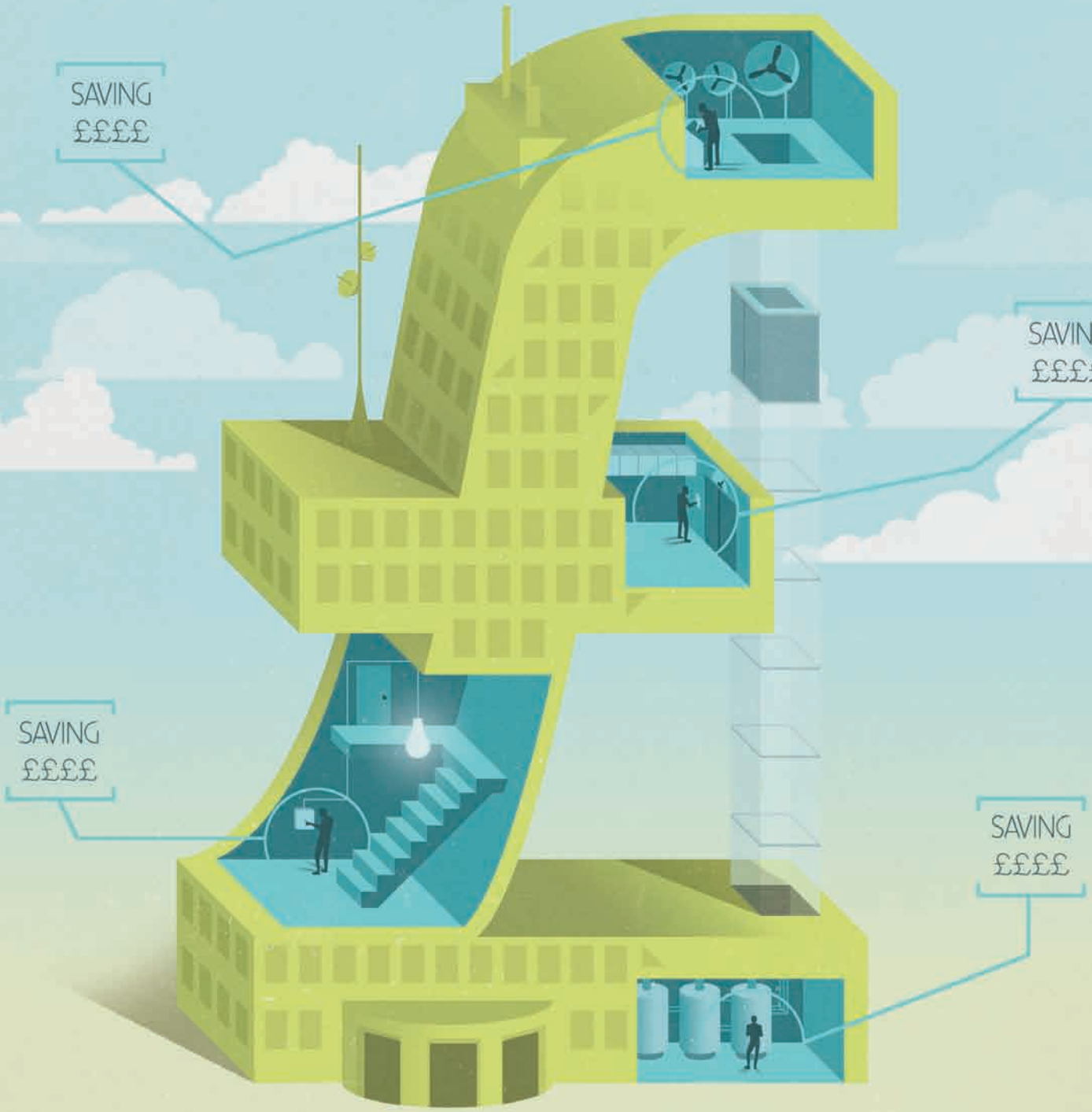
CIBSE JOURNAL

CIBSE

The official magazine of the Chartered Institution of Building Services Engineers

November 2011



QUICK WINS
FOR ENERGY EFFICIENCY

www.cibsejournal.com

Instant Boiling Water

Boiling filtered water, instantly.
Chilled filtered water, instantly.

Plus more energy-saving features than ever before:

Power-Pulse™ electronic power control, cuts energy costs.

Sleep Mode powers down after a period of non-use, maintains 'boiling' water at 64ºC until re-used.

Programmable 24/7 Timer turns power off when not required: such as overnight or weekends.

Dial **01362 852 222** for a brochure.
Or visit **www.ziphydrotap.co.uk**

Zip HydroTap®

Instant boiling and chilled filtered water.

Contents

November 2011

NEWS

OPINION

LEARNING

Features

CLASSIFIED

PEOPLE, JOBS, EVENTS

'How can the bureaucrats in Brussels have a better idea of the real costs of renewables?'
Page 7

The Sustainable Alternative to Air-Conditioning

COOL-PHASE® is a revolutionary Phase Change Material (PCM) based low energy, ventilation, cooling and heat recovery system.

COOL-PHASE combines mechanical ventilation with a thermal energy store to create a truly unique offering; a low energy solution that it is able to meet building regulation requirements for thermal comfort and ventilation.

- **Up to 90% reduction in energy consumption**
- **Payback is typically 5 years or less**
- **Maintains temperatures within the comfort zone**
- **Long lifetime, with low servicing and maintenance costs**
- **Easy to retrofit, with scalable solutions**
- **Creates a healthier and more productive indoor space**

Tel: 01494 897700 www.cool-phase.com Monodraught

CIBSE JOURNAL

www.cibsejournal.com

Editorial
Editor: Bob Cervi
Tel: 01223 273520
Email: bcervi@cibsejournal.com
Reporter: Carina Bailey
Tel: 01223 273521
Email: cbailey@cibsejournal.com
Senior designer: David Houghton
Technical editor: Tim Dwyer

Advertisement sales
Sales manager: Jim Folley
Tel: 020 7324 2786, jim.folley@redactive.co.uk
Sales consultant: Mark Palmer, Tel: 020 7324 2785, mark.palmer@redactive.co.uk
Sales executive: Darren Hale
Tel: 020 7880 6206, darren.hale@redactive.co.uk
Recruitment sales: Stephen Fontana
Tel: 020 7324 2787
stephen.fontana@redactive.co.uk
Advertising production: Jane Easterman
Tel: 020 7880 6248
jane.easterman@redactive.co.uk

For CIBSE
Publishing co-ordinator: Edward Palmer
Tel: 020 8772 3697, epalmer@cibse.org

CIBSE Journal is written and produced by Cambridge Publishers Ltd. Tel: +44 (0) 1223 477411. www.cpl.biz 275 Newmarket Road, Cambridge CB5 8JE.

Editorial copy deadline: First day of the month preceding the publication month

CIBSE, 222 Balham High Road, London SW12 9BS
Tel: +44 (0) 20 8675 5211. www.cibse.org

Subscription enquiries
If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £80 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Edward Palmer at epalmer@cibse.org or telephone +44 (0)20 8772 3697. Individual copies are also available at a cost of £7 per copy plus postage.

The 2011 US annual subscription price is £100. Airfreight and mailing in the US by Air Business, C/O Worldnet Shipping NY Inc, C/O Air Business Ltd / 155-11 146th Street, Jamaica, New York, NY11434. Periodical postage pending at Jamaica NY 11431. US Postmaster: Send address changes to *CIBSE Journal*, C/O Air Business Ltd / 155-11 146th Street, Jamaica, New York, NY11434.

Cover illustration: Jack Hughes/YCN

ABC audited circulation: 19,139 January to December 2010

Talkin' about their generation

The new Energy Act holds out great expectations for making Britain's existing building stock more energy efficient in coming years. The Department for Energy and Climate Change describes what's in store, via the proposed Green Deal, as nothing less than a 'revolution' (see News, page 6). But, as CIBSE points out, the absence from the legislation of a plan to extend mandatory Display Energy Certificates to commercial buildings is a major lost opportunity.

Whatever the eventual outcome of the Green Deal in the long term, there is no reason why building owners and landlords cannot act now to look for the 'quick wins' that can be made from improving their premises. As our cover feature shows (page 40), there are simple and relatively cheap changes that can be made to the lighting, cooling and heating systems, which can save a lot of energy and offer fast payback on the costs involved.

> With this much drive among older and younger generations, there is hope for a greener environment

And perhaps the single most useful act that can be taken – but it has to be done daily – is to turn all the plant off as early as possible in the evening. If this year's CIBSE-ASHRAE Graduate Awards are anything to go by, the next generation of young engineers is well aware of the importance of sustainability in the built environment (see pages 11 and 18). The green agenda seems to be a key factor in why many bright young engineering graduates are turning to the built environment to pursue their careers.

This new generation also seems acutely aware of the importance of collaborative project team-working for the sustainable design and contruction of new buildings. Angela Malynn, the 2011 Graduate of the Year, writes eloquently in this issue of the need for the older generation of engineers to empower the younger generation, so that the latter can 'be at the forefront' of the sustainability agenda and really push it forward.

As our roundtable debate on young engineers testifies, the older generation is acutely aware of the need to devolve power; the conundrum is how to make it happen (see page 23). But, with this much awareness and drive across the generations, we hopefully won't need to rely on the success of government 'green deals' to push forward change in the built environment.

Bob Cervi, Editor
bcervi@cibsejournal.com

NEWS

All the latest news from around the building industry

ATTACK ON 'MIXED' GREEN MESSAGES

The government has been accused of sending mixed messages on its ambitions to cut carbon emissions.

Chancellor George Osborne told the recent Conservative Party annual conference that he agreed 'climate change is a man-made disaster' and insisted 'we must have investment in greener energy'.

But he added: 'Britain makes up less than 2% of the world's carbon emissions, to China and America's 40%. We are not going to save the planet by putting our country out of business.

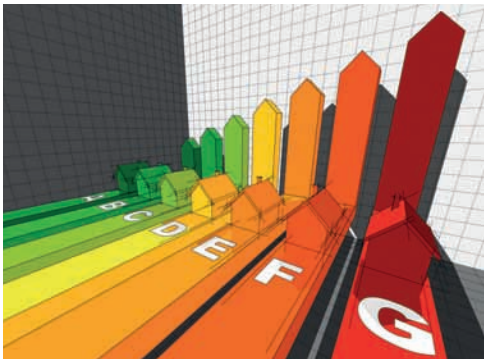
'So let's at the very least resolve that we're going to cut our carbon emissions no slower – but no faster – than our fellow countries in Europe.'

Neil Bentley, the deputy director general of business lobby group the CBI, said: 'Despite our green ambitions, economic and political realities bite. We find ourselves not ahead of the pack, but out on a limb.

'We've got no international deal, no global carbon price, no meaningful EU price and the UK tying itself in costly green policy knots. The UK is in danger of straining to hit its targets but missing the point: that we need an economy that's low carbon and competitive.'

Industry highlights green gaps in new Energy Act

Failure to roll out DECs is a huge disappointment, says CIBSE



Slavo Valigursky/Shutterstock.com

Ministers have pledged to 'revolutionise' the energy efficiency of Britain's homes and businesses, in the wake of the Energy Act becoming law.

The Act sets out plans for the government's Green Deal, which is due to come into effect in a year's time.

But CIBSE has criticised the government for failing to use the legislation to extend mandatory Display Energy Certificates (DECs) to commercial buildings.

Andy Ford, president of CIBSE, said: ' At a time when the UK faces rapidly rising energy bills, increasing capacity constraints and a huge cost to renew the UK's generating capacity, the decision not to include the public display of energy use in large commercial buildings in the Act is incomprehensible and hugely disappointing, especially from a government that markets itself as being "green" and business friendly.

'The government has ignored both the success of its own campaign to reduce energy use across its own estate and a plea from a wide cross-section of industry to include this critical enabling measure. What a waste.'

The National Insulation Association called on the government to develop a plan 'to insulate the housing stock and support the transition from lower-cost cavity wall and loft insulation to higher cost solid wall insulation (SWI). This will need to include support and funding for skills and training for SWI,' it said.

'Ministers have ignored their own green successes'

Measures in the Act include allowing property improvements to be repaid via a charge on the energy bill, setting a 'quality mark' for contractors, and setting an energy-efficiency threshold for privately-rented homes. The Department for Energy and Climate Change has also published a 'Housing Energy Fact File', which it says highlights that more than half of homes in Britain don't have sufficient insulation.

Separately, the government has launched a consultation on its plans to review the Renewables Oligation (RO) scheme, which provides funding for major green electricity-generation projects. It is seeking comments on proposals for the levels of banded support to be made available.

For more information visit:
www.decc.gov.uk www.cibse.org

RHI launch delayed by European 'red tape'

EU Commission expresses concern over large-biomass tariffs

The launch of the Renewable Heat Incentive (RHI) scheme has been postponed, leaving some participants out of pocket, it is claimed.

The scheme, which will see businesses and organisations using renewable heat receiving quarterly subsidy payments for 20 years, was due to be launched in September, but has been delayed by regulators in Brussels.

A statement released by the Department for Energy and Climate Change said: 'DECC was planning to launch the Renewable Heat Incentive (RHI) for non-domestic generators on 30 September 2011. State aid approval is a necessary condition for the scheme to go ahead.

'As part of that process, the European Commission has expressed concerns that the large biomass tariff is set too high. We understand that the commission has given state aid approval for the RHI, subject to a reduction in the large biomass tariff, and we expect to receive written confirmation of this very soon.'

'How can the bureaucrats in Brussels have a better idea of the real costs of renewables?'

William Worsley, president of the Country Land and Business Association, which represents owners of land property and businesses in rural England and Wales, said: 'The announcement for RHI funding was made in the Comprehensive Spending Review last October, so the UK government should have ironed out the wrinkles well in advance of the launch date.'

Adding that some of the association's members had already installed equipment to take advantage of renewable heat sources, he continued: 'We fail to see how the bureaucrats in Brussels have a better idea of the real costs of installing large-scale renewable heat systems than our own government.'

Ulrich Mueller/Shutterstock.com

Biomass is at the heart of EU concerns

The scheme is expected to get under way within the next couple of months, subject to the RHI regulations being amended and submitted to parliament for approval.

DECC will make a further announcement as soon as it has received written confirmation from the commission.

The statement concluded: 'We are committed to launching the scheme as soon as possible to minimise disruption to stakeholders.'

- Renewables now provide nearly 10% of the UK's electricity, a record high, according to new government statistics. Between April and June 2011, renewable energy sources supplied 9.6% of the UK's electricty, up from 6.3% in the same period for 2010.

For more information visit:
www.decc.gov.uk

In Brief

CONSTRUCTION STRUGGLING
The UK construction industry saw almost no growth in September, according to the latest CIPS/Markit survey. The September CIPS construction index was 50.1, just above the 50 contraction/expansion line, and below analysts' forecast for a 51.7 outturn. The September reading was down from 52.6 in August. But the survey did show construction employment rising for the first time in four months.
www.markiteconomics.co.uk

MODELLING SURVEY
A survey of quantity surveyors and project managers has found that nearly a third have had some experience of building information modelling (BIM). But only 10% of QSs and 3% of managers are using BIM regularly. The Royal Institution of Chartered Surveyors (RICS), which published the survey, said further research is needed as part of the government's proposal to require the use of BIM on certain projects by 2016.
www. rics.org

CARBON CAPTURE 'FARCE'
Environmental group, the WWF, has attacked the government decision not to proceed with a carbon-capture and storage (CCS) test scheme in Longannet, Scotland. WWF said: 'Almost four years after launching its funding competition, plans for carbon capture in the UK have descended into farce.' The government said it was pursuing alternative projects.'

The UK Green Building Council-led body will target the UK construction and property sectors

Clickthis/Antart/Shutterstock

Task group to combat industry 'greenwash'

New body aims to establish a framework for sustainability best practice

A new task force has been launched to create a comprehensive framework that recommends the best information and advice for 'green buildings'.

The UK Green Building Council's (UKGBC) Green Building Guidance Task Group was created in response to the proliferation of information, tools, guidance, products and services around green buildings.

The group aims to provide a comprehensive framework for the construction and property sector that will signpost businesses to the most appropriate information and advice to help make their organisations sustainable.

The group is due to report early in the New Year, and will explore issues such as how products and services can meaningfully be compared, what constitutes best practice in sustainability, and what evidence currently exists that provides a business case for organisations to become more sustainable.

According to the UKGBC, its intention is to help combat 'greenwash' and to help make sustainability profitable, by directing businesses to tools and metrics that work and that are most relevant to their organisation, and allow benchmarking against peers.

The Task Group, which has already met, is made up of UKGBC members representing a broad spread of organisations from across the built environment sector.

Paul King, chief executive of UKGBC, said: 'Even for the most committed, the sustainability landscape can be confusing and sometimes overwhelming. People looking to demonstrate good or best practice – wherever they stand in the building lifecycle or supply chain – need practical and clear guidance, to help them embed sustainability in their business, and benchmark themselves against their peers.

'People looking to demonstrate good or best practice need practical, clear guidance'

'The Green Building Guidance Task Group will develop a framework populated with the most important targets, tools, metrics, and examples of best practice for each sector – as assessed by industry professionals for industry professionals.'

For more information visit:
www.ukgbc.org

UK still needs to improve on CO_2

Annual survey suggests Britain needs to do more in future on climate change

The UK remains the third-best country in the world in a global league table for reducing carbon in the built environment. But the nation still has much to do to ensure its place in future years, according to the Royal Institution of Chartered Surveyors.

A new report from RICS shows that Britain has been the third-best country in the world since 2009.

But despite holding its position in 2010 because of its carbon-reduction policies, the UK remains one of the worst performers in terms of significant improvement, year-on-year, says the annual *Global Zero Carbon Capacity Index* (or ZC2 Index), which was launched in 2008.

However, there has been considerable movement in the middle of the rankings, with six countries – Finland, Sweden, France, the Slovak Republic, USA and Belgium – showing notable improvement.

ZC2 Index assesses 34 individual countries on a number of factors, looking at how they are progressing towards a zero carbon built environment.

Mikeledray/Shutterstock.com

Britain needs to do more to ensure its high ranking on climate change, says the report

'Norway is top for the third year running, with Brazil moving to second place, due to low energy use and the role of renewables'

It assesses advances towards a decarbonised environment by using three indicators: consumption of energy in the residential, tertiary and transport sectors; the contribution of renewable energy to total primary energy supply (TPES); and the policy frameworks countries have put in place to promote carbon reductions in the built environment.

Norway is top for the third year running, while Brazil moved up to second place from sixth place in 2008, due to low energy use and high contribution of renewable energy.

There is little change overall at the bottom of the rankings, with Russia and Luxembourg still last, while India, Ireland and Italy have fallen significantly in their rankings since 2008.

Other findings of the index reveal that overall renewable energy contributions remain similar to last year and there is no change in the five-best performing countries.

The stability in these figures reflects the lead time in investment on renewable energy infrastructure, and the effort required to significantly shift the basis of energy generation in a country.

For more information visit:
www.rics.org

In Brief

LED TO 'LEAD THE WAY'
Energy consumption of domestic and commercial lighting could be reduced by 70% by 2050, if LED lighting achieves its expected levels of efficiency, according to research body, BRE, in its report *LED Lighting*. However, LED products need to be developed before they can offer savings to compete with other types of lighting while meeting customer expectations, the report says.
www.brebookshop.com

SUSTAINABILITY STANDARD
The British Standards Institution has launched a standard to help manufacturers demonstrate best practice on the sustainability of products. BS 8905:2011, *Framework for the Assessment of the Sustainable Use of Materials*, encourages manufacturers to give due consideration to environmental, social and economic impacts.
www.standards.org

LEARNING TO LOWER COSTS
A collaboration of Laing O'Rourke and Atkins has developed a model for delivering primary and secondary schools, using standardised building components. The model claims to deliver savings of 30% on building costs, per pupil – with schools designed and delivered within 18 months, and to standard specifications outlined in the UK government's construction strategy.
www.laingorourke.com

Vartanov Anatoly/Shutterstock.com

Electronic gadgets spur growth in home energy use, says study

Growing consumption of consumer goods is a potential threat to carbon targets

Domestic energy usage is growing, despite greater consumer participation in green initiatives such as home insulation.

A report from the Energy Saving Trust reveals that, between 1970 and 2009, energy consumed by electronic consumer goods rose by more than 600%.

In the UK, 29% of carbon emissions came from domestic energy usage. So, if consumption does not fall, the government target of an 80% reduction in emissions by 2050 will not be met, the trust says.

The rise in energy usage is said to be largely down to the proliferation of gadgets such as smart phones and iPods, as well as the development of more traditional electronic items, like TVs, which have grown in size and consume more energy than they did 40 years ago.

Dr Paula Owen, author of the report *The Elephant in the Living Room*, said: 'While many of us feel industry is the biggest contributor to greenhouse gas emissions, it is behaviour on the home front that could make a difference to the UK hitting its overall national carbon emissions reduction target.'

