

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

December 2012

Judgement day
Shortlist for Building
Performance
Awards revealed

Top Rankine
Blue chip firms
turn to Organic
Rankine Cycle to
generate electricity



IMPORTANT

BIOMASS: THE FACTS
EVERYTHING YOU NEED TO KNOW
ABOUT DESIGN AND SPECIFICATION

Seasonally efficient

- New DC inverter compressor for improved low-speed and part-load seasonal performance
- SCOP of up to 4.9 A++ rating and SEER of up to 6.38 A++ rating

Zone-by-zone control

- Individual control of multiple indoor units in each zone
- Adjust temperature settings according to occupancy and external environmental conditions to save on energy

Easy installation

- Compact and lightweight outdoor unit
- Reduced number of outdoor units and less pipework required

Improved comfort

- Slitless fin heat exchanger for improved heating performance
- Cold draft prevention, frost protection and low noise as standard

Eco friendly

- Compatible with existing R22 installations*
- All IVX Standard and Premium models are ErP compliant, exceeding the 2014 ErP Lot 10 standards



* restrictions apply



VRF without the price tag, Premium efficiency as standard

Compatible with a new range of highly-efficient indoor units as well as the KPI-Energy heat recovery ventilation system, IVX Premium is top of its class when it comes to energy efficiency. A new DC inverter compressor is optimised for seasonal part-load performance and reduced energy consumption at low speeds; plus the new slitless fin heat exchanger prevents surface frost forming, improving heating performance even at low temperatures. And credit where it's due, IVX Premium can even be installed using existing pipework for R22 replacements, reducing install costs as well as being substantially more energy efficient.

And with an expanded model range (5kW to 30kW), improved connectivity (up to eight indoor units per outdoor) and zone-by-zone individual control, it's a premium product, at a very affordable price.

Individual control and seasonally efficient – IVX Premium delivers.

Contents



12

NEWS

6 News

Engineers urged to abandon silos; EC moves to reduce gas in refrigeration equipment; UK energy levels 'inadequate'

10 CIBSE News

Young Lighter of the Year winner; situations vacant on Board and Council

12 Judgement day

CIBSE Building Performance Awards 2013 shortlist revealed

OPINION

16 Letters

Call to the professionals; bringing 3D into the real world; passive, renewables or both?

17 On the fifth day of Christmas...

Energy use over Christmas can amount to 4% of an office's annual energy bill

18 Gas can keep the lights on

But a long-term energy strategy will be no consolation if our lights go out before we get there

20 Using data and jumpers

Persuading building occupiers to use energy sensibly

21 Part L: should we be worried?

There has been silence on the plans to revise the Building Regulations

Features

22 COVER FEATURE

Burning issues

Biomass boilers will be key to thousands of projects meeting carbon targets, so it's essential they are designed and installed correctly

30 Director's cut

Irish broadcaster RTÉ overhauls the energy strategy used for its Television Centre, which focuses on a chilled water system

36 Top Rankine

The organic Rankine Cycle might sound like it's straight out of *Dr Who*, but in fact it is used in the latest breed of renewable energy schemes

42 Rules of engagement

Energy performance contracts are set to leverage millions of pounds of funding for retrofit projects, so a proper framework will be required for measurement and verification

48 Entering the comfort zone

An intelligent software system for monitoring underfloor heating

Biomass has become one of the key low carbon technologies expected to help achieve the 2020 carbon reduction targets

Page 22

22



STOCKSNAPPER / SHUTTERSTOCK

LEARNING

53 CPD

Use of CO₂ in transcritical refrigeration applications

CLASSIFIED

57 Products

A round-up of services offered by manufacturers

63 Directory

Suppliers to industry

PEOPLE AND JOBS

65 Appointments

Jobs at jobs.cibsejournal.com

66 Events & training

Events taking place around the UK, including a Society of Light and Lighting event at the London Transport Museum

The world of building maintenance
just got simpler.



The new, improved SFG20 standard maintenance specification for building engineering services. Now including Customiser Compliance and Service Model to prioritise and customise your building maintenance regime.

New criticality ratings enable streamlined budget and project management. With bespoke maintenance models for specific building types and live technical updates to prevent over-maintenance of assets and ensure compliance, clients, consultants and contractors are more in control than ever.

Customise. Prioritise. Lead the way.

For a product order form go to www.sfg20.co.uk/subscribe or call 01768 860405
SFG20 is published by B&ES Publications.



SFG20



www.cibsejournal.com

Editorial

Editor: Alex Smith
Tel: 01223 273520
Email: asmith@cibsejournal.com

Deputy editor: Carina Bailey
Tel: 01223 273521
Email: cbailey@cibsejournal.com

Technical editor: Tim Dwyer
Design: CPL (Cambridge Publishers Ltd)

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: Paul Wade
Tel: 020 7880 6212
paul.wade@redactive.co.uk

Advertising production: Jane Easterman
Tel: 020 7880 6248
jane.easterman@redactive.co.uk

For CIBSE

Publishing co-ordinator: Nicola Hurley
Tel: 020 8772 3697, nhurley@cibse.org

Editorial advisory panel

George Adams, engineering director,
Spie Matthew Hall

Laurence Aston, director, Buro Happold

Annabel Clasby, mechanical building services
engineer, Atkins

Patrick Conaghan, partner, Hoare Lea
Consulting Engineers

Rowan Crowley, director, Einside Track

James Fisher, e3 consultant, FläktWoods

David Hughes, consultant

Philip King, director, Hilson Moran

Chani Leahong, senior associate,
Fulcrum Consulting

Nick Mead, group technical director,
Imtech Technical Services

Christopher Pountney, graduate engineer,
AECOM

Alan Tulla, independent lighting consultant

Ged Tyrrell, managing director, Tyrrell Systems

Ant Wilson, director, AECOM

Terry Wyatt, consultant to Hoare Lea

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

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

The opinions expressed in editorial material do not necessarily represent the views of the Chartered Institution of Building Services Engineers (CIBSE). Unless specifically stated, goods or services mentioned in editorial or advertisements are not formally endorsed by CIBSE, which does not guarantee or endorse or accept any liability for any goods and/or services featured in this publication.

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

©CIBSE Services Ltd. ISSN 1759-846X

Subscription enquiries

If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £30 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Nicola Hurley at nhurley@cibse.org or telephone +44 (0)20 8772 3697. Individual copies are also available at a cost of £7 per copy plus postage.

The 2012 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, NY 11434. 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, NY 11434.

Cover: Dean Farrow



ABC audited circulation:
18,454 January to
December 2011



Energy end games

You know Christmas is around the corner when energy issues rise to the top of the news agenda. The onset of winter prompts heated debate over gas bills, energy conservation and the precarious state of energy supply.

Ofgem chief executive Alistair Buchanan gave CIBSE members a stark insight into the looming energy crisis at the CIBSE Annual Lecture in November. He warned of rolling blackouts by 2015, as the margin in installed capacity falls to as little as 4%.

The crux of the issue is that renewable energy is developing too slowly to replace the energy generated by inefficient traditional power stations. The energy shortfall may be temporary, but will prove critical for UK plc if it leads to the disruption of power supply.

The short-term answer appears to be gas. The Coalition agreement on the Energy Bill (page 7) includes a delay in the announcement of 2030 decarbonisation targets, which means energy firms have the option of building more traditional power stations. This won't please the environmental lobby, but the green-minded energy and climate change secretary Ed Davey has secured £7.6bn of support for low energy power generation. This tension between business minded Conservatives and Lib Dem environmentalists is evident in other areas of government policy.

“If government caves in to housebuilder demands to water down regs it will be a demoralising blow

For instance, we are still waiting for details of the Part L changes that will come into force in 2013 (page 21). If the government caves in to housebuilder demands to water down regs, it will be a demoralising blow to our industry.

On the other hand, the government is still making positive noises about energy efficiency and announced a new strategy (page 7) that it claimed could cut energy use by 11% by 2020 – the equivalent of 22 power stations. The proposals include the national roll-out of London's successful RE:FIT programme. As CIBSE president David Fisk says, managing energy may 'seem boring', but it reduces the need for new generating capacity and helps keep the lights on.

A key component of the renewable energy mix is biomass. Unfortunately, it seems that training has not kept pace with the rise in biomass boiler installations in recent years. Our cover feature (page 22) looks at design issues that could affect safety and efficiency, and offers timely guidance from four industry experts.

Finally, it is the CIBSE Benevolent Fund's 80th birthday next year (page 11). The Fund has assisted hundreds of members, and donations are always gratefully received.

Alex Smith, Editor

asmith@cibsejournal.com



All the latest news from around the building industry

HOARE LEA MOVES TO KING'S CROSS



Hoare Lea is relocating its flagship London office to Stable Street, King's Cross. The consultancy celebrated its 150th anniversary this year

'Sustainable builders need more support'

The sustainable building sector is missing major business opportunities because of skills shortages, inconsistent central and local government policies, and the failure of banks to invest, according to new research.

A report by the University of Hull suggests 'green builders' are faring better than mainstream constructors, thanks to the surge in demand for low energy heating, but the lack of a clear government strategy is making it hard for the sector to realise its full potential.

Respondents to the university survey said there was a tendency for government policy to favour large businesses over small to medium-sized enterprises.

DECC targets energy efficiency

● Strategy aims to cut energy consumption by 20%

The government claims its new energy efficiency strategy will reduce energy consumption by the equivalent of 22 power stations by 2020.

The Department of Energy and Climate Change (DECC) says the strategy will create a more sustainable and secure energy system, deliver cost effectively against the UK's climate change goals and reduce energy imports.

It estimates that the UK could be saving 196TWh in 2020 through 'socially cost-effective investment in energy efficiency'.

'Final energy consumption in

2020 could be 11% lower than the 'business as usual' baseline. This potential can be found across the UK economy and realising this could have significant benefits for businesses and households,' a statement said.

CIBSE welcomed the strategy's focus on 'demand side reduction', but said the country's deteriorating energy situation called for more urgent action. 'We need to be implementing simple, common sense measures, which can reduce energy usage by one fifth, now,' a statement insisted.

'Managing energy may seem a bit of a boring, technical backwater down in the boiler room,' added CIBSE president David Fisk. 'It is anything but. It can help us to keep

the lights on, keep the less well-off warm, reduce our dependence on imported energy, reduce the levels of investment needed for new generating capacity and contribute to a stronger economy.'

The strategy includes:

- £39 million to fund five End Use Energy Demand Centres examining energy usage patterns
- Trialling energy efficiency labelling with John Lewis
- Nationwide rollout of RE:FIT, the Mayor of London's programme to improve public sector energy efficiency
- ENWORKS programme in the North West to support adoption of energy efficient equipment by businesses



High efficiency 360° burner



JS Humidifiers

Condair GS Gas-Fired Humidifier

- High steam outputs
- 65% less energy cost than electric humidifiers
- Low maintenance requirements

T: +44 (0)1903 850200

E: sales@jshumidifiers.com

W: www.jshumidifiers.com



Energy Bill aims to unlock £110bn of energy spending



Ed Davey secured £7.6bn for low energy power generation in Coalition agreement

Coalition agreement paves way for Energy Bill

Coalition partners have reached agreement on the detail of the Energy Bill, which aims to unlock up to £110bn of private investment in new energy infrastructure.

Energy and climate change secretary Ed Davey said the agreement would allow the government to meet legally binding carbon reduction and renewable obligations.

He said: 'This is a durable agreement across the Coalition against which companies can invest and support jobs and our economic recovery.'

The government said a Levy Control Framework would make £7.6bn available for low-carbon electricity investment, and it expected renewables to account

for 30% of electricity generation by 2020 compared to 11% today.

However, green groups criticised the decision to delay the setting of a decarbonisation target until after the next election. The hold-up is likely to lead to an increase in gas investment in the short term.

Hywel Davies, technical director at CIBSE, said: 'It is very important that the Coalition partners have now agreed on the Energy Bill and

that they acknowledge the level of challenge for the UK to have adequate energy supplies to 2020.

'However, they've got to make the agreement stick – the real killer is if there is uncertainty. It kills investor confidence and could make £110bn of investment a pipedream.'

During last month's CIBSE Annual Lecture, Ofgem chief executive Alistair Buchanan warned that the country's energy capacity would be at full stretch by 2015. He estimated that by 2015/16 there will be as little as 4% margin in UK installed capacity and the country could face rolling blackouts.

Twenty-five per cent of total UK power generation is to be shut down over the next three years and Buchanan said it would be hard to plug the gap.

Alistair Buchanan's lecture can be viewed as a webcast at: www.cibse.org/annuallecture

Turn to page 18 for more on Alistair Buchanan's lecture

Keeping the lights on

- Long-term contracts called Contracts for Difference will aim to provide stable revenues for investors in low energy carbon projects
- The creation of a government-owned company providing long-term revenue support for low energy generators
- The government will create a capacity market to ensure there is enough energy when Ofgem and National Grid identify energy shortages
- Energy companies will be able to charge households an extra £7.6bn, to go towards low-carbon electricity infrastructure

In brief

SMART CONSULTATION

The Department of Energy and Climate Change (DECC) has started a consultation into the roll-out of smart meters.

The installation is due to take place in two stages – Foundation and Mass Roll-out. The former began in April 2011 and will end with the start of mass roll-out in late 2014.

The consultation seeks to address arrangements for customers who already have a smart meter, seeking to change energy supplier.

www.decc.gov.uk

NOT SO SMART METERS

Researchers at the University of South Carolina have revealed that so-called 'smart meters' can be a serious threat to the security of building occupants. They said some types of electricity meter broadcast unencrypted information that could be picked up by snoopers.

AMR (automatic meter reading) systems are already installed in one third of American homes and businesses to make it easier for utilities to collect energy use data.

The UK government has pledged to roll out smart meters to all British homes by 2020.

DCLG SET TO SIMPLIFY HOUSING STANDARDS

The Department for Communities and Local Government (DCLG) has started a radical overhaul of the Building Regulations, according to *The Guardian* newspaper.

A four-man 'challenge panel' has been given the task of reducing the amount and complexity of regulations in order to help re-start the house-building market. Many of the previous restrictions on building housing extensions have already been removed and the panel has been given a 'free rein' to rationalise other standards, including those covering fire safety, energy use and access.

The panel is due to report back to DCLG next spring.

Government scraps annual DEC's

Display Energy Certificates (DECs) for public buildings will only be required once a decade following a government decision made behind closed doors. In a letter, Don Foster MP states that it is currently policy not to go beyond the minimum requirements of the Energy Performance of Buildings Directive (EPBD): 'When the threshold for DEC's is lowered to 500 m² in January, DEC's for those smaller buildings will only need to be updated every 10 years.'

According to Foster, the current requirement for annual DEC's was a decision taken by Labour.

In response, CIBSE's technical director Hywel Davies

said: 'It is even more disappointing and perverse that government proposals for extending DEC's in public buildings are missing the chance to cut public sector energy demand – and the associated costs borne by taxpayers – by not introducing annual DEC's to implement the recast EPBD.'

Meanwhile, the European Commission (EC) has started legal proceedings against the UK for failing to set out how it intends to implement the wider roll out of DEC's to all public buildings. The UK faces a fine of €9.6m, followed by daily penalties of hundreds of thousands of Euros.

RIBA drops 50-year-old work stages

The Royal Institution of British Architects (RIBA) has torn up half a century of tradition by deciding to abolish its Plan of Work stages A to L. It intends to replace its traditional 11 stages with seven numbered alternatives from spring 2013 in a bid to simplify project planning and promote industry-wide integration.

The decision has already been ratified by RIBA Council, but the institution revealed it was preparing to conduct a consultation with its membership. However, the move is part of a review aimed at delivering the 'unified industry structure' supported by the Construction Industry Council (CIC), which has called for greater simplification of industry working processes.

Reducing the traditional 11 stages to just seven includes the merging of stages A and B into a single 'preparation stage'. RIBA also said it would be updating contract forms and revising its standard form of agreement in the coming months.

Revised guide focuses on maintenance costs

The SFG20 standard maintenance specification for building and engineering services has been revised to help clients, consultants and contractors reduce costs.

The Building & Engineering Services Association (B&ES) has produced new customisation and prioritisation components for the maintenance schedules contained in this new web-enabled version of its 22-year-old guide. It claims the new version will simplify the tendering process, reduce building maintenance costs and ensure compliance.

SFG20 is recognised as 'the backbone to the building engineering services maintenance industry', according to Bruce Kirton, chief executive of B&ES Publications.

Abandon silos, engineers urged

● Engineers need to take a more disciplinary approach

Students of engineering must break out of their technical 'silos' and engage with other disciplines to deliver the UK's future infrastructure needs, according to leading industry figures.

Professor Barry Clarke, president of the Institution of Civil Engineers (ICE), and former CIBSE president Graham Manly, OBE warned that the UK would fail to deliver vital

projects without a more multi-disciplinary approach.

Speaking during the celebrations of the 120th anniversary of London South Bank University (LSBU) they said educators would have to define a new 'culture' for infrastructure and building engineering. They also identified Building Information Modelling (BIM) as crucial to this proposed new spirit of collaboration.

'BIM is not just software,' said Manly. 'It represents a cultural shift that could transform the way

construction projects are delivered.'

The government's National Infrastructure Plan proposes to spend £200bn of extra money on energy and transport projects, but Clarke said it could prove difficult to spend that money without increasing the number of engineers.

The Royal Academy of Engineering has calculated that the country will need 190,000 more engineering professionals by 2020 to meet the country's infrastructure demands, but it estimates that just 60% of engineering graduates were able to find employment in their chosen discipline.

LSBU has opened a new department to help engineering students develop commercial skills.

Manly congratulated LSBU on its efforts to provide cross-disciplinary education. 'It is vital that students are taught outside of their little silos and I am delighted that LSBU has embraced this in the courses offered by its Urban Engineering department,' he said.



AUREMAR/SHUTTERSTOCK

Ventilation linked to MRSA infections

Healthcare facilities are failing to contain airborne infections transmitted via poorly maintained ventilation and air conditioning systems, according to a leading indoor air quality specialist.

Dr Ghasson Shabha, senior lecturer at Birmingham School of the Built Environment, told a webinar hosted by the CIBSE ASHRAE Group that the threat posed by dirty ductwork is often overlooked by healthcare professionals, who fail to put planned maintenance strategies in place because the source of the infections is 'out of sight, out of mind'.

He also criticised the fact that only around 5% of air conditioning systems have been inspected, despite this now being a mandatory requirement under European regulations. Bacterial spores in ductwork can often be behind outbreaks of MRSA and other serious infections in hospitals and clinics, he told his global audience, which included members of the Building & Engineering Services Association (B&ES) and the Institute of Healthcare Engineering and Estate Management (IHEEM).

'The healthcare environment is a reservoir for potentially infective agents, which can spread unpredictably in ventilation and air conditioning

systems, making the risk difficult to control and manage,' said Shabha. 'People seeking timely information about the patterns of cross-infection are in urgent need of better data.'

He said the ventilation hygiene industry was eager to address this potentially fatal problem, but facilities managers (FMs) did not have a system of information exchange that would highlight the risks, or the extent of the problem across the whole healthcare sector. He advocated a system – being piloted by Leicester and Rutland NHS Trusts – which uses wireless sensors embedded into mechanical ventilation, air conditioning and plumbing systems to assess the risk of airborne infection. This provides real-time data to a remote web server accessible by all healthcare FMs.

He added that 3D building information modelling software could also help ventilation specialists identify 'infection hotspots', and continued: 'The data can then be fed into a predictive infection criticality model (PICM) to assess the intensity, and frequency of colonisation and hotspots. This allows FMs to manage the risks more proactively.'

www.cibseashrae.org

THE INTERNET'S HOME

Google has uploaded its global network of data centres onto Streetview, its 3D mapping programme. Virtual tours can be taken around data centres such as this one in Douglas County, Georgia, which features colour-coded pipes and a fleet of 'G-bikes', enabling engineers to move around the vast building quickly. Google claims its data centres use 50% less energy than typical data centres. The search engine giant says businesses could cut their computer energy use by 65-90% if they used the Google servers distribution and separate containment runs for data and building management system control cabling.



EC keen to speed up refrigerant phase down

● **Industry expresses concerns about the viability of plans**

The European Commission wants to drastically reduce the amount of global warming gas used in air conditioning and refrigeration equipment from 2015. Following a review of the F-Gas Regulation, Climate Commissioner Connie Hedegaard confirmed the EC would introduce a phase-down to cut use of the most widely used refrigerant type – hydrofluorocarbons (HFCs) – to just one fifth of today's level by 2030.

It is also proposing a ban on fluorinated (F) gases in some new equipment where 'viable, more climate-friendly alternatives are readily available'.

However, the industry has serious concerns about the viability of the EC's plans and a number of observers said further cuts were not needed as the original F-Gas Regulation – introduced in 2006 – was already bringing down potentially harmful emissions.

'The EC ideas are arbitrary, unrealistic and

disproportionate,' said Cedric Sloan, director general of the Federation of Environmental Trade Associations (FETA). 'Its purely environmental legal base will encourage a diverse patchwork of interpretations across Europe and create a compliance nightmare for suppliers and contractors.'

He said the Commission had also chosen an 'arbitrary' global warming potential (GWP) ceiling that could lead to 'perfectly good, efficient, working systems being prematurely replaced'.

'Imposing bans on a range of refrigeration applications, starting in 2015, is disproportionate and unrealistic. Industry needs time to adjust and the deadlines between 2015 and 2020 are simply plucked from thin air,' added Sloan.

However, a proposed ban on manufacturers pre-charging non-monobloc air conditioning and heat pump systems with HFCs could be a 'game changer', according to Graeme Fox, president of AREA – the European trade body representing air conditioning, refrigeration and heat pump contractors. He said it would 'put the legitimate

contractor back in charge' and make it easier for governments to track the amount of global warming gas in use.

'EU member states have a legal duty to report the amount of refrigerant gas in circulation, but they have only the vaguest idea how much is out there at the moment,' said Mr Fox. 'Importers only have to report amounts over one tonne, but there are millions of split air conditioning systems coming into the EU that are already pre-charged with refrigerant gas.'

As well as ensuring only registered installers can handle the gas, a ban on pre-charging would also improve operating efficiency, according to Scott Gleed, of the Building & Engineering Services Association (B&ES). 'Pre-charged systems often have too much gas because manufacturers are allowing for pipe runs from 20 to 70 metres, which many applications don't need.'

Other proposed changes to the Regulation include mandatory training for anyone using 'alternative' refrigerants, such as hydrocarbons, ammonia and CO₂.

The perfect combination..... P-Sensor and the CMR Velogrid



VELOGRID
Velocity Averaging Sensor



P-Sensor

CMR are the inventors and manufacturers of both the P-Sensor and the Velogrid. The Velogrids are made to measure to fit any ductsize up to 3m x 3m and the P-Sensor has a keyboard to easily enter : duct height - width - density - magnification factor and the scaling in m/s - m3/s - m3/h - l/s. It can even work out the Air Change rate. And the BMS gets three linear volume signal outputs of 0..10V 4..20mA and an addressable Modbus rtu bus.

