housing schemes, Evinox PaySmart technology provides a facility for residents to pay for their energy in advance.

● Call 0137 272 2277 or email info@evinox.co.uk



Frese launches valve for larger scale heating and cooling systems

Frese, the world's leading developer and manufacturer of pressure independent balancing and control valves, has extended its range of flanged PICVs targeted at the larger cooling and heating applications such as air handling units and plate heat exchangers. The firm has developed a larger scale valve, the PICV Optima DN100, handling 25 litres of flow per second. This capacity makes it ideal for controlling flow and pressure in larger scale units in high rise buildings, supermarkets and factories.

● Call 0170 489 6012 or email info@frese.co.uk



The best of biofuel technology

This year-round, multi-fuel condensing boiler has been developed and installed since the year 2000. There are now many hundreds of boilers burning natural gas, light oil, low-pressure gas and kerosene. The boiler can now burn B100 bio-fuel, transformed from waste oil and rape seed oil. Atlantic has also installed many dual-fuel condensing boilers burning natural gas and B100 bio-fuel, or natural gas and light oil. The boiler bridges the gap between gas condensing boilers and bio-liquid boilers, with efficiencies between 92% and 97% GCV, a range of 10kW to 625kW and a Sedbuk 'A' rating.

● Call 0161 621 5960 or email info@atlanticboilers.com

Pioneering new LST radiator guard brochure launched

Safe surface-temperature specialists Contour Casings has launched a pioneering new LST radiator guard brochure, which features information on a groundbreaking infection prevention study, Contour's innovative BIM programme, and technical specifications and HD case-study photography.

The brochure, for those operating in healthcare, education and other demanding environments, demonstrates how the anti-microbial technology in all LST radiator guard solutions reduces levels of potentially harmful bacteria by 91%.

● Call 0195 229 0498, email sales@contourcasings.co.uk or visit www.contourcasings.co.uk



Heating education from Elco UK

Elco UK, formerly MHS Boilers, has supplied two 24kW Aerotop T air-source heat pumps to Heath Primary School in Kesgrave, Ipswich. The pumps have been installed outside a new stand-alone teaching block to provide central heating services for six classrooms, two group rooms and toilet facilities. The Elco heat pumps were specified because of their ease of siting and installation. Combined with a low-temperature heating circuit using underfloor heating, as well as improved air-tightness regulations, the heat-pump heating system has been designed to greatly minimise utility costs.

● Visit www.elco.co.uk



School now safer with ADT fire alarm

ADT Fire & Security has upgraded the fire-detection cover at Victoria Junior School, in Feltham, Middlesex, from an analogue to a digital addressable system with its MZX Technology solution. This advanced digital system provides smoke and heat detectors, and sounder and sounder/beacon detector bases. The design is applicable to the risk from both a fire detection and false-alarm management approach, and includes audible and visual alarms to comply with the Equalities Act 2010. This all ensures that the school buildings benefit from a reliable and efficient system.

● Call 0844 800 1999



Stonehenge opens visitor centre

With more than one million visitors a year – the majority from overseas – it seems somewhat surprising that the complete lack of visitor facilities at Stonehenge has only recently been redressed. The £27m centre now offers visitors a café and gift shop. But these facilities also go beyond the expected, with an exhibition that includes a forensic reconstruction of the face of a 5,500-year-old Neolithic man. Other attractions include two rare 14th-century manuscripts and a laser, 360-degree 'stand on the stones' feature that allows visitors to experience what the summer and winter solstices are like.

Grundfos Pumps worked in conjunction with Skanska and supplied the full pump requirements. This included members of the ultra energy-efficient Grundfos Magna and Alpha circulator-pump families, TPE in-line centrifugal volute pumps, that are suitable for a wide range of applications, and a Hydro MPC-E booster set, with the solution being supported with Grundfos pressurisation units.

● Call 0152 585 0000, email grundfosuk@grundfos.com or visit www.grundfos.co.uk



Cool-Therm launches new company

Cool-Therm has launched a new company to specialise in the design and management of specialist low-carbon, high-efficiency air-conditioning systems and energy audits. Cool-Therm (Consultants), headed by directors Alex Strong and Rob Young, will offer a nationwide service from the company's locations in Bristol, Cardiff, Reading and Wolverhampton. Strong said: 'With sharp increases in energy prices, running costs for air conditioning are now a major issue. Clients want to ensure that systems operate as efficiently as possible, to minimise the cost of ownership over the lifetime of plant.'