For more information visit:
www.energysavingtrust.org.uk

Chairman for Green Construction Board

Dan Labbad, chief executive of Lend Lease for Europe, Middle East and Africa, has been appointed co-chair of the Green Construction Board by Business Minister Mark Prisk, who is the other co-chair.

The committee, comprising government and industry members, will be driving forward the actions set out in the government's Low Carbon Construction Action Plan.

The plan focuses on demonstrating the benefits of low carbon construction through co-operation between the public and private sectors, as well as clarifying low carbon opportunities for industry and reviewing incentives to enable the market to flourish.

Prisk said: 'Greening the property and construction sector is a great challenge and a massive opportunity. By greening their own operations, pulling green practices through their supply chains and providing better, greener, buildings and infrastructure, we [can] seize an opportunity for growth at the same time.'

Architects predict falling workloads

The outlook for the building industry is looking a little bleaker, according to the Royal Institute of British Architects (RIBA).

The Future Trends Survey for August 2011 stated that the number of architectural practices expecting work to decrease was 27%. This is compared to 25% of practices anticipating a reduction in workload in the previous survey in July.

Firms expecting staff levels to drop totalled 9% in August, compared with 12% in July, while 6% expected an increase in personnel, compared with 9% the previous month.

Adrian Dobson, RIBA director of practice, said: 'Although the RIBA Future Trends Workload Index for August 2011 just remains in positive territory at +2, this represents a fall from +5 in July 2011 and indicates an overall drop in confidence levels about future workloads for the UK.'

GRADUATE SUCCESS

Angela Malynn (front row, second from left) is this year's CIBSE ASHRAE Graduate of the Year. Malynn, who works for Arup, wins a trip to Chicago, where she will take part in January's ASHRAE Winter Meeting. Cash bursaries from the Rumford Club are awarded to the second- and third-placed finalists Colin Lehane (front, far right) of the University of Northumbria and Mott Macdonald, and another Arup engineer, Mel Allwood of University College London (front, far left). For full details visit **www.cibseashrae.org**

Tel: 020 8675 5211 | **Fax:** 020 8675 5449 | **Email:** secretary@cibse.org
President: Andy Ford CEng FCIBSE BSc Eng | **Chief executive:** Stephen Matthews

Presidential recognition at annual event

Members from all backgrounds were rewarded for their achievements at this year's President's Dinner, which was held last month

Members recognised for achievements

CIBSE members have been recognised for their achievements at this year's President's Dinner on 7 October.

Anderson Barcellos, recipient of the Ken Dale Travel Bursary, made a presentation to the Council before receiving a certificate at the President's Dinner.

The Ken Dale Travel Bursary makes funds available to CIBSE members in the developmental stage of their careers to experience technical, economic, environmental, social and political conditions in another country, and to examine how these factors impact the practice of building services engineering.

Barcellos, a researcher at Reading University, travelled around China and Japan for four weeks in order to gain insight into how these nations are implementing energy efficiency in their construction industry. A blog of Anderson's trip is at **www.kendale2011.blogspot.com,** and a report summarising his findings will be made available on the CIBSE website shortly.

Philip Griffiths, of the University of Ulster, accepted the Happold Brilliant Award on behalf of the university. This award was instituted by the Happold Trust in 1996 to recognise excellence in the teaching of building services engineering, and reflects the importance placed by the late Ted Happold on the contribution of education to engineers of the future. The award of £1,000, together with the trophy, a beautifully engraved glass chalice, is awarded to encourage future excellence.

The success of the University of Ulster also extended to the 'CIBSE President's Prize: the Undergraduate Award 2011', where student Adam Booth was a runner up, alongside Lin Qingyang of the University of Nottingham. The award, sponsored by Hays Building Services, is designed to encourage students to develop their potential and aim for excellence.

The winner's award was collected by tutor Martin Longhurst on behalf of Tom Hopton, studying for a BSc in Building Services Engineering at the University of the West of England. Tom impressed the judges with his project on 'An investigation into the performance of a "cooling-only" earth tube system when used to meet building cooling requirements', which describes a simplified analysis tool that has been used to estimate the cooling potential of an earth tube.

The president also awarded silver medals to Mike Smith, Tim Dwyer and Roger Hitchin for services to the Institution.

CIBSE praises Atkins diversity aspirations

Atkins has confirmed that it aspires for women to make up one third of its board by 2015 – a move that has been welcomed by CIBSE.

The move comes amid various media reports stating that UK companies in general are still under-represented by female staff at board level.

Allan Cook, chairman of Atkins, announced: 'Our board believes in the benefits of greater gender diversity and is actively supportive of measures to achieve this, without putting quotas in place. Indeed, women currently account for 22% of our board. Our focus will remain on attracting the right talent and skills, irrespective of gender or ethnicity.'

Action plans have been put in place by each of Atkins regional management teams and progress will be detailed each year in the Annual Report. CIBSE president Andy Ford endorsed this progressive approach: 'I am delighted to see our sector taking diversity seriously.'

Indoor air quality and ventilation

CIBSE has launched a new guide, *Indoor Air Quality and Ventilation*, as part of the CIBSE Knowledge Series.

Poor air quality has been linked to sick building syndrome and reduced productivity in offices. The guide presents an overview of indoor air quality in buildings, and outlines how air quality impacts on occupants' health and performance.

Sick building syndrome occurs in buildings that may have a number of defects, including factors like inadequate ventilation, low light levels and high ambient noise levels.

The guide sets out how to avoid these problems, and gives advice on providing healthy conditions in terms of sufficient fresh air, low pollution concentrations, adequate lighting and heating, and access to drinking water and catering areas. It also covers cooling and air conditioning.

- **www.cibse.org/bookshop**

Green Deal - latest developments

- **Department of Energy and Climate Change pressing ahead with energy efficiency programme**

By the time you receive your copy of this month's *Journal*, we expect a major package of consultation documents – including secondary legislation and guidance material – for the advisory services, installers and finance providers to have been launched.

A full three month consultation should have opened on 24 October; however, this means that it will close on 24 January, so the last month will be lost in the Christmas holiday and return-to-work period.

Work is also proceeding on the installer requirements contained in the draft *Publicly Available Specification PAS 2030*, which was out for comment during October. The requirements for Green Deal advisers have also been out for comment, and the United Kingdom Accreditation Service (UKAS) is developing the procedures for the accreditation of advisers and installers by certification bodies such as CIBSE certification.

At this stage, CIBSE anticipates that there will be a route for existing members who are energy assessors. Those with experience in providing energy efficiency consultancy services will meet many of the requirements, and there will be an accredited prior experiential learning (APEL) route to cover many of the requirements for Green Deal advisers.

'CIBSE anticipates there will be an accredited, prior experiential learning (APEL) route to cover many of the requirements for Green Deal advisers'

Meanwhile, the commercial property working group, convened by the British Property Federation, continues to meet and provide advice to government on the application of the Green Deal to non-domestic properties. This is undoubtedly more complex, both in terms of the buildings and of the tenure and ownership provisions of many commercial buildings. These discussions are ongoing.

First national conference on BSO

IBPSA-England, in association with CIBSE, has announced its first national conference on building simulation and optimisation (BSO).

The event – titled BSO12 – will be held at Loughborough University's Henry Ford College, on 10 and 11 September 2012. A conference dinner will be held at the UK National Space Centre in Leicester.

Building performance modelling and simulation is routinely used in the design of buildings, yet several challenges to the application and development of performance simulation remain.

BSO12 will provide a forum for

the exchange of knowledge – on the development and application of building performance simulation to optimise design and operation of buildings – so will be of interest to both academics and building design professionals.

The conference has three broad themes:

- New performance models and simulation methods;
- Procedures for optimising design and operation; and
- Real-world case studies.

IBPSA-England (**www.ibpsa-england.org**) is a regional affiliate organisation of the International Building Performance Simulation Association (IBPSA), an international organisation that aims to advance and promote the science of building performance simulation in order to improve the design, construction, operation, and maintenance of new and existing buildings worldwide.

- The deadline for submission of abstracts is 5 December 2011.

For more information visit: www.bso12.org

First-ever female ASHRAE president dies

As the *Journal* went to press, CIBSE was saddened to learn that immediate past ASHRAE president, Lynn G Bellenger, the first woman to serve as ASHRAE president, has died. A full obituary will appear in the December issue of the *Journal*.

WARRANTY 10 YEAR

FIREGUARD LED7™

The **NEW 7W LED** **downlight** from JCC

where **fire safety** & **energy saving** meet

For more information please visit:

fireguard-led.co.uk

JCC™

50W HALOGEN EQUIVALENT

Tel: 01243 838999 • **Email:** sales@jcc-lighting.co.uk

Tell us about your training

This is a good time for all new trainees, who may be following an approved employer training scheme, to register their training with CIBSE.

Trainees must also hold a grade of CIBSE membership – for example, graduate for those progressing towards ACIBSE/IEng or MCIBSE/CEng, or student for LCIBSE/EngTech – and, if they have not already applied, we would invite them to do so as soon as possible.

School leavers who are on an appropriate academic course of study are eligible to apply for student membership. Information and application forms for all grades of CIBSE membership are available on CIBSE's website in the Membership section.

The T&D Plan Registration Form is included in the current T&D Manual, and trainees can email the form to **owilliams@cibse.org** Confirmation of registration will be sent via email. Further information is available at **www.cibse.org**, under: CIBSE > IPD & CPD > Employer Training Schemes.

Annual Lecture

Chris Wise will present the 2011 Annual Lecture, addressing the rhetorical question: 'I wonder what it would feel like if we did that?' The lecture, to be held on 10 November at the Wellcome Gallery in London, will be in three parts covering the role of the vital trace elements of imagination, empathy and physicality in engineering design.

- **www.cibse.org/annuallecture**

Intelligent cities seminar

The CIBSE Intelligent Buildings Group will host a seminar on 'Intelligent Cities' at the Science Museum on 8 December. Sponsored by Accenture, it will feature a range of experts from academia, government and business. Topics will include sustainable masterplanning and building design.

- **www.cibse.org/ibg**

Renew your membership now and access the Knowledge Portal

As soon as you renew your 2012 membership subscription you will get online access to the new CIBSE Knowledge Portal. This exciting new tool allows you unlimited free access to search and download the full range of CIBSE published guidance, including all the guides, commissioning codes, applications manuals, technical memoranda and more.

This comprehensive reference tool also provides links to other publications and to thousands of British Standards carefully selected to be directly relevant to building services engineers.

Membership subscriptions are due for renewal on 1 January 2012, but if you pay before then you can gain access to the Knowledge Portal immediately.

The Portal gives unlimited access to our library of more than 150 authoritative, peer-reviewed publications – worth more than £5,000 – identified by text search or browsing. This will give you access to universally acknowledged industry best practice guidance from experts in their field, and enable you to keep up to date easily.

These essential publications provide guidance on a wide variety of topics, from lighting to ventilation, solar shading to lifts, and much more. They can be viewed online or downloaded as pdf files for reference later. Due to its enhanced features, the Knowledge Portal will replace the CIBSE Bookshop.

The Knowledge Portal provides information for 150 other carefully selected publications from leading publishers that are available to purchase in hard copy from CIBSE (usually at preferential member prices). Also included are links to around 3,200 current British Standards, selected for their direct relevance to the work of building services engineers, which are individually linked for more information on each, or for purchasing through the British Standards Institution (BSI) website.

The search functionality works across all Knowledge Portal content, presenting the results in clear subsets – CIBSE, other documents, and BSI. Documents are interlinked, allowing users to follow cross referrals from one document to another.

Whatever your role in the built environment, the work you do is underpinned by experience and expertise. The Knowledge Portal provides a convenient, portable and comprehensive reference tool that puts the world of building services knowledge at your fingertips.

How to renew your membership subscription

As well as access to the Knowledge Portal (see above), your membership subscription offers many other benefits: professional recognition of your qualification, subscription to the monthly *Journal*, networking opportunities through the regional and special interest groups, substantial discounts on CIBSE hard copy publications and discounts on CIBSE events, conferences and training.

Subscriptions are due for renewal on 1 January 2012. Your 2012 subscription renewals notice will be sent to you shortly with a statement of your fees and how to pay.

There are several payment methods available. If you have a bank account in the UK, then payment by direct debit is the easiest method and offers a 5% discount. Members overseas can pay by continuous credit authority. These payments will be collected on 1 February 2012. For the 2012 subscriptions, we are also introducing an additional benefit, enabling payment by direct debit in three installments, although you will not receive the 5% discount.

Alternatively, you can renew online at **www.cibse.org/members**, by phone with a debit/credit card, or by sending a cheque. If you are experiencing difficulty in paying your subscription, please get in touch with us as soon as possible, explaining your circumstances, so we can work out a payment plan.

New members, fellows and associates

MEMBER

Nehro Ali
Abu Dhabi, UAE

Paul David Andrew
London, UK

Keng Been Ang
Singapore

Paul Burke
Knockraha, Republic of Ireland

Chi Yan Cheng
Kowloon, Hong Kong

Wing Kee Choi
Tai Po, Hong Kong

Maurice Dallaghan
Killiney, Republic of Ireland

Enda Gilroy
Cavan, Republic of Ireland

Aymeric Alain Serge Girard
Stratford-Upon-Avon, UK

Kevin John Harry Hogwood
Dover, UK

Chi Hang Kwok
New Territories, Hong Kong

Foo Kwan Lee
Kowloon, Hong Kong

Wesley Lee
London, UK

Sze Chung Lee
New Territories, Hong Kong

Tsz Wai Stanley Leung
Tuen Mun, Hong Kong

Gerald Anthony McPolin
Lisburn, UK

Tsz Kin Ng
New Territories, Hong Kong

Neil Phipps
Manly, Australia

Andrew Paul Thompson
Hull, UK

Robert Wallace
Billericay, UK

Kwok Ming Wong
Sham Shui Po, Hong Kong

Hok Hang Yeung
N.T., Hong Kong

LICENTIATE

Gary Chatfield
Eastbourne, UK

Martin Richard Lilley
Lisburn, UK

Neil Anthony Marsh
London, UK

If it were a car...

The new enhanced Daikin Chiller range

Engineered for brilliant performance, so you can specify with confidence. Daikin's latest free cooling and inverter models are available in any option you like, as long as it's high efficiency. Now an even wider range of chillers offers total versatility for comfort and process cooling and heating, with advanced control system options that put you firmly in the driving seat. In fact, we're so confident about the quality and reliability of Daikin chillers, that we're now offering up to five years warranty for qualifying customers. Contact your nearest Daikin UK office for details.

Capacities from 5kW to 2152kW. Free cooling, inverter, air cooled, water cooled, heat pump and condenserless options.
Operating range in ambient temperatures from -18°C to +45°C. Highest partial load efficiency scores in their class (ESEER up to 5.8).

Email chillers@daikin.co.uk quoting 0009/CH/AD or visit www.daikin.co.uk

your comfort. **our world.**

Scotland Region	Northern Region	Midlands Region	Western Region	North London	South London
0845 641 9330	0845 641 9340	0845 641 9370	0845 641 9320	0845 641 9360	0845 641 9355

DAIKIN

TEAM TIME

Young engineer **Angela Malynn** – this year's CIBSE ASHRAE Graduate of the Year – shares her experience of collaborative team working on a major project and asks why the construction industry cannot be more joined-up

Engineers have been delivering sustainability since before the term was coined. We have always sought, and continue to seek, ways to enhance energy efficiency in the built environment. While decision-makers at national and global levels struggle to agree on a way forward, we as a worldwide engineering community should be putting our geographical boundaries aside, and assessing what measures we can take on a global scale within the industry.

This could involve position papers, briefings to decision-makers, and public engagement to educate the global population on the critical need to adopt measures towards a sustainable future. The collective power and vast knowledge of our community worldwide has to be more effective than working in silos, and provides a positive example to other industries.

By understanding and sharing local knowledge, we can make suggestions as to how global measures can be reached fairly, with input from all nations, based upon their individual resources and requirements.

Within the UK, the construction industry has typically been fragmented by the nature of work stages and contractual responsibilities. While there is good practice within individual stages of design, construction and building operation, the approach needs to be more joined-up if we are to enable optimum sustainable solutions to emerge.

Building services engineers are in a good position to lead collaborative working between engineering disciplines, architects, local authorities, clients, and operations teams, when sustainability is a focus.

Young engineers can help push forward collaborative working

There certainly does appear to be a shift in the industry towards a more collaborative way of working. While working on King's Cross station redevelopment in London, I was lucky to be part of several co-located teams delivering different stages of work. At design stage, the architects were co-located with the engineering team, with the engineers taking the lead; later, at redesign, during early construction, the M&E sub-contractor and client temporarily joined the team; and as construction continued, the client, main contractor, M&E sub-contractor, engineers and architects were all co-located at the site office.

This valuable and enjoyable learning experience gave me what I believe is an unusual exposure to other professionals within the industry.

Effective communication will also be crucial in raising awareness by explaining to the public in practical terms how they can make a difference on sustainability. It is also crucial for our lobbying bodies at national level. We need to show that engineering has been, and will continue to be, a powerful force in solving global challenges such as climate change.

> Building services engineers are in a good position to lead collaborative working

Our industry should consider the communication tools and methods already widely used by young people. Social networking has made the world smaller, and we should be utilising it to our benefit to bring engineers together and share ideas. Social networking media would make it easier for engineers to connect worldwide, break down geographical boundaries, and engage with a wider audience.

I have been very fortunate in that I began my postgraduate working life within project and programme management. When I moved over to building services engineering, these management skills have, I believe, helped me progress my career. This is not a common experience for most BS engineers, but one that I think has some merit.

In order for the building services sector to deliver a sustainable future it needs to consolidate its influence worldwide, collaborate more effectively within the industry, and increase awareness in the public domain. Young engineers need to be at the forefront of this process – which means empowering them more. Only in this way can we prepare now for a truly sustainable future.

● **ANGELA MALYNN** works for Arup. She is the winner of the CIBSE ASHRAE Graduate of the Year Award 2011. *See News, page 11, and the Roundtable debate on young engineers, page 23*

Your letters

Don't blame building owners for energy use

The suggestion that 'the carbon emissions declared on the Energy Performance Certificate (EPC) should be verified by measurement of actual energy consumption' clearly makes sense (*Journal*, July, page 22

However, the further opinion expressed that 'appropriate penalties should be applied to the owner' of a building where measured emissions do not coincide with the declared figures is, in my view, the exact opposite of the real solution.

As a Display Energy Certificate assessor, I am consistently producing operational ratings for relative new builds that are massively worse than the asset rating indicated on the EPC. The building owners are desperately trying to achieve the designed efficiency and have no idea why they are not. They feel let down by the designers, builders and engineers, who have lumbered them with a problem they don't know how to overcome.

Owners are already penalised by higher energy costs, by increased costs of trying to get the building to perform, and, above all, by the frustration this brings. Any penalty needs to apply to the contractor(s) responsible for supplying the owner/occupier with a building that is underperforming. And the onus has to be on commissioning to ensure the occupier is provided with a building that performs as it should, as well as on training to instil the knowledge to keep it that way.

I am seeing buildings that are not capable of achieving designed efficiencies for reasons outside the control of the occupier, and occupiers who have been given the keys to a building they have not been taught how to operate.

The solution is to monitor energy consumption for a suitable period after occupation, and not to complete handover until the 'experts' have actually got the building performing as designed. The occupier will need to be trained how to 'keep it working' – but it is not acceptable to expect them to 'get it working'.

Ian Sturt

Equipment is a wind-up

I have yet to meet not only an engineer but any thinking person who has a good word to say about wind turbines and wind farms – whether on or off shore. Governments are spending millions of pounds of our money on very expensive equipment that has an operating efficiency far below levels that would be acceptable in any other electro-mechanical device. Every month I open the *Journal* hoping to read an argument, discussion or debate on this, but nothing. Is CIBSE 'looking the other way'?

Ray Welby

Good lighting a team effort

An update to *Lighting of Indoor Work Places* is most welcome, but the sweeping comments on the competence and expertise of contractors made by Iain Macrae are a little unfair (*Journal*, September, page 35). Contractors are usually the people who have to make sense of ill-conceived lighting concepts and contradictory specifications, which are the norm rather than the exception. A more positive move would be to bring end-user clients, designers, manufacturers and contractors closer together, to ensure that the lighting and control solutions are appropriate to the task, occupants, physical environment and energy targets.

Kevin Wright

MANUFACTURER'S VIEWPOINT

It does make sense for a product supplier to tell its customers to use less equipment – particularly if we are serious about cutting emissions, writes **Martin Fahey** of Mitsubishi Electric, sponsor of this column

It may seem strange for a manufacturer of heating, cooling, ventilation and power generation systems to say to its customers 'use less equipment', but that is exactly the message that Mitsubishi Electric is urging everyone involved in the built environment to take on board.

Our Green Gateway philosophy asks everyone involved in the industry – from architects, consultants, specifiers, installers, facilities managers, building owners and individual households – to 'do the right thing' with regards to energy use by adopting a 'lean, mean and green' approach.