CMR CONTROLS Ltd

22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
www.cmr-controls.com

Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
sales@cmr-controls.com



Young Lighter of the Year 2012 winner revealed

Sabine De Schutter has been announced as the winner of the Society of Light and Lighting's (SLL) Young Lighter of the Year.

She impressed the judges, with her presentation and paper on *Shadow defining space*, to be presented with a trophy and special Lux Award, in association with Phillips Lighting at the Lux Awards dinner at the Natural History Museum in November.

Despina Tselegkaridou won the best written paper award, which was selected by the Institute of Lighting Professionals (ILP), for her paper on *The Use of Coloured Light in the Urban Environment: is it time for legislation?* Sophia Klees, who presented on the subject 'Catching the Light – lighting for humans in urban context', took the award for best presentation, chosen by the Worshipful Company of Lightmongers.

Shane Nolan, the winner of the Irish Young Lighter of the Year 2011 competition, whose entry was entitled *NRA Intelligent*



Sabine De Schutter receives her award, with SLL president Iain Macrae (second from left)

Street Lighting Pilot Schemes, was also a finalist.

The awards, now in their 18th year, help promote the younger element in the lighting profession. They provide a unique platform for young lighters, whether SLL members or not, to hold forth on a lighting subject, to hone

their presentation skills and to raise their profile within the industry. Each finalist gave their 15-minute presentation to a packed audience at LUXLive on 6 November.

In addition to receiving SLL membership for one year, each finalist is also presented with a cash prize, a certificate and

a lighting publication.

Upon winning, De Schutter said: 'I am very passionate about what I do, and receiving this title from lighting professionals is an enormous reward. My research and lighting design is not just work, it's a fascination.'

You can view all the finalists' presentations at www.sll.org.uk

Young Energy Performance Group launched

The Young Energy Performance Group (YEPG) was launched in October. Responding to the ever-growing interest in building energy performance, the group is a subsidiary of the existing Energy Performance Group (EPG).

The group was officially launched at AECOM's London offices, with more than 100 young professionals from across the country.

John Field, CIBSE vice-president, Phil Jones, chairman of the Energy Performance Group, and Anna Menezes, chairman of the YEPG, highlighted both the importance of initiatives such as this, and the responsibility of young engineers to challenge current practices and drive innovative thinking.

Andrew Saville, from Armville Consultancy,

presented on the night, and noted that, with their boundless energy and enthusiasm, young engineers are the future of our industry, yet they must be nurtured by attentive mentors.

Mike Slessor, from Arup, also presenting, recounted his own experience as a young engineer, illustrating that the right amount of talent and professional stimulation can result in a rewarding career in building services.

The group, made up of young professionals in various disciplines including architecture, physics, sustainability and design, as well as building services engineering, encourages an integrated approach to construction, design and operation.

The group will allow these young professionals to get together and share their research and practical experience with the wider industry, encouraging innovation in matters relating to energy performance of buildings.

YEPG's next event will take place in early 2013 and will take a 'game' approach to solving the UK's energy problems. Further events covering a mixture of topics related to sustainability and energy efficiency will follow.

For more information on the group, visit www.cibse-epg.org/yepg

● To join and receive information on future events, contact join@young.cibse-epg.org

Benevolent fund celebrates 80th birthday

The CIBSE Benevolent Fund celebrates its 80th anniversary next year, marking eight decades of tangible assistance to hundreds of Institution members, their families and dependents during periods of extreme distress.

Over the course of the anniversary year, CIBSE hopes to publish a series of articles, sourced primarily from the almoners of the Institution's regional and overseas branches, to highlight the important voluntary work they quietly and efficiently carry out.

Mr R Comyn Ching, the then vice-president of the Institution of Heating and Ventilating Engineers (IHVE), first suggested the Benevolent Fund in 1933. The IHVE Council agreed to the proposal in October that year, and a first Benevolent Fund Committee was established, comprising Ching as chairman, along with WE Fretwell, W Nelson Haden, AB Potterton and JH Bryant. Ching was instrumental in establishing the fund, drafting the original scheme and, along with Fretwell, offering the initial donations to establish it.



The fund operated for many years under the IHVE and its successors, the CIBS in 1976, and CIBSE in 1985. In 2005 it was reconstituted under a new Declaration of Trust, with trustees Bryan Wright, David Kirby (now both sadly deceased) and Ronald Farminer, who continues to serve. This new CIBSE Benevolent Fund Trust was registered with the charity commissioners on 21 August 2005. The Motto of CIBSE is: 'For the greater comfort of mankind', an admirable sentiment, which is entwined within the 'objects' of the fund, as: 'The relief of persons who are in conditions

of need, hardship or distress and who are members or former members of the IHVE or of the IES, or of the CIBSE and the immediate dependents of such persons.'

From its early days, the Institution developed a regional structure, starting with the Liverpool and District Branch in 1933. Others followed through to 1987, when Australia and New Zealand joined the 'family'. The Benevolent Fund appointed almoners in each region – which now number 19 in total, with 16 covering the UK and three overseas in the Republic of Ireland, Hong Kong and

Australia/New Zealand. The Fund Trust provides assistance and financial aid at the discretion of a Board of Trustees. The board may delegate responsibilities to the Management Committee, presently comprising all the trustees, plus the duly appointed regional almoners.

To support the fund, members of the Institution are invited to make an annual donation, using gift aid where possible. This, together with donations from regional functions, friends and organisations active in the industry, are vital components in ensuring sufficient funds are available to support those in need.

During the celebration year, the management committee has proposed that each region considers donating all of their monies raised to the fund.

● Anyone interested in contributing to future articles should contact Nicola Hurley on nhurley@cibse.org. Complementary information can be found at www.cibse.org and its regional websites.

Situations vacant on Board and Council

The Board is the governing body of the Institution. It is made up of the seven officers (president, president-elect, three vice-presidents, honorary treasurer and immediate past president) and five elected members. Vacancies arise at each annual general meeting (AGM), and the Board is required under Regulation 36 to nominate candidates for all the forthcoming vacancies.

The Board has also agreed that elections should be held for membership of the Council of the Institution – a much larger consultative body that exists to advise the Board on Institution policy – composed mainly of representatives of the regions, societies, groups and standing committees.

The Board has accordingly made nominations to fill vacancies arising at the next AGM in May 2013: Short biographical notes for candidates can be found in the 'Members' section of the CIBSE website at www.cibse.org

Members of the Institution are entitled to nominate additional candidates for election according to the rules set out below:

- Fellows, Members, Associates and Licentiates may submit nominations for the offices of president-elect, vice-president and honorary treasurer and for members of the Board. Only duly qualified individuals who have been supported by 10 nominations from Fellows, Members, Associates and Licentiates will be added to the lists.
- Fellows, Members, Associates and Licentiates may also nominate individuals from those grades for membership of Council. Graduates, Companions and Affiliates (including Students) may nominate individuals from those grades for membership of Council. Only duly

qualified individuals who have been supported by five nominations from members in the appropriate grades will be added to the lists.

- Any such nominations must be made in writing to the chief executive/secretary, and must be received at CIBSE headquarters by **1 February 2013**. These nominations must be accompanied by the written consent of the nominee to accept office if elected. The names of those making nominations will follow the name of the candidate on the ballot paper.

The qualifications for each position are as follows: **President-elect:** Fellows of the Institution who hold, or have held, the office of vice-president. **Vice president:** Fellows, Members, Associates or Licentiates of the Institution who are, or have been, members of Council. **Honorary treasurer:** Fellows, Members, Associates or Licentiates of the Institution who are or have been members of Council. **Members of the Board:** Members of all grades may be nominated (at least three of those elected must be, or have been, members of Council, and at least three must hold membership in the grades of Fellow, Member, Associate or Licentiate). **Members of Council:** Must hold the appropriate membership grade for the category in which nominated, that is Fellow/Member/Associate/Licentiate or Graduate/Companion/Affiliate (including Students). **President elect:** Peter Kinsella. **Vice presidents:** John Field, Nick Mead, Peter Wong. **Honorary treasurer:** Stuart MacPherson. **Member of the Board:** Gay Lawrence Race. **Member of Council:** Derek Mowlds.

JUDGEMENT DAY



Building services experts deliberated long and hard on which projects and companies were worthy of a place on the 2013 Building Performance Awards shortlist, writes **Alex Smith**. Turn over to see who will feature at the industry's event of the year

6 The 2013 Consultancy of the Year award attracted the best collection of entries we've ever had in any award – *Hywel Davies*

CIBSE BUILDING PERFORMANCE AWARDS 2013

RECOGNISING EXCELLENCE IN MAKING BUILDINGS WORK

Join the best of the industry talent and be there on the night to see who will scoop the awards. The glittering event, taking place on 5 February at London's Grosvenor House Hotel, will see the industry come together in a night celebrating the achievements across the building services chain. Don't miss your chance to be there. To book a table, visit www.cibseawards.org, call 020 7324 2771 or email juliette.bond@redactive.co.uk

The shortlist for the 2013 Building Awards has been announced following what was termed the 'toughest day of judging' in the awards' history.

The nine judges, representing the many facets of the building services industry, found it hard to separate the best entrants despite nearly six hours of argument and debate in a central London venue.

The judges found the entries for the Building Services Consultancy of the Year were particularly difficult to separate and had to spend a weekend revisiting each entry before eventually deciding on eight finalists.

'The 2013 Consultancy of the Year award attracted the best collection of entries we've had in any award,' said the chair of the judges Hywel Davies, CIBSE technical director.

In the category for New Build Project of the Year (value over £5m), the judges were struck by the variety and aspiration of the entries. They felt that some entries were very promising, but would be much stronger entries in 2013 when they had a full year's performance data.

Hywel Davies



Susie Diamond, John Field and Graham Manly weigh up the entries



David Vincent and Paddy Conaghan



Foroutan Parand and Jeff House



ALL IMAGES PROVIDED BY AKIN FALOPE

The category for New Build Project of the Year (value up to £5m) was 'keenly contested', and judges were impressed by the level of data from some of the entries, as well as by the application of sound engineering principles to help deliver very good buildings.

The judges feared the Building Operation Award would attract entries full of corporate marketing gloss, but were pleasantly surprised. 'They were all good entries,' said Kevin Kelly, president elect SLL and head of electrical services engineering, Dublin Institute of Technology. 'There were no weak ones.'

The Training for Building Performance Award attracted entrants from a wide range of firms – from large developers with extensive training plans to small consultants with simple but brilliant methods of disseminating information. The final shortlist represents the diversity of the entrants.

The judges spoke highly of the shortlisted entrants in the Contractor of the Year category. 'These are very good examples of quality contractors,' said Graham Manly, business development director, Gratte Brothers. 'Industry would recognise these companies as good firms.' This was another very closely contested category that stimulated a lively discussion among the judges.

In the product categories there was a good range of entrants covering products that use energy as well as the passive category featuring innovative products that reduce energy use in buildings. The judges said they 'enjoyed' reading the entries and said they hoped more manufacturers would be encouraged to enter next year to show off the capacity for innovation in the industry.

The Client Energy Management Award was another close run contest. The judges were pleased to see it had attracted entries from organisations taking a long-term approach to reducing energy use and cutting energy emissions. 'We felt there were some good examples of what clients can do to improve energy efficiency in buildings,' said Davies.

Shortlisting for the Refurbishment Project Award was more clear cut, with everyone agreeing on the best schemes. The judges thought the category important. 'Refurbishment is always difficult and we need to promote examples of good practice,' said Foroutan Parand, URS, head of building physics, URS Infrastructures and Environment UK.

The winners of the awards will be revealed by TV personality and former Conservative MP Gyles Brandreth at the Grosvenor House Hotel on 5 February 2013. **CJ**



Scan the code above to link straight to the awards website

“The judges feared the Building Operation Award would attract entries full of corporate marketing gloss, but they were pleasantly surprised



THE JUDGES

Paddy Conaghan, consultant, Hoare Lea

Hywel Davies, technical director, CIBSE (chair of judges)

Susie Diamond, founding partner, Inklings

John Field, energy services director, TEAM (Energy Auditing Agency Ltd)

Jeff House, marketing & applications manager, Baxi Commercial Division

Kevin Kelly, president elect SLL and head electrical services engineering, Dublin Institute of Technology

Graham Manly OBE, business development director, Gratte Brothers

Foroutan Parand, head of building physics, URS Infrastructures and Environment UK Ltd

David Vincent, director, David Vincent & Associates

SHORTLISTS FOR THE CIBSE BUILDING PERFORMANCE AWARDS 2013

**NEW BUILD PROJECT OF THE YEAR
(VALUE ABOVE £5M)**

Sponsored by Amtech



- Titanic Belfast, Belfast, Northern Ireland – AECOM
- Gardens by the Bay, Singapore – Atelier Ten
- Hengrove Leisure Centre, Bristol, England – Hoare Lea
- The Hive, Worcester, England – Max Fordham
- Royal Welsh College of Music and Drama, Cardiff, Wales – Mott MacDonald
- BMS Annex, University of St Andrews, Fife, Scotland – RSP Consulting Engineers LLP

**NEW BUILD PROJECT OF THE YEAR
(VALUE UP TO £5M)**

Sponsored by Fläkt Woods



- Bushbury Hill Primary School, Wolverhampton, England – Architype
- Colaiste Choilm, Tullamore, Ireland – BDP
- MacMillan Palliative Care Unit, Antrim Area Hospital, Northern Ireland – Beattie Flanigan
- Barnsley College, Barnsley, England – Jefferson Sheard Architects
- Michael Baker Boat House, Worcester, England – Leeds Environmental Design Associates
- Toffee Factory, Newcastle, England – Max Fordham

REFURBISHMENT PROJECT AWARD

- Wolvercote Road, Thamesmead Estate, London, England – Fraser Brown MacKenna Architects
- Number 20 Lena Gardens, London, England – greentomatoenergy
- Bristol Old Vic, Bristol, England – Hoare Lea
- Woolgate Exchange, London, England – Ove Arup & Partners
- The Co-operative Food Store Piccadilly Gardens, Manchester, England – The Co-operative Group
- Vaillant Group HQ, Belper, Derbyshire, England – Vaillant

BUILDING OPERATION AWARD

Sponsored by Gratte Brothers



- Whistler Athletes' Village, British Columbia, Canada – DEC Engineering
- Towards Sustainability – Dublin City University

- Hadlow College RRC, Hadlow, England – Eurobuild
- 2 St Paul's Place, Sheffield, England – Mott MacDonald
- PFI schools in Central Bedfordshire, England – Sustain Limited

CLIENT ENERGY MANAGEMENT AWARD

Sponsored by Lochinvar



- British Land
- Dublin City University
- Ofgem – 9 Milbank
- Slaughter and May, One Bunhill Row – nominated by Waterman Building Services
- UBS – nominated by Norland Managed Services

CLIENT OF THE YEAR

Sponsored by Imtech Technical Services



- Harrods
- IBM – nominated by Atkins
- Marks & Spencer – nominated by Troup Bywaters & Anders
- The Co-operative Group
- Whitbread Hotels and Restaurants

BUILDING SERVICES CONSULTANCY OF THE YEAR

Sponsored by Baxi Commercial Division



- AECOM
- Atelier Ten
- Cundall
- Grontmij
- Hilson Moran
- Hoare Lea
- Max Fordham
- Mott MacDonald

CONTRACTOR OF THE YEAR

Sponsored by Elta Fans



- Interserve Engineering Services Ltd
- Kier Major Projects
- Norland Managed Services

COLLABORATIVE WORKING AWARD

- Atkins and London 2012 Olympic and Paralympic Games
- Cundall and Durham University
- ebm-papst UK, Emerson Network Power and Norland Managed Services
- Harrods, Woods Hardwick, WSP, Riley Consultants and Lift Specialist
- Rediger, World Duty Free Group and Birmingham Airport

ENERGY-USING PRODUCT AWARD

Sponsored by Spirotech



- Belimo Energy Valve – BELIMO Automation UK Limited
- e3co-Crown – Fläkt Woods Limited
- Lighting Platform – Redwood Systems

PASSIVE (ENERGY RELATED) PRODUCT OF THE YEAR

- Aerogel Solar Collector – Buro Happold and Brunel University in collaboration with Nuaire, Xtralitre and Permarock Products
- Bacticell Air Filter Cartridge – Nationwide Filter Company

TRAINING FOR BUILDING PERFORMANCE AWARD

Sponsored by Vaillant



- Energy Survey, Leisure Centre, Burgess Hill – CCL Consulting Limited
- IES & Gensler University Design Excellence 2012 (GUDX-2012) – Integrated Environmental Solutions (IES)
- Low Carbon Fit Out Guide for Retail 2012 – Land Securities
- The Learning Curve – Mitsubishi Electric
- ILM Management Development Programme – Norland Managed Services

CARBON CHAMPION OF THE YEAR

Sponsored by Remeha Commercial



This award is for the individual, team or organisation that has made the most outstanding contribution to achieving improved building performance.

Why Vaillant?

Because we offer wall to wall solutions for every commercial specification.

- New wall hung commercial boilers for 2013
- Outputs range from 80kW to 120kW
- Cascades up to 960kW



Models:

Wall hung boilers
46, 65, 80, 100, 120kW
Stainless steel heat exchanger

Cascade rigs:

Wall to wall
Back to back
L-shaped
Full pipework and insulation
Cascade flues
Low loss header

Integrated in the boiler or separate as an accessory:

Modulating shunt pump
Isolation valves
Pressure safety valve
Gas isolation valve

Controls:

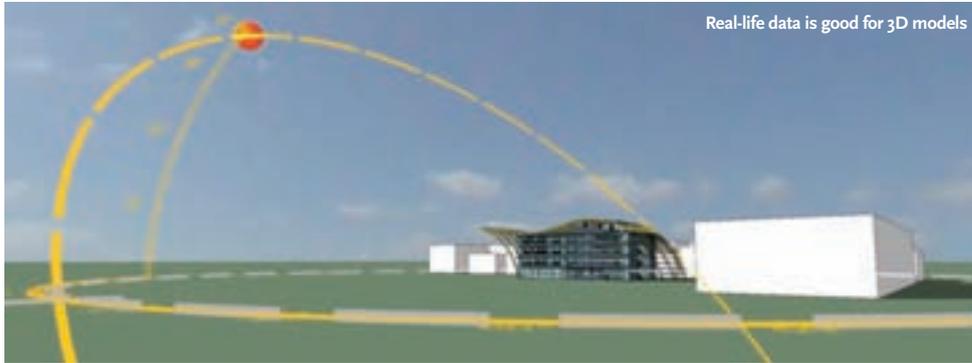
Compatible with Vaillant controls and BMS systems
Boiler management system VRC630
Boiler and solar integrated management system VRS620

For more information or to contact your local business manager please call **0870 240 7545**
www.vaillant.co.uk

■ Heating ■ Hot Water ■ Renewables

Because  **Vaillant** thinks ahead.

Your letters



Real-life data is good for 3D models

This month: Combining passive and renewable solutions, bringing 3D to real life, and online reaction to the CIBSE lecture

Call the professionals

In reply to Catherine Applegate’s letter, I would suggest if we, as a profession, allow people who mend washing machines, install insulation, mend cars and clean drains out to call themselves engineers, then we deserve all we get.

It does not happen to lawyers and accountants. The governing body of those professions will not allow it to happen, but we allow anyone to be called an engineer and that is the real issue.

P. Childe, Leeds



Not a CIBSE professional

Bringing 3D into the real world

Worrying about energy analysis differences between design, compliance and operation is a red herring. The models are completely different. Trying to compare them is a pointless exercise as it’s not a like-for-like situation.

By spending too much time preoccupied with these differences, we are not tackling the major issue – that of ensuring the intentions of good design are followed through into operation.

The industry must begin to safeguard

that control by ensuring both that performance is continuously monitored and that a good design intention is understood and fully adopted by the building users, owners and operators.

So, why are the models different? During design, as model input data can never be entirely known, you are working with assumptions, across elements such as weather data, occupancy, equipment usage, equipment efficiencies, and building fabric material choices. As the design progresses, the number of assumptions fall, but not all of them. At the design stage we are simulating to establish a potential for performance, not emulating the actual performance.

At compliance, model data – be it UK NCM, ASHRAE 90.1 or any other flavour of regulation or voluntary rating system – must ensure consistency for all practitioners. This leads to prescriptive methodologies of calculation, standard weather data, occupancies, and equipment usage; the aim being to produce an energy performance certificate, for instance, that can be fairly compared against some national benchmark. This required consistency means that a compliance model, by its very nature, is definitely not emulating actual performance, and may not even be the same as the design model.

When dealing with buildings in operation you have access to the real-life data; weather, occupancy, internal

Building Regulations play ‘catch up’ and are never ahead of real requirements

conditions, energy usage and so forth. This allows you to calibrate the 3D building model to real life, providing a benchmark against which to analyse and review performance. This way you can uncover hidden savings that review and interrogative building management system data alone just cannot discover. On a recent project we achieved a 20% reduction on the annual energy bill without any capital spend. However, you can also use this approach to identify best renovation energy conservation measures, and track and prove associated financial savings.

Let’s move the debate on and start to understand how we can ensure good design intentions are followed through. *Craig Wheatley, IES*

Passive, renewables or both?

In the November 2012 *Journal*, several letters, articles and references debate the Green Deal. Elsewhere in the same edition, Passivhaus is championed (by Bruce Tofield and others).

At the CIBSE Conference and Exhibition, Paul Morrell said ‘change is coming – the future is here’. But is the future a Green Deal or a Passivhaus/ EnerPHit home? In fighting for one or the other, observers and protagonists may lose sight of the principal aim – to save energy.

We are in debt to energy companies. The industry has morphed into an oligopoly. These companies do not need to compete persuasively for our captive patronage, but only to focus on shareholder value and agency rewards. The only way to reverse this and to lower the price of energy is to stop wasting it.

What is the mechanism for achieving this? Building Regulations play ‘catch up’, and are never ahead of real requirements; coding levels are market-driven options; the Green Deal is aimed primarily at reducing fuel poverty, not eliminating energy consumption. None of these has fully grasped the energy ‘nettle’ – we must all increase its redundancy by cutting consumption to the minimum.



ON THE 5TH DAY OF CHRISTMAS THE HEAD OF FM SAID TO ME...

Energy use over Christmas can amount to 4% of an office's annual energy bill, so it's important to power down for Yuletide

As we all get ready to rush home for the Christmas break, it is worth stopping and pondering on the fact that a large part of the country will be off on leave for the best part of two weeks.

This means that there will be tens of thousands of offices, factories and other places of work almost completely empty for eleven days in a row.

As the people responsible for designing, commissioning and installing the building services in

these premises, we need to be mindful that, while we will have all optimised this equipment to run as efficiently as possible, it makes no sense at all for this equipment to heat, cool, ventilate or light empty buildings.