● Call 0303 030 0004 or email enquiries@coolthermconsultants.co.uk



Titan Products expands TPZ-NET Zigbee wireless range

Titan Products continues to develop its TPZ-Net range of wireless sensors with the release of the TPZ-PIR occupancy sensor. Designed to detect movement in a space, the completely wireless, battery-powered sensor transmits a wireless signal to the TPZ-Net coordinator when movement is detected. The coordinator then communicates this state over a BACnet network that allows applications, such as lighting and HVAC equipment, to be controlled when occupants enter the room.

● Call 0161 406 6480, email admin@titanproducts.com or visit www.titanproducts.com



ABC Group becomes ABEC

The Automated Building Controls Group has changed its name to ABEC, which stands for Automated Building & Energy Controls. The change reflects the increasing importance of energy to building performance and the key role building controls have to play in driving efficiency for clients' costs and carbon savings. Providing an integrated solution for clients' building controls, ABEC's experience means it can not only specify the best controls solution, but also ensure ongoing performance and optimisation.

● Visit www.abec.co.uk or tweet @ABEC_UK

All part of the service

To complement its industry-leading range of pipework insulation, Kingspan Tarec Industrial Insulation has launched the Pipeline Technical Advisory Service. The service will provide customers with free, expert guidance on everything from regulatory requirements and best practice to detailed, project-specific advice and solutions. Kingspan Tarec's technical support team is able to advise on the specification, installation and maintenance of Kingspan Tarec products in any building services/HVAC, refrigeration, process, low-temperature or cryogenic application.

● Call 0808 168 7363, email info@kingspantarec.co.uk or visit www.kingspantarec.com





Friaphon keeps the noise down at King's Cross redevelopment

Durapipe UK's specialist sound attenuated drainage system, Friaphon, has been specified in two new apartment complexes that are part of the King's Cross regeneration project. The project, delivered by the King's Cross Central Limited Partnership, is one of the biggest in Europe and will transform the area into 8 m ft² of mix-used space, including the Rubicon Court, Saxon Court and Roseberry Mansions apartment complexes. When choosing Friaphon, contractor Kylemore was looking for a pipework manufacturer that could provide an easy-to-assemble drainage system that offered superb sound insulation properties in a cost effective way.

● Call 0154 327 9909 or visit www.durapipe.co.uk



SE Controls helps provide the perfect environment at Audi Leicester

Sytner Group's Audi dealership in Leicester is using advanced natural ventilation technology from SE Controls to ensure a comfortable environment is maintained for its customers and staff.

SE Controls supplied, installed and commissioned the complete natural ventilation system, which involved the supply of two SCCO Schuco 500 mm stroke chain actuators and a precision OS2 controller to provide automatic operation of the sloping vents in the showroom atrium. Manual operation of the vents also formed part of the showroom system, operated by tamper-proof key operated switches.

Audi Leicester's workshop area is split into six separate areas, each with its own localised ventilation, control and manual over-ride system. To actuate the Schuco AWS 55 vertical vents, SE Controls installed 18 of its new 24 Volt SECO 24 40 N chain actuators together with six OS2 controllers and key operated switches to give accurate and flexible control over the system.

● Call 0154 344 3060 or visit www.secontrols.com

Mikrofill brings warmth to Wendron-Gordon

Bromsgrove School is a 500-year-old private school offering an enlightened, disciplined and broad education to more than 1,500 pupils. The school takes day and boarding students, and the north side of the central green is dominated by the impressive Wendron-Gordon House, which accommodates 100 boarders.



For the past three years, Wendron-Gordon House has been enjoying the benefits of Mikrofill equipment. Two Ethos 90kW stainless steel condensing boilers, coupled with a Rapide Extreme loading cylinder and pressurisation package, provide the house with heating and hot water.

● Call 0845 260 6020 or visit www.mikrofill.com

Urmet provides glass-panelled door-entry solution

One Tower Bridge is the epitome of five-star luxury living and one of Berkeley Homes' finest riverside developments, situated directly adjacent to Tower Bridge and opposite the Tower of London. Urmet is proud to have been selected to supply the door-entry panels for this prestigious, high-end residential project. For this development, Berkeley Homes needed a full-IP solution that was aesthetically pleasing and also reflected the needs and requirements of the highly discerning individuals who will take up residency at this elegant development. London's largest developers chose 52 Power over Ethernet (PoE) Elekta glass panels for all of the entrances at the eight blocks within the development, which comprises 350 apartments.