Existing buildings are crucial to making a difference and have their part to play by avoiding 'locking in' poor performance.

There are 26m homes and 1.8m commercial buildings already in existence. These buildings are an area where we are able to make a real difference quickly, and they should be viewed as a priority, especially when you consider that around 75% of existing buildings will still be in use for the next 40 years at least.

It is also clear that the fabric of these existing buildings is an excellent place to start. Improvements in insulation can often be achieved simply and cost-effectively, and can make a real difference to energy bills and use. This 'lean' approach will ensure that less equipment will be needed to offset the loads that remain – something we fervently believe is the right approach to generating truly sustainable buildings.

Since we launched the first phase of the Green Gateway in 2007, our customers have applied initiatives that have reduced CO_2 by 85,000 tonnes (as of March 2011) and cut running costs by £12m in the buildings of the ultimate end-user of the solutions provided. So it can be done, and it can help to save on running costs.

> Since 2007 our customers have applied initiatives that have reduced CO_2 by 85,000 tonnes

Once the energy efficiency of the building's envelope has been improved, the next step is to be 'mean' by correctly deploying and monitoring the most effective and efficient equipment for that building. This may mean simply using what is already there more efficiently by adding more effective controls. Old technology could be changed for more modern, energy efficient equipment. The use of fossil fuel on site, with its relatively high direct emissions, can be removed in favour of lower carbon alternatives.

However, until you start to monitor and examine energy use, it is impossible to know how to use it more efficiently. Engaging fully with the users of the system gives a vital link towards achieving long-lasting reductions.

Lastly, we urge everyone to be 'green' by incorporating low and zero-carbon technologies where possible, to create some or all of the energy required. If you would like to join the debate, visit **www.greengateway.mitsubishielectric.co.uk**

GAS CONTAINMENT

The European Regulation governing the use of fluorocarbon refrigerants is being reviewed by the European Commission, which is seeking industry feedback. **Hywel Davies** explains

The EU F-gas Regulation aims to reduce use of man-made greenhouse gases, particularly hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride, also known as F-gases. They are used as refrigerants, foam-blowing agents and aerosol propellants, and also as insulation gases in a range of electrical equipment.

The Regulation is part of the EU's Kyoto Protocol commitment to cut greenhouse gas emissions. Along with the MAC Directive 2006/ EC/40 on emissions from motor vehicle air-conditioning systems, the Regulation aims to reduce F-gas emissions in the EU significantly in 2010 – from the predicted 98m tonnes of CO2-equivalent to 75m tonnes of CO2eq.

Since July 2006, the F-Gas Regulation has required fixed air conditioning systems containing more than 3 kg of fluorinated refrigerant gases to be inspected regularly by competent, trained and certified personnel. But this requirement had to be reviewed after five years – so the European Commission last year commissioned a report and 'preparatory study' to analyse the impact of the current rules and assess the need for further action to cut F-gas emissions.

The report found evidence of successful application of the use and marketing provisions, and of the labelling restrictions. But it also identifed delays in introducing training and certification provisions in some member states, and found varying levels of compliance. Unsurprisingly, some member states have yet to fully implement national enforcement provisions. There is also a growing opportunity for further action to recover F-gases from old or disused equipment.

The Commission's study also concluded that current measures will reduce F-gas emissions by about 100m tonnes of CO2eq by 2050, stabilising emissions at today's level of 110m tonnes, a reduction of 28 % compared to the 'business as usual' scenario in 2020, of 44% in 2030 and of 46% in 2050 – at a cost of approx £35 per tonne. However, to achieve this, the Commission 'calls on Member States to intensify their efforts towards rapid and proper implementation and enforcement'.

Looking ahead, the report notes that due to the accelerated phase-out of ozone-depleting substances under the Montreal Protocol, use of hydrofluorocarbons, the most common F-gases, is likely to increase fourfold by 2030, with significant implications for efforts to limit the rise in global surface temperatures to 2C. The Commission therefore proposes action under the Montreal Protocol to phase out the use of hydrofluorocarbons.

Adisa/Shutterstock.com

Use of certain refrigerant gases is being restricted by the EU

The report also argues that new technology in the refrigeration, air conditioning and heat pumps sectors using low global warming potential (GWP) refrigerants such as carbon dioxide, ammonia and hydrocarbons, offers improvements on safety, performance and cost – although in some applications or circumstances there remain ongoing challenges.

These low-GWP products have

recently been gaining EU market share in domestic, commercial and industrial refrigeration, in some heat pumps, and in single-packaged air conditioning units. The report therefore proposes actions to 'drive transition to technologies with lower global warming potential' and 'improve containment and recovery provisions'.

It suggests that avoiding the use of F-gases, where this is feasible and cost effective, offers the greatest potential to cut emissions – by up to 70m tonnes of CO2eq by 2030, at a cost lower than £20 per tonne. Such a reduction could be achieved by introducing limits for the quantity of F-gases placed on the EU market. There could be bans and voluntary environmental agreements within the EU.

The Regulation already has measures to reduce leakage and ensure proper recovery of high-GWP F-gases. The report notes how important it is that 'existing provisions are properly implemented and enforced by Member States'. However, a look at the list of Member States that are tardy in implementing measures suggests that the report may be optimistic.

Possible options to 'further improve' the provisions include widening the containment and recovery rules to cover vehicles or smaller equipment; extending training and certification; setting maximum leakage rates; and developing EU standards and guidance on best available techniques and environmental practices to prevent and minimise F-gas emissions. But analysis suggests limited scope for cost-effective further improvement of these provisions, although extending them to refrigeration systems in trucks and trailers and requiring labelling of new products and equipment 'merit further consideration and assessment'.

So the next step is to consult on how best to further reduce emissions of F-gases. There is a consultation open now, for which details are given below. CIBSE will be liaising with other industry bodies in preparing a response. Any members wishing to contribute to the discussion are asked initially to contact Chris Breslin at **cbreslin@cibse.org**

> The next step is to consult on how best to further reduce F-gas emissions

HYWEL DAVIES is technical director of CIBSE. www.cibse.org The subject of F-gases was previously covered in this column in May 2009, which can be found at: **http://content.yudu.com/A17lqi/CJMAY09/resources/22.htm.**

WEB LINKS

The consultation package is at **http://ec.europa.eu/clima/consultations/0011/index_en.htm**. The consultation 'will provide feedback to the European Commission and assist them in preparing proposals for amending the EC F gas Regulation'. The deadline for submission of input to the consultation is 19 December 2011.

To view the full report go to **http://ec.europa.eu/clima/policies/f-gas/docs/report_en.pdf** Brussels, 26.9.2011, COM(2011) 581 final. *Report from the commission on the application, effects and adequacy of the Regulation on certain fluorinated greenhouse gases (Regulation (EC) No 842/2006)* (12 pages).

For the full study go to **http://ec.europa.eu/clima/policies/f-gas/docs/2011_study_en.pdf** Preparatory study for a review of Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases. Final Report prepared for the European Commission in the context of Service Contract No 070307/2009/548866/SER/C4. This amounts to some 340 pages of very detailed analysis.

GENERATION next

Are professional bodies in the construction sector still relevant to young engineers? How can senior professionals encourage newcomers to the industry to have more of a say in decisions that affect their future? Is a completely different approach to mentoring young engineers needed? A group of senior industry figures from Britain and the US came together to offer some grey-haired wisdom. **Ewen Rose** chaired

Grabbing the attention of young engineers – and keeping it – is proving a very difficult task for the industry's professional organisations. Should they even try? What do young engineers aspire to? And does it have anything to do with our industry's 'traditional' centres of influence and leadership?

These and other questions dominated the recent meeting of the heads of four leading professional bodies in London. Representatives from CIBSE, ASHRAE, IMechE and the Institute of Refrigeration (IoR) gathered at IMechE headquarters to discuss: 'What should we, as leaders of professional institutions, be doing now, to empower the industry's leaders of tomorrow?'

All agreed that the traditional methods of communicating with members of professional bodies did not work for a new generation of engineers used to communicating immediately, and continually, via social media networks. Young engineers are also more likely to seek dialogue with other young engineers rather than the 'grey-haired' leaders of previous generations. Changing the orientation of traditional industry bodies to better cater for younger engineers was proving difficult, but needed to be done, said the senior engineers gathered around the table at the IMechE.

Who are the leaders?

The baby-boomer generation (born between 1946 and 1964) accounts for nearly 50% of the current workforce, but many are approaching the end of their professional lives. The challenge, according to the group, was to engage the 'millennial' generation born in the '80s – and later – and now forming the bulk of the modern engineering workforce.

'We have a tendency to focus on activities that are near-term. We are also very good with technical things, but we avoid the more difficult question of developing leaders of tomorrow,' said ASHRAE president Ron Jarnagin. 'Our first task is to identify them. Are they student members; those 35 and under, or others? How do we speak to them? What messages translate for them?'

CIBSE president Andy Ford said that the emergence of the sustainability agenda would inevitably put young engineers at the top of the profession. 'Sustainability is taught and understood by a younger generation,' he said. 'That is where the expertise is. We need to make use of that expertise and get rid of the assumption that as you get older you gain more knowledge. Our task is to enable the crossover.'

However, getting to grips with the motives of a new generation of engineers – totally different from their predecessors – is proving hard for professional bodies

Simon Weir www.simonweir.com

David Warriner of IMechE discusses the role of young engineers in the industry

to accommodate: 'What they expect to get from an organisation and how they expect it to behave is very different to what we are used to,' said Ford.

'We have to deliver clear value to them and their businesses. Also, their interest is global. They expect to communicate across boundaries – national and professional. They don't operate in the same silos we are used to, and the power structures are not reflecting that expectation.'

So, perhaps the current generation at the top of professional bodies should just get out of the way, said Andy Pearson, president of the Institute of Refrigeration (IoR).

'The best thing we can do is nothing,' he said. 'We need to get out of their way. That doesn't mean abandon ship, but step aside and assist. If we are taking up all the seats at the top table and in committees, we are not leaving space for new, fresh ideas and the exuberance of youth.'

Getting the older generation to give up its 'power' would not be easy, though, the speakers agreed.

Handing over power

Former ASHRAE president, Richard Rooley, knows things have to change, but said: 'It is uncomfortable for us to hand over the leadership roles we spent so long working for. We resent it and feel uncomfortable, but we have to be prepared to take a risk.

'The young people always say we are making mistakes, so we should give them a chance to put things right.'

However, it is the older generation that

Roundtable participants, left to right: Ron Jarnagin of ASHRAE, Jeff Littleton (ASHRAE), Stephen Matthews of CIBSE and David Warriner of IMechE

has the time to devote to committees and activities. Also, younger engineers are not necessarily attracted by the idea of travelling long distances to sit round committee tables.

'Inviting young people to join a committee is not always the answer,' said Ford. 'We should set up discussions about a topic that is across the whole discipline and capture their interest that way.

'Let's get real debate going and let them argue, bring out differences of opinion among the group – not confine them to engaging with traditional structures.'

The best platform for that kind of debate would be social media, and professional bodies could help by facilitating the networks for their young members, according to several of the speakers.

'I don't think we should get into quotas,' said Pearson. 'Artificially changing the mix to include more young engineers won't work. This is not purely about age – but it is all about attitude. Some people cram a lot more into their early years than others.

'We need new ways of thinking to tackle the issues of today, like water shortages and population growth.'

The possibility of seeing older, retired engineers as leaders of the future was also discussed. They have useful experience and have more freedom to contribute.

But this could only be a partial answer; the crucial issue was getting more participation on industry decision-making panels, standard writing bodies and the like, from a greater proportion of young

What they said...

If we are taking up all the seats at the top table and in committees, we are not leaving space for new, fresh ideas and the exuberance of youth

We need to make a better job of professional development. That is where we can make a difference by helping newer engineers develop and learn from our experience

Young engineers need to see some advantage to them or their company – if you don't give them that you lose them. And once they are gone, it is hard to get them back

It is uncomfortable for us to hand over the leadership roles we spent so long working for. We resent it and feel uncomfortable, but we have to be prepared to take a risk

Young engineers expect to communicate across national and professional boundaries. They don't operate in the same silos we are used to, and the power structures are not reflecting that expectation

CIBSE president Andy Ford, left, and Andy Pearson of the Institute of Refrigeration

engineers. But older engineers should offer themselves as mentors.

However, all agreed that it was still difficult to get young engineers to engage in this kind of work because of pressure from their employers to focus on their short-term business goals.

'In difficult economic circumstances, employer support for participation in volunteer activities declines,' said ASHRAE executive vice-president Jeff Littleton. 'Also, young members focused on balancing careers and personal life do not feel the same obligation to contribute to the greater good as older members who are looking to give something back after years in the industry; they need to see some advantage to them or their company – if you don't give them that you lose them. And once they are gone, it is hard to get them back.'

Time for mentors

Stephen Matthews, chief executive of CIBSE, went further: 'That culture is dead; young people will not sit around a table and discuss things that they don't see as important. We need to focus on our tone and allow people to participate in an organisation in a way they feel comfortable with. It doesn't suit them to use the old, grey man model of life – we just need to give them some encouragement and confidence and they will fly.'

Employers need to buy into the process, and Pearson advised them to see economic benefit in 'lending' their young minds to the broader work of the industry. 'They should treat it as a form of sponsorship,' he said. 'They should also realise it can be very good value for money for businesses because, if they have people serving on committees, it helps them to stay in touch with wider developments. Perhaps the institutions also need to recognise it as a form of sponsorship and give more publicity to the companies, which permit their staff to engage in the committee work.'

This raised the question of how primarily technical and engineering-led bodies handle 'softer' skills and business issues.

'Professional institutions tend to focus on technical activities, but in the current climate it is the business and professional skills we should be focusing on,' said David Warriner, chairman of IMechE's construction and building services division.

'We need to make a better job of professional development. It is depressing that there is an image that engineers emerge from college fully formed – I look back in horror about how little I knew. That is where we can make a difference by helping newer engineers develop and learn from our experience.'

'Our role as industry bodies is to take the advocacy role and focus on professional development,' said Warriner.

He pointed out that the coming generation was facing far more challenging times than the baby boomer generation experienced – with sustainability as the key issue.

'They will have to fix the technical problems, but their businesses will have to be sustainable too. They will have to deal with ethics, social factors – softer subjects that we often ignore.'

At the same time, the panel agreed that businesses would have to become less risk averse and allow young engineers to experiment and make mistakes.

'Innovation requires mistakes; error is part of what happens and is how you get progress,' said Ford. 'The companies need to allow young engineers to develop in a relatively benign environment so they feel able to experiment and make mistakes.'

He also said this needed to be explained to politicians, most of whom had no idea how engineering solutions were delivered. 'Our institutions can take on that role and show how things actually happen and how we get the progress the politicians expect of us.'

So, professional bodies – on both sides of the Atlantic – are wrestling with a similar problem. All of the panellists agreed that there was no more urgent task facing the current leadership generation than reaching out to their successors. **CJ**

ROUNDTABLE PARTICIPANTS

Andy Ford is president of CIBSE

Ron Jarnagin is president of ASHRAE (American Society of Heating, Refrigerating and Air-conditioning Engineers)

Jeff Littleton is executive vice-president of ASHRAE

Stephen Matthews is chief executive of CIBSE

Andy Pearson is president of the Institute of Refrigeration

Richard Rooley is former president of ASHRAE

David Warriner is chairman of IMechE's construction and building services division

The FLEET

Hamworthy

Heating *at work.*

The most versatile boiler ever

An advanced condensing boiler design which sets new standards for delivering heat from small spaces, the FLEET range comprises wall hung, floor standing horizontal and vertical models.

Transforming commercial boiler solutions, each FLEET model features our new heat exchanger, which comes with a 5 year warranty.

FLEET Vertical
26 models
80-1050kW

FLEET Wall hung
8 models
40-150kW

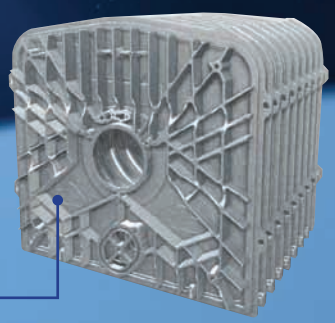
FLEET Horizontal
13 models
40-350kW

MADE IN BRITAIN

Check out the impressive performance of the FLEET.
Talk to Hamworthy for all your commercial boiler needs.

Tel: **0844 225 1588** Email: **fleet@hamworthy-heating.com**
Visit: **www.fleetboilers.com**

Hamworthy's innovative NEW heat exchanger!



Matt Apps/Shutterstock.com

HEIGHT OF SUSTAINABILITY

A major refurbishment of an iconic American skyscaper is projected to slash energy use and pay for itself within a few years. **Andy Pearson** reports

On 17 March 1930, at the height of the Great Depression, construction began on the edifice that was to become an icon of the New York City skyline – the Empire State Building. Now, in the midst of a new economic crisis and growing concerns about climate change, the 102-storey, 2.85 million sq ft art deco skyscraper is undergoing a major retrofit aimed at transforming it into one of the United States' most energy efficient buildings.

In August 2006, a $550m investment programme was launched by the building's owner, Malkin Holdings, to comprehensively upgrade it. And while this programme was being rolled out, the Clinton Climate Initiative (CCI) was in discussion with Anthony Malkin, president of Malkin, about the possibility of turning one of America's most famous buildings into an exemplar of sustainability. The CCI hoped the kudos of turning the Empire State Building green would inspire the owners and operators of less prestigious structures to do the same.

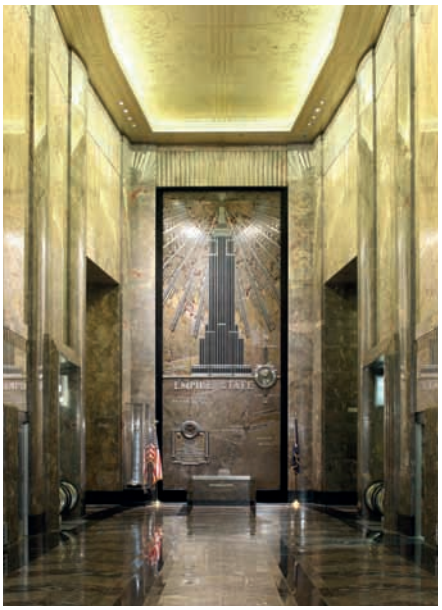
The subsequent sustainability programme for the Empire State Building was founded on a commercial business model – one that sought to cut energy consumption by nearly 40%, double that of a typical commercial building retrofit, and with a payback period of only three years.

In April 2008 a team of specialists was assembled, including energy services company Johnson Controls, environmental organisation Rocky Mountain Institute and project manager Jones Lang LaSalle. It took seven months of audits, brainstorming, energy modelling and financial analysis spread over four phases to determine what it was possible to achieve within strict cost parameters.

In the first phase, the sustainability goals were integrated with the existing capital refurbishment programme to improve their cost effectiveness. The capital project team of Jones Lang LaSalle, TPG Architects and MEP consultant Lakhani & Jordan worked with the sustainability team to review and identify sustainable alternatives or modifications to existing capital projects to achieve higher standards. Since upgrades such as resealing all the windows were already in the capital upgrade programme, it made sense to analyse whether it was cost effective to invest more, further improving their performance to achieve significantly higher energy savings.

An important element of the second phase of the sustainability initiative was to narrow down the number of potential energy saving solutions to a manageable number. As part of the process the team did a lot of work on quantifying energy efficiency. Malkin was a critic of the silo approach to energy efficiency in multi-tenanted buildings where the focus was individually on lighting, heating, ventilation, air conditioning, pumps and elevators. In the document *Lessons Learned Retrofitting an American Icon*, he argues that 'true cost savings come when the projects are considered as one integrated package'.

This was true for the Empire State Building, where some of the biggest cost savings are expected to come from upgrading the chiller plant rather than replacing it. This was only possible, however, because of a



The 1930s art deco Empire State Building (above and left) has undergone a major eco-refurbishment

Windows are replaced and resealed to increase the energy efficiency of the building

> You can teach an old building new tricks and cost effectively move it to the top 10% in energy efficiency

reduction in cooling load of 1,600 tonnes as a result of, first, the window refit reducing solar gain, and, second, a separate demand control ventilation project, which reduced the amount of fresh air needing to be cooled.

As part of the process of deciding which strategies to implement, the team had to factor in the length of time it would take to implement each strategy because of its effect on the payback period; if a strategy with a short payback took a long time to implement, that would affect the cost-benefit equation for that strategy.

While the team worked out which solutions were the most cost effective, Johnson Controls documented tenant energy usage for the building's 1,000 businesses and 21,000 employees spread over the 200,500 sq m of office space.

The third phase of the initiative centred on modelling the whittled-down solutions using the US Department of Energy's eQuest Energy Model to obtain a cost-benefit analysis for the various proposals. Speaking at the launch of the project, Iain Campbell, vice-president of Johnson Controls, described this as a 'state-of-the-art computer model that was able to simulate the energy performance of the virtually infinite number of combinations of the identified improvement measures, and then evaluate them from both a carbon reduction and financial return perspective'.