While it is worth making customers aware of this, there is a limit to what we can do in terms of other people's premises. However, there are things we can all do as individuals to make a difference.

If you look around your own offices, almost all of them are likely to have photocopiers, monitors, televisions, printers and even computers plugged in and left on standby.

They are all potentially wasting a huge amount of energy – and racking up needless utility bills.

Eleven days equates to just under 4% of your annual bill, which is certainly not to be sniffed at in these austere times.

And when we remember that buildings in all their forms produce nearly half of all emissions in this country – more than either transport or industry – then surely it is worth stopping to see if we can't arrange this better.

It is quite simple to ensure that any non-essential items are unplugged so they can't carry on consuming energy on stand-by.

Leaving the office television on stand-by, for example, can generate

the equivalent of 2.5kg of CO₂ over Christmas, whereas leaving a computer on over the 11-day break will use enough energy to produce the equivalent of three inflatable garden Santas worth of CO₂.

There are some simple things you can do to stop this waste. Don't forget to turn off printers or photocopiers at the socket for example. Even though they may have a power-saving mode, photocopiers can still be using 90 per cent of the regular

standing energy consumption. Turn down the temperature on any heating system so that it's on the minimum needed to protect your building from any unexpected frost or freezing temperatures.

And it is also worth thinking about water consumption by fixing dripping taps or cisterns before the break. Just two drips per second from a tap will waste over 30 litres of water during the festive period.

So I hope you have a really enjoyable Yuletide break and that Father Christmas brings you all the presents you could wish for.

But at the same time, it is worth planning for the shutdown – and encouraging everyone else to do the same to help keep energy bills down to a minimum.

Martin Fahey is sustainable solutions manager at Mitsubishi Electric. Join the debate by visiting the Green Gateway LinkedIn group, or following Martin's Twitter account (@green_gateway) which offers followers a chance to receive up-to-the-minute news and views from those within and outside the industry, including key opinion leaders.

SPONSORED BY
MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

How can this be achieved? Not by choosing between Green Deal and Passivhaus, but by combining them in one binding goal – minimal energy consumption. Green Deal could be the vehicle, but the barrier to nationwide change is the 'Golden Rule'.

If this is not achievable, it will deter home improvements, leaving a continuing legacy of rising energy costs in leaky houses. Energy demands will be entombed in our living standards forever, unless government makes a commitment to: eliminating unnecessary barriers; funding Green Deal improvements; and Passivhaus/EnerPHit standards by grant-aiding the balance between EnerPHit costs and subsequent energy savings in

all existing properties.

This may seem radical and potentially costly, but I believe radical is essential if we are to avoid future repetition of the current energy problem.

Robert Bridges, Bolton

CIBSE Journal welcomes article proposals from any reader, wherever you are – whether it be letters, longer opinion pieces, news stories, people or events listings, humorous items, or any ideas for possible articles.

Please send all letters and any other items for possible publication in the CIBSE Journal to: editor@cibsejournal.com, or write to Alex Smith, Editor, CIBSE Journal, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters. Please indicate how you wish your letter to be attributed, and whether you wish to have your contact details included.

From the forums

Future energy supply

CIBSE LinkedIn group

Richard Topping: Reducing the energy use of existing buildings is going to help reduce the demands on the supply of electricity and gas in the future. You've either got to hit people in the pocket for them to wake up to the situation or make reductions mandatory.

Alistair Fisher: I wonder how your comment would be perceived by someone living in a typical solid wall inter-war dwelling and struggling to make ends meet? Like it or not, the majority of this country's energy will come from hydrocarbon resources for the next 50 years, and the majority of poor quality housing stock built up to the mid 20th century will still be around. UK sector Oil and Gas production is in decline, a result of the country's insatiable urge

to sell off anything of value that could be considered a national asset for the benefit of all over the last two decades to the highest profit-motivated bidder.

Richard Topping: In the CIBSE annual lecture Alistair Buchanan didn't talk about rotting extraction platforms. He said that the remaining gas-fired plant in the UK was being mothballed because there are no incentives to improve them. He talked about shale gas as if there were no other available sources of gas.

Alistair Fisher: I don't think we'll see land-based shale gas extraction in the UK any time soon. There is too much public opposition. Plus, for as long as there is no cross-party consensus on long-term energy supply, then frankly, it ain't gonna happen. We're going to be hugely reliant on the wholesale world gas market, along with everyone else, with very little gas storage capacity or domestic gas production.

● Join the debate at www.cibse.org/linkedin

GAS CAN KEEP THE LIGHTS ON

The UK has a clear long-term energy strategy, but that will be no consolation if our lights go out before we get there, says **Blane Judd**

Over the next four months, 8% of our total national energy capacity is to be shut down as several coal and oil-fired power stations are taken offline. Then things start to get really interesting because, over the next three years, we will lose 25% of our power generation as ageing generators are switched off.

During last month's CIBSE Annual Lecture, Ofgem chief executive Alistair Buchanan explained that the already gloomy predictions about our looming energy gap had been accelerated by two years, and the UK could have no spare energy capacity at all in three years' time – at best we'll have a 4% margin.

The answer to the question posed by his lecture title: 'How secure is Great Britain's electricity and gas supply over the next decade?' was 'not very'. The 'next decade' is definitely looking bleak.

Renewables development is moving 'profoundly slowly' and is expensive; electricity costs around £50 per MWh to produce but, if we switch to wind, the cost rises by up to £180, while our one major biomass development (Siemens/Drax) is on hold.

Another problem is a lack of storage. During the winter of 2010/11, Centrica said it would run out of gas on 19 February. Luckily, we had the warmest January and February on record.

This government has a clear vision of where it wants to be in 2020 and 2030, but what do we do in the meantime? Renewables account for less than 10% of our needs and Buchanan has no real answers. Europe and the US are investing in micro-grid research, but its implementation is still some years away.

Four major UK power stations are closing next March. One new gas-fired power station is under construction, but will not be running until 2017 – at the earliest. The start of the carbon floor tax next April will finish off the remaining coal-fired energy plants because they will be uneconomic to run with a £16 tax on each tonne of carbon emissions. Last year, according to Ofgem, coal provided 45% of the UK's electricity capacity.



SHUTTERSTOCK / SPONNER

During the winter of 2010/11, Centrica said it would run out of gas on 19 February

Meanwhile, Hinkley B, which will be the first of our new generation of nuclear power plants, is at least two years behind schedule. It is now expected to come on-stream in 2021.

So, could we reverse our decision to close down coal and gas? Apparently not. Mr Buchanan said there was 'nothing happening' with clean coal technology and the UK would be in a tricky legal position with the EU if it turned its back on reducing pollution.

However, there is plenty of gas around. Again, Ofgem has revised its predictions: gas was expected to fall back from providing around 40% of our power needs to between 20 and 30% by 2020. In fact, according to Mr Buchanan, it will need to be providing as much as 70% by the end of the decade.

We will need to import a lot of gas, but can we rely on renegade states like Russia? In February, it reduced supplies to the West by 10% for several days.

There is huge competition for gas from Europe and also the Far East, where prices are much higher. Shale gas is \$2.50 (£1.57) per therm (mmBTU) in the US; \$9 (£5.64) in Europe; and \$18 (£11.28) in Asia. The US is also determined to become energy independent, so it is retaining a lot of its supplies. Plus, shale gas is more

expensive to extract, and would increase European bills by between 20% and 50% – assuming extractors get over their current legislative hurdles.

Australia's Liquefied Natural Gas (LNG) was the great hope before shale, but transportation costs have rocketed and the industry has been hit by delays. Also, the main distribution route is via the Straits of Hormuz – through the politically unstable Middle East. Japan and China are also lining up to take a huge slice out of 'our' LNG supplies.

It is also definitely not helpful that our wholesale gas market may have been manipulated by unscrupulous traders. However, despite these problems, gas clearly represents our best hope of keeping the lights on in the short term.

A future power market driven by gas will be very expensive, but we have little alternative. Buildings are responsible for more than 40% of total energy demand. There surely can be no more persuasive argument for a comprehensive programme of energy efficiency than this bleak energy supply picture.

Buchanan's lecture can be viewed as a webcast at www.cibse.org/annuallecture

● **BLANE JUDD** is chief executive of the Building & Engineering Services Association (B&ES). He will be delivering a paper on electricity efficiency at the CIBSE Technical Symposium in April.

CO2 based Ventilation Control

Provides a comfortable environment while saving energy!

Good ventilation in buildings is essential if a comfortable, healthy and productive environment is to be maintained.

Correct ventilation has a positive effect on occupant health and performance and significantly improves building energy efficiency.

Telaire Ventostat 8000 series- analog and now new BACnet version



Significantly reduces installation costs by featuring single communication wire for three measurement signals.

- Saves Energy
- Provides a Healthy Environment
- Lifetime Warranty on CO2 Calibration



GE imagination at work



www.ge-mcs.com

DATA AND JUMPERS CAN HELP SAVE PLANET



The word ‘sustainability’ should be banned from descriptions of any building until post-occupancy data backs up the architect’s eco-claims, says **Peter Williams**

As an architect, there are times when I find it very difficult to read the architectural press without laughing, crying or shouting. What triggers the emotional rollercoaster is usually the outlandish claims about designs in terms of sustainability.

Whether our buildings wear the BREEAM badge of greatness, or the green-roofed hat of biodiversity, or even a simple necklace of sparkly PVs, they are all now indisputably sustainable. How do we know this? Mainly because the architects tell us they are and the journalists report this as fact.

Perhaps we should agree to ban the word ‘sustainability’ in connection with any unbuilt scheme and focus on the targets set. Until a building has been through at least two years’ of seasonal change and the energy use patterns are established, we cannot report with any accuracy whether it is working properly. Without this information the claims of consultants are simply PR.

Despite the good work of the soft landings initiative (www.bsria.co.uk/services/design/soft-landings) sadly, some construction professionals still do not consider what happens to the building once it’s been handed over as an important issue, and they swiftly move onto the next project.

Perhaps this is because there is very rarely time to think in practice these days, as fees become tighter and allocated project hours more limited. Perhaps it is not stressed enough during architectural education, or perhaps (most worryingly) it is simply not high enough on our list of project priorities.

In my role as director of Professional Practice for The University of Cambridge, I recently asked Bill Bordass to come and give a seminar on post-occupancy surveys to our Part 3 students. At the end of the seminar, Bill said: ‘I think about 50% of them understood what I was on about.’ Given what the industry is setting



SHUTTERSTOCK / JARYSA NIGIREVA

Sadly, some construction professionals still do not consider what happens to the building once it’s been handed over

out to achieve, it is inconceivable that architecture students can complete five years of study and still not understand the importance of the issue.

Having been involved in post-occupancy surveys on previous projects, the benefits are considerable in terms of valuable lessons learned, from complex building management system (BMS) issues through to simple items of user occupation and use.

Given the value, do we undertake enough? Should each completed scheme be obliged, through regulation, to undertake one? Should clients demand them as part of a complete professional service? I certainly feel that full knowledge of a building’s actual energy use – no matter how frightening to the consultant team – will, firstly, prevent us all from claiming too much credit during the design stages and, secondly, will focus our efforts on the areas that really matter: how to ensure our buildings perform to the agreed design criteria and energy use.

Generally, the clients spoil things by insisting on moving into the buildings, ruining not only our architectural photographs but also putting all the lights on and playing with the heating controls, appearing unable to control the occupants. However, I do appreciate how hard it is to deal with

the expectations of building users. In my own home, even during November, it appears acceptable behaviour – not by me, I might add – to wear minimal clothing and simply turn the heating up to compensate for any exposed skin on show. The intellectual arguments that follow do not always favour the building owner (me), despite the threats to the users over their responsibility for melting ice caps.

This behaviour does seem outlandish and ridiculous, but it does not seem so bad when I think of all the sustainability conferences I have attended where the air conditioning has been so cold I have had to keep at least three layers of clothing on. Perhaps our first major step towards energy use should be a major rethink of acceptable clothing that adapts to the prevailing weather conditions. Maybe the response to a client who asks for a radical approach to low energy design should be a discussion about allowing staff to wear shorts and t-shirts when the weather heats up and a fleece when it cools down?

As a result of the behaviour of my own building users (agreed: it is harsh to think of daughters in this way) I do understand how hard it is to reduce energy use, but I have decided to adopt that great anthem to reducing gas and electricity use in the home, Michael Jackson’s *Man in the Mirror*: ‘I’m starting with the Man in the Mirror, I’m asking him to change his ways, and no message could have been any clearer, if you want to make the world a better place take a look at yourself, then make a change.’ So, jumpers when it’s cold. And no vests between April and October – a good rule for clients everywhere.

● **PETER WILLIAMS** is a director with Moses Cameron Williams Architects and is director of Professional Practice at the University of Cambridge. The views expressed above are his personal views and do not represent the aforementioned organisations

PART L - SHOULD WE BE WORRIED?



Earlier this year, the Department for Communities and Local Government consulted on the Building Regulations. There was much press coverage of the so-called conservatory tax and, since then, silence. **Hywel Davies** asks whether the delayed publication is a cause for concern

In January of this year the Department for Communities and Local Government (DCLG) issued a major consultation package on its proposals to revise the Building Regulations, in particular Part L, in 2013. The consultation closed in April 2012, and the revised Regulations and Approved Documents were promised for this autumn.

The consultation was split into two parts. One section covered proposals for householders to be required to install certain energy efficiency measures, known as consequential improvements, when doing other regulated work. This required responses in late March to enable the changes to be made in time to support the launch of the UK-wide Green Deal, which was then intended to start in October 2012.

CIBSE members and staff spent many hours reading the package and preparing a thorough response, which suggested some modifications to the proposals, and supported the idea that when people improve their home they should do the simple, energy efficient things that have not yet been done. We have heard nothing since. It is now highly unlikely that changes will be ready for introduction in April 2013, as originally proposed, leaving aspects of the Green Deal in disarray. But will they even be ready for October 2013? And should CIBSE members be concerned?

During the consultation, DCLG officials made a series of public presentations on the proposed changes to Part L and accompanying impact assessments. The proposed changes are all cost beneficial, with benefits outweighing costs over the life of the measures. In the domestic sector, the additional costs fall predominantly onto housebuilders and their land banks, while homeowners benefit.

Under Treasury rules for assessing proposed regulations under the one



LIANEM / SHUTTERSTOCK

in/one out rules, only benefits to businesses count. And the coalition had already promised to reduce the net burden of regulation on housebuilders by the end of this parliament. But at that stage, DCLG officials suggested, they had identified various potential 'outs' to enable their proposals to proceed. The uncertainty holding back activity in the sector apparently does not count as a burden or a cost.

A key element of the changes is an 8% uplift in the carbon emissions target for new homes, as a step towards achieving zero carbon homes in 2016, which is the official policy position. There have been many reports that housebuilders are seriously concerned about the costs of achieving this, and wanted no change in 2013, allowing the general economy – and especially the housing market – to recover from recession, with the tighter emissions targets coming later.

Meanwhile, DCLG proposed a 20% tightening of the emissions targets for non-domestic buildings. This was less challenging in terms of one in/one out, as the benefits accrue to business as well

as the costs, and it is a cost beneficial change overall.

So what is the problem? Why are we waiting for an announcement about the 2013 changes to Part L?

Simply, we do not know, since DCLG is saying nothing. But it is not hard to see that the changes for new homes have run into trouble, being seen by the Treasury as a burden on housebuilders and a barrier to getting Britain building again. The facts that more energy efficient homes would be cheaper for their owners to run, year after year, and that more efficient homes add less to UK imported energy, seem to have been disregarded.

And we all saw the furious onslaught regarding consequential improvements, launched in April by elements of the press, with 'sources close to 10 Downing Street' indicating that the proposals would not be implemented.

So that leaves the non-domestic proposals. A failure to sort out domestic changes is no reason to fail to sort out non-domestic, where there are clear business benefits and new technologies can be better targeted. So surely we should hear soon about the timetable for introducing the changes and for publication of the revised Approved Documents? Then the industry as a whole, and CIBSE members in particular, can begin to prepare, assess the implications, brief their clients and train their staff.

It would be disastrous if the self-styled 'greenest government ever' allows its desire to reduce burdens on housebuilders to scupper much needed, cost beneficial changes to Part L for the non-domestic market. For those businesses committed to better building performance, that should be a serious worry.

It would be disastrous if the 'greenest government ever' allows its desire to reduce burdens on housebuilders to scupper much needed changes to Part L

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

BURNING ISSUES

Biomass boilers will be key to thousands of projects meeting carbon targets so it is essential they are designed and specified correctly. Here are the most pertinent issues surrounding their safe and efficient design, according to four industry experts



There is absolutely no place for an architect to define the chimney height or boiler-house location without being supported by a fully trained professional engineer at the very earliest concept stage

Despite being a relatively immature industry in the UK, biomass has become one of the key low carbon technologies expected to help the country achieve its tough 2020 carbon reduction targets. However, reports by building services experts and a Health and Safety Executive (HSE) Safety Notice¹ suggest that a major overhaul of training programmes is required if biomass boiler system installations are to be both safe and efficient.

According to the Carbon Trust's report, *Biomass Heat Accelerator: overview and summary of output*², many large construction projects – such as schools and housing developments – do not involve biomass specialists. Thus, the installation

of a biomass appliance is treated like a standard gas installation, incorporating the biomass boiler into a standard heating system. According to the Carbon Trust, this lack of knowledge of both correct system sizing and integration with fossil fuel back-up technologies, has led to installations that do not achieve expected cost and carbon savings.

This lack of knowledge is compromising safety too. Badly installed boilers and wrongly specified storage areas pose a risk of explosions due to build up of flue gases and build up of static electricity while filling containers. A badly designed wood pellet store could potentially cause carbon monoxide poisoning or farmer's lung.

CIBSE is now producing an *Application Manual on Biomass Heating*



DESIGN CHECKLIST

The characteristics of efficient and reliable installations can be summarised as:

- Chimney height determined by technical and emission dispersion needs alone
- Chimneys are designed in accordance with harmonised BS EN Standards, have no bends, minimal horizontal run length and are CE marked where they are pre-fabricated system chimneys.
- The heating load has been adequately assessed, preferably using monitored data
- Minimum loads are adequate throughout the working year
- Initial system design was in conformity with the Biomass Decision Support Tool. Typical designs size the biomass boiler at 25% to 50% of peak load. Thermal storage and auxiliary boilers support peak loads
- Systems with adequately sized 4-port thermal stores have fewer operating problems
- System hydraulics respect basic physics, and are formally proven to provide controllable systems
- Biomass boiler control arrangements configured as an integrated system with demand side loads, and not an add-on to an existing system
- Effective control strategies properly utilise thermal storage to maximise use of biomass heat, and to support peak loads
- Commissioning must be proven for all load conditions.

to provide robust guidance for the whole procurement chain. And so serious is the risk of poisoning by carbon monoxide that the HSE last month released a Safety Notice on the storage of wood pellets for biomass boilers. Since 2002, at least nine fatalities have been recorded in Europe following entry into inadequately ventilated wood pellet storage areas – three of which were caused when people entered domestic wood pellet stores.

Wood pellets for boilers are normally stored in a large sealed hopper/tank or room. Due to the enclosed nature of these areas, the atmosphere inside can become toxic. Another potential hazard is that wet biomass pellets can self-heat above 105°C and spontaneously combust. Pellets must be kept dry. Rain must be kept out, and

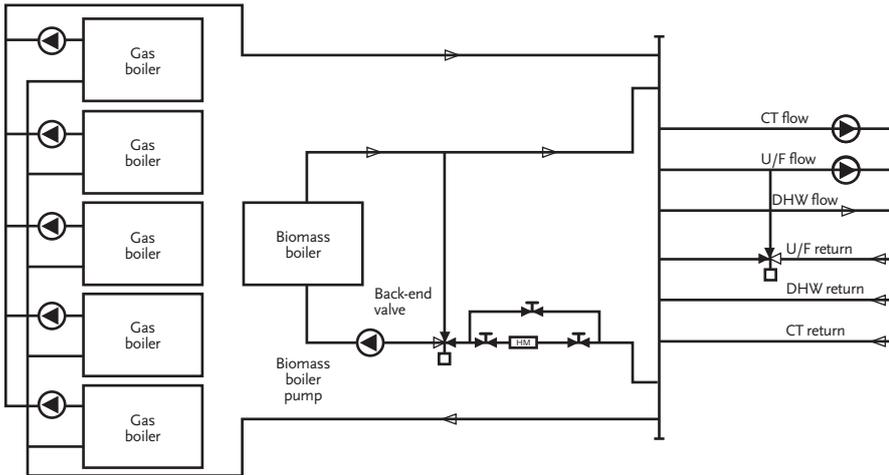
condensation must not drip onto biomass. Also biomass chips stored for more than one month with a moisture content of more than 35% can support a mould that causes farmer's lung – a disease as deadly as asbestosis.

In addition to these hazards, there is also a possibility of carbon monoxide being present in storage areas because of a 'back-flow' of flue gases via the fuel supply mechanism from the boiler. This can be caused by inadequate equipment being installed or by poorly designed flues.

According to the Carbon Trust, a survey in 2010 revealed that only 30% of installations are working well. There are around 3,000 commercial biomass boiler installations operating in the UK, with new installations running at approximately

At the end of 2012, there may be less than 12 people in the UK with adequate knowledge (of procuring biomass boiler systems)

Biomass boiler installation without buffer vessel



Training will be needed for architects, civil engineers, cost consultants, town planners, project managers, construction managers, commissioning engineers and technicians, facilities managers, maintenance fitters and site staff

250 per month. It has been estimated by Colin Ashford, lead author on the *CIBSE Application Manual* that, to meet the UK government’s targets for decarbonising buildings by 2020, 400 fully trained professional engineers and 4,000 design technicians will be required.

Sizing chimneys

In ‘slumber mode’, the boiler fire bed remains alight with minimal combustion air. Under these conditions, flue gases have been measured to be within the lower and upper explosive limits. The fire bed contains the ignition source, and explosions have been reported.

Planners will need support to make rational decisions, but very few people working now have ever sized chimneys.

Common header (low-loss header) design rules

A properly designed low-loss header helps avoid interaction between water flowing in boilers – normally at a constant temperature and flow rate, and the variable temperature and flows in heating and hot water circuits. This hydraulic isolation helps the biomass boiler work efficiently and within manufacturer’s limits. Low loss header and its associated circuits should be designed as follows:

Rule 1. The flow along the header must always be in a forward direction. This requires the total of flows from the primary circuits to be greater than the total of flows of the secondary circuits at all times.

Rule 2. The flow velocity along the header should not exceed 0.15m/s at full load. A rule of thumb to achieve this is to ensure that the diameter of the header is at least three times that of the largest pipe attached to the header.

Rule 3. The header should be mounted vertically.