● Visit www.ipervice.co.uk



Gray Scott reaps benefits of KNX partner training

Gray Scott is one of a growing number of electrical contractors to become fully certified as a KNX partner. This has given the company all the necessary accreditations to undertake KNX home-automation and intelligent-building installations using KNX-certified products. It has also opened up new business opportunities for Gray Scott Electrical Contractors. Based in the Chichester area, the company has been established for 20 years and is fully accredited with the Electrical Contractors Association (ECA).

● Call 0845 869 5908, email admin@knxuk.org or visit www.knxuk.org



Century of cables for Prysmian

On 20 January 1914, Pirelli cables signed an agreement to build its first cable factory in the UK. One hundred years later, the company – now called Prysmian Group – is the largest cable manufacturer in the world and, unlike its competitors, continues its commitment to manufacturing in the UK. To celebrate a century of continuous production, the company will be running a series of commemorative events at its sites around the country throughout 2014. The first of these was held in Southampton, near to the site of that first factory. The event reunited many of the local people who have worked for the company over the past 100 years.

● Visit uk.prysmiangroup.com



Minus 7 – the true hybrid energy harvester – exhibits at EcoBuild 2014

The Minus 7 Hybrid Energy Harvesting System is an innovative renewable-energy system that provides hot water and heating for homes using endothermic roof-tile planks, a solar-energy processor, a water-to-water heat pump, heat-transfer units and a thermal store. The system is classified as a solar-assisted heat-pump technology and the NCM (SAP) identifier for the product is Minus 7 SEP3G10 1/2/3.

The system is capable of servicing up to three dwellings at once, keeping them at a comfortable temperature of at least 21°C, even in the worst mid-winter. It is highly suitable for housing associations. 'This will be the third year for Minus 7 exhibiting at the EcoBuild show.

Response has always been very positive,' said managing director Mark Wozencroft. 'In recent years, many visitors commented that it was the best roofing product that they had seen at the show and noted the very high standard of engineering, choice of components and finish.'

● Call 0192 241 9405 or email info@minus7.co.uk



Overcoming access issues for power-generator installations

The installation of a generator for a flagship retail store in Oxford Circus was an important – but straightforward – power solution for Shentong Group. The generator provides standby power to the essential services in the building, and acts as a 'peak lopper' to enable the store to deal with the high electrical demands of peak periods. The new system was required to deal with the increase in business and longer hours associated with the 2012 Olympics.

The real challenge of the project wasn't in the power solution, but in the installation of the system. The location for the generator was on the sixth floor (accessed by a lift) and the fuel tanks were located in the sub-basement, requiring more than 60 metres of fuel pipe. The solution was a complete engine stripdown. The engine and alternator were taken apart so that all of the elements of the 8-tonne generator could fit into a lift 850 mm x 950 mm, with a load capacity of 600 kgs. This meant around 15 trips just to get the generator to the sixth floor.

● Call 0844 888 4445 or visit www.shentongroup.co.uk/technical



Big Foot Systems launches 'Simply a Better Way'

For 2014, Big Foot Systems has launched a new company brand and 'Simply a Better Way' marketing campaign to promote its innovative rooftop building services support systems. Despite the construction-industry downturn, this growing Sussex company has doubled its core business every year for the past four years. Set for further growth, the company hopes the new-look branding and marketing campaign will highlight its non-penetrative support solutions, which offer huge benefits when compared with traditional methods.

Big Foot Systems leads the way in non-penetrative rooftop support solutions, offering the largest range in the world. But many in the construction industry are still unaware of the benefits of these non-penetrative frameworks, such as reduced programme complexity and significant savings on materials and labour costs. To help raise awareness, Big Foot Systems is running the 'Simply a Better Way' marketing campaign, which includes the launch of a brochure and website, featuring a new corporate video.

● Call 0132 384 4355, email enquiry@bigfootsupport.com or visit www.bigfootsupport.com



Remeha boilers meet all the criteria at Shire Hall

Shire Hall, Cambridgeshire County Council's HQ and main administrative centre, has refurbished its boiler plant room with three Remeha Gas 310 Eco Pro 10-section boilers. 'Reliability was a key factor in this heating replacement project,' said Roy Drayton, engineering services manager at Cambridgeshire CC. 'This was also an opportunity to improve our energy efficiency and reduce both carbon emissions and fuel consumption. The Remeha boilers met all the criteria. By carefully selecting the right product, we now have an installation that exceeds expectations.'