The sustainability team produced a matrix of costs and financial benefits. These were integrated with sustainability ratings, architectural programming and operational best practices to gain an understanding of how different strategies, implemented individually or in combination, would affect project cost and building performance. According to Campbell: 'This allowed us to identify the optimal combination of improvement measures and then evaluate them from both a carbon reduction and financial return perspective.'

More than 60 ideas were vetted before being eventually whittled down to eight. The reduction was achieved by looking at measures that would reduce both cooling and heating loads, such as: upgrading the windows; seeking to maximise the efficiency of the plant; and implementing a control strategy so that the equipment was used only when needed (see 'refurbishment' box).

The final phase of the sustainability review culminated in the production of the masterplan. Retrofits typically reduce energy consumption by 10% to 20%, but over an eight-month period the team had determined that, at current energy costs, it

Figure 1: Empire State Building refurbishment: costs and projected savings for key measures

Project description	Projected capital cost	2008 capital budget	Incremental cost	Estimated annual savings
Windows	$4.5m	$455,000	$4m	$410,000
Radiative barrier	$2.7m	$0	$2.7m	$190,000
DDC controls	$7.6m	$2m	$5.6m	$741,000
Demand control vent	Included above	$0	Included above	$117,000
Chiller retrofit	$5.1m	$22.4m	-$17.3m	$675,000
VAV AHUs	$47.2m	$44.8m	$2.4m	$702,000
Tenant daylight/plugs	$24.5m	$16.1m	$8.4m	$941,000
Tenant energy management	$365,000	$0	$365,000	$396,000
Totals	$91,965,000	$85,755,000	$6,165,000	$4,172,000

Source: *Lessons Learned: Retrofitting an American Icon*, Anthony Malkin

SANISPEED

Sanispeed is a pump which is intended for light commercial situations.

Part of the Saniflo Professional Range

SANICOM2
PROFESSIONAL RANGE

SANIBEST
PROFESSIONAL RANGE

SANICUBIC
PROFESSIONAL RANGE

SANICONDENS BEST
PROFESSIONAL RANGE

check out the website for details: www.saniflo.co.uk

SANIFLO

The UK's market leader for over 30 years

Saniflo Ltd. Howard House, The Runway, South Ruislip, Middx. HA4 6SE Tel: 020 8842 0033 Fax: 020 8842 1671 e-mail: sales@saniflo.co.uk

Some of the biggest financial savings are expected to come from the upgraded chiller plant

was economically possible to reduce energy consumption by 38% and save 105,000 tonnes of CO2 over 15 years. In January 2011, Malkin agreed to buy carbon offsets totalling 55 million kilowatt hours per year of renewable energy, making the Empire State Building carbon-neutral, according to the company.

The greatest reduction in CO2 emissions at the Empire State Building is expected to come from upgrading the control systems to Johnson Controls' Metasys building management system. The strategy is predicted to reduce energy use by 9%. Encouraging tenants to make better use of daylight and plug-load management will aim to save 6% from the energy baseline; while upgrades and enhancements to the air handling units, chillers and glazing could each save 5%. Tenant energy management, including access to online benchmarking tools, could save 3%. Finally, the addition of a radiative barrier and tenant demand ventilation based on CO2 sensors could each save 2%.

The building energy model will be used in conjunction with utility, weather and usage data, tracking savings each year to determine if targets have been met. If they have not, Johnson Controls will pay the owners for the shortfall. The savings are guaranteed for 15 years.

As aggressive as Malkin and his team were toward energy-reduction opportunities under their control, the success of the programme will also rely on actions taken by the building's tenants. The owners and the tenants are implementing the longer-term projects, which need to be coordinated with tenant turnover. These are some of the most cost-effective energy saving measures when coordinated with planned equipment replacement. Figure 1 shows cost and projected energy savings for each measure. The total energy savings are predicted to be $4.4m, representing a payback period of three years.

The Empire State Building, whose retrofit is due for completion in 2013, recently received LEED Gold certification. It also has an Energy Star rating of 90. Anthony Malkin is being recognised for his input by the US Green Building Council, which is awarding him its Leadership Award 2011. As Campbell puts it: 'Through this project we have proven that you can teach an old building new tricks and cost effectively move it to the top 10% of all commercial buildings in energy efficiency.' **CJ**

Empire State Building Eight steps to a cost-effective refurbishment

Reduce loads:

Windows

The 6,500 existing windows were upgraded by removing the sashes from their frames and replacing them with a temporary window. The windows were then taken to a workshop set up on the fifth floor, where they were dismantled and cleaned. A new super-insulated glass unit was created by taking one of the original panes of clear uncoated glass, laying a warm edge spacer on it and then a suspended low-emissivity film to help reduce solar gain.

Another edge spacer was added so that the outer glass can be laid on top, creating a triple-glazed unit from the reused components, to the same dimensions as the original. The assembly is then baked in an oven for about 90 minutes to shrink the film, turning it taut and translucent.

The process improves the window's thermal performance from a U-value of 0.5w/sq m K to 0.125W/sq m K, while halving solar gain.

Radiative barrier

More than 6,000 insulated, heat-reflective barriers will be installed behind the building's perimeter radiator units.

Tenant daylighting, lighting and plugs

This measure involves reducing lighting power density and energy use in tenant spaces by making better use of daylight and task lighting, and by installing dimmable ballasts and photosensors for perimeter spaces to link lighting to daylight levels. It also involved providing tenants with a plug load occupancy sensor to turn desk-top devices on and off depending on whether they are at their desk. The owners have also pre-built

> True cost savings come when the projects are considered as one integrated package

a LEED platinum model office space in the building to show tenants what a low energy office could look like.

Use efficient technology

Chiller retrofit

The cooling load reduction projects above made it possible to reduce chiller capacity, and allowed refurbishment of the existing chillers and upgrade their controls and drives rather than install new units. In addition, existing R500 refrigerant will be removed and replaced with R134A.

VAV air handling units

A new layout means the number of constant volume air handling units can be halved. Two variable air volume units will replace the four constant volume units over time. This minimises capital cost, while reducing maintenance costs and improving tenant comfort by reduced noise and improved control.

Controls

Demand control ventilation

This project involved the installation of CO_2 sensors to bring in appropriate quantities of outside air based on occupancy levels, reducing energy use and improving indoor air quality.

Balance of direct digital controls

Existing control systems for building systems are to be upgraded using Johnson Control's Metasys solution.

Tenant energy management

Tenants will be individually metered and encouraged to save energy, according to ESB. They will have access to online energy and benchmarking information, allowing them to compare their energy use with other tenants to find out if they are average, high or low performers.

PASSIVE OUTCOMES

New low carbon buildings are often designed to have minimal heat loss, but real performance is often disappointing. **Sally Godber** looks at some key Passivhaus principles that can help bridge this gap

As building services engineers, we should be able to predict the variables in heating loads accurately. Almost all of the calculations involved in this process are in our hands. And yet, it seems, we often fail to achieve this basic function. A well-publicised Joseph Roundtree Foundation report on the heat losses of dwellings shows just how wide the gap is between the original design assumptions and the actual performance of buildings (see Figure 1).

This discrepancy was exactly what interested Wolfgang Feist, the co-creator of Passivhaus, 20 years ago. He wrote: 'I was working as a physicist. I read that the construction industry had experimented with adding insulation to new buildings and that energy consumption had failed to reduce. This offended me – it was counter to the basic laws of physics. I knew that they must be doing something wrong. So I made it my mission to find out what, and to establish what was needed to do it right.'

The major underlying cause of the 'reality gap' is a lack of appreciation of the less obvious heat loss mechanisms. This article looks at some key Passivhaus design principles and gives examples of where the building may fail to live up to expectations.

JPW Associates

Powys County Council's new IT and adult learning centre, which opened in 2009, was the UK's first Passivhaus Institut-certified office building, and underwent extensive performance monitoring to compare design intentions against outcomes. It won the New Build category in the CIBSE Building Performance Awards 2011 (see the *Journal*, April 2011, page 34)

Modelling

Heat demand is calculated as the balance of heat losses and gains. The two charts in Figure 2 show typical annual energy values per square metre of floor area for housing in the 1980s, and for a modern low energy building. The balance of losses and gains gives the annual heating demand – shown in yellow.

The two charts demonstrate how the dominating factors have altered over the past 30 years. Previously, the fabric and infiltration losses dominated. Now solar gains, internal gains, window losses and thermal bridges have become much more critical.

This is why the Passivhaus design principles have been developed with a much more stringent interrogation of these factors. This means that, for modern buildings, Passivhaus should provide a more accurate estimate of the heating requirement, a fact borne out in the European CEPHUS study (**www.passivehouse.com/07_eng/news/CEPHEUS_final_long.pdf**).

Correct U-value assessment

Manufacturers should not be relied upon to calculate opaque U-values. Instead, this

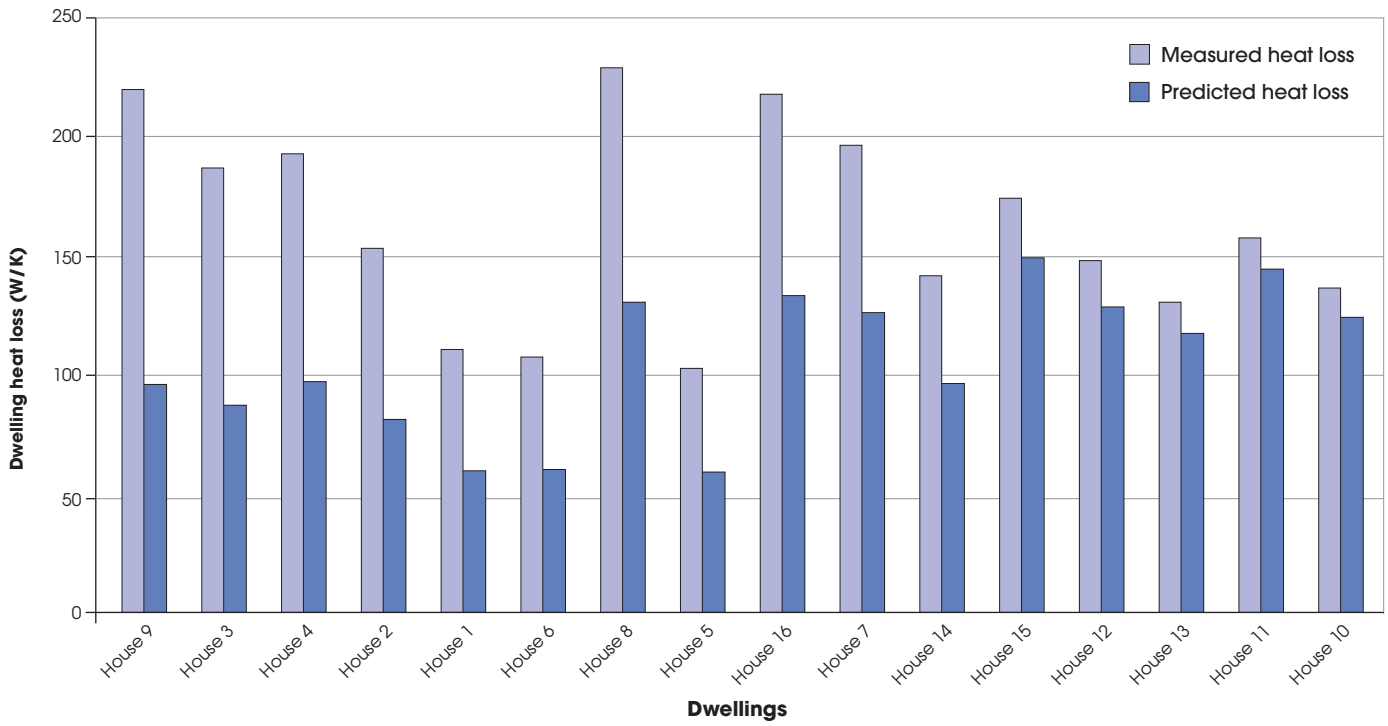


Figure 1: A summary of the results of heat-loss monitoring data from the Elm Tree Mews Field trial, carried out by the Centre for the Built Environment at Leeds Metropolitan University, on behalf of the Joseph Rowntree Foundation and Joseph Rowntree Housing Trust. www.lmu.ac.uk/as/cebe

task should be undertaken by a member of the design team who understands the complexities of insulation performance. In general, a conservative approach is recommended, as changes during design development or construction rarely improve performance.

Particular care is needed when scrutinising insulation conductivities. Manufacturers are improving their products, but specifiers need to be somewhat sceptical about their claims. Insulation materials should always refer to the λ90/90 value, which ensures that a conservative figure is used and on-going sampling is in place to ensure quality. If in any doubt, take a conservative value from *CIBSE Guide A: Environmental Design*.

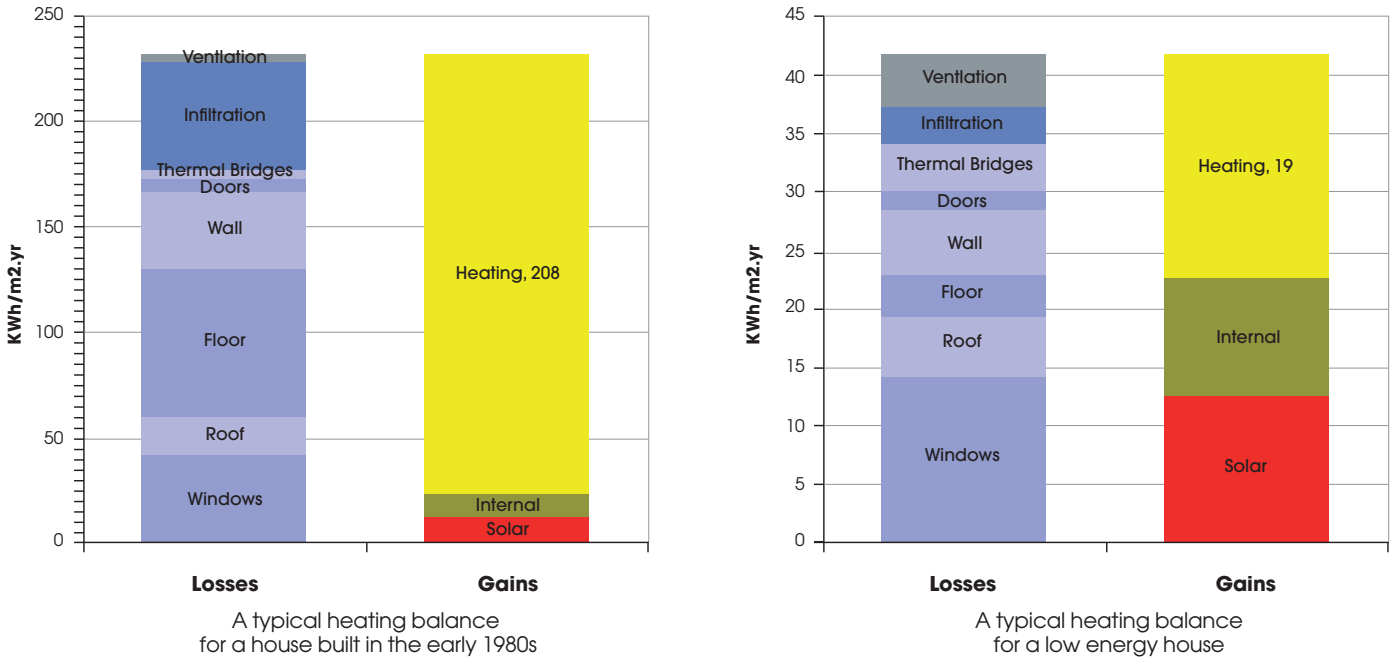


Figure 2: Comparison of thermal losses and gains in older and newer homes. The left-hand bars represent annual heat losses – heat conduction through fabric such as windows, roof and walls, as well as heat loss due to bulk air transfer via infiltration and ventilation. The right-hand bars show the solar and internal heat gains, with the heating in yellow representing the difference between the losses and gains

Figure 3: Cold air can bypass the insulation, substantially reducing its performance. Note the level of insulation here – 50mm would be insufficient for most modern buildings

WARM: Low Energy Building Practice

Figure 4: A fully-filled cavity wall using a compressible insulation. There are no gaps at all in the insulation. The inner face of the blockwork will be plastered to provide an airtight barrier, while the outer face will be rendered to prevent moisture penetration

> Passivhaus design principles have been developed with a much more stringent interrogation of these factors

The inclusion of regularly-repeating thermal bridges – particularly the extent of timber frame – within U-values also needs care. The default figures given in the standards for Building Regulations, BR497, are too generous: 15% is taken as the timber fraction of timber-framed structures; but various studies have found typical values in excess of 25% (**www.jrf.org.uk/sites/files/jrf/low-carbon-housing-full.pdf**). Ideally, the structure should be removed from the insulation, so the U-value is not dominated by the extent of bridging.

Some structures use cavities in the construction that are ventilated to the outside. It is wishful thinking to hope that any insulation between these cavities and the outside will do anything thermally, given the vagaries of onsite installation. It is generally best to exclude from the U-value calculation any material on the outside of ventilated cavities.

Bypass and blowthrough

Air movement through or around insulation significantly decreases the performance. There are two primary ways this can happen: blowthrough and convective bypass.

Convective bypass occurs where there are gaps between and around insulation. Because of the temperature difference between the two sides of the insulation, convective air currents will move heat from the warm side of the insulation to the cold side, bypassing it and reducing its performance. The impact is significant; a 7.5 mm gap between wall insulation boards can cause a 200% increase in heat loss.

Figure 3 shows a classic case of a partially filled cavity that is ventilated to the outside. The picture demonstrates particularly poor installation; the architect's drawing would have shown the insulation flush against the inner course of blocks on the right-hand side.

Because of the tolerances of rigid insulation, together with the uneven surface of the blockwork, it is almost impossible to construct this detail well; as it is covered up so quickly, it is even harder to check. Where rigid insulation is used, it should be installed with tongue-and-grove edges, or with layers overlapping each other. Expanding foam can then be used in the odd case where gaps are present and then all joints should be taped to further mitigate air movement.

A more thermally robust detail would be to replace this insulation with a mineral wool batt, which could closely follow the contours of the wall, and could butt up together with a tolerance fit. However, this causes another problem: blowthough, which occurs in open-cell insulation, such as a mineral wool in contact with a ventilated cavity. As the cold air moves through the cavity (primarily due to external pressure from the wind) there

> The major underlying cause of the 'reality gap' is a lack of appreciation of the less obvious heat loss mechanisms

is nothing to stop bulk air movement through the insulations itself – removing heat as it goes.

There is a very simple solution to this problem: avoid ventilated cavities next to insulation. There are two methods of achieving this in the cavity wall example: either use a wind-proof membrane between void and insulation; or fully fill the cavity and get rid of the ventilation. The latter is much easier to build well, but does rely on a quality render to prevent moisture ingress (see Figure 4).

Air tightness

Air tightness has come to the fore since 2006 with the publication of the Part L requirements. Good air tightness will improve occupant comfort and fabric durability, as well as energy consumption. However, in order to achieve the best results, it must always be coupled with a well-designed ventilation system; relying on a leaky building for ventilation is not a good idea for a low energy design.

Air and wind tightness are different. Air tightness means absolutely preventing air from penetrating through the shell, while wind tightness merely stops air movement through the insulation. Both are needed on a good construction.

The easiest way to achieve a high standard of air tightness is to simplify the air-tight layer as much as possible – junctions will always be difficult, so minimising these is the first step.

An air-tightness strategy should then be discussed (preferably before planning) and fully developed as the construction is chosen. There are a number of air-tightness consultants and manufacturers that can provide advice, but a good, basic understanding of these principles is needed within the design team.

Thermal bridges

Even though an understanding of what constitutes a thermal bridge is commonplace, a clear strategy to reduce its impact is not.

The most significant thermal bridges occur where there is a conflict between structural and thermal elements around complex junctions.

The most successful way of reducing thermal bridging is to challenge the architect to make the thermal envelope as simple as possible. A construction method is needed that separates the structural elements (which generally have high conductivity) from the insulation as much as possible, preferably with the structure inside the thermal envelope.

This strategy ensures that the thermal bridges are kept to a minimum. Where they do occur, thermal analysis software can be used to quantify their effect. However, the calculation should be undertaken with caution, as the result is primarily a small difference between two large numbers, and so is easy to get wrong.

Conclusion

By bringing an understanding of building physics to the table, building services engineers can undoubtedly change the way buildings are designed, creating thermal envelopes that are simpler, easier to build and better performing.

The wider field of building physics covers this topic in much more detail to include areas such as comfort and moisture transfer. The Passivhaus Designer course, run by CarbonLite, allows participants to fast-track their understanding of this and other aspects of low energy design highlighted within this article.