At low flow velocity any sludge in the hydraulic system will accumulate in the header. The header must be mounted vertically in order to trap sludge at the bottom and be able to drain it. Any air in the system will rise to the top of the header, where it can be removed with an automatic air valve.

Rule 4. The header should operate at neutral pressure. To achieve this, the suction (inlet) side of all pumps in the system should be connected directly to the header. This is consistent with good practice design, where boiler pumps should pressurise boilers to avoid kettling, and secondary load pumps pressurise load circuits.

Rule 5. System pressurisation should be directly onto the header. The pressurisation connection should be above the level at which sludge could collect and below the lowest primary circuit connection. This ensures that every pump is pressurised on its inlet to avoid cavitation.

Modern biomass boilers have very different performance characteristics and requirements from either current fluid-fuelled boilers or former coal boilers. Most of the relevant skills base has now retired.

To stop flue gases causing a nuisance, planning authorities must be informed by flue height calculations, such as specified in BS EN 13384-1³, together with realistic topographical appraisal. This chimney sizing calculation method was available in 2003. In addition, dispersion modelling will be advisable if the flue has nearby tall buildings – that is, a distance of less than seven times the building’s height.

There is some confusion about the applicable guidance and regulations on flue heights. *HMIP Technical Guidance Note (Dispersion) D1: Guidelines on discharge stack heights for polluting emissions* is available from the Environment Agency. That note assumes efflux velocities greater than 10 m/s, which is associated with older boilers with high flue gas temperatures. Biomass boiler flues have efflux velocities in the order of 3 m/s and occasionally up to 5 m/s. D1 calculations are not applicable. Also, HETAS guidance applies to biomass and solid fuel domestic heating appliances and associated services.

Safety on loss of electrical supply

Few designers realise the need to maintain flue draught on power failure. When power fails on a biomass installation, it does not stop combustion or generation of flue gases, so installations may need an uninterruptible power supply (UPS) configured as a safety critical system. This has to maintain the biomass boiler’s control system and the main building’s building management system (BMS), run pumps to take residual heat out of the boiler, as well as the flue fan if installed, until the installation has safely cooled. This may need to run for 90 to 120 minutes.

Biomass boilers have a far higher thermal inertia than oil or gas boilers. Designers need to ask: ‘What happens if the power fails?’ Water flow through the boiler will stop, but the heat in the fire-bed and firebricks must be removed if the boiler is to avoid damage from overheating. Flues with long horizontal runs will often have fans – but these will stop. Then, minimal heat will escape via the flue. Some biomass boilers have a separate cooling water facility to minimise overheating and damage to the fire grate and fire-bricks. The heated water will run to waste.

One small change makes a big difference.

*LPG can cut emissions by over 22%**

*LPG fuelled CHP[†] can reduce energy use by over 50%**



Did you know that just by converting old oil heating systems to Calor LPG, buildings can cut CO₂ emissions by over 22%?*

*A study conducted by NIFES** consultancy group has shown that Calor LPG can reduce carbon emissions and make significant improvements in energy efficiency when replacing old oil heating systems located off the mains gas grid.*

What's more, when using technology such as CHP[†] fuelled by Calor LPG, CO₂ emission reductions can exceed 30%, while energy savings can increase to over 50%.*

As for Calor, over 75 years' experience and the UK's largest team of dedicated LPG engineers ensure expertise is never far away.

*Quoted figures are based on specific circumstances. Further information is available at www.calor.co.uk/nifes **NIFES is a consultancy group specialising in energy efficiency, www.nifes.co.uk.
†Combined Heat and Power.

For more information:
Visit us at *Ecobuild* (Stand N2610)
or call 0800 121 7854 (quoting 'Ecobuild')



*LPG*Genius
from





Very few people working now have ever sized chimneys

What happens if that water supply is from a cold-water boost set? Water in a break tank can run out. The emergency cooling water supply must be testable for flow, and monitored for supply pressure by the BMS.

Effective control of biomass boilers

Biomass boilers are far more complex to control effectively. Biomass systems must be designed to take account of the complete system operation, recognising that biomass boilers produce heat for

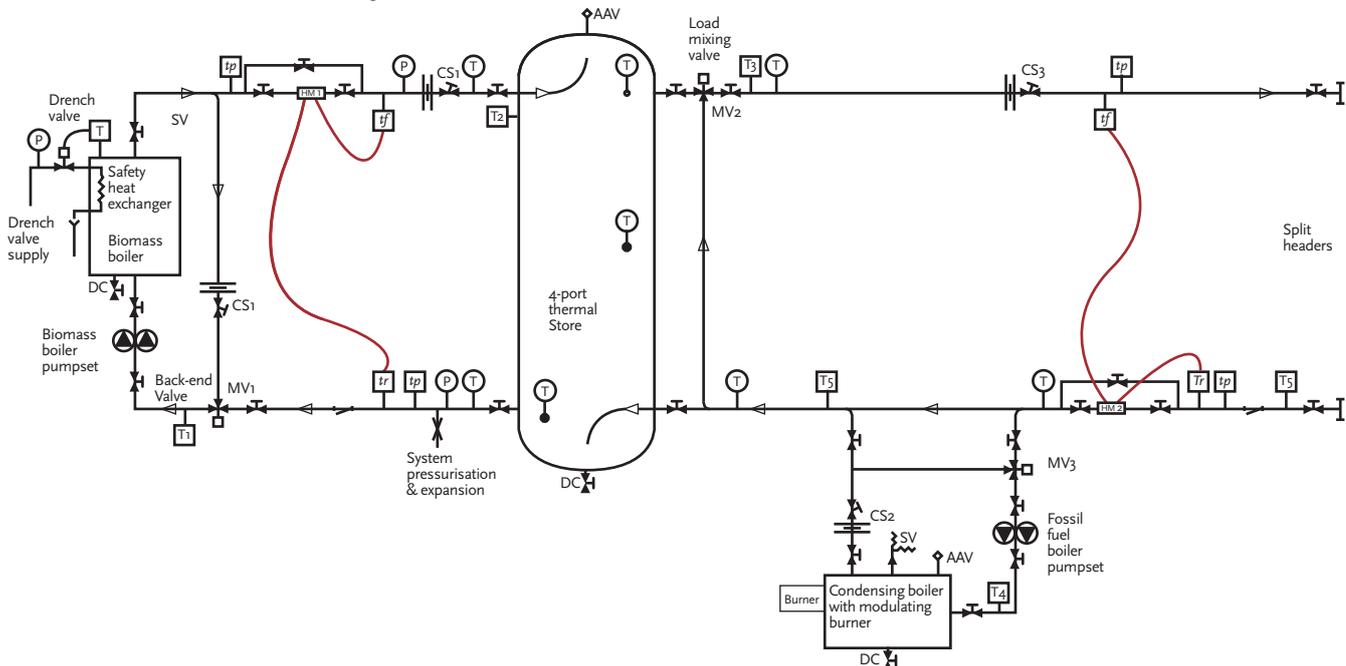
30 minutes to two hours after the call for heat ceases. For efficient operation, this heat should not be lost up the flue, but stored in a buffer vessel or thermal store. A full controllability review is recommended at an early stage in the design – controls cannot just be added on at the end of the design process.

Variable flow is essential for some systems to work effectively and, together with temperature control from the thermal store, can maximise thermal store stratification and hence its effectiveness.

A major cause of underusing biomass boilers is that the auxiliary fossil fuel boilers are not effectively controlled and inhibited from operation when heat is available from the biomass boiler and thermal store. Once enabled, the fossil fuel boilers normally respond more quickly to demand and take over the lead role.

The most effective control strategies frequently use heat-load control, rather than simple temperature-based control. Heat-load control has been available for many years but is not often used due to the additional cost of flow/heat meters. Fortunately, costs have significantly decreased in recent years. Any flow meter – including heat meters – must be correctly installed. Normally, a minimum of 10 diameters upstream and five diameters downstream of straight pipe are required, although some types of meter need more. Meters with analogue outputs are normally preferable for control functions.

Biomass boiler with thermal store and condensing boiler





BoosterMat - Pressure Boosting Systems from KSB

KSB, with renowned global experience gained over more than 125 years, provides a total solution for every water management application all in accordance with the highest quality requirements. With BoosterMat, KSB has defined a new standard that also meets WRAS approvals.

The BoosterMat is both versatile and robust, which allows it to be incorporated in the simplest of domestic applications through to the most sophisticated of engineered or process demands. Typical applications include residential, industry, water utility, office buildings, hospitals, hotels, irrigations and other applications.

KSB Limited • 2 Cotton Way • Loughborough • Leicestershire • LE11 5TF • 01509 231872 • www.ksb.com



Ventilation Solutions by Fläkt Woods Limited

Calling all Building Services Engineers

Why choose the new **e³co Crown** energy recovery unit over typical medium efficient units?

- Thermal efficiency up to **95%** = Reducing your heating demand
- SFP levels as low as **0.67** w/l/s = Meeting Part L
- Low breakout levels = Compliant with **BB93**
- Save **20%** on SBEM = Reduce your renewables
- Payback as little as ***2.5 years**
- Reduce your carbon emissions by ***25 tonnes**
- Pre-wired controls and sensors with **BMS interface**
- Air volume to **1.6m³/s**, with heating and cooling options available
- EC motors **2015 ErP directive compliant**

CIBSE approved CPD available on High Efficiency Energy Recovery Units Vs Medium Efficiency
email marketing.uk@flaktwoods.com for more information



* Based on independent study, for more information please contact marketing.uk@flaktwoods.com

Fläkt Woods Limited
Axial Way, Colchester, Essex, CO4 5ZD
Tel: 01206 222 555 Fax: 01206 222 777 Twitter: @flaktwoodsuk
email: marketing.uk@flaktwoods.com website: www.flaktwoods.co.uk



Safe storage of pellets

We are used to hazards from liquid and gaseous fuels and to the precautions these make necessary. The seemingly benign, environmentally friendly wood pellet fuel is, surprisingly, no less hazardous and we must take appropriate measures to guard against its unexpected hazards.

The normal decomposition of wood includes oxidation of the fatty acids, such as linoleic acid, into methane, carbon monoxide (CO) and hexanal (an inflammable liquid). This proceeds so slowly, however, that no harm is done.

Making wood pellets involves crushing the wood down to about the consistency of sawdust in a hammer mill followed by compression to $\frac{2}{7}$ of the normal volume and extrusion. This alters the rate at which the above oxidative reaction occurs. The extreme case occurs during sea transport when thousands of tons of pellets can

be confined in bulk carrier chambers for around two to three weeks. The headspace in these chambers has been found to contain as little as 1% oxygen and as much as 1% CO, plus the other gases.

There have been stevedore deaths in Rotterdam and Helsingborg, Sweden. But there have been deaths in domestic, pellet-fired installations in Ireland and Switzerland and in large-scale plant in Germany as well. This atmosphere will asphyxiate and is potentially explosive in contact with the outside air. The risk of dust explosion is also present during delivery.

Ventilation of the store is essential to sustain safety, especially in view of the fact that a CO₂ alarm would need to be intrinsically safe and would be forever causing nuisance alerts because of the supply of CO₂.

Equipotential cross-bonding of all metal parts of stores with the building's electrical system, and earthing of delivery trucks and hoses with a minimum 4mm² copper cable before and during delivery, is essential to eliminate the occurrence of static discharge igniting either the explosively inflammable gases or the dust. This is now an official recommendation given by the German Energy Wood and Pellet Association and German Pellet Institute. Explosions due to both causes have taken place in Europe. The rate of the oxidative reaction is temperature dependent and tails off after six to seven weeks.

Therefore pellet fuel hoppers/stores must have a notice placed prominently by any openings and must have the relevant hazard warning symbols displayed.

● **Jim Kinnibrugh** is divisional director at **Specialist Chimney Consultants**

PERFORMANCE CHECKLIST

Systems that are well designed and properly integrated with the building or process, achieve the following:

- The building uses at least 75% of the heat in the fuel
- Subject to client needs, more than 90% of annual heat needs are supplied from biomass
- Plant downtime (except for major services) is less than 150 hours per year
- Flue gases are well dispersed and stay clear of adjacent buildings
- Ash production is less than 0.5% of input fuel weight
- Boiler tube cleaning is needed less than once per month.

Integration between the biomass boiler packaged controls and the BMS/direct digital controls (DDC) can be difficult. Communication protocols may not be easy to interface with building management systems, and suppliers may have limited product knowledge and understanding of effective control strategies.

What can be achieved

The picture is not all bleak, as case studies written by the Carbon Trust show. For example, Lochaber leisure centre's biomass system has been operating reliably for the last 15 months, supplying more than 95% of the total heat requirement. This installation also ticks nearly all of the boxes in the checklists included in the new *CIBSE Application Manual*, and this is by no means an isolated example.

Successful installations have ensured that the whole procurement process for biomass boilers is properly informed, with a fully trained professional engineer engaged at the earliest concept stage to define the chimney height or boiler-house location.

Where do we go from here?

To ensure all those involved in the procurement process of a biomass boiler are adequately trained will be a mammoth task. Professional level engineering training is likely to require a total of five to seven days to complete, plus mentoring

on the first three or four projects. Design technician training will take a minimum of three days, together with access to professional-level engineers. Then training will be needed for architects, civil engineers, cost consultants, town planners, project managers, construction managers, commissioning engineers and technicians, facilities managers, maintenance fitters and site staff. All of this will need to be built up from a very small initial skills base of people with knowledge of the biomass procurement process from start to finish. **CJ**

A guide to biomass heating

The *CIBSE Application Manual on Biomass Heating* is due to be published in spring 2013, with 140 pages covering the whole procurement process, with advice for a wide range of audiences.

References

- 1 Safety Notice: Risk of carbon monoxide release during the storage of wood pellets, The Health and Safety Executive, November 2012
- 2 Biomass Heat Accelerator: overview and summary of output, Carbon Trust 2012
- 3 BS EN 13384-1 Chimneys. Thermal and fluid dynamic calculation methods. Chimneys serving one appliance.

Four experts contributed to this article:

COLIN ASHFORD, consultant to the Carbon Trust and editor of the *Application Manual on Biomass Heating*; **DAVID PALMER**, the founding member of Campbell Palmer Partnership and lead technical author of the new manual; **JIM KINNIBRUGH**, divisional director of The Specialist Group; and **GRAHAM SMITH**, founding member of Birling Consulting.

Who keeps you warm when
it's cold outside?

Hoval



...the Hoval national service team.

We believe that after sales care is just as important as the product itself.



www.hoval.co.uk

Responsibility for energy and environment



The chilled water system has to be reliable – as well as efficient – to ensure RTE stays on air

DIRECTOR'S CUT

Public service broadcasters can't be seen to squander licence fees on inefficient operations, which is why Irish broadcaster RTÉ undertook an extensive audit of its Television Centre chilled water system. It led to an overhaul of the energy control strategy, resulting in savings of €70,000 a year. **James McConnologue** explains

Ireland's national broadcaster, Raidió Teilifís Éireann (RTÉ), is committed to energy reduction in the management of existing and new infrastructure. In a bid to reduce energy use and cut costs it undertook an audit of the Television Centre's chilled water system (CHWS), focusing on the system's direct electrical energy consumption and the potential for delivering improvements that would increase operational efficiency.

The audit revealed the inadequacy of the initial control strategy and led to the introduction of an enhanced building

management system (BMS), which helped cut energy bills by €70,000 (£55,600) at a capital cost of only €3,400 (£2,716). The changes were introduced without compromising the performance of air handling units (AHUs), which were critical in cooling transmission equipment used for live television.

The project

The Television Centre building is a two-storey structure with basement and roof plant space. The building was constructed over two phases (1962 and 1979). It houses all the main television studios, along with technical and administrative areas supporting the full television production process.

Its CHWS comprises two chillers, two cooling towers, six condenser water pumps and four primary CHW pumps. Prior to this project, all AHUs and the CHWS were set to run on a time clock, based on the occupancy of the building. This level of control was achieved using a BMS.

The CHWS supplies the cooling energy requirements of the Television Centre's 22 AHUs. There are a number of different modes of use for the chilled water, from the original dual-duct, multizone AHUs, to

more modern fan coil circuits. The critical loads include live transmission television studios, which rely heavily on the safe and secure delivery of chilled water to ensure uninterrupted transmission on many of the station's flagship live programmes.

While RTE is committed to energy saving, there is a constant requirement to balance this objective with the primary business function of delivering uninterrupted transmission across its different media platforms. The CHWS forms a vital component in this function.

The air conditioning load for the Television Centre building is met by the AHUs. Cooling is achieved by using fresh air – free cooling – when possible and if free cooling is not available, then a cooling coil is enabled, using chilled water (CHW) supplied by the CHWS.

Key project steps

- Reduction in the CHWS operational hours by introducing more stringent time scheduling for the Television Centre's AHUs, ultimately reducing the cooling load demand on the CHWS
- Enhanced BMS strategies, focusing on demand-led engineering, which has the potential for significant energy saving through efficient operation
- Introduction of Modbus interfacing between chillers and existing BMS to maximise the effectiveness of the BMS control strategy. The inclusion of this type of interfacing is expected to broaden the



An example of a chiller used at RTE Television Centre

scope of control capabilities of the CHWS

- Improvement to the operation and efficiency of the chillers, in particular the relationship between condensed and evaporator water temperature.

Cooling load energy audit

In May 2009, a detailed energy audit of the air conditioning system was conducted and a strategy developed that primarily focused on the implementation of free cooling methodologies for the Television Centre's

“The chilled water systems respond to demands by more critical air handling units quicker than less critical AHUs”





6 The issue of matching system response to AHU loads required rigorous testing to ensure comfort conditions were always met and this was achieved through a considerable amount of analysis facilitated by the BMS system

➤ AHUs. An additional goal of the energy audit was to reduce the AHUs' operating schedule, providing not only a reduction in both operational and maintenance costs, but also providing for a significant reduction in the operating hours of the CHWS due to this reduced demand. The findings of the audit allowed for a daily reduction in the operating schedule of three hours (16%), which is achieved without adversely affecting the thermal conditions and health of occupants.

Chilled water system energy audit

The initial findings from the air conditioning system audit also highlighted the inadequacy in the initial control strategy to deliver an efficient mode of operation for the CHWS. The process of developing a new control strategy incorporated the monitoring of each AHU's cooling coil requirement, and using this information to control the CHWS based on a demand-led strategy. The following outlines the strategy:

- Each of the Television Centre's 22 AHUs that require cooling energy were separated into two groups that formed 'priority high' and 'low' formats
- High priority are transmission critical AHUs, while low prioritisation covers non-technical areas
- Each prioritisation group has a 'threshold on/threshold off' facility for the cooling coil percentage valve openings, allowing for a 'delay on' facility for that event
- This tuning facility will allow for the strategy to cope with both fluctuations

in load – due to the on/off status of the different AHU time schedules – ensuring that the strategy provides protection to the chillers' compressors, by reducing the potential for unnecessary stop/starts, which would decrease the life expectancy of the compressor

- The respective priority group set-points can be user-adjusted at the BMS to suit the seasonal operational requirements of the CHWS

Modulating control strategy

It is through the modulating control strategy that the CHWS achieves its load matching capabilities. The BMS was initially limited in its ability to control the chilled water process, and only allowed for a system on/off function by way of a time schedule. The CHWS audit led to a reduction in the actual system 'on' times. However, more savings were available with the introduction of modulating control to the control strategy.

The principle is that the demand for the CHWS is reduced by weighting its response to the AHUs according to their criticality. Put simply, the CHWS responds to demands from more critical AHUs quicker than less critical AHUs.

When the CHWS is eventually enabled, it ramps up in a phased manner, firstly by slowly increasing CHW flow rates; then, if demand continues, it reduces supply water temperature until the load is met. Compared to the previous method of turning the CHWS onto 100% capacity for a set number

NEW GENERATION OF EASY ACCESS MACERATORS

**COMING
SOON**

FROM

SANIFLO[®]

4 New Products Available

- **Easy access – Service your product in place**
- **Fast and efficient maintenance**



SANI ACCESS

- **Quiet technology**
- **Vertical discharge: 5m**
- **Horizontal discharge: 100m**

Ideal for *new installations* in both domestic and commercial premises with light use, such as guest house en-suites and small shops and offices where **business continuity is important.**

For more information visit
www.saniflo.co.uk

of hours per day, it becomes clear how savings were achieved.

The issue of matching system response to AHU loads required rigorous testing to ensure comfort conditions were always met. This was achieved through a considerable amount of analysis, enabled by the BMS system. The eventual solution, in the form of an innovative control strategy, is one that can be applied to a wide variety of applications. An example of this reapplication has been achieved in RTÉ, with a neighbouring building to the Television Centre.

In late August 2009, as a direct result of further investigations into enhancing the modulating capabilities of the CHWS, the project evolved to include the introduction of Modbus control (a communication protocol for connecting industrial electronic devices) for the chillers. This added control allowed for the control strategy design to introduce a variable return temperature set-point for the two chillers.

The implementation of a variable set-point allowed for the strategy to write a set-point between 7°C and 11°C to each chiller, dependent on the load requirements of the Television Centre AHUs. This level of control interfacing reduces the chillers; annual electrical energy consumption by approximately 25% – dependent on outdoor ambient conditions on site. The inclusion of the Modbus interfacing for the two Montair chillers required a capital investment of €3,400 (£2,716). This is the only capital investment that was required for the implementation of a modulating control strategy for the CHWS.

The implementation of the project – based on the findings of the air conditioning system audit, modulating control strategy and Modbus control implementation – has led to electrical energy savings for the entire project of approximately 691,000 kWh in its first year of operation, equating to around a €70,000 (£55,600) saving. This stringent scheduling and demand-led control was pivotal in the delivery of a cohesive energy strategy for the CHWS and, most importantly, required only a relatively small capital investment.

Project performance review

The project is continually evolving, and the management of the new CHWS strategy – in terms of both manpower participation and energy monitoring – are the key areas that keep this project on track. Figure 1 illustrates the overall electrical energy usage on site for the measured period (2008 to 2011).