● Call 0118 978 3434, email boilers@remeha.co.uk or visit www.remeha.co.uk

Assa supplies specialist hospital

Assa, part of Assa Abloy Security Solutions, a division of Assa Abloy, carefully balanced access and security when supplying products for Bradley Woodlands Hospital, a 23-bed care home near Grimsby. Assa Abloy Security Solutions and Lincoln Security Locksmiths worked closely with the hospital to ensure that patient and visitor access and freedom was carefully balanced with security. Lincoln Security recommended Assa's P600 patented six-pin cylinders to provide robust, cost-effective high security, with the capability to handle complex master-key systems on one key profile.

● Visit www.assa.co.uk



Vent-Axia welcomes David Cameron

Sussex-based fan manufacturer Vent-Axia, a leader in low-carbon ventilation, was delighted to welcome Prime Minister David Cameron to its headquarters in Fleming Way, Crawley, on 23 January. Mr Cameron visited the successful British firm to view its assembly lines, which were brought back to the UK from China. The new production lines have created 35 new site jobs in a tough economic climate and increased the number of Vent-Axia's

on-site assembly staff by 50% compared with before the reshoring of the production lines.
● Call 0844 856 0590



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Panasonic launches Aquarea 5kW Mono Bloc heat pump with the highest COP on the market

Panasonic's highly efficient air-to-water heat pump range now offers the 5kW Aquarea Mono Bloc heat pump. Designed for low-consumption homes, the Aquarea 5kW Mono-Bloc is ideal for new residential properties, or where space for an outdoor unit is limited. There is no separate indoor unit needed because Panasonic's Mono-Bloc enclosure contains all the components within a single unit: heat exchanger; seven-speed hot-water circulation pump; safety valve; pressure gauge and a 3kW electrical heater to provide back-up in extreme cold weather.

● Visit www.panasonic-heating.co.uk



Students get life-saving carbon monoxide advice in housing search

A survey of University of Warwick students searching for rented accommodation has highlighted a lack of awareness of symptoms that



could be a sign of potentially fatal carbon monoxide (CO) poisoning. The survey was carried out by local home-safety products specialist Sprue Safety Products at the university's annual Housing Day, when students looking

to move off campus for the next academic year collect information and advice from local housing providers and community groups to help them in their search. While 91% said they were aware of carbon monoxide, only 43% said they knew the symptoms that could indicate the presence of the gas.

● Visit www.sprue.com, youtu.be/6oUoon1GVNg or www.fireangel.co.uk



Polypipe Terrain's FUZE selected for luxury London residential development

Polypipe, the UK's largest plastic-piping systems manufacturer, has had its groundbreaking Terrain FUZE pipe selected for use in a luxury residential development in central London. Goodman's Fields, developed by Berkeley, is a unique mixed-use, seven-acre development in the heart of the City, located just north of Tower Bridge and east of Aldgate, and adjacent to previous Berkeley developments, City Quarter and Sugar House. The original plan called for a cast-iron piping system, but after consultation with contractors Fitzpatrick Mechanical Services, Polypipe Terrain's FUZE system was specified throughout the project.

● Call 01622 795200 or visit www.polypipe.com

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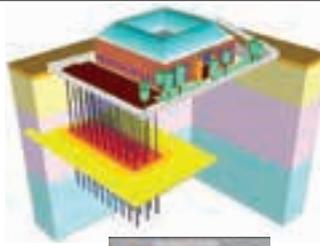
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Contact: michael.vieira@bsvrecruitment.co.uk

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Contact: darren.warmington@bsvrecruitment.co.uk

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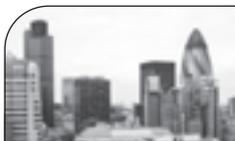
Sth London | £45-50k | Ref: 14107
Our Client is currently looking to employ a Senior Electrical Design to commence work immediately. The position will be office based in South London. The ideal candidate must have a minimum of a HND Electrical Engineering as well as relevant experience with Electrical Design as well as have knowledge and experience in a range of projects. This is a great opportunity for someone who has recently progressed from Intermediate to a Senior Level to work within a team of friendly and experienced engineers. **Contact: matthew.baker@bsvrecruitment.co.uk**

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Interviews scheduled for w/c 24 March 2014.