Visit **www.carbonlite.org.uk** for more information. **CJ**

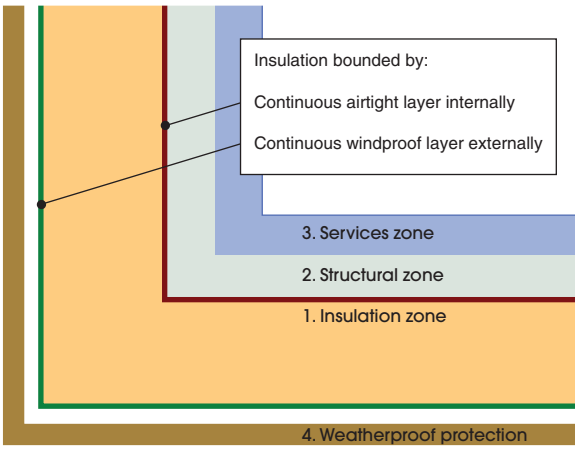
SALLY GODBER is a chartered engineer and partner at WARM: Low Energy Building Practice. **www.peterwarm.co.uk** *CIBSE Guide A: Environmental Design* can be obtained at **www.cibse.org/bookshop**

Factfile Basic rules of good insulation

These basic rules below will help to deliver a better performing building fabric. A typical corner incorporating these elements is shown in the diagram.

1. Keep a separate insulation zone, free from thermal bridges or cavities. Externally, this is covered in a windproof layer to stop blowthrough. Internally, an airtightness layer stops air movement through the fabric, and reduces moisture penetration; note that the airtightness membrane can also be located on the inside of the structural zone if it makes the construction simpler, but must be on the outside of the services zone.

2. A separate structural zone, which might be in-filled with insulation to improve the performance, but this is not the primary role.



3. All services should be kept clear of the insulation and airtightness layers – a services zone is the easiest way to achieve this.

4. Weatherproof cladding to provide protection from water ingress and aesthetic, in some cases (such as fully filled brick cavity) the weatherproof protection and windproof layer may be the same thing.

QUICK WINS

Need to make some low-cost changes that will reduce energy consumption and offer fast payback? Two services managers of a landmark building in central London mapped out a plan to do just that. Report by **Andy Pearson**

Portland House in central London, which underwent a range of no-cost or low-cost energy saving improvements. (Images on the following pages are generic and are not connected with Portland House)

At 27 storeys, Portland House is the tallest building in Westminster. It was constructed in 1962 as single-occupier building for Portland Cement. However, since being acquired by Land Securities, the building became multi-tenanted and is home to about 40 business tenants. Land Securities has ambitious plans to redevelop this area of London as part of a new planned new transport interchange. As a consequence, all the tenants' leases are due to expire in 2015.

When the building's technical services managers, Paul Camsell and Kevin Barrett, were tasked with saving energy as part of Land Securities' commitment to reduce its carbon emissions by 30% by 2020, they had to work with a payback period of possibly less than 3.5 years. As a result, all of their attention has been focused on no-cost or low-cost energy-saving solutions.

Their focus on 'quick wins' is beginning to pay off. The following pages outline five key ones – and some longer-term changes.

Win 1: Turn off the emergency staircase lighting

The lights on the two 27-storey emergency staircases at Portland House were on all day, every day. There are 189 light fittings in total, each with a 30W lamp. Camsell says it was costing almost £5,000 a year in electricity just to keep the empty staircase illuminated. 'We said to ourselves 'this is wrong,' he explains, so Camsell and Barrett set about finding a solution.

It was not possible to use a time clock-based solution to turn the lights off during the day because it was an emergency staircase. So they opted for a presence detection solution instead. The ESP Micro Sensor switch from Parkway Electrical Services uses microwaves to detect people and it had the addition advantage that it could be installed inside an existing fitting without the need for any modification.

It was established that, if the motion sensors turned off the lights for 90% of the time, about £4,500 a year could be saved. The sensors cost £8,500 installed, which gave him a payback of under two years, which was well within his 3.5 year cut-off.

> With motion sensors to turn off the lights for 90% of the time, about £4,500 a year could be saved

Before the work started, the power consumption of the staircase lighting was recorded for a week. Again, after the sensors were fitted, power consumption was monitored. A graph of consumption showed the detectors were performing well, with one exception. Twice a week, at lunchtime, there was an unexplained blip on the power consumption graph. 'We spent ages trying to figure out what was causing the problem,' Camsell says. The mystery was solved by painters working on the stairs who had spotted one of the tenants using the staircase for fitness training by running up and down it twice a week.

Measurements confirmed the modification was saving £4,228 a year, which gives a payback of two years. 'We'd have got down to 1.9 years payback if it wasn't for that bloke running up and down the stairs,' Camsel jokes. The system has been so successful that it will now being rolled out across all of Land Securities' London portfolio.

£4,228
TOTAL ANNUAL SAVING

Win 2: Turn off unnecessary lift shaft lighting

Camsell says he was waiting for the lift one morning when he noticed the service lights were on in the lift shaft. He assumed the lift was being serviced. The following morning the lights were still on; they remained on for almost two weeks. He checked the other five lift shafts; the lights were on in these too. Then he got out his calculator: in total there were 238 light fittings in the lift shafts, each with twin 58W lamps, giving a total lighting load of 29.7 kW. At an electricity cost of 8.5p a unit, lighting the empty lift shafts was costing him £60 per day. Camsell spoke to the lift company about energy wastage. There has been no problem since. Assuming the lift shaft lights are on for maintenance 10% of the time, Camsell says this no-cost intervention has saved him about £19,500 a year.

£19,500
TOTAL ANNUAL SAVING

Win 3: Ensure the chillers run only when cooling is needed

Kevin Barrett was on the roof one winter's night to carry out an audit when he noticed the chillers were running. There are five one-mega-watt chillers, and they were using a lot of energy to cool an empty building in the middle of winter. He told the maintenance team. They claimed to have solved the problem but when Camsell made a nocturnal visit to the roof several weeks later, he noticed the chillers were still running.

Camsell and Barrett set about resolving problem. First they found some rogue time schedules in the BMS system, which were calling for the chillers to run 24 hours. They removed these and the chillers ceased running at night. 'That removed 12 hours running costs every single day,' says Camsell.

However, even though the chillers were no longer running at night they were still running when they should not have been, for example during a winter's day while it was snowing. Camsell and Barrett turned their attention to the 'hold-off' temperatures for each floor. These should 'hold-off' the cooling system until the outside temperature rises above 15C. 'We found that where maintenance had been carried out these had been set to zero on some floors, so the sensor was always calling for cooling,' Camsell says. With the hold-off points reset, chiller operating times were significantly reduced. However, the chillers were still coming on at 7am every morning, running for a short time, and then turning off again.

The problem was narrowed down to one outside air sensor linked to the hold-off control for one particular floor. This sensor had been relocated so that it was positioned inside the fresh air intake on the floor's air handling unit. The problem was that the air handling unit was turned off at night. As a result the sensor warmed up so that in the morning it was calling for cooling. As soon as the air handling unit started working, cold outside air was pulled across the sensor, cooling it so that it no longer called for cooling. To resolve the issue, the sensor was relocated.

'The chillers now run only when there is a genuine demand,' says Camsell. A glance at the building's energy figures shows the impact the initiative has had on energy usage. In November 2010, before the works, the building consumed 88,973 kWh. In March after the issues had been resolved, this had dropped to 22,106 kWh. What's more there was no capital investment needed, just time. 'We did it all in house and the savings are phenomenal,' he says.

> However, even though the chillers were no longer running at night, they were still running when they should not have been, for example during a winter's day while it was snowing

Win 4: Ensure pumps have been commissioned correctly

When Camsell and Barrett first arrived at Portland House three years ago the tenants were complaining about the noise of water in the radiator system. They were also unhappy about the radiators' thermostatic values, which had a tendency to spring open making the rooms overheat.

The system had been in place for two years. It was designed to slow the circulating pumps as the thermostatic valves start to close to match the reduced demand for heat. 'When we looked at the system, we found the circulating pumps were running at full speed, forcing water through the system, making it noisy and increasing wear on pipework and valves,' says Camsell. He suspected the run-away pumps were also forcing open the thermostatic valves.

The solution: When the pump was being commissioned a jump-wire had been placed between two control terminals to make it run flat-out. The wire had never been removed. With the wire disconnected, the system performed as designed. The thermostatic valves now work properly, which means the load on the boilers has been reduced, saving gas, while the pump's reduced speed saves electricity. 'We had assumed everyone had done their job correctly,' says Barrett.

Win 5: Turn everything off

The plant is scheduled to turn off at 7pm. However, Camsell now turns it off at 6pm, which saves one hour's running time a day. 'No one has even noticed,' he says.

Five not-quite-so-quick wins

'We need the quick wins in Portland House because of its uncertain future, but for some of the other buildings in LandSecurities Victoria portfolio, payback can be longer,' says Camsell. Adjacent to Portland House is the Cardinal Place development, which includes 80 and 100 Victoria Steet and 16 Palace Street. The scheme was completed in 2005. According to Camsell and Barrett, it is well-designed and the buildings run well; even so, the dynamic duo have made some serious energy savings:

1.Turn off the maintenance transformers

A feature of 80 and 100 Victoria Street are the 110V transformers dotted around the buildings. These were installed as part of the buildings' high specification fit out, ostensibly to allow the maintenance teams to plug in low voltage power tools. However, in his three years running the building, Camsell had never seen the transformers used. 'Contractors either use a 240V drill or they have their own portable transformer,' he says. The units felt warm to the touch. 'Each unit was pulling 0.6amps with no load,' he says. Camsell did a quick calculation: in total there are approximately 100 transformers, which meant a total load of 60amps at 240 Volts, or 14kW. In hard cash, the units were costing almost £30 in electricity a day for doing nothing. Camsell had the units disconnected at no cost.

> In hard cash, the units were costing almost £30 in electricity a day for doing nothing. Camsell had the units disconnected at no cost

2.Turn off the car park lighting

There is a car park situated beneath Cardinal Place. The proposal is to fit the same sensors used for the escape stairs in Portland House to control the car park lighting. 'There are about 300 light fittings and the proposal is expected to save about £10,000 a year, with a payback of about 1.5 years,' says Barrett.

3.Change the humidifiers

Maintenance of all the building's steam humidifiers was proving expensive, so Camsell and Barrett decided to test a new system manufactured by Gibbons Humidification, which atomises water to an ultra-fine mist in the airstream. Barrett did some calculations: 'It was clear the savings from using the rotary units are reasonably good, based on maintenance costs alone,' he says.

They decided to install the rotary unit in one air handling unit at Palace Street. As soon as the system was up and running it was obvious it was generating additional energy savings. 'We're not using energy to raise steam for humidification and we don't have to cool the humidified air to achieve satisfactory supply conditions,' says Barrett. Accurate results will be available after a full year because the humidification requirement varies over the year. However, 'initial indications from Palace Street indicate substantial savings in energy', he says.

4. Ensure chillers run at full load

There are 10 chillers on the roof of 100 Victoria Steet. However, rather than have one chiller running efficiently at full load, the control strategy was letting each chiller decide its own load independently of the others. The control strategy was changed to allow the building management system to decide how many chillers were needed, based on the chilled water return temperature. 'We only run the minimum number of chillers needed for the load, which saves a lot of energy,' Camsell says.

5 Extend Earth Hour

Every year conservation body WWF encourages everyone to turn off their lights for an hour at 8.30pm on the last Saturday in March for its Earth Hour campaign. LandSecurities encourages its tenants to participate in this initiative. The three-hour blackout saves £180. However, if this initiative was rolled out every night, Barrett estimates the combined electricity savings of 80 and 100 Victoria Street would be in the region of £65,000 a year. **CJ**

Typical costs	Steam	Rotary
Equipment cost	£0	£90,000
Maintenance costs	£2,500 x 20 = £50,000	£600 x 20 = £12,000
Repair costs	£19,000 x 6 = £114,000	Included above
Gas inspections	£500 x 20 = £10,000	£0
Total over 20 years	£174,000	£102,000
Average cost per year	£8,700	£5,100

Maintenance cost comparison of steam versus rotary humidifier for four units over 20 years

Heating That Won't Cost The Earth

TOP PERFORMERS

Energy Saving Radiators for Heat Pumps

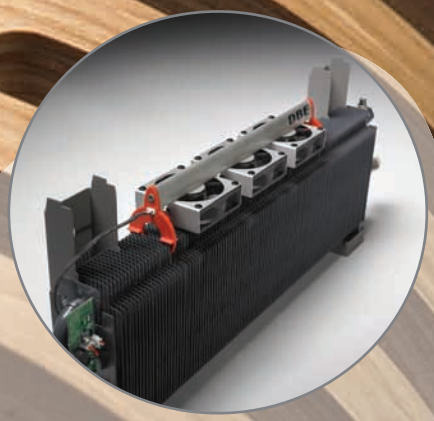
Thought there wasn't a radiator around that works effectively with heat pump systems? Think again.

The innovative DBE technology only found in Jaga's compact **Top Performers** radiators ensures they perform at flow temperatures as low as 40ºC.

Making them perfect for use with ground source, bedrock, water and air heat pump systems. Jaga Top Performers also offer **24%* less energy** consumption over a 24 hour period compared to a heat pump twinned with underfloor heating.

Jaga Top Performers are available in a wide variety of **attractive** wall-mounted and free-standing radiators as well as trench/perimeter heating options.

Contact Jaga to find out more about the environmental and **energy saving benefits** of Top Performers radiators.



jaga

Jaga Home Heating | Tel: 01531 631533 | Fax: 01531 631534 | e-mail: info@jagahomeheating.co.uk | www.jagahomeheating.co.uk

*using a typical 2 heating period daily heating profile with night saving

SAS International

The refurbishment of the London School of Hygiene and Tropical Medicine faced a number of challenges including restricted space

BEAMED EFFICIENCY

When a leading London college wanted to refurbish a grade-II listed site, cooling presented a major challenge because of space restrictions. But a chilled-beams solution provided the answer, writes **Paul Downie**

The London School of Hygiene and Tropical Medicine (LSHTM) is an internationally renowned postgraduate medical school; one of only a few in the world specialising in the study of public health and tropical medicine. Past discoveries have included the mode of transmission for malaria, the link between lung cancer and smoking and the treatment of sexually transmitted diseases, including HIV. Growth in student numbers has put huge pressures on the School's existing teaching and research space. Upgrading its building stock therefore became a priority. The School's main site is the Grade II-listed

SAS International

Cooling for the building is provided by chilled beams supplied by SAS International, which was part of the project team

> With no way up and no way out, the design needed to consider an option that explored a deeper solution in the form of 'open loop heat transfer'

Keppel Street building, completed in 1929. It provides teaching and research accommodation for around 1,000 students. The development of its South Courtyard development was key to the improvement programme.

However, due to the constraints of the site and planning restrictions, there was no possibility of extending outwards or upwards. The original building can effectively be thought of as an upside-down capital A. The South Courtyard was an under-utilised open area that also housed two lecture theatres dating from 1957.

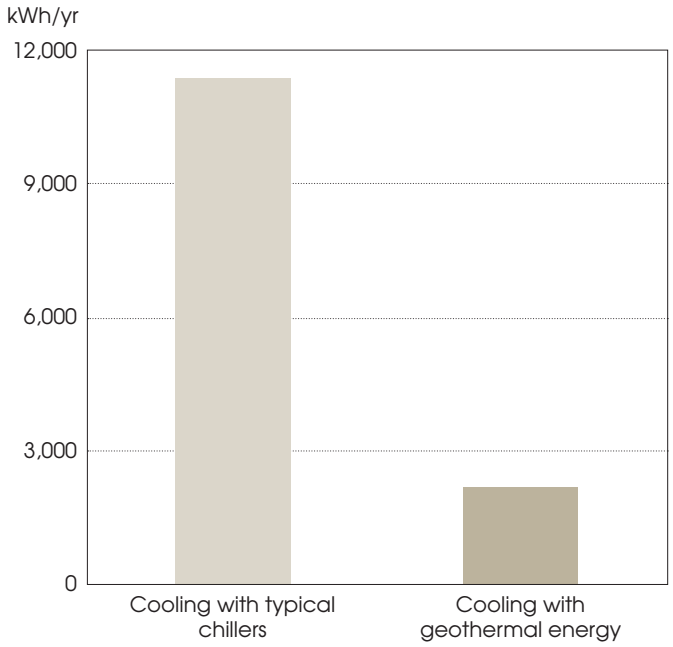
The new development rises five storeys above ground level in the former courtyard. Completed last year, the building was designed by Devereux Architects working with Downie consulting engineers. The challenge for the design team was to maintain the building's environment in a sustainable manner within the confines of an extremely restricted location. A detailed thermal building model was produced to assess the effects of the surrounding building on the new development, and vice versa. This established that significant cooling would be required to maintain comfortable conditions.

A number of primary cooling systems were considered, including traditional vapour compression refrigeration plant, but these either did not achieve the school's aspirations for sustainability or were not technically viable. 'Ground linked closed loop' systems were considered too restrictive to provide even a small percentage of the project's needs; and the limited roof space restricted the available scope for the inclusion of air source heat pumps.

With no way up and no way out, the design needed to consider an option that explored a deeper solution in the form of 'open loop heat transfer'. With a potentially abundant source of ground water at around 12C, it would be possible to cool the building efficiently using chilled beams.

Chilled beams have been in use in buildings for more than 20 years, and much is known about their reliability, very low maintenance needs, and design performance. For the refurbishment of the School, the key challenge was commissioning them in a way that would meet the client and architect's aspirations for a clean, efficient, modern, minimal aesthetic.

To achieve the required design capacity, active chilled beams (forced air movement) were employed with a catalogue design output of 140-160 W/sq m cooling output, depending on which technical data is used: most technical data relates to ideal installation scenarios and is usually produced in near-laboratory conditions. Passive units (using natural convection) will achieve up to 100 W/sq m and, if fully exposed to the space, approximately 80% convective cooling and 20% radiant cooling, as opposed to an active unit which is mainly convective. Active chilled beams will operate at an air pressure of up to 200 Pa; operating more than two units in series is not a good option due to high cumulative



Geothermal	kWh/year	$kgCO_2$/year
Cooling with typical chillers	11,350	4,800
Cooling with geothermal energy	2,200	900
Energy and CO_2 reduction	-9,150	-3,900
CO_2 reduction over baseline		-6.7%

Chilled beam comparison between open loop geothermal generator (8.9 kWe/kWth) and air cooled chiller (2.5kWe/kWth)

(Part L compliance calculations in accordance with the National Calculation Methodology, and using dynamic simulation with accredited software, IESve V6.0.2)

The 950 sq m area served by the chilled beams was modelled using commercial accredited software. When considering the yearly operational benefits of a chilled beam connected to an open loop geothermal system, compared with a chilled beam connected to a traditional air-cooled chiller with a seasonal efficiency of 2.5, the expectation for this system is clear – as shown here.

> The geothermal cooling system is 'demand-led' being controlled directly by measured occupancy levels

air pressure drop and the potential for noise due to higher air velocities in beams closest to the main distribution.

The planning required for incorporating chilled beams into a building design should not be underestimated, particularly when, as in this case, they are being used in conjunction with an exposed soffit; interconnecting pipework and ductwork are fully exposed and the units themselves will shield some of the beneficial thermal mass from the occupants below. Additionally the height – usually a minimum of 2.7 metres from the floor – and the relationship to occupants needs consideration in terms of maintaining appropriate comfort, and, of reducing the potential for close exposure to low temperatures above occupants heads.

Relative to a distributed system such as fan coils, the maintenance of a chilled beam system is less as it has fewer filters. However, water flow rates are usually low, which can result in dirt particles gravitating out and depositing in water coils, so the use of filters or particle separation with appropriate maintenance and flushing is essential.

Chilled beams can typically operate at a chilled water flow temperature of 15C, which in itself can achieve significant energy savings over a traditional system that requires refrigeration to supply water temperatures below 10C; but when connected to the open loop geothermal system, with a generator efficiency of 8.9 kWe/kWth, the benefits in terms of reduced CO2 emissions have been modelled as significant.

The geothermal cooling system is 'demand-led' being controlled directly by measured occupancy levels. The floor templates are zoned into 14 occupied areas, six of which are cellularised offices and the remaining eight are open-plan spaces. Each zone is capable of independently controlling temperature and air flow through variable volume dampers and a two port valve cassette system. Occupant sensing is achieved through passive infra red sensors located throughout floor templates, which monitor occupancy levels and report, via a building management system, to variable volume secondary pumps. These react by increasing or reducing air and water volumes as required – thus optimising the energy consumed by the pump.

Photovoltaic cells incorporated into glazed modules act as solar shades to minimize solar gain to the building whilst generating electricity. Each module was specifically designed to create a glazed atrium forming the roof, spanning the existing and new building.

The technology was completed in 2010 as part of the two-year refurbishment project, and is in the process of having the monitoring system re-commissioned. Some initial test data is available, but further system commissioning is currently in process and further data will be made available during the operational period of the building. **CJ**

● **PAUL DOWNIE** is founder of Downie Consulting Engineers **www.downieconsult.com**

KX6 VRF... applied

Curve Theatre, Leicester

Two auditoria with 1,200 seats, studios, rehearsal suites, dressing rooms and dining facilities all climate controlled simply, effectively, efficiently.