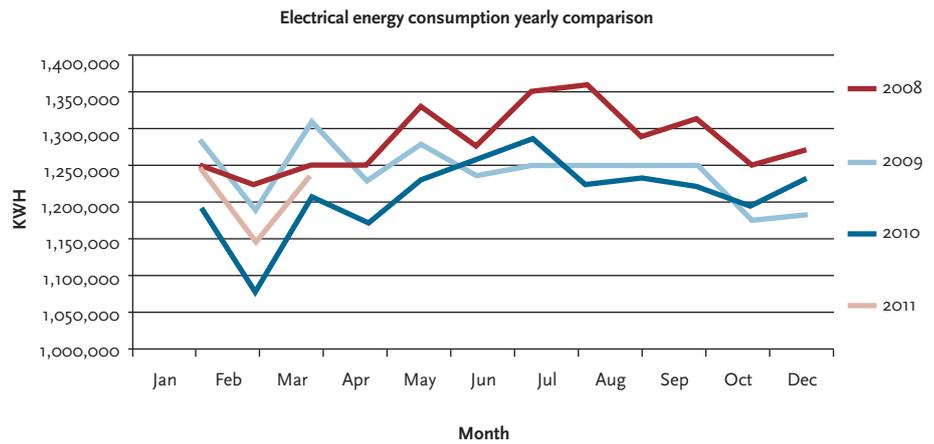


Figure 1 Electrical energy usage comparison: 2008 - 2011

Project summary

- Innovative control strategy allowing demand-led modulating control of a large CHWS
- Implementation of policy changes within RTÉ to allow interdepartmental coordination, leading to schedule matching between users and their respective AHUs
- Introduction of Modbus interfacing between chillers and existing BMS to maximise the BMS control ability over the chillers internal control strategy
- Informing the capital expenditure budget to maximise returns on investment and energy reduction
- Continuous professional development of staff in relation to new control and reporting technologies

It is hoped that the results outlined in this paper will benefit both building services engineers and energy managers alike, by delivering a greater understanding of the operation and design of a CHWS, and the potential energy saving measures that can be implemented for best effect. CJ



ACKNOWLEDGEMENTS

This researcher would like to acknowledge the contribution and assistance of Michael Chaney and Jim Carraher (RTÉ Property & Services) & Troy Bannon CEng MIEI PMP (RTÉ Building Services Engineer) for their time and technical support, which was invaluable to the project, Niall Leonard of Ashdown Controls, Dublin, for his technical assistance in the development of the control strategy and Colm Agnew from the School of Electrical Engineering Systems, Dublin Institute of Technology, for his time in assisting in the completion of the original dissertation for this research.

A full version of this article will appear in the second issue of the *SDAR Journal* (www.arrow.dit.ie/sdar) The *SDAR Journal* is the journal for Sustainable Design and applied Research in Engineering of the Built Environment. It is practically orientated with articles mainly by working engineers about building services applications. It is jointly published by CIBSE (Roi) and the Dublin Institute of Technology (DIT). The first two issues are about Irish projects, but the outcomes may be of interest to all practicing engineers. The 2013 issue will include British projects if papers are forthcoming. Details about submissions are available on the website, or by contacting the editor, Dr Kevin Kelly, at kevin.kelly@dit.ie

High-Performance Green Buildings

Find out
What's new in
Hevacomp

design
components
design
sustainability
architecture
sustainability
architecture
geometry



Image courtesy Hamilton Associates



Image courtesy HKR Architects



Image courtesy Foster+Partners

Software for Building Energy Design, Analysis and Simulation

Successfully creating high-performance buildings demands the accurate prediction of energy consumption, CO₂ 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



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

© 2011 Bentley Systems, Incorporated. Bentley, and the "B" Bentley logo are either registered or unregistered trademarks or service marks of Bentley Systems, Incorporated or one of its direct or indirect wholly owned subsidiaries. Tas copyright EDLS. Used with Permission. Other brands and product names are trademarks of their respective owners.

TOP RANKINE

The Organic Rankine Cycle may sound like it's straight out of *Dr Who*, but instead of enabling time travel it's being used in the latest breed of renewable energy schemes. **Andrew Brister** looks at how it works, and why it's attracted the likes of BSKyB and BAA



What do Otto, Carnot, Rankine and Stirling have in common? An easy 'starter for 10' for the physicists, perhaps, but none of these thermodynamic cycles named after their inventors are as well-known as Mr Diesel's.

Yet, there is a distinct buzz in the building services world about the latest developments in the cycle, devised by Scottish engineer William John Macquorn Rankine back in the 19th century. The Rankine Cycle is a thermodynamic cycle that converts heat into work. The heat is supplied externally to a closed loop, which usually uses water as working fluid. The Rankine Cycle, based on water, provides approximately 85% of electricity production worldwide.

If water is replaced by an organic fluid, thermodynamic efficiency can be greatly increased (see box). Today's Organic Rankine Cycle (ORC) technology is being used for electricity generation from renewable sources and heat recovery, with a major scheme already completed at BSKyB's new television studio and office scheme in London, and another under way at BAA's Heathrow Terminal 2.

Both projects are using ORC equipment supplied by Italian-based manufacturer, Turboden. While the company has been developing ORC technology since the 1980s, it is now seeing a widening of interest, given the drive towards lower carbon building services solutions. 'Traditionally, Turboden has developed projects in which ORC units were suitable for district heating in small- to medium-sized villages,' says Paolo Bertuzzi, general manager at Turboden. 'In the last few years, Turboden has started to develop trigenerative projects for large, single public or private buildings whose drive is not only the return on the investment, but also the green vision of the environment.'

Turboden's ORC unit has been installed into the UK headquarters of television giant BSKyB in a turnkey design and build project by bioenergy solutions provider, Clearpower. Clearpower has built what is claimed to be the UK and Ireland's first biomass combined cooling, heating and power (CCHP) system at BSKyB's new studio and office development in Osterley in west London – Harlequin 1.

The main components of the system are housed in a 16,000 m² energy centre, which comprises a 5.5 MWth biomass boiler, used to provide up to 2 MW of heat, 2 MW of cooling and to power Turboden's 1 MWe ORC electricity generator. It is expected to reduce the building's carbon footprint by at least 20%.

'You need to have a significant demand for heat for this approach to be technically and



6 You need a significant demand for heat for this to be economically viable



economically viable,' explains Mike Shelly, bioenergy manager at Clearpower. 'The ratio of heat output to power is around 4:1. BSKyB has both a high demand for heating and a high demand for cooling, so we could use some of the heat produced for cooling as well.'

A crane system will take the biomass fuel (recycled woodchip) into the furnace, where it will heat thermal oil to more than 300°C. This in turn will heat a silicon organic oil in the ORC generator, which will produce electricity, as well as hot water at 90°C as a by-product. This hot water is then siphoned either directly to the heating system or to chillers, which will provide the cooling required for the studios and data centres at the complex.

There are alternatives to ORC, of course. 'There are three options for power generation with biomass systems: gasification, steam turbines or ORC generators,' says John Heffernan, managing director at Clearpower. On paper, gasification looks the best bet, boasting electrical efficiencies of around 40%, compared to around 19% for ORC and 20% to 30% for steam. 'There are a number of gasification systems up and running, but it's not proven technology and there have been reported failures,' says Heffernan.

'While an ORC system will perhaps be more expensive and slightly less efficient than steam turbine alternative, it will be more reliable,' says Heffernan. This is because steam turbines are operating at high pressure, often 4-50 bar, ➤

Organic is good for you

The Organic Rankine Cycle's (ORC) principle is based on a turbogenerator working as a normal steam turbine to transform thermal energy into mechanical energy and finally into electrical energy through an electrical generator. Instead of steam from water, the ORC system vaporises an organic fluid, characterised by a molecular mass higher than water, which leads to a slower rotation of the turbine.

ORC technology is being used in a number of energy applications, mostly in biomass and geothermal schemes, but great rises in solar and heat recovery applications are also expected. In a typical biomass combined heat and power

plant the process is based on the following thermodynamic cycle:

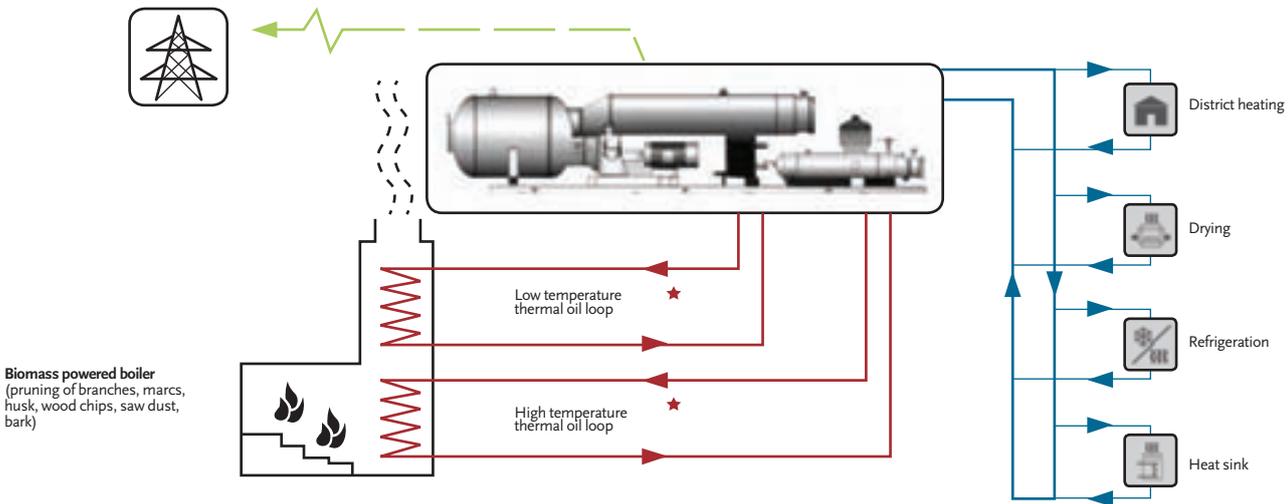
- A heat source heats thermal oil to a high temperature – typically about 300°C – in a closed circuit
- The hot thermal oil is drawn to and from the ORC module in closed circuit. In the ORC it evaporates the organic working fluid of the ORC in a suitable heat exchanger system (pre-heater and evaporator)
- Organic vapour expands in the turbine, producing mechanical energy, which is further transformed into electrical energy through a generator

The vapour is then cooled by a fluid in a closed circuit and condensed. The water warms up at about 80-90°C and it is used for different applications requiring heat

- The condensed organic fluid is pumped back into the regenerator to close the circuit and restart the cycle.

The ORC cycle has a high overall energy efficiency: 98% of incoming thermal power in the thermal oil is transformed into electrical energy (around 20%) and heat (78%), with extremely limited thermal leaks – only 2% due to thermal isolation, radiance and losses in the generator.

CHP plant in biomass applications



ORC systems will prove to be more reliable than steam turbine technology or gasification systems

whereas ORC technology will be working at pressures of only several bar.

The by-product from electricity generation using ORC technology is hot water at 90°C; this is far more useful in a building services setting than steam, since it can easily be used for heating. The electrical efficiency can also be raised to around 21% to 22%, but this will reduce the water temperature by-product to 40°C to 50°C, which is less usable – unless your application has a high demand for hot water in kitchens, showers, and so on.

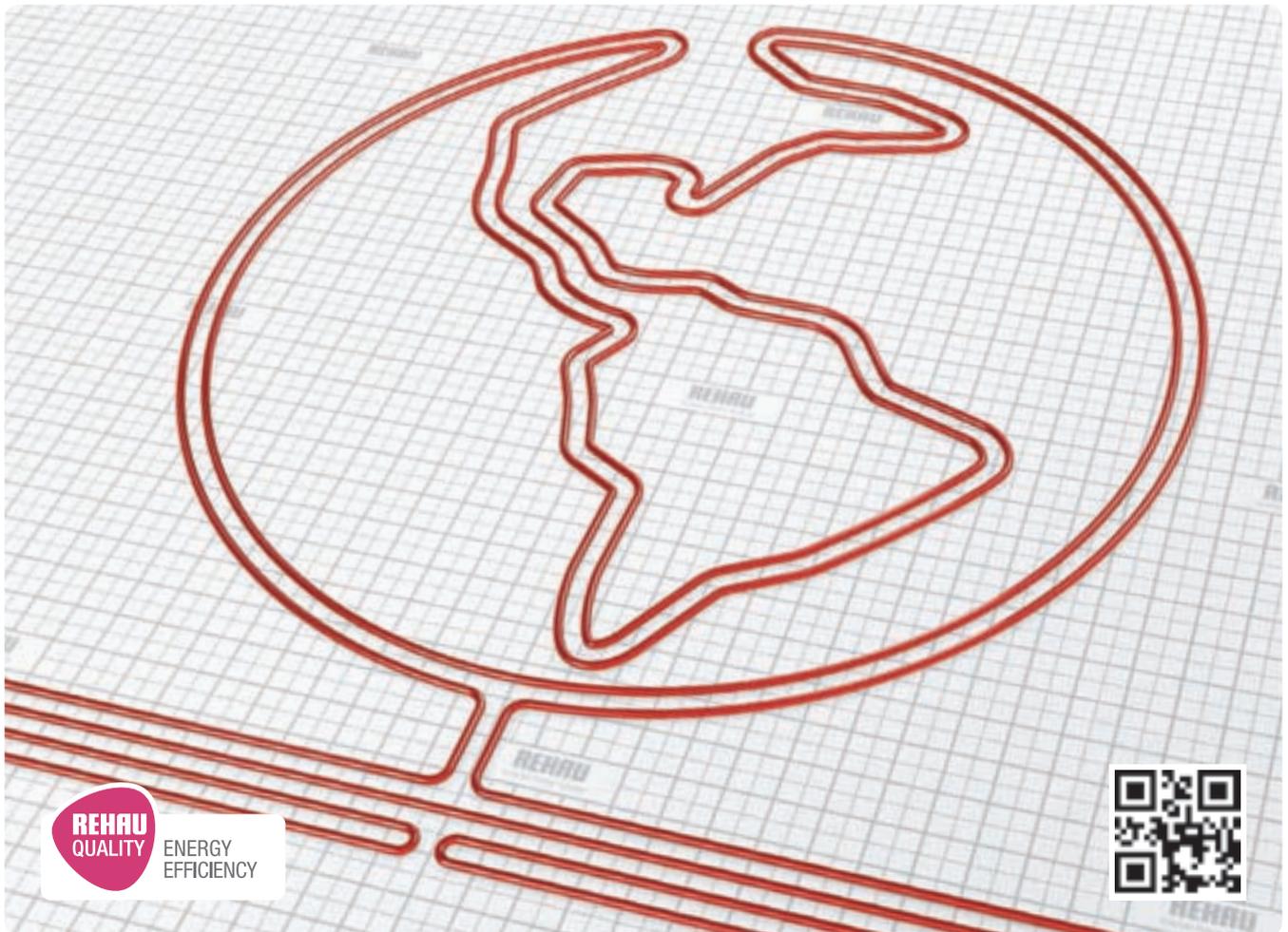
The technology is far from widespread yet, in the UK, but BAA has opted for a similar biomass-fuelled CCHP plant at its new energy centre for Heathrow Terminal 2, which is currently being completely redeveloped prior to re-opening in spring 2014. The energy centre will also contribute base heating and power to Terminal 5 in advance of the £2.5bn Terminal 2 becoming operational.

The 10 MW system will deliver a thermal capacity of 8 MW (75% heat and 25% to chillers, providing heating and cooling to Terminals T2a and T2b and heat only to Terminal T5) and drive a Turboden ORC electricity generator, rated at 1.8 MWe. The plant will enable Heathrow to reduce CO₂ emissions at the airport by at least 13,000 tonnes each year, compared with producing the same output from natural gas. The aim is to reduce Heathrow's carbon footprint by 34% by 2020, with the new Terminal 2 facility using 40% less carbon than its predecessor.

'ORC systems will prove to be more reliable than steam turbine technology or gasification systems,' says Heffernan. 'They are only just starting out in the UK and we haven't got back into investment mode on large projects, but they will appear on schemes in the future.' William Rankine was way ahead of his time. **CJ**

ENVIRONMENTAL CONTROL

ENERGY EFFICIENT HEATING & COOLING SOLUTIONS

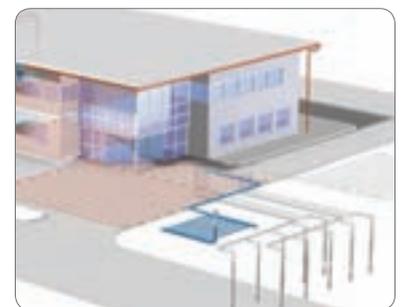


Whilst underfloor heating is undoubtedly an energy efficient way of heating and cooling buildings, the real efficiency of the system can only be realised through good design.

REHAU design underfloor heating and cooling solutions that benefit the construction process in the short term and the life of the building in the long term.

With low water temperatures circulating in the floor system, the distribution of heat only where you need it and reduced on-site maintenance, REHAU offer an energy efficient and cost effective solution.

*Whatever you're working on,
work with REHAU.*



REHAU Ground-source solutions integrating underfloor heating & heat pumps

IT'S UNDER CONTROL

To find out how REHAU can deliver a solution for you visit www.rehau.co.uk/underfloorheating

ORC's path to carbon neutral

For 'nearly zero' carbon UK buildings to become reality, engineers need to take an holistic view of projects and ensure they are making effective use of the energy source.

John Dalley has long held the view that applying integrated site-wide solutions, using proven technologies, will substantially reduce operating costs and provide truly 'zero' carbon site energy. A concept zero carbon (or 'carbon neutral') site powered by a centralised energy unit is shown schematically by Dalley in the figure below. The core of the installation is based around a two-stage ORC CHP plant.

ORC technology has been successfully applied in Europe since the 1980s and can be fuelled with a range of heat sources from biomass and refuse derived fuels (including processed sewage pellets) through to solar collectors, geothermal and ground sources.

The ORC is suitable for waste heat recuperation, where a thermal oil transfers heat from the source to the ORC unit, and can use the heat rejected from other power processes such as reciprocating engines and potentially fuel cells. Dependent on the quality of heat input, the ORC unit would typically produce around 20% electrical output.

As indicated in the figure below, the available heat resource can be almost wholly utilised through a combination of technologies

that allow the capture, storage and delivery of heat. This will enable the highest exergy fraction to be maintained by consuming the heat where best use is made of its quality.

The higher temperature heat is distributed to (commercial) heating and, in conjunction with absorption refrigeration, to cooling loads. Low temperature heat may be used directly in applications such as underfloor heating, or potentially in conjunction with transcritical heat pumps to supply domestic hot water.

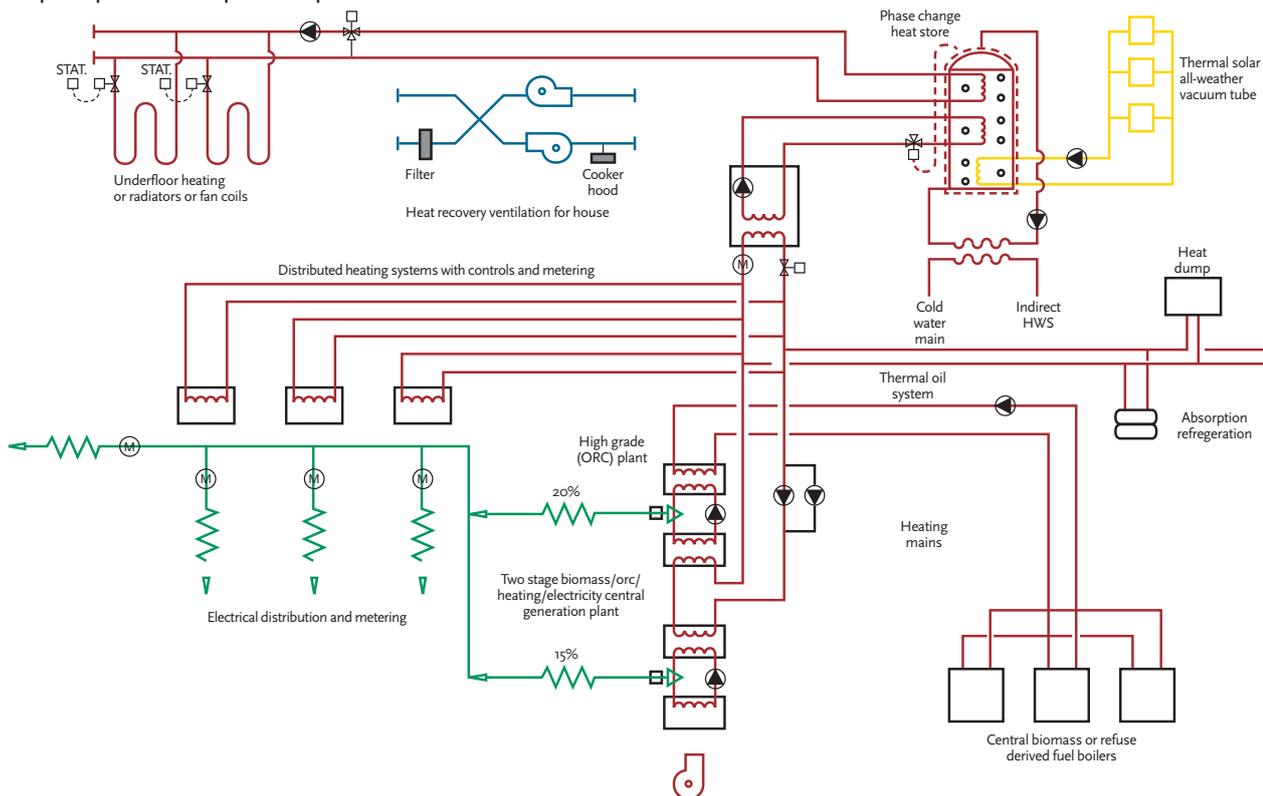
The success of a carbon neutral site is dependent on having a balanced profile of loads to maintain maximum utilisation. The inclusion of thermal storage – in this case illustrated by a phase-change store employing eutectic salts but it could be ground or rock storage – will provide flexibility in matching available heat to the transient demand. To maximize heat benefit and to minimize pumping energy the temperature differences across the loads would preferably be more flexible, and greater, than the still widely adopted 80°C/60°C.