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Senior Mechanical Design Engineer

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Chartered Electrical Engineer

To £60k + benefits, Central London

An exciting opportunity has arisen to join one of the World's leading design consultancies who are renowned for being involved in revolutionary engineering projects. Due to continued project wins they are looking to recruit a senior electrical design engineer with a minimum of 8 years' experience to take a lead role within their London team. BAR1655/CB

Head of Mechanical Engineering (Building Services)

Macau, Hong Kong, 100,000MOP PCM

A world renowned Hotel/Casino chain currently require a Head of Mechanical Engineering to lead the Mechanical element of an iconic new mixed-use development. This role will be site based, working directly for the developer. Candidates will need to display previous experience of having worked on similar prestigious projects; the role will initially involve analysing and making recommendations on technical specifications and evolve into progressing the project through to the progressing the project through the design and build stages. BAR917/PA

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Market leading Commercial Property Consultancy seeking MEP Surveyors to complete dilapidation reports /condition surveys on behalf of their MEP division across the country; you'll be required to attend site surveys and deliver reports with executive summaries on various commercial properties on an ad-hoc basis. Seeking engineers based in Birmingham, Manchester, Newcastle, Leeds, and Bristol. BAR733/TA

Senior Electrical Design Engineer

£45k + benefits, Central London

An international design consultancy is actively seeking a Senior Electrical Design Engineer to join their busy team in Central London. The client undertakes projects in the commercial, leisure, mission critical, education and healthcare sectors. Due to natural growth, and constant project wins they need an Electrical Engineer to join their team. BAR1429/JA

Thinking of your future

www.b-a-r.com



Senior Mechanical Engineer | Bristol | to £45K+ | ref: 4906

An independent award winning multidisciplinary consultancy are seeking an ambitious Building Services engineer to work on signature high rise buildings, hospitals, airports and major international developments. You will assist with the detailed design of iconic projects. Exceptional opportunity for self-development and progression.

Mechanical or Electrical Engineer | Hampshire | to £45K+ | ref: 5095

A busy, medium sized M&E consultancy requires an Electrical and Mechanical engineer. Working on a variety of projects including commercial, residential, government schemes and data centres, this is an excellent opportunity. The ideal candidate will be Chartered and keen to develop.

Senior Mechanical Engineer | London | to £50K+ | ref: 5124

Fantastic opportunity to join one of the most admired multidisciplinary consultancies. Working alongside signature Architects on some of the most prestigious global projects they are currently seeking a determined Mechanical engineer. With unrivalled project exposure and career development this is a brilliant opportunity for an engineer to progress in the building services industry.

Mechanical Associate Director | London | £Competitive | ref: 4746

One of the market leading, industry recognised consultancies with an enviable reputation for project delivery and engineering excellence is currently seeking an Associate Director. The right candidate will have a proven background in running projects as an associate, lead or project engineer. Exceptional opportunity for a highly motivated, driven individual.

Senior Electrical Engineer | London | to £50K+ | ref: 4972

Renowned for successfully delivering engineering solutions, a prestigious Building Services consultancy are currently seeking an Electrical engineer to join their thriving London team. Ideal candidates will have large commercial and residential experience and be Chartered, or working towards.

t: 02392 603030
e: cv@blueprintrecruit.com
www.blueprintrecruit.com



Scotch is a vibrant young practice providing building services design, sustainability, energy and acoustic consultancy services.

We have opportunities for building services engineers from graduate through to senior positions. We are also seeking assessors experienced in BREEAM and Code for Sustainable Homes.

You should be creative, positive, innovative and dynamic.

London based - excellent benefits - inclusive - friendly.

If you are interested please send your CV with a covering email to: opportunity@scotchpartners.com



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Associate Mechanical Engineer | Cumbria
£55,000 Plus Excellent Package

This world class Building Services Consultancy in Cumbria is seeking an Engineer to help lead their team of Designers. Positioned at the top of the ladder in the engineering industry, this company holds a large portfolio of handpicked high profile clients within the educational, residential and hotel and commercial sectors. They need an experienced Mechanical Engineer to lead a team of Mechanical Building Services Engineers and Technicians on some of the most challenging and exciting projects on this planet.