Ford Showroom, Swindon

600m² showroom, offices, meeting rooms and a 900m² service centre and canteen in need of cooling, but little plant space. Solution; KX6 micro single fan outdoor units.

Icon Hotel, Luton

43 guest bedrooms, reception, bars, restaurants and fitness suite zones simultaneously receive heating or cooling as required, with simplified guest controls for ultimate comfort.

ecoolution

amp air conditioning limited
Tel: 01707 378670 Fax: 01707 378699, sales@ampair.co.uk, www.ampair.co.uk

HRP Limited
Tel: 01359 270888 Fax: 01359 271132, headoffice@hrpltd.co.uk, www.hrponline.co.uk

3D Air Sales
Tel: 01753 495720 Fax: 01753 495721, sales@3dair.co.uk, www.3dair.co.uk
Scotland Tel: 0141 777 5007, Ireland Tel: 00 353 (0) 1463 8604

MITSUBISHI HEAVY INDUSTRIES, LTD.
AIR CONDITIONING

MARLEY
Plumbing & Drainage Solutions

Aura TOUCH infra-red flush actuation plate

Linnum floor drainage with 'Azure Blue' glass cover

Aura TOUCH infra-red flush actuation plate with WC cistern and frame

Who says beauty is only skin deep

Linnum floor drainage with 'Elegance' grid

With over 40 years experience in the manufacture and design of sanitary pipework systems, Marley is extending its solutions offer with a range of sanitary systems.

Hidden behind a wall or under the floor, confidence in performance is vital. Marley introduce a new range of concealed cisterns, sanitary frames and shower drainage from Europe, the performance of which has been proven over time. Aesthetics have not been ignored, with an extensive range of flush actuation plates, including real wood and glass options and a selection of design styles for shower channel grids and covers.

Innovation & Expertise

FIND OUT MORE

marley.co.uk

BEEF/Shutterstock.com

Keeping corrosion at bay

Cleaning pipework at the pre-commissioning stage in new projects is becoming increasingly important to prevent contamination. Below, **Reginald Brown** explains the risks and offers a guide to good practice. On page 58 we look at pipework materials

The trend toward variable speed pump and two port control of heating and chilled water systems saves pumping energy. But low flow velocity also increases the risk of corrosion and microbiological problems, if water quality is not carefully managed throughout the life of the system, particularly during construction and commissioning.

Low and intermittent flow can allow sedimentation of suspended solids and increases the opportunity for biofilm to colonise the surface of the pipe. Trapped air may not be moved to vent points. The combination of solids, biofilm and oxygen is a recipe for rapid corrosion. And, unless the building management system is programmed to allow periodic circulation

Minimisation of risk starts with ensuring the system is installed as cleanly as possible

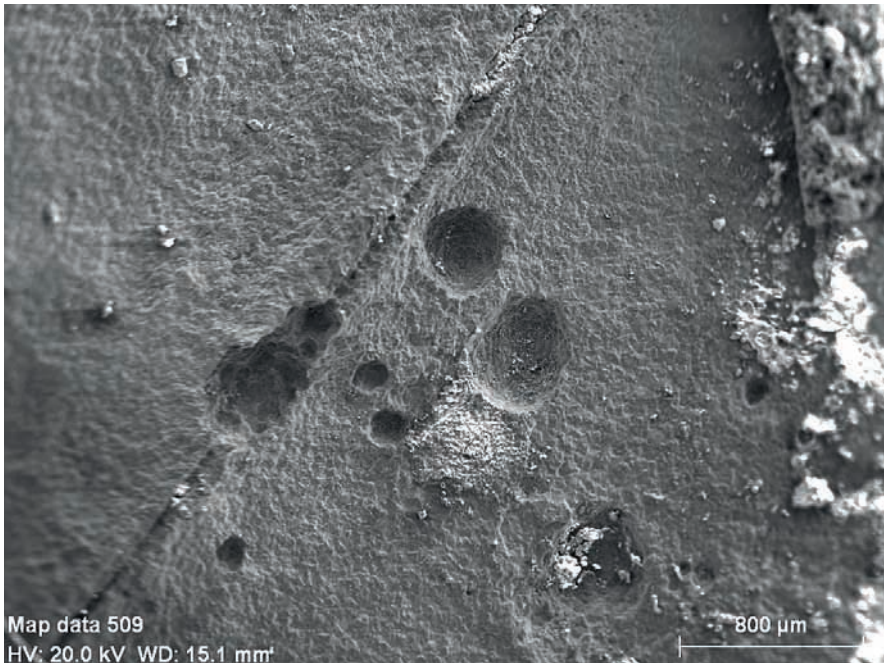
> It is no longer sufficient to assume that serious contamination of the system can be corrected at pre-commission cleaning

of water under no load conditions, water treatment chemicals may not reach vulnerable areas of the heating system in the summer period or vulnerable areas of the chilled water system pipework in the winter period.

Minimisation of risk starts with ensuring that the system is installed as cleanly as possible and continues through the pressure testing, pre-commission cleaning and commissioning phases to practical completion and handover into normal operation.

It is no longer sufficient to assume that serious contamination of the system can be corrected at pre-commission cleaning; or that the inhibitors and biocides added after pre-commission cleaning will still be present in sufficient concentration at practical completion. Partial draining and refilling the system for remedial works can allow levels of treatment chemicals to fall below their effective concentration, while bacteriological action can remove nitrite, a common inhibitor, within days. Once the chemical protection is compromised, particularly with high dissolved oxygen levels due to the addition of fresh water, then corrosion will follow.

Modern materials can also aggravate the



Three examples of corrosion caused by water-quality problems. Top: Corrosion debris in half inch carbon steel pipe. Left: Crevice corrosion leading to perforation of a radiator. Right: Electron micrograph of seam weld pitting in carbon steel pipe. (Source: BSRIA/Reginald Brown)

problem. Traditional mild steel pipework is susceptible to oxygen corrosion, but thick enough to tolerate a short period of attack, during which dissolved oxygen is gradually depleted from the system water. Oxygen corrosion then more or less stops. Thin wall carbon steel pipe is less forgiving and can suffer from rapid oxygen pitting corrosion if conditions are not carefully managed.

Once pitting is initiated it is likely to carry on, even if problems with water quality are subsequently remedied. Plastic piping does not itself corrode, but in a system that is largely constructed of non-corrodible materials, oxygen levels will tend to remain higher for longer, and those materials present that are vulnerable to corrosion will be even more at risk.

Steel radiators on plastic pipe distribution systems in large buildings seem to be a recurring problem, sometimes with perforation less than 12 months after handover. The same problems rarely occur on single house systems as the period between system filling and initial operation of the boiler is much shorter (hours or days rather than weeks or months) and the applied heat from early operation of the boiler will remove much of the dissolved oxygen from the system water.

> Once pitting is initiated it is likely to carry on, even if problems with water quality are subsequently remedied

The main factors to reduce the risk of corrosion in large projects are:

- Ensure clean standards of construction and good quality fill water;
- Minimise the length of time when the system is unprotected, particularly the period between system filling/pressure testing and pre-commission cleaning;
- Ensure that treated water can be routinely circulated throughout the system as soon as possible in the commissioning period; and
- Regularly monitor water quality to ensure optimum concentration of inhibitors and pick up any developing problems, not just at the system pumps but also at the end of the system.

This wider perspective of risk reduction

High-Performance Green Buildings

Find out What's new in Hevacomp

Image courtesy Hamilton Associates

Image courtesy HKR Arhitects

Image courtesy Foster+Partners

Software for Building Energy Design, Analysis and Simulation

Successfully creating high-performance buildings demands the accurate prediction of energy consumption, CO_2 emissions, operating costs, and occupant comfort.

Bentley's comprehensive suite of industry-leading energy design, simulation and analysis applications, including **Bentley Hevacomp** and **Bentley Tas,** provides today's professionals with these capabilities and more, facilitating the productive delivery of sustainable 'green' buildings.

These applications are used by leading firms worldwide to effectively simulate and analyze building energy performance – optimizing the balance of function, comfort, and energy and carbon impact and helping building teams sustain our environment.

www.bentley.com/CIBSE

Already a Hevacomp user? Improve your productivity with Training:

www.bentley.com/UK-Green-Training

Special Offers!

For more information:

0808 101 9247 (UK only)

+353 1 436 4600 (Europe)

Press 1 for energy modelling and building services software

1-800-BENTLEY (US)

Bentley® Sustaining Infrastructure

is recognised in the new BSRIA guide for pre-commission cleaning (BG29/2011), which details the recommended level of monitoring and provides guidelines for water quality during each stage of construction, starting with analysis of the fill water. The system is then periodically monitored between pressure testing and pre-commission cleaning, and more frequently through the commissioning period to practical completion. Cleaning and water treatment specialists should be able to correct any imbalance in water treatment, whether due to site activity or unexpected microbiological action, as soon as it occurs.

The BSRIA guide will be backed up by a new British Standard (BS8552, currently being drafted), which details how, where and when system water samples should be taken for closed water systems in buildings and how they should be analysed.

This is intended to improve the level of agreement between results for samples collected by different parties and analysed by different laboratories, and ensure that guidelines can be applied in a consistent manner. **CJ**

● **REGINALD BROWN** is head of energy and environment at building services research body BSRIA. **www.bsria.co.uk**

Metal guru

Ductile iron is best for water and sewer pipe applications, argues manufacturer **David Smoker**

Polyethylene (PE) is often perceived as the modern alternative to ductile iron because it can't 'overcome' the perceived problems of iron pipes. There is a commonly-held view that welded polyethylene pipelines are less prone to leaks than jointed systems such as ductile iron. Butt fusion, properly undertaken, delivers leak-free joints, however, the same cannot be said of electrofusion jointing, whose failure and leakage issues are well-documented.

The high performance of ductile iron was confirmed in a recent report published by UK Water Industry Research, which stated that, on trunk mains, ductile iron needed only 30 repairs per 10,000 km annually, compared with 68 for polyethylene. The report continued that there were 'higher repair frequencies observed on plastic mains than on ferrous or concrete mains'. This conclusion is consistent with other European studies.

Polyethylene pipe is frequently supplied on 'easy-to-use' coils, particularly in smaller diameters, ideal for slip lining and similar applications. Apart from the safety issues associated with unstrapping coils, for open-cut installation the fact that the pipe has been coiled means it may have to be held in place in the trench, while its ovality makes it harder to weld or joint. Ductile iron pipes, being semi-rigid, can be reliably positioned. This 'installability' is key, with the emphasis in the UK now very much on open-cut pipe laying rather than slip lining.

> This flexibility, coupled with the phenomenon of visco-elastic creep, requires far more stringent engineering design

The flexibility of PE is often touted as one of its great merits. However, this flexibility, coupled with the phenomenon of visco-elastic creep, requires far more stringent engineering design. For example, how many pipeline engineers fully understand Poisson's ratio and its role in producing extremely high end loads in medium and large diameter welded PE systems? With ductile iron, since its diameter does not expand significantly under pressure (and with a lower Poisson's ratio) the resultant longitudinal stresses are easily accommodated by the variety of restrained joint systems developed by the major ductile iron manufacturers.

Ductile iron's inherent strength makes it less reliant on backfilling, unlike flexible polyethylene systems, which require aggregate to achieve the necessary compaction to resist side stresses. Installation standards also require flexible pipes to use a wider trench than ductile iron pipes of the same external diameter. Coupled with the potential to 'downsize' – the internal diameter of a ductile iron pipe is often equivalent to that of a larger external diameter PE pipe – this means that installation and environmental benefits can be maximised.

Ductile iron wins the sustainability debate hands down. The process to extract and convert crude oil into polyethylene pipes is highly energy-intensive and depletes a valuable natural resource. However, ductile iron is manufactured from 97% recycled material (scrap), which is fully recyclable and has a residual value at the end of its life. While polyethylene systems may claim recyclability, thermoplastic products degrade each time they are processed, meaning they can only be made into low-grade products. Meanwhile, the propensity of polyethylene to retain chemicals in the pipe wall mean it cannot be remanufactured into water pipes.

Where short-term cost is the major consideration and risks from system failure are negligible, polyethylene systems will be more frequently specified. However, the criticality of the pipeline, along with the direct and indirect costs in the event of failure, must be part of any pipeline material decision.

In terms of a cost-in-use analysis, ease of installation, longevity, and inherent performance benefits, ductile iron is a highly sustainable option.

● **DR DAVID SMOKER** is the business development director, Saint-Gobain PAM UK

Goodbye Kettle.

Farewell Bottled Water.

Hello Aquatap.

HEATRAE SADIA INVITE YOU TO THE LAUNCH OF THE AQUATAP

Drinks and canapés will be provided at this open evening between 4pm-7pm on Wednesday 30th November at The Building Centre, 26 Store Street, London WC1E 7BT.

Call 01603 420220 to register your place.

HEATRAE SADIA
Aquatap

The safer, more-efficient solution to instant boiling, ambient and chilled water

Professional development

The *CIBSE Journal* CPD Programme

Members of the Chartered Institution of Building Services Engineers (CIBSE) and other professional bodies are required to maintain their professional competence throughout their careers.

Continuing professional development (CPD) means the systematic maintenance, improvement and broadening of your knowledge and skills, and is therefore a long-term commitment to enhancing your competence. CPD is a requirement of both CIBSE and the Register of the Engineering Council (UK).

CIBSE Journal is pleased to offer this module in its CPD programme. The programme is free and can be used by any reader. This module will help you to meet CIBSE's requirement for CPD. It will equally assist members of other institutions, who should record CPD activities in accordance with their institution's guidance.

Simply study the module and complete the questionnaire on the final page, following the instructions for its submission. Modules will be available online at **www.cibsejournal.com/cpd** while the information they contain remains current.

You can also complete the questionnaire online, and receive your results by return email.

Matching the fan to the ventilation system

The flow of air and water in ducts and pipes have been explored over the last few CPD articles and the methods of duct sizing were introduced in October's CPD.This article considers how the fan provides the appropriate pressure and flow rate to satisfy the demand of the ventilation system.

The function of the fan is to move the required air flow rate through the system, and to overcome the total pressure loss (the sum of the static pressure losses through the duct system plus the discharge velocity pressure). So when selecting a fan it should be chosen on that same basis – a design flow rate and a total pressure.

The characteristics of a fan are normally obtained from a manufacturer and these would have been based on standard tests measuring the output of a fan – volume flow rate and pressure – for a range of conditions. This is shown (in concept) in Figure 1, ranging from the flow being fully closed off when the air path is completely open – all this at a constant fan speed. At the same time, the power input to the fan (not the motor) is recorded (using mechanical or electrical means).

The fan total pressure is made up from the fan velocity pressure – the kinetic energy at the fan outlet (given by $0.5\,\rho\,c^2$) – and the fan static pressure. The static pressure is wholly available to overcome the pressure drop in the attached ductwork, whereas the availability of the velocity pressure will depend on the velocity at the outlet – if the outlet is the same size as the fan outlet area, then all of this velocity pressure will be lost when the air leaves the system. However a lower final outlet velocity (for example through a diffuser) will allow some of this velocity pressure to be 'usefully' employed. Some manufacturers are not clear in catalogue data for their fans, whether the fan characteristics represent total or simply static pressure. The data will reflect ideal test conditions – such as that given in BS5801:2008[i]. These perfect conditions are unlikely to be matched in practical installations where the challenges of fitting fans into systems introduce bends or other obstructions near the fan inlet or outlet – these will reduce the fan's performance.

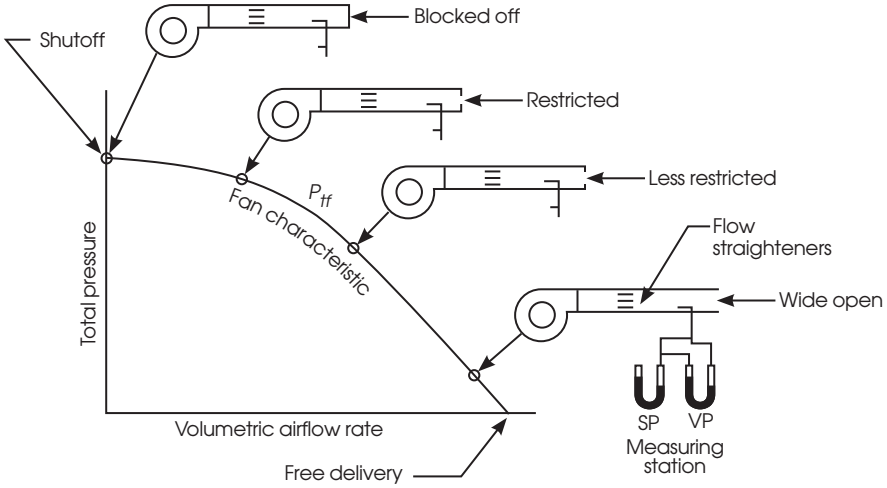


Figure 1 – The creation of a fan curve (after ASHRAE HVAC Handbook 2008)

Using the test data, a complete set of fan characteristic curves may be produced as illustrated in Figure 3. This includes the fan efficiency curve that has been produced

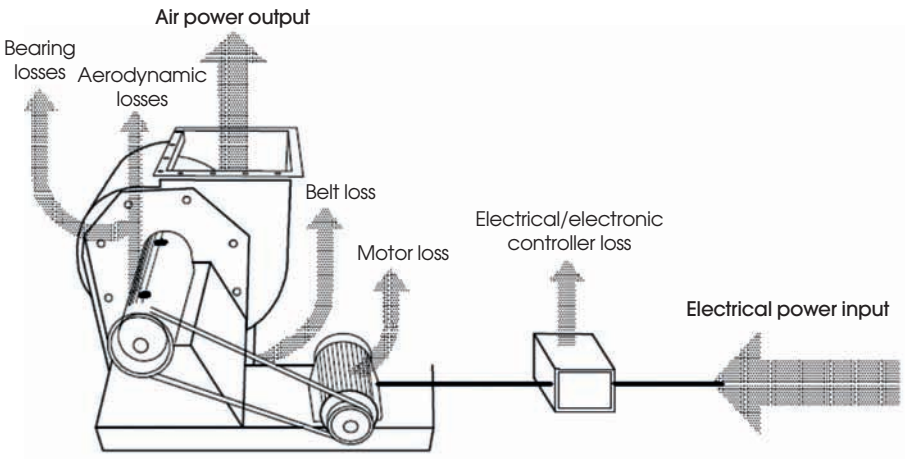


Figure 2 – Losses from the whole fan subsystem (after BS 5801:2008)

by dividing air power (pressure, Pa x volume flowrate, m^3/s) by the shaft input power. The actual shape of the curves will depend on the type of fan (and the shape of this example is typical of a 'backward curved centrifugal' fan). The manufacturer will often identify a 'selection range' that is recommended for the fan. This is shown as the yellow highlight in Figure 3.

The fan efficiency varies across the operational range of the fan. The losses will be due to friction in the fan case; turbulence and 'shock' losses; losses in bearings and seals; and leakage and short-circuiting. The total losses (including the whole subsystem from electrical power compared to the air power being supplied) will be somewhat greater than those indicated on the fan curves due to external losses, as illustrated in Figure 2 for an example fan.

The fan meets the system

As discussed in recent CPD articles, if the volume flow rate in the ductwork is varied the pressure loss will be related to the square of the volume flow rate. This may be simplified to $\Delta p = RQ^2$ where Δp is the system pressure drop (Pa), Q is the volume flow (m^3/s) and R is a constant for the system relating to its resistance to air flow (the term resistance, should not be confused with system pressure drop).

Using a calculated pressure drop at any particular flow rate, the value of R may be determined and then a curve drawn for a range of volume flow rates against pressure drop, as in the system curve in Figure 4.

This figure has also had the fan curve from Figure 3 superimposed – the fan curve being a series of points at which the fan can operate at a constant speed. Likewise, a system curve is the series of points at which the system can operate. The operating point for the fan-system combination is where these two curves intersect, and this provides the flow rate for this particular fan running at a particular speed with this system. In this case the efficiency also appears to be almost at a maximum so the fan will be operating at its most effective.

However, of course, this is not the required design flow rate (shown in green) – the fan, running at this speed, will deliver more air though the system than is required. Also the practicality of real system operation must not be forgotten. Although the system curve has been established from design calculations, the installed system is bound to differ from this due to installation vagaries and uncertainties in the design data. Also, while in use there will be continuous changes in the pressure profiles, both in the system and the building, so when considering the operating point, thought must be given to the potential range of conditions and the effect they may have on the fan output. The extremes of operation can be particularly significant when considering variable air volume (VAV) systems.

The temperature of the air passing across a fan will affect the mass flow rate of the air. For example, if a fan is simply passing fresh air through a system, then as the external temperature increases the air density will reduce and hence the mass flow rate of air will also reduce. This is shown in Figure 5 – note how the volume flow rate will remain constant.