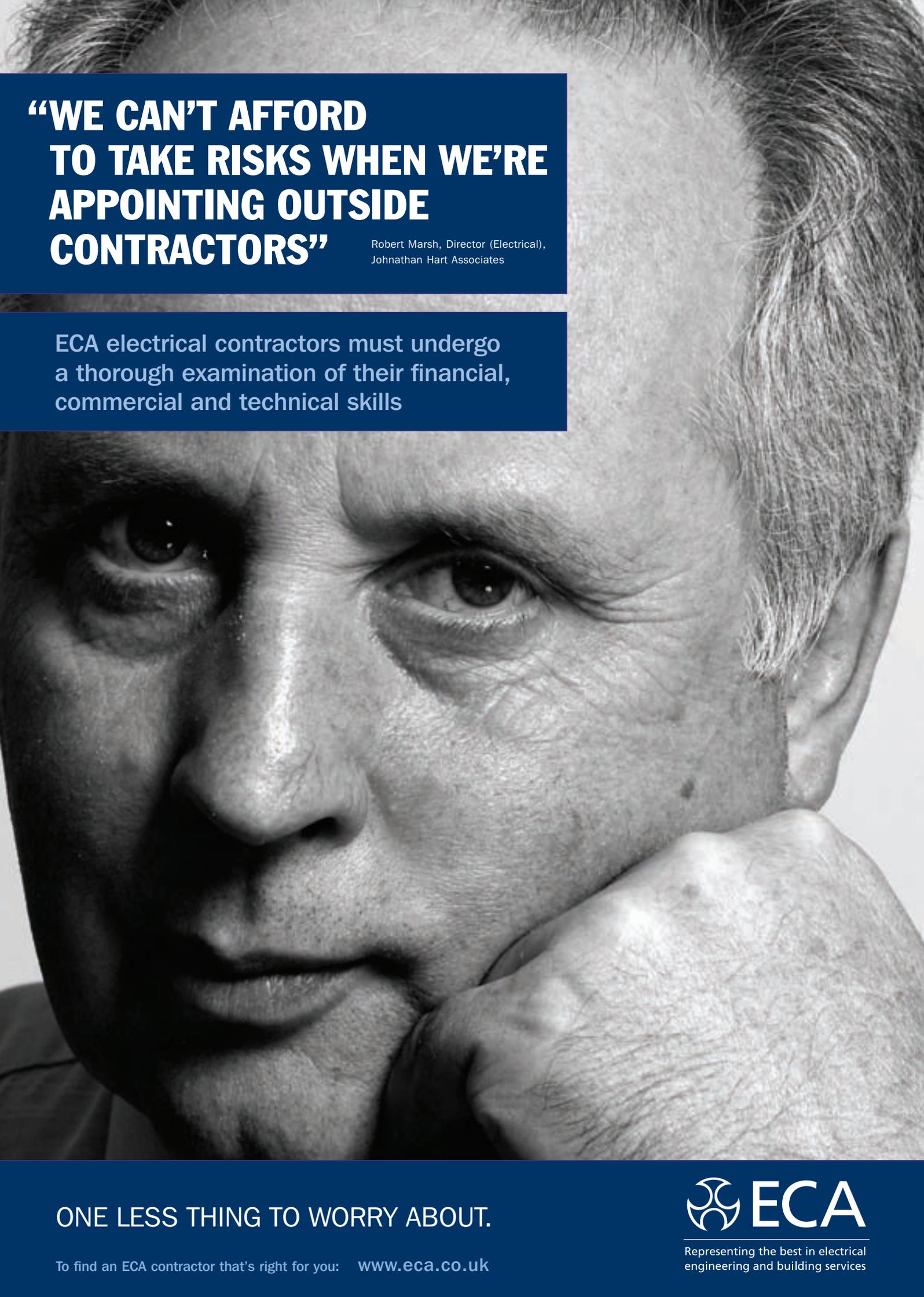
Low exergy sources such as ground loops are fed into the low grade ORC plant, while sources such as refuse-fuelled boilers would supply the high grade ORC plant. Linking the low and high grade ORC units could result in a combined electrical output of about 30%.

Linking the low and high grade ORC units could result in a combined electrical output of around 30%

JOHN DALLEY was formerly design manager at DIS and is now an independent consultant

The principle of operation of a simplified ORC plant





**“WE CAN’T AFFORD
TO TAKE RISKS WHEN WE’RE
APPOINTING OUTSIDE
CONTRACTORS”**

Robert Marsh, Director (Electrical),
Johnathan Hart Associates

ECA electrical contractors must undergo
a thorough examination of their financial,
commercial and technical skills

ONE LESS THING TO WORRY ABOUT.

To find an ECA contractor that’s right for you: www.eca.co.uk



Representing the best in electrical
engineering and building services



RULES OF ENGAGEMENT

Energy performance contracts are set to leverage millions of pounds of funding for retrofit projects, but without a proper framework for measurement and verification, clients and contractors will be financially exposed to unexpected rises in energy use. **Tony Day** explains

A retrofit at Ealing Town Hall – aimed at cutting CO₂ by 1,000 tonnes per annum – was funded through RE:FIT, an energy performance contract model that transfers risk of performance to energy service companies



Measurement and verification should cost no more than 10% of the annual savings, although set-up costs may exceed this in the first year

Energy performance guarantees and contracts are on the increase. The reductions in public sector budgets and a squeeze on finances in general are leading many organisations to find ways of cutting costs without large capital outlay.

This is leading to a growth of third-party financing of energy conservation measures (ECMs), where the financial savings from reduced energy consumption are used to pay back the capital, cover the operational costs, and reduce overall costs for the end user.

In an energy performance contract (EPC) the contractor will often provide the capital, install and operate the ECMs, and provide contractual guarantees on the magnitude of the resulting savings. The client then pays a flat fee over the life of the contract, with the proviso that, if the savings are not being realised, then the contractor will refund the difference.

It is essential to have a well defined energy performance baseline, founded on sound principles, from which to calculate expected savings, and a fully agreed and transparent process for measurement and verification (M&V) of the true savings going forward.

There are a number of variants on EPC including client or other investor funding, energy supply and billing arrangements, or shared savings models (where the client pays the contractor a proportion of the actual savings). However, the principle is always the same – that energy savings fund investment and operation of energy conservation measures and, if set up correctly, it is a winning arrangement for both parties.

ECMs can include anything that saves energy from changing light fittings to boiler replacements or building fabric upgrades, and even behaviour-change programmes. The concept also extends to renewable energy and CHP schemes.

The difficulty with ECMs is that energy consumption is rarely fixed, particularly in buildings. It will vary according to a number of factors including weather, occupancy patterns and behaviour, processes, and operational changes. This makes it very difficult to predict with any certainty just how much a building would have used in any given period of time, and therefore to state exactly what savings have been made for a particular ECM.

If a contract is to serve its purpose, it needs to ensure that neither party is exposed to unexpected or unmanageable risk. For example, if gas consumption were to rise unexpectedly high in a particular month, it must be ascertained whether this is due to failure of an ECM (contractor pays), natural weather effects (terms of contract apply),

or to some operational change outside the contractor's control (client pays).

In setting up a M&V process the contractor will conduct investment grade audits, which form the basis of the business plan for an EPC. This will also involve the need to develop the baselines from which to determine the savings. It is in everyone's interest that these baselines are scrutinised by an independent third party, and that the subsequent M&V is also conducted by that party.

North America has a strong track record in energy performance contracting and energy service companies (ESCOs). The need for impartial arbitration and de-risking contracts has resulted in the Efficiency Valuation Organisation (EVO) producing the International Performance Measurement and Verification Protocol (IPMVP). This sets out the principles of M&V that, if followed correctly, should result in conflict-free EPCs. There is also work under way to develop an ISO in the 5000x series for M&V that will be based on the same principles.

Principles of M&V

IPMVP provides a framework for defining the scope of a project, determining baselines, and measuring and reporting savings. It also incorporates guidelines on the cost of an M&V activity, and the trade-off between cost and statistical uncertainty in the results (for example, the greater the required accuracy, the higher the cost).

At its heart are the four 'options' for an M&V activity, briefly defined as follows:

- **Option A** – retrofit isolation with key parameter measurement
- **Option B** – retrofit isolation with all parameter measurement
- **Option C** – whole facility measurement
- **Option D** – calibrated simulation
- **Options A and B** both look at isolated subsystems that are locally metered. Option A allows some of the influencing factors to have an assumed impact.

For example a re-lamping exercise may have the before and after power consumption measured accurately, but the hours of operation assumed. Option B requires that no assumptions are made and that all factors are metered or measured. This will add costs, but improve accuracy and confidence in the results.

Option C may commonly be used for a building with a number of ECMs installed, where it is difficult to separate their impacts – particularly where some ECMs have interactive impacts of overall energy consumption. Each of options A, B and C above rely on baselines



Under RE:FIT five air handling units have been upgraded at Newham University Hospital

6 All parties should agree and sign off the baselines, as they form an integral part of the final contract, and they will ultimately determine in which direction the money will flow

➤ being produced from records of previous energy consumption. However, if the system being installed is completely new, or if no historical data exists, it may be possible to provide a simulation using a computational model (option D).
 However, it is important that the simulation is calibrated to actual conditions as real data becomes available in order to provide confidence that the original baseline is reliable.
 An example might be for a new building, simulated to show the impact of various ECMs, to be incorporated into the final design compared to them not being incorporated. Calibration would entail comparing the actual

operation to simulations (with ECMs) to demonstrate the reliability of the modelling. Option D may also extend to individual sub-systems, where no historical data exists.

Baselines

Baselines are an all-important feature of M&V. They may be very simply and easily determined (as in the lighting example given above), or else may require detailed analysis with either statistical interpretations, or (as with Option D) complex simulations. Clearly a level of expertise is required in order to develop the baselines, or to scrutinise and verify that they are fit for purpose.

All parties should agree and sign off the baselines, as they form an integral part of the final contract, and they will ultimately determine in which direction the money will flow.

One typical type of baseline would be a plot of gas consumption against heating degree-days, which provides weather correction to expected energy consumption in a given month. This would apply, for example, in a replacement boiler installation, or other measures affecting heating demand. Where a good correlation exists (with limited amount of scatter) this can provide a reliable way of determining whether savings are being made.

However, what happens if some operational change occurs after the ECMs have been implemented, for example operating hours ➤

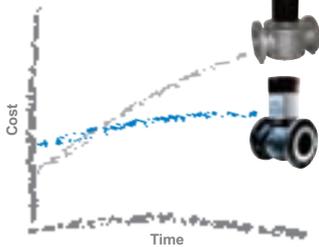


A RE:FIT project at NHS Waltham Forest Primary Care Trust aims to save 139 tonnes of CO₂ per annum

Powerseat®



**cuts electricity and carbon costs
saves money**



Solenoid gas shut-off valve

Lower capital cost of solenoid type valve is offset by high running costs, making the solenoid valve more expensive in the long run

Powerseat electro-hydraulic gas shut-off valve

Powerseat consumes just a fraction of the energy required by a solenoid type valve – reducing energy costs and carbon emissions. Meaning that initial capital outlay can be recouped in less than two years

Payback in less than 2 years

www.powerseat.co.uk
www.blackteknigas.com | 01480 407074



Simply Refreshing

The only independently tested complete answer to tempered fresh air ventilation



Envirofresh 70



Air Source Renewable Energy Stand Alone Packaged Heat Pump Air Handling Unit

Air Handlers Northern Ltd.
Tel: 0161 745 8888
Web: www.airhandlers.net



Air Climate Solutions by Fläkt Woods Limited

prepared for the future...



**eQ PRIME the most effective solution
for lower capital and running costs**



Fläkt Woods Limited
Unit 6240, Birmingham Business Park, Bishops Court
Solihull Parkway, Birmingham, B37 7YB
Tel: 0121 717 4693 Fax: 0121 717 4699 Twitter: @flaktwoodsuk
Email: systems.uk@flaktwoods.com Website: www.flaktwoods.co.uk



The principles of M&V should be routinely applied to such technologies to ensure that they continue to deliver over their lifetime

become extended or a new extension is added? In such cases it is important to provide adjustments to the baseline to incorporate the changes, which may be based on metered data, modelling, or even educated assumptions. Again it is essential that all parties agree on the methodology adopted to account for these so-called 'static factors'.

Uncertainty

In all but the simplest systems, energy consumption will vary and it is seldom possible to assign these variations to individual driving factors. It is often necessary to include statistical analysis of reported energy use to determine how much confidence one can have that savings are being made. The importance of this is to determine the appropriate cost of metering and measurement. If a particular level of metering results in a high level of uncertainty, it may be cost-effective to spend more money to improve accuracy. Good analysis can help with this type of decision.

Reporting

The reporting process will tell all parties what savings, if any, have been made. It needs to show clearly how the reported savings have been arrived at, and what adjustments have been made to account for variable and static factors. As with baselines, the method of reporting should be agreed by all parties at the beginning of the project. The aim is to avoid disputes, and to provide independent arbitration if either side questions the results.

Much of this analysis and reporting is not new. M&V should perhaps be seen as a sub-set of the wider activity of monitoring and targeting (M&T), which has been carried out in the UK for years. Many of the techniques such as regression analysis, cumulative sum control chart (Cusum) and energy signatures are standard procedures, which can be used in M&V projects. M&V just gives these a new focus for interpreting energy data.

Costs

M&V is an additional cost to the project and needs to be factored into the business case. It would normally be paid for by the contractor, but the M&V specialists may not necessarily be appointed by the contractor. The general guidance is that M&V should cost no more than 10% of the annual savings, although set-up costs may exceed this in the first year. It will often depend on the degree of accuracy required by a particular project.

The discussions above have centred on energy savings measures and typical energy performance contracting. However, low carbon technologies, including integrated renewables, also provide energy generation (solar, wind, CHP and so on). There is evidence that many of these do not live up to expectations, partly due to poor commissioning, lack of maintenance, or simply a lack of understanding how systems should work. These are being included in EPCs, and in some instances are subject to performance guarantees.

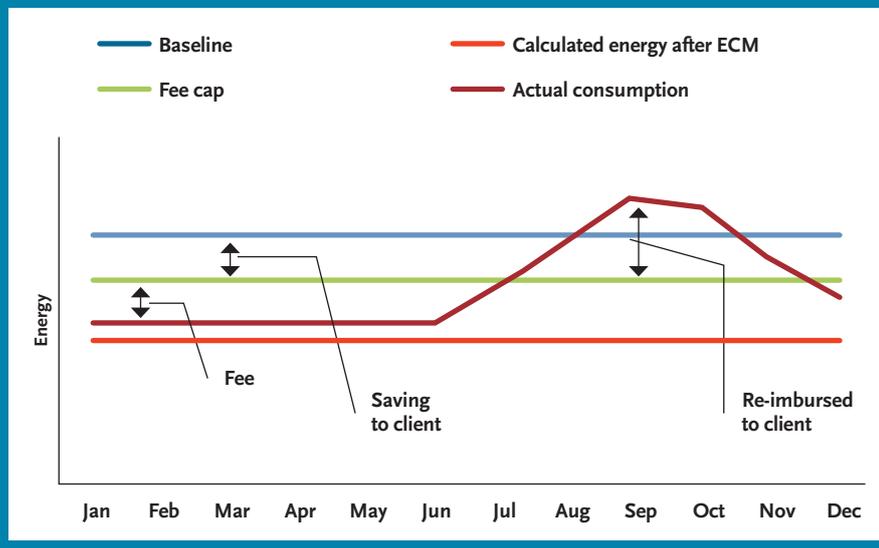
The principles of M&V should be routinely applied to such technologies to ensure that they continue to deliver over their lifetime. It may even become the norm that clients expect performance guarantees on all low carbon designs and systems, especially where they are perceived as a significant extra investment in a new build or refurbishment project. If this does become the case, then the engineering design community will need to be well versed in the language and practice of M&V. CJ

ENERGY PERFORMANCE CONTRACT FINANCIAL ARRANGEMENTS

Figure 1 shows a notional example of how money flows in an energy performance contract (EPC). The example uses a simplified case of a constant rate of energy use for both the baseline and post ECM installation. However, the actual energy use is seen to vary (perhaps because the ECM has failed to operate). The Fee Cap is the level of energy use that the client would expect to pay. The difference between this cap and the post installation consumption is the fee the client pays to the contractor. If, however, the actual energy use rises above this Fee Cap, then the contractor has to pay the difference to the client.

It is in the interest of the contractor to ensure that the actual energy consumption is always as low as possible to ensure a maximum rate of return on the capital investment. The fee paid in any period will depend on actual metered energy consumption.

The issue becomes much more complex when the energy consumption varies (as is usually the case). The baseline should show expected variations, and the variations in actual consumption need to be correctly explained, i.e. whether from expected natural variations (say in the weather), or from operational changes (such as changes in working hours). The cause of the variations will be important in determining which party is responsible for the apparent savings not being achieved, and therefore in which direction money transfers need to take place.



TONY DAY is energy services director at TEAM

The Tempair Range

- COP 10:1 (HR + Compressor)
- Controls options available
- Renewable energy heat pump
- Variable air and refrigerant volume
- Demand controlled ventilation
- Compressor pumpdown
- Savings in LPHW or CW costs

Tempair is a low energy, air source, heat pump system providing heating, cooling and recovery for occupancy fresh air control.



AirSource Ventilation Limited
 email: info@air-source.net website: www.air-source.net
 tel: 0161 425 8553

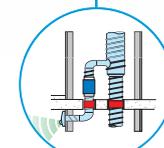
ON DEMAND VENTILATION WHEN YOU NEED IT MOST



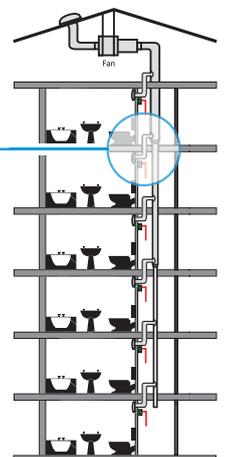
Aire-olve Constant Pressure Twin Fans from Nuair

The system of fans, controls and sensors installed in multi room ducted system is intended to provide continuous background ventilation when the served spaces are unoccupied and will automatically boost when the room is occupied to the design requirements. This energy efficient ventilation solution is extremely cost effective to run and simple to install as all components are delivered assembled, wired and tested. Specify Nuair Ecosmart Constant Pressure and blow away your client's energy bills.

LOCATION OF CVD OR NRG DAMPER



ALL TYPES OF GRILLE AND DAMPER SHOWN, BUT ONLY ONE TYPE IS NEEDED



Nuair. For the complete ventilation solution.

Call **0844 583 0044** email info@nuaire.co.uk visit www.nuaire.co.uk/aire-olve Quote ref code **CIBSE1212**

ENTERING THE COMFORT ZONE

When research revealed demand for underfloor heating was being held back by a perceived lack of controls, one firm decided to develop intelligent software that prevented overheating and worked alongside other sources of heat

Underfloor heating supplier Warmafloor were understandably pleased that their heating system was specified for five of the 11 apartment blocks at the London 2012 Olympics Athlete's Village.

What was even more encouraging for the firm was that the system had been used by Triathlon Homes, the affordable housing provider that had bought 1,379 of the 2,818 homes at the Athletes' Village. Underfloor heating is more commonly associated with luxury apartments than social housing, and the company was keen to prove to the market that underfloor heating isn't just the choice of high-end developers.

Despite this contract win, and other high-profile jobs at Westfield Stratford and Chobham Academy on the Olympic Park, Warmafloor felt the market for underfloor heating was being held back by a perceived lack of adequate controls.

Market research conducted for Warmafloor by International Business Research confirmed that the perceived slow response time of surface heating and cooling was the biggest barrier to the specification of underfloor heating.

Radiant underfloor heating is different to air source heat; it requires closer control. With conventional on/off controls it is easy to overshoot and undershoot, because of





5 Hanover Square

6 The central challenge was developing intelligent enough software to evaluate the effect of varying materials on the effectiveness of the surface heating system



London 2012 Olympic Games Athletes' Village

the mass being heated and cooled, Warmafloor looked at controls from existing manufacturers but could not find a solution that met its requirements.

It set up a dedicated research and development team to investigate an advanced control system to facilitate whole-house appliance management. The aim was to create a system that enabled closer monitoring and manipulation of energy consumption to reduce waste, lower running costs and ensure maximum user satisfaction.

Mike Lamb, managing director of Warmafloor, says: 'When we began researching the controls market we found that many of the existing systems achieved central management by linking up to the building's building management system, which we felt was more of a temporary fix than a long-term solution.'

The central challenge, says Lamb, was developing intelligent enough software to evaluate the impact of varying materials on the effectiveness of the surface heating system. 'Through rigorous testing, we developed a system that can learn the thermal inertia through different thermal masses in the building, be it screeded floors with carpets, screeded floors with ceramic tiling or lightweight acoustic battened timber flooring,' he says.

Warmafloor's Total Integrated Control System (TICS) starts by turning the sensor on 180 mins before the selected time and monitors how long it takes for each individual area to achieve set-point. Through Proportional-Integral-Device logic (PID), the area sensors then learn the heat-up time for each area and reduce the 'on' time accordingly to reduce energy usage. For the first two to three days the system will overshoot and undershoot, until the chips learn the thermal inertia of each space and trim the timings accordingly. Once this initial learning phase has been completed, TICS will accurately maintain the set-point at the selected times.

The learning chip continues to adjust the system because internal heat-up times may vary with different seasons. Once set-point is achieved the sensor, once again, learns the time requirement or 'On' period for the thermal actuators in each area.

The system features energy saver scheduling, for example super-heat during low-cost night-time electricity, a two-hour hot water boost facility and stop/disable functions for rooms not in use. It monitors inactive devices and cycles dormant equipment. An exercising regime runs every two weeks of non-usage to ensure that the pumps, valves and actuators remain efficient. This, combined with an in-built



Heating can be controlled from a touchscreen tablet interface

► maintenance strategy with embedded diagnostics to alert users to malfunctions, aims to minimise repair costs.

Rather than using wireless technology, the system consists of a bespoke wiring diagram and configuration, which Warmafloor claims is low in cost and ensures minimal maintenance. ‘Many systems use RF wireless technology, which requires frequent battery changes that are both disruptive and costly for building users,’ says Lamb.

The system can control up to 32 zones from one central location, with each zone boasting its own sensor, which is connected in a hard-wired BUS cabling system to the input/output logic box relay units and a central touch-screen control pad which can be located anywhere in the property.

So far TICS have been installed in two apartment schemes: Mont Havelet in Guernsey and 5 Hanover Square in Mayfair, London (see box).

J&B Hopkins was the M&E consultant for Mont Havelet. Project manager Adam Hill says: ‘An inadequate controls system had the ability to scupper our energy efficiency targets. With poor controls, it is not unusual to find that some portions of a building are greatly overheated as means of maintaining comfortable conditions in other apartments.’

‘Warmafloor ensured that users can control the heating, ventilation and hot water from one central touchscreen control with discrete sensors in each room.’ **CJ**



MONITORING IN MAYFAIR

Reducing energy consumption is critical, especially in apartment blocks, which are susceptible to high levels of energy waste. Warmafloor was commissioned by AECOM Building Services Engineers to install its control strategy at 5 Hanover Square, a development of five luxury apartments in central London.

Energy efficiency and cost savings formed a key part of the project brief and the individual time and temperature control of each room, in compliance with 2010 Building Regulations Part L, was appealing. The system was tailored for each apartment and controls the underfloor heating and fan coil units to enable automated switching between heating and cooling modes.

This ensures the temperature selected in each room is achieved when it is needed, and helps to maintain a straight-line performance throughout the duration of heating time.

There are also programmed settings for both summer and winter modes – a benefit that provides total user control and maximises energy efficiency. The system also allows the co-ordination of renewable energy sources, such as solar panels, heat pumps, boilers and even garden sprinklers and lights.

The system is able to ascertain which is best suited to the energy need, and ensure that the most expensive source is used only when needed. This helped 5 Hanover Square achieve an ‘Excellent’ BREEAM rating for its sustainable methodologies in construction and building services design.

The precision such a system provides is also important for cutting costs. The controls strategy at Hanover Square is accurate to 0.5°C in comparison to the 4°C of usual thermostats, facilitating lower energy consumption and reduced running costs. With the estimation that every degree Celsius overshoot equates to 10% energy waste, this potential 3°C temperature reduction allows for significant financial savings. Other features that enhance cost efficiency include the system’s programmable winter and summer settings, which enable high energy savings throughout the year, and the energy saver scheduling, which optimises energy use.