Project Associate Mechanical Engineer
 London, Farringdon
£55,000 Plus Bonus Plus Benefits

Large international multi-disciplined consultancy is looking for a Mechanical Engineer to lead teams of Mechanical Engineers on projects within the Education, Healthcare and Laboratory sectors. Candidates will be experienced running teams of engineers and technicians, and have proven experience with maintaining client relationships with architects and developers. Within this role you will be reporting to the Regional Director.

Associate Electrical Engineer | London, Waterloo
£50,000-£55,000 Plus Bonus Plus Package

Great opportunity to work for a well-known medium sized Building Services Practice, out of their newly formed office near Waterloo Station. This consultancy is looking for an experienced Electrical Engineer who can run projects within the Hotel, Residential, Commercial and Leisure sectors. You should be experienced in running a team of up to 4 Electrical Engineers. Great opportunity to be promoted to a very senior level following the gradual expansion planned for this office.

Partner | Birmingham
£65,000 Plus Equity Plus Benefits

Within this role you would be working directly with the two Equity Partners, to grow their presence within the London region. This opportunity holds a strong managerial element with a responsibility for running a team in the London office. You will actively pursue building services business opportunities, and be responsible for the quality of output within your own area of expertise, whilst managing the direction of the office and ensuring the availability of adequate resources making this practice a model of excellence that achieves, or exceeds, its business plan.

Partner | London
£75,000 Plus Equity Plus Benefits

We require a dedicated and professional individual to lead and develop a team of MEP Building Services Engineers within our client's Central London office. This is an exciting opportunity for an individual to make a mark for themselves within a leading UK practice, where you will be given support to promote the office and bring in new business. You will also be given a mandate to recruit staff as you require, as well as being responsible for the operations, commercial and strategic decisions for the office. This position would either suit an Associate who is looking for their next step up, and who would be supported by a Partner until you were experienced enough to "stand on your own two feet." Alternatively, this position could suit a current Director of a Building Services Consultancy who is now eager to obtain equity within a leading practice.

Find more jobs online at:
www.conradconsulting.co.uk



For a confidential discussion about your career, contact george@conradconsulting.co.uk | 0203 159 5387

DEGREE OF SUCCESS

The University of Sheffield has cut its carbon emissions, achieving the Carbon Trust Standard in 2011. Now, it has vowed to make a 43% reduction in carbon emissions by 2020.

Miriam Webb explains



Each year, the University of Sheffield spends about £7.5m on utility bills, of which £4.5m goes on electricity alone. Its annual CO₂ emissions would fill the Royal Albert Hall 212 times, or 7,400 hot air balloons. But, after pledging to cut its carbon emissions by 43% in the next six years, the university hopes to recover £450,000 per year.

How are you reducing energy consumption and emissions in university buildings?

In 2012 we commissioned consultants Ove Arup & Partners to develop an energy strategy, which concluded that there were clear, commercially viable, strategic opportunities open to the university to reduce carbon and improve business continuity through: behaviour change; building services upgrades; and self-generation of both low and zero carbon interventions.

What has had the most impact on your CO₂ emissions?

The university carries out a huge amount of energy-intensive research and many of our buildings are in operation 24 hours a day, 365 days a year. Much of this space requires close control, and there are significant quantities of energy-intensive equipment such as fume cupboards, so maintaining laboratory facilities has the largest impact on emissions.

Have you had any quick wins?

The labs' switch-off competition, which took place over a month, was part of the Carbon Trust's Low Carbon Behaviour Change pilot scheme, aiming to encourage labs to decrease

Attempting to reduce consumption as we attract more students is our biggest challenge

their energy use. Six departments took part, with the winner reducing its energy use by 9.49% compared with the previous year.

What's your main challenge?

We continue to build on our position as one of the UK's leading universities by attracting more students and more research income, constructing new buildings and more energy-intensive floor space. Attempting to reduce consumption against such a background is our biggest challenge.

Which faculties/departments are the most energy-intensive, and how do you tackle that?

We have two faculties that account for 80% of the university's total carbon emissions. Much of the research activity undertaken by both science and engineering faculties is – ironically – focused on meeting the increasing energy and food needs of the world's population, in the context of an uncertain climate and global environment change.

How do you engage students?

For the last four years, the university has been part of the national behaviour change programme, Green Impact. The emphasis is on making pro-environmental behaviour simple and fun – two very important factors in engaging both the staff and student populations.

What is your carbon reduction target?

The Higher Education Funding Council has set a sector reduction target of 43% by 2020, against a 2005 baseline, and we've aligned our targets with that.

What advice would you give other university departments?