A family of fan curves

The performance of fans is determined by a number of relationships (known 'fan laws') that can be derived to examine what will affect a fan's operation. In the ranges that would be expected in building services applications:

Q is proportional to $D^3 N$
p is proportional to $D^2 N^2 \rho$
Power is proportional to $D^5 N^3 \rho$
Where D = fan impeller diameter,
ρ = density of air and N = speed of fan rotation

So the flow rate will alter with the cube of the impeller diameter, (and the pressure with the square of the diameter), so a change in a fan diameter will make a disproportionate alteration to the volume flow (compared with the swept area of the fan impeller). And the power (being the product of pressure and volume flow rate) will increase to the fifth order of the diameter, so a small change in fan diameter can produce a large increase in fan power and a consequent increase in motor power and supply electrical power.

The fan's diameter, D, and the air density, ρ, are normally assumed to be constant when considering a specific fan and system combination, and so the three relationships are conveniently simplified to $Q \propto N$, $p \propto N^2$, and Power $\propto N^3$. So, for example, a 10% increase in fan speed means a 10% increase in air volume flow rate, a 21% increase in pressure and a 33% increase in power consumption.

And using these relationships families of fan curves can be drawn for operating the fan at different speeds as in Figure 6 – each of the fan speeds has its own operating point with the system but, in this case, only the low fan speed provides the required flow rate for this example.

Varying the flow

The flow can also be altered (reduced) on the system side by adding restrictions (such as dampers) or by altering the way that air is fed into the fan using 'guide vanes' or 'throttling discs'. Although these may be a capitally cheap option, and appropriate for infrequently used systems or for those where only minor regulation is required, their use for significant alterations to the operating point should be carefully considered as they are likely to severely reduce the potential savings available from the reduction of air volume flow rates. Multiple speed electrical motors can be used to provide efficient 'step changes' in fan output – this is where there are separate windings within a single motor that can be used to alter the speed to meet specific load requirements (for example, in a cooking area where there are quite different air supply requirements when preparing food, compared to when

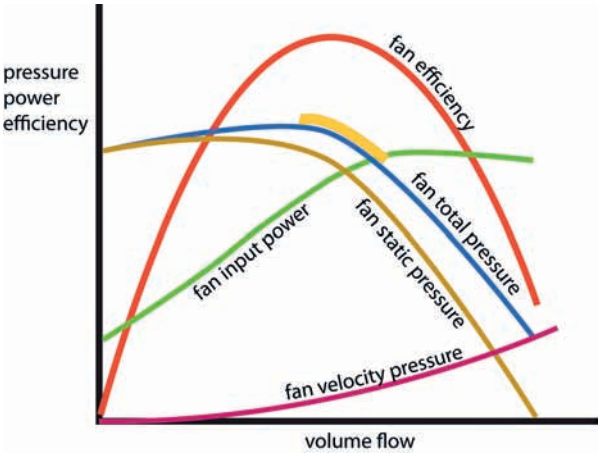


Figure 3 - Full set of fan characteristic curves

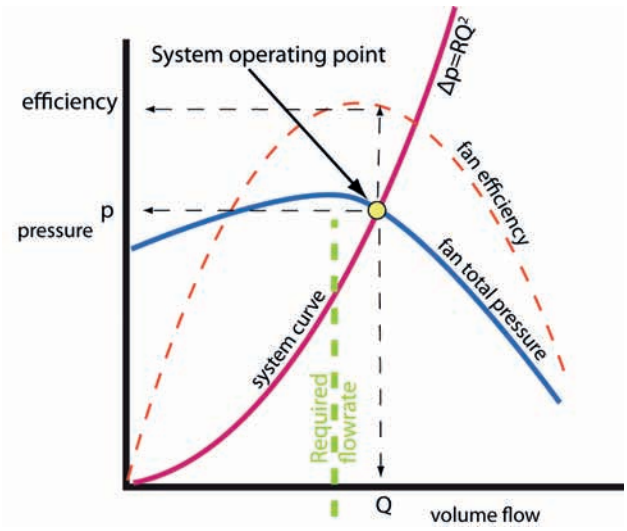


Figure 4 - System and fan operating point

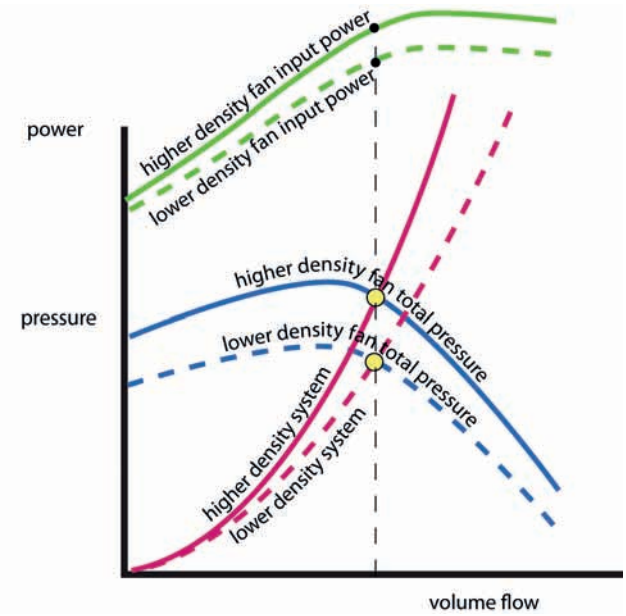


Figure 5 – The effect of varying air density of fan and system operation

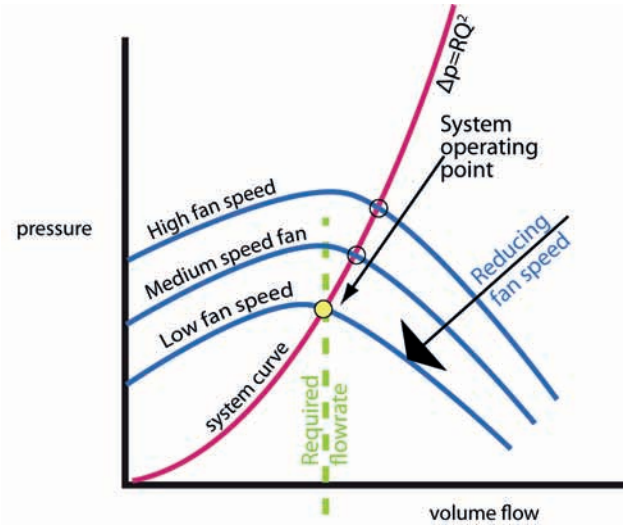


Figure 6 – Variable speed fan providing operating point at required flowrate

cooking is taking place). So aside from altering the mechanisms or the physical size (or possibly geometry) of the fan, the increasingly adopted option is to alter the fan rotational speed. This would have traditionally been undertaken through mechanical devices such as hydraulic clutches, fluid couplings, and adjustable belts and pulley. (Altering pulley sizes on indirectly driven fans is still routinely used as an efficient way of setting a fan's installed speed.) Electrical devices have also been used, such as eddy current clutches (where the torque passed from the motor drive to the fan is varied) and wound rotor motor controllers (where motor voltage or resistance is altered). More recently variable frequency drives, VFDs (often known as 'inverters'), have become a cheaper alternative.

VFDs vary the effective supply frequency to the AC fan motor giving speed reductions down to 20%. The power conversion efficiency of such drives is typically above 96%, although the imperfect output waveform created by the electronics (ie not perfectly sinusoidal) may reduce peak motor efficiency by 1 or 2%. Motor efficiency may itself reduce significantly at speeds below 75%[ii].

When the fan speed is reduced, the curves for fan performance and power both move downwards and to the left. Since the fan efficiency curve shifts to the left as the speed is reduced, the fan can still maintain high efficiencies (as in Figure 4) even at lower output.

Since the principal element of noise from a fan outlet is due to its aerodynamics, reducing the fan speed will mean that the noise emitted by the fan is also likely to reduce. This will then lessen the adverse effects of the ventilation system on occupants and may also reduce the need for sound attenuation. (Note that when comparing two different fans, a slower fan will not necessarily be quieter – the octave band sound power levels of the individual fans at the design flow rate and pressure must be used to compare the noise).

The fans

There are two principal types of fans used in building services engineering for ducted systems – centrifugal and axial. A future CPD article will consider the details, variants and application of these fans and reflect on how installation will affect performance.

For further reading in this area the CIBSE Fan application guide (*CIBSE TM42: 2006*) provides extensive detail on fan types and their application. A book that is currently out of print but particularly useful is *Woods Practical Guide to Fan Engineering*. It is still widely available as a second-hand purchase. *ASHRAE HVAC Handbook 2008* Chapter 20 also provides core material.

Module 34

November 2011

1. If air at 20C left a room supply diffuser at 4 m/s what would be the total pressure required from the fan if the static pressure loss in the system was 112Pa?

- ☐ A 10Pa
- ☐ B 102Pa
- ☐ C 112Pa
- ☐ D 116Pa
- ☐ E 122Pa

2. Which of these is not taken into account in the published efficiency data for a fan?

- ☐ A Bearing loss
- ☐ B Shock loss
- ☐ C Turbulence loss
- ☐ D Motor loss
- ☐ E Casing air friction loss

3. If a system has a calculated pressure loss of 160Pa at an air flow rate of 2m³/s what is the pressure drop likely to be at an air flow rate of 2.5m³/s?

- ☐ A 160Pa
- ☐ B 180Pa
- ☐ C 200Pa
- ☐ D 225Pa
- ☐ E 250Pa

4. If the speed of a fan is increased from 750 revolutions per minute to 900 revolutions per minute, how much is the air volume flow rate likely to rise?

- ☐ A 5%
- ☐ B 10%
- ☐ C 20%
- ☐ D 56%
- ☐ E 95%

5. What can be expected as a power conversion efficiency of an electronic VFD?

- ☐ A 2%
- ☐ B 20%
- ☐ C 75%
- ☐ D 96%
- ☐ E 100%

Name (please print) .....

Job title .....

Organisation .....

Address .....

.....

.....

Postcode .....

Email .....

Are you a member of:

☐ CIBSE

If so, please state your membership number

(if available) .....

☐ Other institution

(please state) .....

To help us develop future CPD modules, please indicate your primary job activity:

- ☐ Building services engineer
- ☐ Mechanical engineer
- ☐ Electrical engineer
- ☐ Commissioning engineer
- ☐ Energy manager
- ☐ Facilities manager
- ☐ Other (please give details) .....

By entering your details above, you agree that CIBSE may contact you from time to time with information about CPD and other training or professional development programmes, and about membership of CIBSE if you are not currently a member.

Please go to **www.cibsejournal.com/cpd** to complete this questionnaire online. You will receive notification by email of successful completion, which can then be used to validate your CPD records in accordance with your institution's guidance.

Alternatively, you can fill in this page and post it to:
E Palmer, CIBSE, 222 Balham High Road, London, SW12 9BS

Telephone: 020 7324 2763 **Email:** jatinder.pal@redactive.co.uk

Elta Fans supplies ventilation fans for the A3 Hindhead Tunnel

Elta Fans has supplied specialist fans for the road tunnel being built as part of a new bypass on the A3 in Surrey. The road is the major highway between London and Portsmouth, previously climbing around the side of the Devil's Punch Bowl, the large natural amphitheatre and beauty spot. It is a Site of Special Scientific Interest and designated a part of a Special Protection Area. The new tunnel, which is 1.2 miles long, is the longest non-estuarial tunnel in the United Kingdom.

● **For more information call 01384 275800 or visit www.eltafans.com**

Grundfos 'hits' one million

Today there is an increasing reliance on cyber space as a vital communication tool, so it is important that companies review their websites to ensure they are continuing to meet the expectations of their audiences. With this in mind, and following extensive research and many hours of development, Grundfos Pumps has launched a new-look website in 2010. This hub has proved its popularity by receiving one million visits in less than a year.

● **For more information call 01525 850000 or visit uk.grundfos.com**

New rainwater outlets from Blucher

An all-new range of stainless steel rainwater outlets have been launched by the world's leading stainless steel drainage supplier, Blucher. The new outlets are suitable for gravity and siphonic applications and can be installed with virtually any type of flat roof. The new rainwater outlets from Blucher conform to BS-EN 1253 and boast a flow rate of up to 9 l/s for the gravity system, and as high as 18 l/s for the siphonic system.

● **For more information call 01937 83800**

Gaia Climate Solutions expands its underfloor heating offering

Focusing on providing a comprehensive range of high-quality underfloor heating (UFH) systems, Gaia Climate Solutions (formerly DEVI Electroheat) now designs, supplies and installs hydronic UFH, as well as the electric alternative. The hydronic, ultra-efficient wet, UFH system is suitable for a wide range of applications, and provides high comfort levels by circulating water at low temperatures through a series of pipe loops laid within a screed, or between timber joists, beneath the floor surface.

● **For more information call 0845 434 9488 or visit www.gaiacs.com**

Aesthetic appeal for specifiers at Hartpury College with Marco

Marco, the UK's largest manufacturer of steel wire cable tray and a uPVC cable management company, has made the grade at Gloucestershire-based Hartpury College with its Elite range. More than 200 metres of Marco's Elite 3 trunking has been installed, alongside a range of accessories at a new learning facility. The college, specialising in equine care, animal science, agricultural and land management and sports science, has recently opened a state-of-the-art learning resource centre for agricultural and land students at its Home Farm estate.

● **For more information visit www.marcocableman.co.uk**

Powerstar cuts Whitbread's hotel and restaurant energy consumption

Rotherham-based EMSc is pleased to announce it has successfully installed 25 of the company's market leading voltage optimisation products, Powerstar, for the UK's leading hospitality company, Whitbread. The products have been installed in a number of different Whitbread hotels and restaurants across the country. The locations were chosen for their different energy consumption and profiles. EMS worked closely with Whitbread, not only to understand the company's energy and carbon reduction strategy, but also the specific requirements of each individual location.

● **For more information call 01709 836 200 or visit www.powerstar.co.uk**

Telephone: 020 7324 2763 **Email:** jatinder.pal@redactive.co.uk

Mellow Light V by Zumtobel sets the bench mark at Henrietta House

Zumtobel's Mellow Light V was the only luminaire to meet performance, energy-saving and aesthetic criteria for replacement fittings in a prestigious London office. The installation was part of the refurbishment of Henrietta House, formerly the Diageo building, to create new West End offices for commercial property firm, CB Richard Ellis. The brief was to achieve the lowest possible installed load per square metre yet delivered, and to reduce the overall number of main office luminaires to levels below that seen on previous projects.

● **For more information call 0208 589 1800 or visit www.zumtobel.co.uk**

MHS heat pumps provide food for thought at Waitrose in London

Staff and customers at the new Waitrose store, Tottenham Court Road, London, are benefiting from energy efficient cool air in the summer, and effective heating in the winter, thanks to two Aquatop® T28 reversible water-to-water heat pumps and a 2,000 litre buffer vessel, supplied by MHS Boilers, part of Elco Heating Solutions. John Lewis Property Services specified the Aquatop® heat pumps to work from reclaimed heat generated via the store's low carbon refrigeration system – the first installation of this type.

● **For more information visit www.mhsboilers.com**

VES Ecovent – lower energy with heat recovery ventilation

The new Ecovent range includes highly efficient heat recovery units, enhancing the product portfolio of VES, the market-leading heat recovery specialists. These highly adaptable units feature low energy, high efficiency fans and plate heat exchangers. The Ecovent suits all applications, offering a wide range of models for ceiling voids, plant room and external locations, with a variety of control options. The Ecovent is a standardised range in eight sizes, covering air flow volumes from 0.1m³/s to 2.5m³/s.

● **For more information visit www.ves.co.uk/heat-recovery**

Solar PV system documentation packs

Comprehensive solar inspection test report and certificate documentation packs from Seaward Solar make it easy for installers of solar PV systems to complete the necessary test reports, in compliance with the Microgeneration Certification Scheme (MCS) and IEC62446. Both MCS accreditation and the IEC62446 standard define minimum requirements for solar PV system documentation, commissioning tests and inspection. Completion of system documentation is a specific requirement for all solar panel installations to demonstrate that all key tests have been carried out.

● **For more information call 0191 586 3511 or visit www.seawardsolar.com**

Casella CEL's TUFF range gains ANZEx Intrisically Safe approval

Casella CEL's ground-breaking TUFF range of Personal Air Sampling Pumps has recently gained ANZEx Intrinsically Safe approval for use in flammable atmospheres. This means the TUFF pumps can be used in hazardous plants and production sites across Australia and New Zealand, where there is a potential risk of explosive dust or gas. This latest certification is in addition to the ATEX (EU) and IECEx (International) Intrinsically Safe approvals Casella CEL's TUFF Personal Air Sampling Pumps already hold.

● **For more information call 01234 841490 or visit www.casellameasurement.com**

Bristol school project relies on Stokvis Energy solutions for sustainability

An innovative school project constructed via the Skanska Partnership in Bristol has utilised high performance gas boilers and plate heat exchangers from Stokvis Energy Systems, as part of a sustainable and practical solution to an educational establishment's needs. The Oasis Academy John Williams – one of the 'family' of Oasis Academies across the country – has been built by Bristol City Council to replace an earlier building on adjoining land. The large plant room contains both renewable and conventional technologies.

● **For more information call 0208 783 3050 or visit www.stokvisboilers.com**

Telephone: 020 7324 2763 **Email:** jatinder.pal@redactive.co.uk

Substantial energy savings made for detached home with mini-CHP

Although best known in the commercial heating sector, Baxi-SenerTec UK combined heat and power technology has recently been employed to save energy and cut carbon emissions in a residential property in London. A Dachs mini-CHP unit generates electricity while producing heat that feeds into the central heating system, supplemented by two newly-installed condensing boilers. The property is a substantial Victorian detached house with a modern extension housing an indoor swimming pool, which makes it an ideal project for mini-CHP.

● **For more information call 0845 070 1055 or visit www.baxi-senertec.co.uk**

Thorn Lighting launches PopPack Pro fluorescent batten

Thorn Lighting, a global supplier of both outdoor and indoor luminaires and integrated controls, has announced the launch of the PopPack Pro fluorescent batten. With an innovative and patented fixing mechanism, the new diffuser is 50% quicker to install than the previous 'classic' model and installers can not only see, but also hear, how securely the diffuser clicks into place. Maintenance of the diffuser is also easier, as the batten can be removed simply by squeezing the release tabs on the fixing system.

● **For more information call 0844 855 4810 or visit www.thornlighting.co.uk/poppackpro**

Back to the future for lighting manufacturer Coughtrie International

Coughtrie International, one of the UK's leading commercial and industrial lighting manufacturers, has been in business since 1938. Many of its early light fittings are now highly sought after for both restoration projects and by those who want truly classic lighting design. To meet this demand, Coughtrie has re-introduced several of its earliest products. These timeless classics are made in the UK using the original tooling and materials.

● **For more information call 0141 882 3262 or visit www.coughtrie.com**

Ideal maximises LPG efficiency

Hot on the success of the Evomax natural gas range, Ideal Commercial is taking wall-hung LPG boilers to new levels of performance. The British-based manufacturer has launched the Evomax LPG, a boiler designed specifically for customers who are not connected to mains gas, but who still demand high-efficiency solutions to heating and hot water. Built to the same high specifications as the existing Evomax – with specialist modifications made to the gas management system – the Evomax LPG boasts exceptional performance.

● **For more information call 0870 849 8056 or visit www.idealcommercialheating.com**

Vaillant reiterates support for commissioning Benchmark scheme

Vaillant, one of Europe's leading heating technology manufacturers, has urged installers and consumers to be more aware of the importance of the completion of commissioning checks. Vaillant joined other gas boiler manufacturers in the UK to support the Benchmark member scheme at the time of its introduction on 1 January 2011.This is an initiative which requires installers to complete checks and record these via a checklist when commissioning a new heating appliance installation.

● **For more information visit www.vaillant.co.uk**

London medical centre prescribes Mitsubishi heat recovery system

An energy-saving VRF air conditioning system from Mitsubishi Heavy Industries (MHI) was prescribed to ensure high-efficiency heating and cooling for the new wing of a London medical centre. The KXR system installed at Parchmore Medical Centre uses inverter technology and surplus heat recovery to achieve an impressive CoP of up to 3.4. The centre's MHI system qualifies for the government's Enhanced Capital Allowance scheme, which offers enhanced tax relief for investment in plant and machinery.

● **For more information call 0207 842 8100 or visit www.mitsubishiaircon.co.uk**

Telephone: 020 7324 2763 **Email:** jatinder.pal@redactive.co.uk

Apex modular wiring in Olympic global broadcast

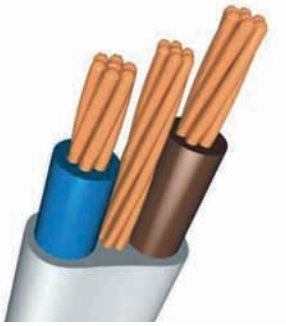
When the action begins at the 2012 Olympic Games, the world's media, using the newly built International Broadcast Centre in Stratford, East London, will be connecting their equipment to electrical power, supplied via one of the most advanced modular wiring systems in the UK. Market leader Apex Wiring Solutions has won the prestigious multi-million pound electrical wiring contract after seeing its advanced modular technology specified for delivering a reliable power supply around the 60,000 sq m facility.