Many systems use RF wireless technology, which requires frequent battery changes that are both disruptive and costly for building users
– Mike Lamb

Compact Flexibility



FLEXTRO® Foldable Plenum Boxes

The unique casing concept of the FLEXTRO plenum boxes offers maximum performance and comfort whilst requiring minimum space.

Advantages

- 60 % lower transport and storage volume
- 50 % weight savings
- Acoustically optimised damper blade
- Connecting spigot with double lip seal and damper with interlock in 15° increments from 0 to 90°
- Innovative air distribution element

TROX® TECHNIK

The art of handling air

www.troxuk.co.uk



Commercially, we've got it covered.

Discover our world...



In today's carbon-conscious world, the usual pressures of costs, timescales and reliability have taken on a new dimension. So wouldn't it be nice to have an experienced, reliable and innovative partner to share the load when specifying for commercial projects?

Dimplex is that perfect partner. With decades of experience in manufacturing, supplying and supporting renewables technologies, we really have got it all covered.

With air and ground source heat pumps, low energy radiators, solar thermal hot water and PV systems, commercial hot water storage and a lot more besides, Dimplex already has an unrivalled track record in providing innovative renewable solutions for schools, hospitals, public buildings, offices, hotels and housing developments across the UK.

And of course, it's not just about the products. Dimplex will be on hand with advice, technical support and even funding, all backed up by an extensive national network of fully accredited installers.

Discover our world of renewables expertise today.

For more information on our wide range of commercial products, to read **case studies** of recent projects and to learn about our **full technical support** and help with obtaining **grants and funding** scan here.



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.

Going transcritical with CO₂

This module looks at the growing use of carbon dioxide in transcritical refrigeration applications

Carbon dioxide (R-744) is regaining its place in the refrigeration world, having almost disappeared from widespread use in building services in the early days of air conditioning. Driven by environmental concerns, legislation¹ is requiring increased adoption of 'alternative' refrigerants, of which CO₂ is one. However, the development of transcritical CO₂ systems also provides opportunities for using this largely benign, naturally occurring chemical to power air-sourced heat pumps that can effectively produce temperatures suitable for domestic hot water.

The rise and fall of CO₂

The resurgence of CO₂ is due to its environmental credibility as a 'natural refrigerant', but it is also non-flammable and has thermodynamic properties that give smaller volumetric refrigerant flowrates compared to the well-established halocarbon systems. It also has the benefit of being categorised as non-toxic (although it is an asphyxiant gas).

CO₂ as a gas makes up more than 390 ppm (0.039% by volume) of the earth's atmosphere – one of the more significant gases. The ease by which it can

be produced led to its early application in refrigeration in the mid 1800s, and it was subsequently applied widely in food refrigeration.

The use of CO₂ refrigeration in sea transport enabled the liberalisation of the world fresh food market, and it reigned until the middle of the 1940s, when newly invented synthetic halocarbons became popular owing to their higher efficiencies and lower operating pressures. These displaced CO₂ as the favoured refrigerant, so that by 1960 CO₂ was rarely used in marine applications².

Its use continued in 'cascade systems' for industrial and process applications, where it provides low temperature refrigeration 'cascaded' with a higher temperature cycle (employing another refrigerant) to provide final heat rejection. However, over the last 40 years, the environmental consequences of chlorofluorocarbons (CFCs) and, subsequently, hydrochlorofluorocarbon (HCFCs) and, then, the realisation of the global warming penalty of hydrofluorocarbons (HFCs) has turned the focus back to natural occurring refrigerants such as CO₂, ammonia, and the hydrocarbons.

The many personae of CO₂

CO₂ is well known both to the general public and engineers. Atmospheric CO₂

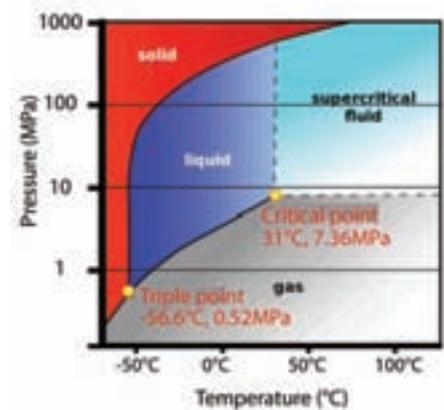


Figure 1: The phases of carbon dioxide

is closely associated with climate change – providing about 60% of the enhanced greenhouse effect – where relatively small changes in global concentrations are linked with rises in global temperatures. The global warming potential (GWP) of CO₂ is relatively low compared with synthetic refrigerants such as R134a, which has a GWP 1,300 times that of CO₂, or even the recently developed 'environmentally friendly' refrigerants such as HFO-1234yf, with a GWP of 4. By comparison, naturally produced methane has a GWP of 25.

CO₂ is produced by the combustion of coal or hydrocarbons, through respiration, ▶

by fermentation, via plant decay, plus it is released from the earth's core through openings such as springs and volcanoes, and produced from acidic water on carbonated material such as limestone. Naturally-occurring CO₂ emissions are roughly balanced by both photosynthesis in plants and absorption at the surface of the world's water masses. Atmospheric CO₂ is thought to have risen about 40% since the start of the industrial revolution.

Internal environmental CO₂ levels (in the air) are typically considered to be at around 1,000 ppm and above, although many studies have measured long-term values that, in practice, are much higher, with the attendant concerns about the effect of this on mental performance and physical health³.

The phases of CO₂ are shown in Figure 1. The *triple point*, at -56.6°C and 0.52MPa, indicates the point where CO₂ may co-exist as solid, liquid and gas – a slight perturbation in pressure or temperature can switch the state instantaneously. Above the *critical point*, 31.1°C at a pressure of 7.36MPa, there is no separated liquid or vapour – it is a homogenous 'supercritical' fluid. Above this point, the latent heat of vaporisation is zero – it does not exist. If the supercritical fluid was extremely compressed (far beyond anything in the commercial HVAC world) it would form a solid.

CO₂ may be distributed as a solid (created by pressurising and refrigerating carbon dioxide rich gases), and as it sublimates to a gas at -78.5°C (at standard atmospheric pressure) it will consistently provide a source of cooling (but with little opportunity to recycle the gas). Thus, it provides a portable source of cooling that requires no equipment at point of use. (It is also used theatrically as 'dry ice'.) Each kilogram of solid CO₂ will absorb 571 kJ from its surroundings as it sublimates into a vapour. It is more often distributed as a liquid in pressure vessels and is used for industrial processes, fire extinguishers, in the food industry and – increasingly – refrigeration. The cost of CO₂ is very low compared with other manufactured refrigerants.

CO₂ in transcritical refrigeration

The outlines for both simple R134a (subcritical) and CO₂ (transcritical) systems are shown on the combined pressure enthalpy diagrams in Figure 2 – the term 'transcritical' simply meaning that the cycle passes across the critical

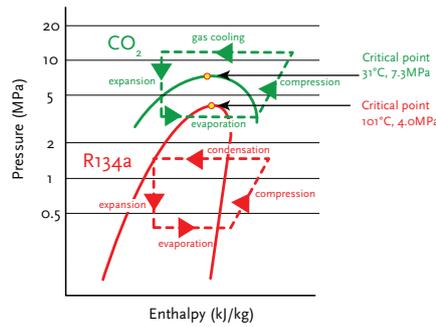


Figure 2: A basic comparison of simple refrigeration cycles – subcritical R134a refrigeration and transcritical CO₂ cycle

point. Applications of transcritical refrigeration have taken off in the last 20 years, particularly with small refrigeration systems – initially for automotive and small marine applications – that are generally acknowledged to have developed from work undertaken by Gustav Lorentzen in the late 1980s. Conveniently, the low critical temperature sits in the middle of the ranges of temperature that are frequently found in HVAC and R applications.

In transcritical refrigeration cycles, CO₂ operates at much higher pressures than traditional HFC and ammonia systems. Modern manufacturing methods have enabled the production of low-cost components capable of operating at the high pressures required for CO₂ refrigeration. This includes small domestic units, heat pumps, supermarket applications, and, to a

lesser extent, industrial applications. Smaller CO₂ systems tend to use unitary transcritical systems, whereas larger, commercial and industrial systems are more likely to employ CO₂ as a low temperature refrigerant in cascade systems, together with other refrigerants such as ammonia being used as the high temperature refrigerant. There have been developments in small scroll compressors and reciprocating compressors specifically for transcritical CO₂ systems. CO₂ has a higher volumetric refrigeration capacity than traditional refrigerants (so requiring less displacement) but at much higher pressure differentials. The reduced volume flows of the refrigerant provides opportunities for smaller components.

CO₂ can also be used as a direct refrigerant, where liquid CO₂ is simply pumped under pressure to an evaporator supplying the cooling load, with the vaporised CO₂ then passed through a low temperature heat exchanger (still at high pressure) and condensed, ready to be recirculated to the load.

Subcritical and transcritical cycles

Looking at Figure 2, the R134a cycle has the evaporating process starting off bottom left, where the low temperature refrigerant is a mix of vapour and liquid. As the refrigerant gains heat from the surrounding cooling load (or heat source for heat pump), its enthalpy rises with

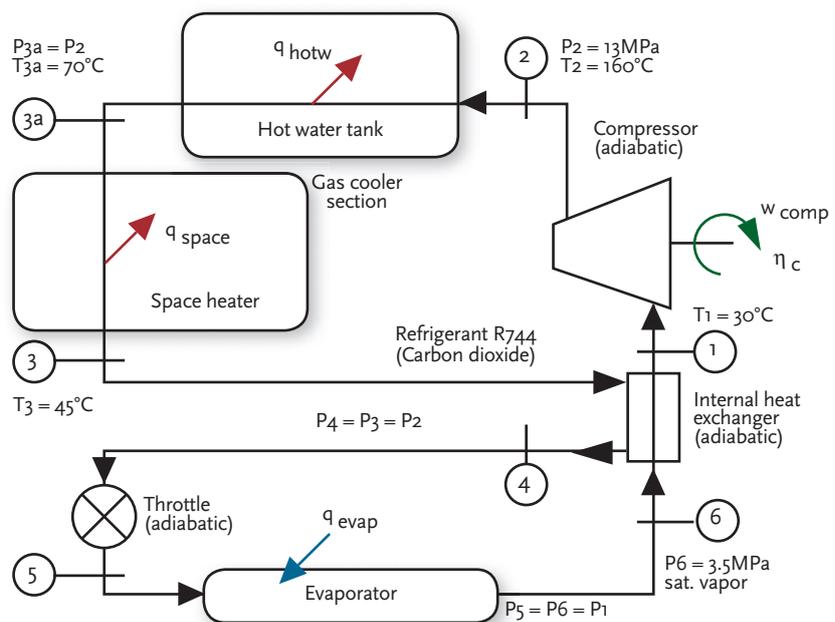


Figure 3 Outline CO₂ transcritical heat pump operation schematic⁴ (example created by Israel Urieli www.ohio.edu/mechanical/thermo)

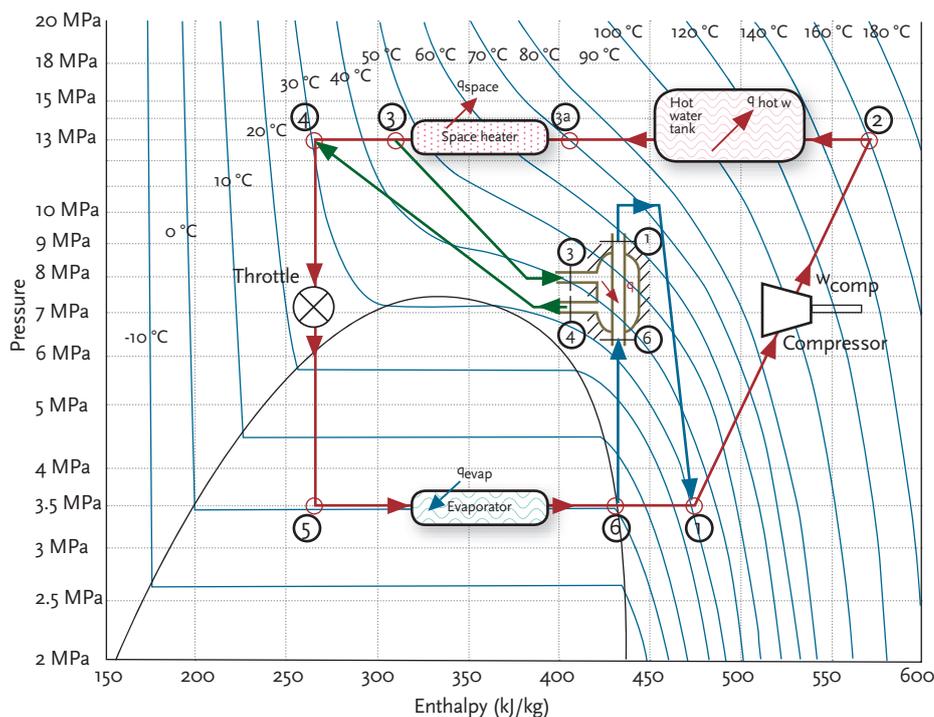


Figure 4: Pressure enthalpy diagram for example CO₂ transcritical heat pump (based on work created by Israel Urieli: www.ohio.edu/mechanical/thermo/)

the refrigerant at constant pressure, until it becomes a superheated gas at the intake of the compressor. The compressor increases the pressure, also adding heat to the refrigerant, and consuming power to drive the motor. The hot, high-pressure, superheated gas enters the condenser, where heat is rejected (or, in a heat pump, passed to the heat transfer medium) and the gas reverts back to a liquid. The warm, high-pressure liquid (often subcooled) passes through a pressure-reducing device (an expansion device) at constant enthalpy. The whole cycle is below the critical point, so is known as a ‘subcritical’ process. The expansion device is designed primarily to ensure that superheated gas enters the compressor by sensing the condition of the low-pressure refrigerant leaving the evaporator to control the flow.

For a transcritical CO₂ cycle, the process does not look greatly different; however, the heat rejection occurs above the critical point and the temperature reduces while the CO₂ remains a gas, and there is no condensation. Both the absolute operating pressures and the range of pressures is far higher than for halocarbon systems. By the system – and specifically the ‘gas cooler’ – rejecting heat above the critical temperature, it allows the CO₂ system to operate so that it can provide heat at an exergy that is useful for heating domestic hot water (while the evaporator is operating at low temperatures suitable

for cooling, or for drawing heat from low-temperature outdoor air in a heat pump application).

At its simplest, the pressure reduction is undertaken using a high-pressure expansion valve (HPEV) that controls the flow of refrigerant based on the pressure in the heat rejection (gas cooler) part of the cycle. In principle, the HPEV is normally held closed by a spring that works in opposition to the pressure in the gas cooler. There are enhancements that have been applied to the expansion process to improve the seasonal performance such as using two stages of expansion, with an intermediate liquid receiver with a direct vapour feed into the end of the evaporator process. A liquid receiver is often variously used (sometimes in association with an additional expansion valve to prevent damaging liquid CO₂ entering the compressor) at the start or end of the evaporator to provide a buffer that allows the metering of the refrigerant to maintain optimum design pressures in the gas cooler.

The efficiency of the system is closely related to optimising the lift provided by the compressor and the temperature at the outlet of the gas cooler – commercially available systems use tuned control algorithms to ensure seasonal performance is maximised. A heat exchanger is often used to exchange heat between the relatively hot discharge from

the gas cooler and the cold discharge from the evaporator. An example application is shown in figure 4 for a heat pump feeding domestic hot water and space heating. In the example, the evaporator is operating at 0°C. To ensure good performance, the heating load – in this case, the space heating – should be designed to work on a wide temperature drop, allowing the gas cooler to work most effectively and provide the greatest opportunity for the evaporator to absorb heat from the outdoor heat source. Systems are available using hermetic and semi-hermetic multistage CO₂ compressors to match the range of loads suitable for building services engineering. For larger systems, such as supermarkets, CO₂ transcritical systems are now frequently used to provide high temperature loads in conjunction with lower temperature, subcritical CO₂ systems.

© Tim Dwyer, 2012.

Further reading:

For an introduction to the basic refrigeration process, see Refrigeration – inside the box, *CIBSE Journal CPD* March 2009.

There is an excellent presentation at [www.phi-usa//Papers/CO₂-presentation-LAM-2003-06.pdf](http://www.phi-usa//Papers/CO2-presentation-LAM-2003-06.pdf) that looks at the comparative attributes of CO₂.

CO₂ – a refrigerant from the past with prospects of being one of the main refrigerants in the future, by Neksa, P., provides both an historical perspective and description of key components (freely available – find via a web search engine).

For a historical perspective, see Pearson, A., Carbon dioxide—new uses for an old refrigerant, *International Journal of Refrigeration*, Volume 28, Issue 8, December 2005.

For safe commissioning and operation of CO₂ systems, the pre-eminent reference is the Institute of Refrigeration’s (IoR) *Safety Code Of Practice for Refrigerating Systems Utilising Carbon Dioxide Refrigerant*.

References

- 1 EC.europa.eu/clima/policies/ff-gas/index_en.htm – accessed 11 November 2012.
- 2 Forbes Pearson, S., *Report on Lloyds Register of Shipping*, 1970.
- 3 *Impact of CO₂ on human decision-making and productivity*, Satish, U., et al., Sunny Upstate Medical University, CARTI Presentations, April 2010.
- 4 www.ohio.edu/mechanical/thermo/Applied/Chapt.7_11/Chapter9.html – accessed 11 November 2012.

Module 47

December 2012

1. What is the approximate current average concentration of CO₂ in the earth's atmosphere?

- A 360ppm
- B 370ppm
- C 380ppm
- D 390ppm
- E 400ppm

2. What conditions define the critical point of CO₂?

- A -78.5°C and 0.52MPa
- B -56.6°C and 0.52MPa
- C -56.6°C and 7.36MPa
- D 31.1°C and 0.52MPa
- E 31.1°C and 7.36MPa

3. If CO₂ was at a temperature of 0°C and a pressure of 10MPa, what state would it be in?

- A A point where it may co-exist as solid, liquid and gas
- B Gas
- C Liquid
- D Solid
- E Supercritical fluid

4. Which one of these is most likely to apply specifically to a transcritical CO₂ refrigeration cycle?

- A It works both above and below the critical point
- B The transport of liquid is critical to operation
- C The transfer of heat is critical
- D The whole cycle is above the critical point
- E The whole cycle is below the critical point

5. Considering the article and the diagrams, which one of these statements about the cycles in a R134a subcritical cycle compared to a CO₂ transcritical cycle is most likely to be correct?

- A If the outlet from the expansion device stays at a constant enthalpy but the evaporator pressure rises, the potential for evaporator heat transfer increases in both cycles
- B The heat rejection process in the transcritical process takes place at six to eight times the pressure of that of the subcritical process, and at a significantly higher temperature
- C The heat rejection process for both cycles is dependent on condensation
- D The compression process for the transcritical system can accept liquid at the entry to the compressor, whereas the subcritical system can not
- E The compressor is likely to have smaller refrigerant volume flowrate in the R134a system compared to the CO₂ system for similar loads

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:

N Hurley, CIBSE, 222 Balham High Road, London, SW12 9BS

Smartcool ECO3 adds energy efficiency to smart thermostat systems

Smartcool retrofitted its ECO3 on two Trane air conditioning units cooling a government office building in Miami, Florida. One of the air conditioning units was a 22 kW dual compressor unit, and the other an 11.5 kW TR19 Hi-Lo unit with a single compressor, both controlled by a smart thermostat. Despite their pre-existing energy efficiency, Smartcool's ECO3 was able to save an additional 32% of energy when operating the compressors, saving more than \$7,000 USD per year on the building's electricity bills.

● Call 01420 544868 (UK) or +1 713 263 7888 (USA) or visit www.smartcooleco3.com



New electro-dynamic voltage optimisation system launched

Following the success of its existing Star range of energy saving solutions, EMSc (UK) has launched a system into the Powerstar collection. Powerstar HV MAX is a low-loss amorphous core HV transformer with the award-winning Powerstar Voltage Optimisation combined, which allows for 11,000 v input and electronically regulated 380 v (or user regulated) output. The product will allow companies to save costs and reduce carbon emissions in high voltage, as well as low voltage, areas.

● Visit www.powerstar.co.uk or call 01709 836200



Titan Products launch TPZ-Net Zigbee wireless range

The TPZ-Net is a new range of wireless environmental products from Titan Products. Incorporating Zigbee wireless technology, the range creates extremely stable, self-healing mesh networking capabilities. The TPZ-Net range is designed to monitor temperature wirelessly, CO₂, humidity, light and occupancy levels and transfer this information back to the Titan Products coordinator, where the information can be transferred onto a BACnet network or to other Titan product controllers or I/O (input/output) devices.

● Visit www.titanproducts.com or call 0161 406 6480



Remeha Commercial appoints national sales manager to join the team

Remeha Commercial has appointed Chris Meir as national sales manager. Meir is tasked with leading the sales team in the continued success of Remeha Commercial and growing its share of the commercial heating market. He rejoined Remeha Commercial in December 2009 as areas sales manager, having previously been with the company from 2002 to 2005. He was appointed national business development manager in October 2011. James Porter replaces Meir as national business development manager and area sales manager for the West Midlands. James previously held sales managerial positions at Ferrol Commercial, Pipe Center, part of Wolseley Centers, and Biasi UK.

● Visit www.remeha.co.uk or call 0118 978 3434

Panasonic enlists Logicool

In a bid to further increase product awareness, sales opportunities and long-term company growth, Panasonic has recently signed a distribution agreement for its air-conditioning ranges with Logicool Air Conditioning Distribution. Recent Product Distributor of the Year winners at the ACR News Awards 2012, Logicool is known within the air conditioning industry as one of the top distributors for some of the most widely recognised heating and cooling brands within the UK.

● Visit www.panasonic.co.uk/aircon



EPEA approval for CradleVent

CradleVent claims the accolade of the first ventilation duct in the world to receive Cradle to Cradle approval by the EPEA Institute in Hamburg, Germany (www.epea-hamburg.org). The certification documents the sustainability of the product and the fact that KE Fibertec take responsibility of its life cycle from cradle to cradle – that is, from production to recycling. By establishing a circle now, we can meet the future shortage of raw materials. CradleVent is our product contribution for achieving future-proof and sustainable air distribution in comfort zones.

● Visit www.ke-fibertec.com/c2c

Ebm-papst wins prestigious industry award for data centre upgrade



Europe's leading manufacturer of high efficiency EC fans and motors, ebm-papst, has won a coveted 2012 RAC Cooling Industry Award. The accolade was given in the Industrial and

Commercial Project of the Year category for ebm-papst's collaborative work with Emerson Network Power and Norland Managed Services. The award-winning project looked at a data centre upgrade for the National Bank, which improved energy savings by around £240,000 to £270,000 per annum.