There is a great deal of enthusiasm and support from staff and students across all faculties. Harnessing this can result in relatively low-cost successes, although the time taken to properly support this should not be underestimated.

How important are renewables in your strategy?

The strategy includes a self-generation strand, but is likely to focus on gas-fired combined heat and power. Being close to the city centre precludes significant investment in on-site renewables, although photovoltaic installations are being considered alongside building refurbishments. The university has a 900kW wind turbine off site, and there are plans to build a second.

Is there any legislation that keeps you awake at night?

The need for Display Energy Certificates for buildings between 250 and 500m².

Why do universities have a reputation for energy inefficiency?

Our buildings are in use for long hours to serve the needs of students and researchers, and we are often contacted by neighbouring residents, who incorrectly assume lighting has been left on overnight unnecessarily. If universities do have a bad reputation, it is undeserved, as there are numerous examples of good practice across the HE sector.

● **MIRIAM WEBB** is sustainable behaviour assistant at the University of Sheffield

Events & training

NATIONAL EVENTS AND CONFERENCES

CIBSE at Ecobuild

4-6 March, London
CIBSE continues its support of Ecobuild, the world's leading event for sustainable design, construction, energy and the built environment. CIBSE is exhibiting at stand N310/11, where the membership team will hold membership clinics, offering advice on joining CIBSE or upgrading your existing membership. To book a slot with an adviser, visit www.cibse.org/membershipclinic

CIBSE at NEMEX

1-3 April, Birmingham
CIBSE Certification will be exhibiting at NEMEX, the innovation and energy management event. Dr Andrew Geens, head of CIBSE certification, will be chairing a seminar on achieving compliance in the most efficient way. www.sustainabilitylive.com

CIBSE/ASHRAE Technical Symposium

3-4 April, Dublin
The popular annual Technical Symposium heads to Dublin. See boxout for more details. www.cibse.org/symposium2014

CIBSE GROUPS AND SOCIETIES

For more information, visit www.cibse.org/events

Ken Dale Award Presentations

4 March, Leeds
Ken Dale Award winners from CIBSE in 2013 – Kayley Lockhead, Katie Wallace and Angela Reid – will each give a presentation on their chosen project. An evening event organised by the Yorkshire Region. www.cibse.org/events

BioGas/Waste Heat/ Fracking

4 March, Northampton
An event organised by the East Midlands Region. www.cibse.org/events

Daylight Group Research Review

5 March
www.cibse.org/daylight

Hospital Engineering CPD Course

6-18 March, Hong Kong
Because of the expanded facilities and infrastructures for the healthcare industry, this tailor-made CPD course has been specially designed for our young engineers. The purpose of the course is for the participants to be familiar with the design and operational concepts associated with the healthcare and laboratory facilities. www.cibse.org.hk/event.php

East Midlands Annual Dinner

7 March, Nottingham
The East Midlands Region Annual Dinner will be held at the Crown Plaza Hotel, Wollaton Street. This year's speaker is established corporate entertainer Steve Womack. www.cibse.org/events

Fire Training-rig Visit – Robin Hood Airport

12 March, Doncaster
A short presentation by the RHADS firefighting service will be followed by a rare opportunity for 18 people to view and experience the full effects of an aircraft firefighting simulator at close hand. An event organised by the Yorkshire Region. www.cibse.org/events

Colour and Colour Therapy: The HCNW Lighting Paper

13 March, High Wycombe
Monocrom will demonstrate the profound psychological impact of colour using its colour dome – a planetarium-like shroud for therapy that generates a sense of floating in infinite space filled with brilliant colour projections. An event organised by the HCNW Region. www.cibse.org/events

LG Publications

13 March, Merseyside
An evening event organised by the Merseyside & North Wales Region. www.cibse.org/events

Introduction to Elevator Technology

19 March, Birmingham
An evening event organised by the West Midlands Region. www.cibse.org/events

Lighting

13 March, Brighton
An evening event organised by the Southern Region. www.cibse.org/events

Society of Public Health Engineers Technical Evening on 'Solar Thermal systems – choosing the right one!'