● **For more information visit www.apexwiringsolutions.co.uk**

Celebrating two decades of CableCalc level P with a free version of new twin and earth calculations

To celebrate 20 years of CableCalc, Castline Systems has released a new, free version of its popular CableCalc program, which will calculate single phase radial and ring circuits wired in twin and earth cable. It even includes free technical support by email. CableCalc level P is a fully working, unlimited use version and provides far more than just simple volt drop calculations. CableCalc level P can be downloaded from **www.castlinesystems.com** free of charge.

● **For more information call 01293 871751 or visit www.castlinesystems.com**



Sirius supplies energy efficient filtration to 13 Westfield restaurants

Filtration and air management specialist, Sirius Products, has supplied 13 restaurants in the new Westfield Stratford City development with energy-saving ESP and UV filtration. The modular systems combine to eliminate up to 98% of perceptible grease, smoke and odour from kitchen extract emissions using patented technologies and high-performance materials. By improving capture efficiency and eliminating the need for non-recyclable filters, Sirius' ESP and UV filtration sends almost zero waste to landfill and significantly reduces overall energy consumption.

● **For more information call 01707 299339 or email info@siriusproducts.co.uk**

Condair MK5 from JS Humidifiers

JS Humidifiers is launching the Condair Mk5 resistive steam humidifier, offering close humidity control and maintenance costs that can be up to 65% less than electrode boiler humidifiers. Unlike electrode boiler humidifiers, which require replaceable boiling cylinders when scale builds up inside, the Condair Mk5 manages scale so that it's easy to remove and eliminates the need for expensive disposable boiling cylinders. Scale that forms on the Condair Mk5's heating elements is detached during normal operation.

● **For more information call 01903 850200 or email dmarshallgeorge@jshumidifiers.com**

Rinnai water heaters excel in light commercial settings

Rinnai's new generation of Infinity continuous flow hot-water systems are claimed to have the best energy efficiency figures in the industry, and guarantee to deliver safe, temperature controlled hot water – all day, every day. The systems are suited to commercial sites – cafés, pubs and restaurants, offices, shops and hairdressers and small industrial process applications. Design improvements by Rinnai have increased the efficiency of its hot-water appliances to world record levels, from 90% to 105% net efficiency, while decreasing gas consumption by about 16%.

● **For more information visit www.rinnaiuk.com**

Superlite range now available through Flakt Woods UK distribution partners

Fläkt Woods has announced the launch of a range of products to the UK, none of which have been readily available before. All now are offered exclusively through its nationwide group of SuperLite Partners. The range includes a revolutionary SuperLite axial fan, a choice of market leading Veloduct® sealed fittings, Iris dampers, an innovative roof fan, in addition to fire dampers, valves and domestic fans. The inclusion of duct fittings and fire dampers within the range is expected to enable the exclusive SuperLite partners to access new markets.

● **For more information call 01206 222555 or email info.uk@flaktwoods.com**

PRODUCTS & SERVICES

Telephone: 020 7324 2763 **Email:** jatinder.pal@redactive.co.uk

Classroom ventilation units

Aircraft Air Handling's 260mm-high classroom ventilation units are silenced to nr25. The plate recuperator is 60% efficient, with an air volume of 0-500 litres. Heating: LPHW/ELECTRIC. Cooling: CW/DX. Larger air volumes and bespoke units are available.

● **For more information visit www.aircraftairhandling.com**

Adding colour and sophistication to composite panel systems

Under a collaboration between Telling Architectural and Eurobond Laminates, the Argeton terracotta rainscreen system can now be applied directly onto Rainspan insulated steel faced panels. The proven Rainspan composite panel system can be clad using the Argeton terracotta tile – available in 13 natural colours, with the tiles either smooth faced, wire drag, engobe, riven or glazed. Architects and specifiers are not restricted in the aesthetic achievable for their buildings when using the fast-track construction method offered by the Rainspan composite panel system.

● **For more information call 01902 797700 or email info@telling.co.uk**

Public Health Design Software

This new public health design software will simplify the design process. It incorporates five applications in one product, involving popular topics, such as pipe sizing water supply systems, with integrated LU conversion, head loss, and industry standard tabulation, assessment of tail end hot/cold and blended water design flow (based on probability), sanitary design flow, eaves gutter-sizing, and storage capacities for harvesting systems. Priced at £95 + VAT, it is supplied as a binder, enclosing CD and user guide. The product is designed to appeal to professionals and trainees.

● **For more information visit www.phoffice.co.uk/design-software.php**

DIRECTORY

Your guide to building services suppliers

Telephone: 020 7880 6206 **Email:** cibsedirectory@redactive.co.uk

Air Conditioning

Air Handling

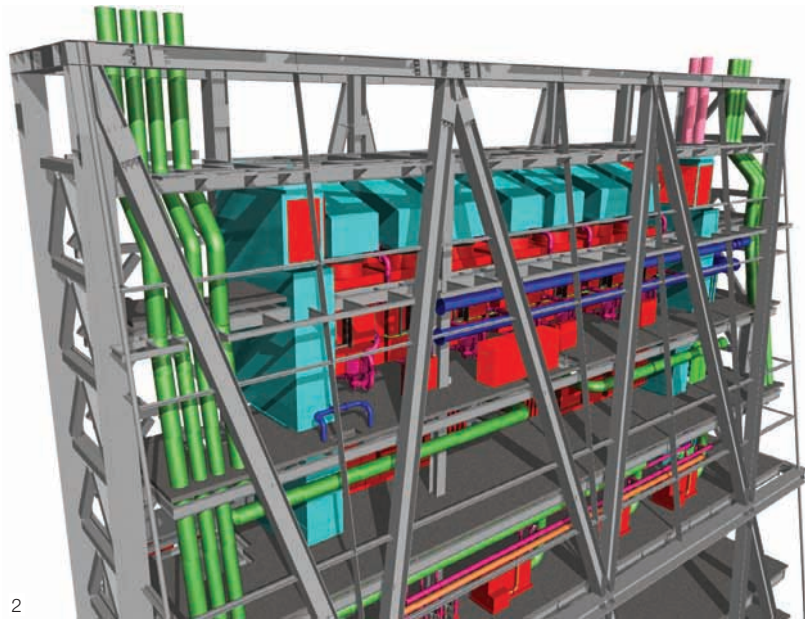
CAD Services

LST Radiators

Energy Efficiency

Pump Packages

Refurbishment



Building Services Engineers

(mechanical, electrical and public health)

Arup is a firm of engineering designers and specialists, our independence and philosophy sets us apart and is the creative and inspirational force behind many of the world's most innovative and sustainable projects.

If you have, or are about to achieve Chartered status, then this is your chance to go beyond your own discipline and embrace an integrated approach to design. By joining Building Engineering London, you will put your skills and imagination to work on all sorts of inspiring and high profile projects, sharing ideas with, and learning from, some of the most respected names in the industry.

In London we are one dedicated team bringing together 400 uniquely skilled people, closely linked to 10,000 in the wider Arup community working in 92 offices worldwide, we have projects in the UK and abroad together with opportunities for travel.

To apply, please email your updated CV quoting 'CIBSE' in the subject line to: UKMEArecruitment@arup.com. *We are committed to equal opportunities.*

We shape a better world

www.arup.com

ARUP

1 **Central St Giles**
"2011 BCO Winner Best of the Best"

2 **122 Leadenhall St**
"3D Model"

3 **The Shard**
"Tallest Building in Western Europe"

MANCHESTER 1824

The University of Manchester

www.manchester.ac.uk/jobs

Professional Services Unit

Principal Mechanical and Energy Engineer

£46,696 – £55,758 p.a. **Ref: PSS/00165**

The Professional Services Unit of the Directorate of Estates & Facilities (DOEF) contributes to the strategic management of the University buildings and provides a number of professional client-side functions including Mechanical Engineering and Energy/Utilities Management across the University Estate.

You will set, develop and monitor appropriate and acceptable standards of service in respect of mechanical engineering design and maintenance, and energy management issues across the estate. You will design, implement and maintain policies that ensure mechanical services including reactive, planned maintenance and replacement is carried out in a manner that meets legislative, statutory and safety requirements, best practice, and value for money. You will lead on the development of strategy for energy consumption reduction from mechanical engineering and associated services in the context of the University's Carbon Management Plan and Environmental Sustainability Strategy.

You will develop outline design briefs to enable the commissioning of internal and external consultants and set and maintain strict mechanical and low energy design parameters for all development and conduct or commission an ongoing programme of mechanical and energy condition surveys to assist in the development of a long-term maintenance plan.

You will manage a team of Mechanical and Energy Engineers and other technical staff and manage and control a delegated budget.

You must hold an appropriate academic qualification to degree level or equivalent in a Mechanical and Energy engineering related discipline and hold Professional Chartered Membership of the CIBSE. You will have an established track record and experience in Mechanical and Energy engineering management across a wide portfolio of building types and possess experience of managing and controlling budgets.

Application forms and further particulars are available from our website or contact +44(0) 161 275 2044 or hrrecruitment@manchester.ac.uk quoting the reference number.

Closing date: 14 November 2011.

The University of Manchester values a diverse workforce and welcomes applications from all sections of the community.

POSITIVE ABOUT DISABLED PEOPLE

Electrical Engineer

Bracknell Forest Council

£32,350 to £36,950 pa
Bracknell, Berkshire

You will have responsibility for design, management and supervision of building services projects, reactive maintenance, planned maintenance and condition surveys. You'll work well within a team, have project design and building maintenance experience, including strong technical and negotiation skills.

This varied role will enable you to be involved in the refurbishment and replacement of 3 Phase electrical systems, fire alarms and security systems as well as reactive and planned maintenance of the Council's buildings, which include schools, libraries, leisure centres and office buildings.

You'll have an HNC/HND or equivalent and a sound knowledge of health and safety legislation, especially the Construction Design and Management Regulations and Asbestos Regulations. Good use of Word, Excel and design software packages is also important.

A current driving licence and use of a car is essential.

Flexible working, flexible benefits, and, if relocating, expenses of up to £8,000 plus mortgage assistance add to our generous package.

Closing date: 7 November 2011

For further information and to apply online, please visit

https://recruitr-bracknell.jobsgopublic.com/vacancies/view/586

NO AGENCIES PLEASE

POSITIVE ABOUT DISABLED PEOPLE

BSV RECRUITMENT

Constructing Relationships
Engineering Careers

Tailored recruitment for the Construction and Engineering industry.

Mechanical Quantity Surveyor

West London | £35,000-55,000 | Ref: 12357

A major M&E services contractor, established for over 30 years, have an urgent need for a HVAC Services Quantity Surveyor. You will be experienced in measurement and settlement of the contractor side variations and final account with specific abilities to identify and measure Mechanical HVAC Building Services. This is a team based role with Regional management potential. Tasks will involve managing sub-contractor accounts, being responsible for valuations, submitting variations, measurement etc. You will be running projects from £250k to multi £m mechanical fit out.

Contact darren.warmington@bsvconsultants.co.uk

Lighting, Acoustic and Fire engineers

Central London | £35,000 | Ref: 12328

Our client is a major international engineering design consultancy, they are looking for degree qualified candidates to fill the positions of Lighting, Fire Safety and Acoustic Engineers. The ideal candidates will have worked within a multi-disciplinary design team or as a stand-alone specialist in their filed. Based in the Central London office, you will be working on some of the newest, bespoke multi £m construction projects being designed to date.

Contact darren.warmington@bsvconsultants.co.uk

For more vacancies please visit **www.bsvrecruitment.co.uk** or call today.

T +44 (0) 1483 768600 | E info@bsvrecruitment.co.uk | www.bsvrecruitment.co.uk

Events & Training

NATIONAL EVENTS AND CONFERENCES

Climate Change
02 November, Exeter
This seminar looks at the holistic, integrated approaches and policies needed to produce healthy built environments. A RIBA event.
www.architecture.com

Planning and Localism Conference
04 November, Newcastle upon Tyne
As the 'Big Society' and 'Localism' agendas emerge, this event will consider the opportunities and structures of the new system; what it means for built environment professionals and how you and your clients can stay ahead of the game.
www.architecture.com

Natural ventilation in low energy building design
09 November, Leeds
The aim of the seminar is to discuss the fundamentals of low energy buildings and how natural ventilation techniques can be used to meet the current building regulations.
www.architecture.com

CIBSE Annual Lecture
10 November, London
The 2011 Annual Lecture will be presented by Chris Wise, who will address the rhetorical question: 'I wonder what it would feel like if we did that?'
www.cibsetraining.co.uk/conferences
vwilliams@cibse.org

What future for CHP and district heating?
16 November, London
Where does CHP fit in the government's drive towards carbon reduction targets of 50% by 2025?
www.cibsetraining.co.uk/conferences

Integrated Energy 2011
22 November, London
The Combined Heat and Power Association conference will focus on how CHP can support efforts to deliver a better balance for the UK energy economy.
www.integrated-energy.co.uk

Annual Conference of the National Insulation Association 2011
01 December, Harrogate
This event is relevant for all those involved in solid wall insulation, cavity wall insulation, loft insulation and draft proofing.
www.nationalinsulationassociation.org.uk

All Hands on DEC!
08 December, London
See box, right
www.cibsetraining.co.uk

CIBSE Building Performance Awards 2012
08 February 2012, London
The CIBSE Building Performance Awards recognise, reward and celebrate the best performance, innovation and practice in buildings.
www.cibseawards.org

CIBSE ASHRAE Technical Symposium
18-19 April 2012, London
This symposium brings to the fore the latest practice and research.
www.cibse.org
vwilliams@cibse.org

SOCIETY OF LIGHT AND LIGHTING

Mid-career college: How to specify lighting – office lighting
08 November, London
This course provides the designer with essential information and techniques for office lighting referencing *LG7: Office Lighting Guide*, and also considers innovative new lighting solutions for the office workplace.
www.cibsetraining.co.uk

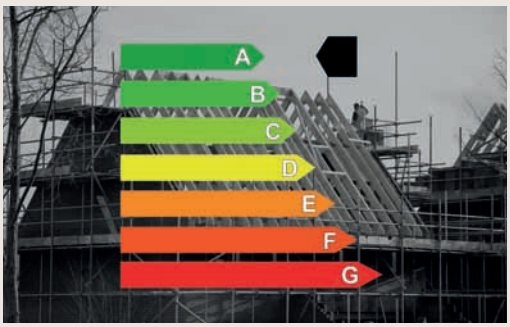
Mid-career college: How to specify lighting – lighting and energy efficiency
15 November, London
How to provide the right light in the right place at the right time, using the right lighting system.
www.cibsetraining.co.uk

SLL Masterclass: One building a minute
24 November 2011
Manchester
The theme for the Masterclass is refurbishment, picking up on the need for the lighting community to address those buildings already in the ground, which are oozing energy.
www.sll.org.uk

Follow the code?
13 December, London
This event, at the Royal Society of Arts at 6pm, will explore the new Code for Lighting and whether or not designers should be allowed to break the rules!
www.sll.org.uk

All Hands on DEC!

8 December, CIBSE – organised by the Energy Performance Group



The increasing use of Display Energy Certificates (DECs) is exposing the poor energy performance of many non-domestic buildings. The roll-out to much smaller public buildings, and possibly into the commercial sector, will bring major opportunities to improve energy efficiency.

Equally, the increasing use of Automatic Meter Reading (AMR) systems to gather and analyse data is drilling down into buildings to find where all the energy is going. This pincer movement on energy performance in the non-domestic stock will highlight good buildings but will also put a spotlight on poor performance and how we can improve operational ratings.

This conference sets out to show how DECs, monitoring and metering are highlighting good and bad performance and will demonstrate that there are a range of cost-effective solutions to improve DEC ratings. It will also discuss the current problems with DECs and AMR and their future wider implementation.

For more information visit **www.cibsetraining.co.uk**

CIBSE GROUPS AND REGIONS

Society of Facade Engineering – technical visit
15 November, London
Details to be confirmed
sfe@cibse.org

Society of Public Health Engineers presents: Adjusting long held beliefs, correcting standard practice
10 November, Bristol
This event gives an account of the pinhole investigation and then discusses how knowledge and lessons learnt can be more effectively incorporated into design codes.
www.cibse.org/sophe

Society of Public Health Engineers presents: Innovations in water treatment equipment
16 November, Manchester
Full details of each event will be advised to members of the CIBSE North West region and SoPHE members prior to each meeting.
www.cibse.org/sophe

Society of Public Health Engineers presents: Gaseous fire suppression systems
22 November, London
Presentation by TYCO.
www.cibse.org/sophe

CHP/Carbon Footprint Reduction
22 November, London
Speakers: Lars Fabricius/ Jan Henson (SAV)
www.cibse.org

CIBSE Intelligent Buildings Group seminar on intelligent cities
08 December, London
Details to be confirmed
www.cibse.org

Sunlight, health and circadian rhythms — are these design issues?
07 December, London
Speakers: Richard Hobday, Becca Hotopf, and John Mardaljevic.
www.cibse.org

CPD TRAINING

Visit **www.cibsetraining.co.uk,** call 020 8772 3660 or email **eventbookings@cibse.org**

Energy Surveys
01 November, London

2010 Building Regulations Part G Explained
02 November, London

Standby Diesel Generator
03 November, London

LCEA/EPC Training
07-08 November, Leeds

Cooling and Refrigeration
09 November, Newcastle

Energy Efficient Façade Design
10 November, London

Successful Design
15 November, Birmingham

Energy Efficient Heating
22 November, Birmingham

AC inspectors update – issues on site and reports
22 November, London

Mechanical Services Explained
23-25 November, London

Dealing with multiple building sites and improving the accuracy of your DEC
29 November, London

Send your event details to **cbailey@cibsejournal.com**

Don't let a Weak Link Affect Your Wet Systems Performance.

Benefit from state-of-the-art pressurisation, deaeration, dirt separation and chemical treatments with Spirotech's new

TOTAL SOLUTIONS

Spirotech are again leading the way in wet system conditioning by being the first supplier to offer all aspects of wet system treatments under-one-roof. We call this new offering 'Total Solutions' and it allows us to ensure that all treatments are working seamlessly and to the same high standards synonymous with the Spirotech name. Additional benefits include rapid detection of any underlying problems within a wet system, which can then be quickly resolved without supplier disputes.

A well designed wet systems should always start with pressurisation and then lead to dearation, dirt separation and chemical treatments. Proper integration of each of these stages, reduces the requirement for the next and therefore results in a cost-effective system which also delivers optimum performance.

TOTAL SOLUTIONS
in wet system conditioning

- CHEMICAL TREATMENT
- DIRT SEPARATION
- DEAERATION
- PRESSURISATION

IHEEM HVCA AFFILIATE CSA CIBSE CPD

40 years of experience
and full system knowledge

SPIROTECH
FOR BETTER PERFORMANCE

T: 0208 451 3344 | www.spirotech.co.uk | F: 0208 451 3366 | info@spirotech.co.uk

CMR in complete control

CMR Controls manufactures low air pressure and air volume measurement sensors and control systems for standard air conditioning, clean rooms, sterile laboratories, containment facilities, and fume cupboard extract systems.

DPC CONTROLLER

Fast and accurate controls to drive high speed dampers or invertors. Full PID stand alone controls with BMS interface.

DPM PRESSURE SENSOR

Panel Mount Pressure or Velocity Transducers with remote alarms, analogue and digital interfaces. Traceable calibration certificates supplied as standard.

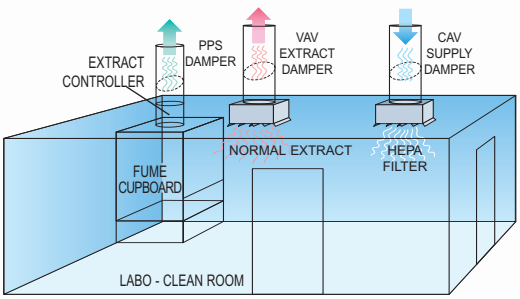
CAV AND VAV DAMPERS

Accurate air flow measurement with the unique CMR Venturi built into the airtight shut-off damper to control room pressure or constant volume.

Metal Damper

AIR MANAGEMENT SYSTEM

A complete turn-key system to control room pressure to +/-1Pa. Fume cupboard face velocity to 0.5m/s at high speed and provide constant air changes into the labo - clean room.



PPS EXTRACT DAMPER

Poly-propelene control and shut off valve incorporating the CMR Venturi Nozzle. This is essential when dealing with corrosive extract air especially from fume cupboard systems.

PPS Damper

PRECISION COMPONENTS FOR VENTILATION AND PROCESS CONTROL

CMR CONTROLS

A Division of C. M. RICHTER (EUROPE) LTD

22 Repton Court, Repton Close,
Basildon, Essex SS13 1LN. GB
Website: http://www.cmr.co.uk

Tel: +44 (0)1268 287222
Fax: +44 (0)1268 287099
E-mail: sales@cmr.co.uk

CMR®