19 March, Manchester
www.cibse.org/sophe

Ramboll

20 March, Southampton
An evening event organised by the Southern Region. www.cibse.org/events

Society of Public Health Engineers Technical Evening on 'Keeping water safe in premises'

20 March
www.cibse.org/sophe

Merseyside & North Wales Annual Luncheon

21 March, Liverpool
To be held in the Trophy Room at Anfield, with guest speaker and ex-footballer Paul Merson. www.cibse.org/events

Sustainable Lighting

25 March, Chelmsford
Jamie Yates of Trilux Lighting discusses modern and energy efficient lighting technologies. An evening event organised by the HCNE Region. www.cibse.org/events

Electrical Power Quality, Harmonics and Power Factor Correction

25 March, Belfast
A technical event organised by the Northern Ireland Region. www.cibse.org/events

Hong Kong Branch 35th Anniversary Dinner

27 March, Hong Kong
All members of CIBSE are encouraged and welcome to attend at the JW Marriott Hotel Ballroom. The guest of honour, Dr York Chow, Equal Opportunities Commission chairperson, will deliver a speech. www.cibse.org.hk/event.php

CIBSE/ASHRAE 2014 TECHNICAL SYMPOSIUM

Places for this year's Technical Symposium, entitled 'Moving to a new world of building systems performance' are being snapped up fast. Recognising that system and plant performance is a global issue, this joint CIBSE and ASHRAE symposium gives a platform to the latest practice and research in active and passive building systems that will shape an effective future for the built environment with minimum resource impact.

The fourth annual Technical Symposium aims to encourage the participation of young and experienced researchers, and industry practitioners, to share experiences and develop networks.

Some of the confirmed sessions taking place include:

- The effectiveness of systems in use
- Evaluating the performance gap
- The reality of setting 'thermal comfort'
- Measuring and managing energy use to reduce impact
- Balancing energy use with user expectation
- Mind the gap – modelling towards reality
- Benchmarking to enable improved building design
- Taking the heat off the grid – local heat and power systems
- Assessing and delivering designs that aspire to nothing
- The urban truth of delivering sustainable cities

This year the event is supported by the Future Cities Catapult. To secure your place and view the full programme visit www.cibse.org/symposium2014

CIBSE Canada Annual General Meeting

28 March, Toronto
The Ontario chapter will be holding a combined AGM with the IET and IMechE. www.cibse.org/canada

CPD TRAINING

For more information, visit www.cibsetraining.co.uk or call **020 8772 3660**

Earthing and bonding systems

5 March, Manchester

Sanitary and rainwater drainage design: BS EN 12056

6 March, London

Practical controls for HVAC systems

7 March, London

Air-conditioning inspection for buildings

10 March, London

Introduction to energy efficiency

11 March, London

Low-carbon consultant and low-carbon energy

11 March, London

assessor training

11-12 March, Birmingham

Heating services explained (2 days)

12-13 March, London

Fire risk-management systems: PAS 7 2013

14 March, London

Lighting legislation (including daylight)

18 March, London

Energy surveys

19 March, London

Energy efficiency building regulations: Part L 2013

20 March, Newcastle

Display energy certificates (DEC)

25 March, London

Low-carbon buildings for local authorities

26 March, Manchester

HSE guidance on legionella control

27 March, London

HVAC systems and building services

31 March, Birmingham

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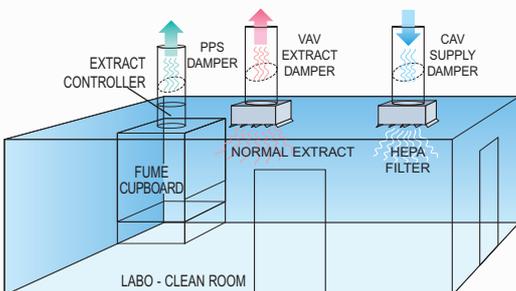


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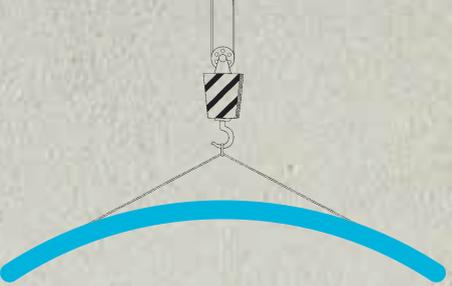
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INTERNATIONAL PORTFOLIO



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China

31 March-03 April 2014, SNEC, Shanghai
www.ecobuildchina.com



ecobuild

India

9-10 May 2014, Nehru Centre, Mumbai
www.ecobuild-india.com



ecobuild

Southeast Asia

17-19 Sept 2014, PWTC, Kuala Lumpur
www.ecobuildsea.com

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