● Visit www.ebmpapst.co.uk

Helvar's addition to DIGIDIM lighting control most compact interface yet

Helvar has announced the latest additions to its DIGIDIM systems range with the launch of the new 445 Switch Interface Unit, and two single channel relay units – the 492 and 493. The DIGIDIM 445 Switch Interface Unit is Helvar's most compact interface for converting third party switches and buttons to be compatible with a Helvar lighting control system. The new unit provides four switch inputs and four LED output drivers for indicator LEDs.



● Visit www.helvar.com

Vitodens 200 W boilers expand output range three years ahead of regulations

Viessmann's new 125 and 150 kW models meet the high output wall-hung boiler needs of commercial installers and deliver on energy savings three years ahead of impending legislation. Viessmann has launched two new models to its line of Vitodens 200 W gas-condensing commercial boilers, now offering even higher outputs of 125 and 150 kW. This means the range can be cascaded to produce outputs of up to 900 kW – 60 kW more than previously.

● Email info-uk@viessmann.com or visit www.viessmann.co.uk



Air Conditioning and Refrigeration Show 2014 gathers momentum

The new official website for the forthcoming Air Conditioning and Refrigeration Show 2014 is now live, the organisers have announced.

Visitors and exhibitors can now visit the site (www.acrshow.co.uk) to see the latest news and developments on the event – the only national exhibition dedicated to the air conditioning and refrigeration industry – which takes place at the NEC, 11 to 13 February 2014. People can register via the website to receive regular updates on the show.

● Visit www.acrshow.co.uk



Concealed air curtains at Cannon Street

JS Air Curtains has supplied four custom air curtains for a concealed installation at 110 Cannon Street, where they have been discreetly embedded into the walls. The air curtains are hidden from view on both sides of the imposing main entrance and quietly ensure a comfortable temperature within the elegant reception lobby. Building engineering consultant AECOM called in air curtain specialist, JS Air Curtains, with whom they had previously worked, to tender. JS's innovative, 'concealed' design proved the ideal solution.

● Visit www.jsaircurtains.com or call 01903 858656



Armstrong pump range delivers optimum efficiency

Armstrong has launched a range of variable speed pumps that can offer outstanding energy efficient performance across a wider operating envelope than ever before. Designed with a built-in safety net, they eradicate the need to trade-off the energy efficiency of the installation through over-sizing equipment 'to be on the safe side'. Incorporating Armstrong's award-winning on-board inverter control feature, they adjust quickly to changes in load to optimise energy efficiency of the system automatically.

● Visit www.armstrongintegrated.com or call 08444 145145



GE wins HSBC Canary Wharf contract

GE Lighting has been appointed to update the signage atop all four sides of the HSBC building in London's Canary Wharf, with its highly efficient Tetra PowerMax LED modules. The work was scheduled to commence in November,

and will see the removal of the outdated signage and the installation of new, five-metre-high letters and a logo spanning almost 30 metres. The lettering will appear black during the day and will shine bright white at night.

● Visit www.gelighting.co/uk



CIBSE mark of approval for CPD

Hamworthy's latest Continuing Professional Development (CPD) seminar has gained accreditation from CIBSE, endorsing the course and its content to benefit the building services engineer professionally, enabling it to count towards a CIBSE member's annual CPD hours. Continuing Professional Development is about learning and putting into practice new competences year after year. CIBSE members are required by the Code of Professional Conduct to maintain their professional competence throughout their career, which can be achieved in a number of ways.

● Email sales@hamworthy-heating.com or call 0845 450 2865



Hitachi Air Conditioning Europe – ready for Eco-design Directive



The Eco-Design of Energy-related Products (ErP) Directive provides consistent EU-wide rules for improving the environmental performance of energy related products. The directive requires integration of eco considerations at

the outset of product design – ensuring reduced energy consumption to benefit both businesses and consumers. These regulations include air conditioning products, which are a key source of energy consumption in buildings, and require all manufacturers to calculate energy usage in a more realistic way.

● Email maryfery@sky.com or call 07745 368118

Polypipe launches international brochure to showcase its expertise

A leading European plastic piping systems manufacturer, Polypipe, has launched an all-encompassing international brochure to showcase the benefits and versatility of its expertly



engineered solutions to consultants, contractors and distributors globally. The new and impressive guide features an array of innovative, high quality plastic piping systems for the effective movement of water, air, energy, telecoms and chemicals. The

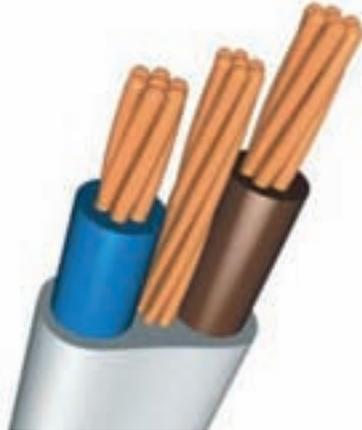
brochure is available to construction professionals in English, French, German, Italian, Spanish, Russian and Arabic.

● Visit www.polypipe.com

Flexible door-entry system from Urmet

Door-entry manufacturer Urmet Domus reports impressive sales to date of more than 30,000 systems of their 2Voice, two-wire system. Installed using only two wires, 2Voice connects with a twisted pair of a Cat5 cable. 2Voice is compatible with Urmet's latest range of monitors and entry panels and is billed as ideal for building renewal installations, with no need to replace the existing wires. This offers the end-user or building owner a flexible and modern-day system without the need to re-wire the building.

● Email marketing@urmet.co.uk



Marking two decades of CableCalc Level P with a free version of new twin and earth calculations

To mark 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 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.

● Call 01293 871751 or visit www.castlinesystems.com

Jaga launches all-in-one heating, cooling, ventilating trench system

The all-new Jaga Quatro Canal provides mechanical and electrical professionals with the opportunity to design-in powerful heating, cooling and ventilation services, all from a single trench system. Equally suitable for use with either traditional boiler or low temperature renewable heating systems, and designed for use in a four-pipe set-up, the Quatro Canal is stylishly contemporary looking, yet discrete, and measures just 270 mm wide to minimise the visual impact on a building's design and layout. Each unit includes a dynamic four-pipe heat exchanger and up to four tangential thermic activators, which can be controlled by a building management system or simple room thermostat.

● Visit www.jaga.co.uk or call 01531 631533

Armstrong Ceilings headline at BRE's latest Innovation Park in Scotland

Energy-saving tiles from Armstrong Ceilings are at the forefront of BRE's (Building Research Establishment) latest Innovation Park in Scotland. Armstrong's CoolZone system features on the ceiling of the main seminar area of the visitors' centre at the heart of the 1,125-acre Ravenscraig Regeneration Project. The centre is the first completed building on BRE's two-acre Innovation Park. The building represents the latest in off-site manufacture, technology integration and building management.

● Visit www.armstrong-ceilings.co.uk or call 01895 251122



Pre-fabricated options

Pre-fabricated valve assemblies from Marflow Hydraulics, the specialist solution providers for the balancing, controlling and metering of water distribution systems in the heating, ventilating and air conditioning industry, are proving to be a real time-saver for customers. With numerous options to suit individual application needs, Marflow Hydraulics' valve assembly units, known as Xterminators, are not only supplied pre-assembled, but also pre-tested and individually tagged and labelled, indicating valve reference to help save customers a great deal of time on site.

● Visit www.marflowhydraulics.co.uk or call 0845 564 1555





HFO-based turbomiser chiller 'solves two critical issues', says Cool-Therm

Cool-Therm is championing the adoption of a new generation of ultra green turbomiser chillers based on HFO refrigerants. The award-winning company believes that the chillers, which run on HFO1234ZE, offer the best solution to the industry's twin requirement for improved energy efficiency and reduced environmental impact. Ken Strong, managing director, said: 'HFO1234ZE has a Global Warming Potential of just six compared with 1,300 for the common HFC refrigerant R134a. It is effectively 217 times less damaging than today's mainstream refrigerant.'

● Email enquiries@cool-therm.co.uk or call 0117 9610006

Airvent contributes to FIRAS – the fire safety accreditation scheme

Once again pioneering improvements in the fire safety industry, Airvent has contributed to the development of the FIRAS scheme, which aims to set a minimum industry standard for the installation and maintenance of smoke control systems. Under the FIRAS scheme, certified companies are obliged to employ competent supervisors and technicians who have been assessed by FIRAS inspectors. These competent employees are regularly reviewed, ensuring their technical and practical abilities remain in accordance with FIRAS regulations.

● Visit www.airvent.co.uk



Mitsubishi Electric hails partnership

Mitsubishi Electric has hailed its 2012 partner conferences a great success after hosting them at the home of the Premiership champions, Manchester City, and the European Champions and FA Cup winners, Chelsea. The day-long events, held at the home of both famous clubs, saw hundreds of Mitsubishi Electric customers attend to hear market forecasts, learn about the pioneering new products the company will be introducing in the coming year, and understand what the firm is planning to do to help boost the business of its partners.

● Visit www.mitsubishielectric.co.uk

MAGNA3 sets new standards

Offering features such as record low energy consumption, the best quality available and a user-friendly wireless interface, the new generation of Grundfos MAGNA3 products will soon be available to the market. These innovations include new state-of-the-art circulator pumps that will contribute to strengthening Grundfos' position as a world-leading pump manufacturer. With 40 years of experience with electronically controlled pumps, and a million test hours spent putting the MAGNA3 through its paces in extreme conditions, Grundfos guarantees that the pump is built to last.

● Email uk-sales@grundfos.co.uk or call 01525 850000

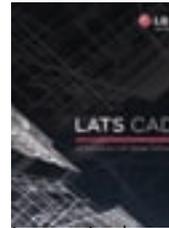


Hager launches universal dimming solution – first in UK claim

Hager claims to be the first manufacturer in the UK to offer a dimming solution that can recognise new loads. The new range of dimmers has a lamp learning function, which allows it to detect and control different lamps, including dimmable CFLs and LEDs. The new dimmers will allow the end customer to change the lamp type without having to call the installer for advice. Steve Dyson, product manager for Hager, said: 'Our solution is a one or two module control device that is fitted in the electrical distribution board. This means that any wiring accessory with a retractive switch can be used for dimming.'

● Visit www.hager.co.uk or call 0870 240 0400

New from LG – intuitive Autocad add-on



LG Electronics air conditioning and energy solutions division has developed a new tool aimed specifically at consultants. LatsCAD is an 'add-on' to CAD packages for designing air conditioning systems. LG

is committed to providing quality products and complete service for consulting engineers designing HVAC building systems. This latest LG innovation, LatsCAD, can be seamlessly integrated into AutoCAD 2010 Professional and can reduce design time by up to 60%.

● Visit www.uk.lgeaircon.com

Energy
Efficiency
Exhibitions
including Renewables Roadshow

Renewables on the road again

The award-winning Renewables Roadshow is set to tour the UK once again in September 2013, as the more expansive Energy Efficiency Exhibitions. Featuring a comprehensive mix of demonstrations, presentations and product displays, the Renewable Heat Incentive and Green Deal will also feature strongly. Tickets will be free and include access to all areas. Dates for 2013: South West, 10 September; Midlands, 12 September; North East, 17 September; Scotland, 19 September; South East, 24 September; North West, 26 September.

● Visit www.energyefficiencyexhibitions.co.uk

Nuairé recognised with double win

Caerphilly-based Nuairé, one of the world's leading manufacturers of energy efficient ventilation systems, has won two awards for innovation and creativity in manufacturing at the Made in Wales Awards 2012. At a glitzy ceremony hosted by broadcaster Huw Edwards at the Mercure Holland House Hotel in Cardiff, Nuairé scooped the Manufacturing Innovation Award and the Creative Design Award, in recognition of its efforts to redevelop its residential portfolio to match increasingly strict housing regulations.

● Visit www.nuaire.co.uk



New Street's high-voltage supply switched on in Birmingham

A new critical high-voltage electricity supply has been switched on at Birmingham's main railway station, thanks to growing independent multi-utility connections specialist, Energetics. The company overcame demanding challenges to deliver the supply as part of the redevelopment of Birmingham New Street station, which will deliver a 21 century transport hub for the city and wider West Midlands. Under Energetics' £1m contract, it laid 3 km of cabling through Birmingham city centre. It also built two new bespoke, compact intake HV switchrooms.

● Visit www.energetics-uk.com

Saint-Gobain PAM UK launches VortX microsite to showcase its products

Following the recent introduction of its new VortX cast iron floor drainage products, leading iron technology solutions provider, Saint-Gobain PAM

UK, has launched a dedicated microsite, which is designed to give customers all the information they need on the full VortX range for the commercial and construction market.

Visitors to the site can get an overview of the products within the range in categories such as gratings and rodding eyes, gully bodies, raising pieces, inserts, adaptors and accessories.

● Visit www.pam-vortx.co.uk or call 0115 930 0681



Fastlane hired for retail and hotel project

When Travelodge opened a combined store and hotel development with Topshop in Edinburgh's retail heartland in a UK first, Fastlane Ventilation were contacted to supply the heat recovery equipment. The unit and control panel from the air handling specialist, based in Netherton in the West Midlands, was used to condition and circulate the air as part of the new heating, ventilation and air conditioning system. The former stockroom area is above Edinburgh's flagship Topshop store, which is housed in Scotland's very first steel frame grade II listed building.

● Email sales@fastlaneventilation.com.uk or call 01384 720460

Future markets demonstration at ARM TechCon in California

PhotonStar LED Group, the British designer and manufacturer of smart LED lighting solutions, was invited by ARM Holdings to provide a demonstration of LED lighting with embedded microprocessors as part of a future markets showcase at the ARM TechCon in Santa Clara, California, on 30 October. PhotonStar's ChromaWhite colour tunable LED technology is one of the first lighting solutions that features an embedded ARM microprocessor.

● Visit www.photonstarled.com



Fläkt Woods plays leading role

Staff and pupils visiting Yarm School's new Performing Arts Centre in North Yorkshire are benefiting from highly efficient ventilation, thanks to three eQ air handling units – all supplied by Fläkt Woods. The units were installed as part of a £20m redevelopment programme to expand and update the school's riverside campus. The centre was officially opened by Princess Alexandra in May 2012 and includes an 800 seat auditorium, separate galleried theatre, atrium, terrace, dance studio and music performance suite.

● Visit www.Flaktwoods.co.uk

Lochinvar solar thermal gets top marks from university

Lochinvar was the first choice to supply a solar thermal solution to meet the high demand for hot water in Liverpool John Moores University's new city centre Redmond Building. Consisting of a range of social and learning spaces, the 11,500 m² building has toilet and changing facilities, including showers, on each of its six floors, with a hot water requirement throughout the day. A solar hot water system integrated with a gas-fired condensing water heater was specified.

● Visit www.lochinvar.ltd.uk



Rinnai infinity cascades in a new form

Rinnai's new Infinity Plus Cascade is a custom-made water heating solution that brings together multiple units of the company's award winning HDC1500 condensing continuous flow water heater into single, easy to handle modules. It has been developed by Rinnai to guarantee the maximum amount of affordable, ecologically friendly, safe, temperature-controlled hot water required at any one time by even the heaviest commercial user. Infinity Plus Cascade 1500 is engineered to the highest standards and brings the benefits of continuous flow hot water systems to a bigger market sector.

● Visit www.rinnaiuk.com



HygroMatik launches video guides

HygroMatik, one of the world's leading experts in humidification systems, has added a collection of step-by-step video guides to its website to explain the operating principles of its range of humidification equipment, as well as to demonstrate installation and maintenance procedures. A series of short videos illustrate each of the main product ranges: the electrode-based HyLine and CompactLine ranges, as well as the immersion-based HeaterLine and HeaterCompact equipment.

● Visit www.hygroamatik.de

Mitsubishi Electric recognised as Manufacturer of the Year

Mitsubishi Electric secured the prestigious title of Manufacturer of the Year at the Micropower Council Awards 2012, staged on 10 October. The awards were part of the nextgen renewable energy event – a two-day exhibition and conference, held at Stoneleigh Park in Warwickshire, this year co-located with ebec – the UK's largest bioenergy show, and microgen, a show serving small-scale (sub-50 kW) power producers. Mitsubishi Electric won the recognition for its development of a range of renewable heating products for both commercial and residential properties, as well as its Green Gateway initiative.

● Visit www.mitsubishielectric.co.uk



Concord Lytelab range reaches new heights

Concord has expanded its range of architectural fittings with the introduction of the state-of-the-art Lytelab spotlight. Designed for areas with high ceilings, the Concord Lytelab features a unique adjustable and lockable Fresnel lens, which allows the beam angle to adjust from 14 to 45 degrees. Lytelab provides significant energy savings due to its total power consumption being just 45 W. Lytelab contains high powered, sharp LEDs, which have an impressive output of 800 lux at five metres.

● Visit www.havells-sylvania.com



LG'S new generation of VRF with Multi V III

The Multi V III is LG's latest range of VRF air conditioning products designed for commercial buildings, office complexes and large retail outlets. LG's Multi V III offers three key benefits: higher energy efficiency, larger capacity and longer piping lengths. The Multi V III is expected to be a key player in the UK VRF market. This series is being introduced at a time where there is an increasing market demand for energy-saving technology.

● Visit www.uk.lgeaircon.com



PRODUCTS & SERVICES

Telephone: 020 7880 7614 Email: Patrick.Lynn@redactive.co.uk

Countdown to Christmas with Danfoss calendar

Heating controls manufacturer Danfoss is counting the days to Christmas with the return of its prize-packed online Advent Calendar competition. Until Christmas Eve 2012, visitors to www.danfoss-randall.co.uk can click on this year's Advent Calendar for a chance to win prizes, from food hampers and shopping vouchers to the latest electronic gadgets. Behind each day on the 2012 Danfoss Advent Calendar is a multiple-choice question relating to the company's extensive range of energy saving solutions, from programmers and thermostats to TRVs and motorised control valves.

● Visit

www.danfoss-randall.co.uk or call 01234 364621



Rinnai UK – one flue to technological ingenuity

Rinnai UK has announced the launch of a common flue system to support its pioneering commercial water heating solutions. The flues will streamline installations of its award-winning condensing, continuous flow gas hot water heaters and make the process significantly more cost effective. Rinnai has designed and developed a common header flue system that eliminates the need for individual flue termination on modular banks of water heaters and commercial buffer systems.

● Visit www.rinnaiuk.com



Contractors opt for Marco treble at academy

Marco, a leading uPVC cable management company, and the UK's largest manufacturer of Steel Wire Cable Tray, has been chosen to supply three separate product orders to contractors working on the £12m Kearsley Academy education facility in Leigh, Lancashire. Marco's dado trunking, bench trunking and steel wire cable tray will be used across the site by electrical engineering specialist, SR Waite Electrical Contractors, also based in Leigh, which designs and installs electrical engineering services.

● Visit www.marco.com

DIRECTORY Your guide to building services suppliers

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

Air Conditioning

CLIVET
For total solutions in air-conditioning

E: info@clivet-uk.co.uk
W: www.clivet.com
T: 01489 572238
W: www.versatemp.co.uk

Air Handling

AirCraft
AIR HANDLING LTD

Manufacturer of high quality bespoke AHU's and fan coils.

Specialists in refurbishment and site assembly projects.

Expedient delivery service available.

Aircraft Air Handling Ltd
Unit 20, Moorfield Ind Est,
Cotes Heath, Stafford, ST21 6QY
Tel: 01782 791545 Fax: 01782 791283
Email: info@aircraftairhandling.com
Web: www.aircraftairhandling.com

CAD Services

CadEURO
Draughting Services

- Building Services Work Undertaken
- 2D Draughting
- 3D Autocad MEP
- Record Drawings
- Excellent Rates & Turnaround Service
- MEP BIM Services

Contact Stephen:-
T: 020 7043 7491
F: 020 7043 7493
E: cad@cadeuro.co.uk
W: www.cadeuro.co.uk

Controls/BMS/Controllability

Birling Consulting Ltd
Professional Services:

- BMS Design & Specification
- System design for controllable energy efficient operation
- Integration of Low Carbon Technologies
- Controllability Reviews
- PM, Reports, Guides, Advice, etc.

See: Taking Control - CIBSE Journal Dec 2011

Graham P Smith CEng MInstMC MCIBSE
T: 01548 830672
E: grahambirling@aol.com
W: www.birlingconsulting.co.uk

LST Radiators

autron
LST Radiators

Range of Low Surface Temperature radiator models to suit all budgets & applications

- Easy installation – ready assembled
- Attractive functional design
- BSRIA tested outputs and surface temperatures
- SteriTouch® antimicrobial surfaces as standard
- Energy efficient copper aluminium emitters

BSRIA
Call 01787 274135
www.autron.co.uk

Energy Efficiency

GROENHOLLAND

Ground Source Heat Pump Installations

Meeting Renewables Targets

Tel: 02392 450889
Fax: 02392 471319
www.groenholland.co.uk

Pump Packages

AquaTech Pressmain

LEADERS IN FLUID PUMPING EQUIPMENT AND CONTROLS

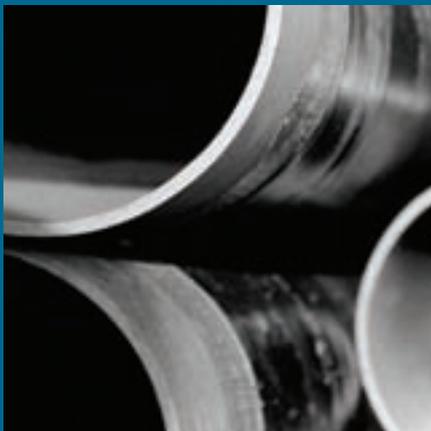
- Water Pressure Booster Sets
- Tank Level & Temperature Controls
- Sealed System Pressurisation Units
- Bespoke Design Service
- Water Storage
- Energy Efficient
- Hydraulic Shock Control

Head Office: 01206 215121
Manchester: 0161 226 4727
www.aquatechpressmain.co.uk



CIBSE Publications Brochure 2012–2013

Download our NEW publications brochure containing our full list of publications for the period of 2012–2013. The new brochure covers a wide range of specialisms within building services such as ventilation, water systems, design allowing you to stay abreast of industry.



If you are already a CIBSE member then you have unlimited access to CIBSE publications as part of your membership from our Knowledge Portal.

The brochure also features NEW titles such as:

CIBSE Guide F: Energy efficiency in buildings

CIBSE KS17: Indoor air quality and ventilation

CIBSE TM44: Inspection air quality and ventilation

SLL Code for Lighting

KS18: Data Centres

KS19: Humidification

Look out for forthcoming titles such as:

CIBSE AM12: Small-scale CHP combined heat and power for buildings

CIBSE TM13: Minimising the risk of Legionnaires' disease

CIBSE TM51: Ground source heat pumps

SLL LG01: Lighting Guide – The industrial environment

SLL Guide for limiting obtrusive light

For more information on CIBSE publications and prices, visit www.cibseknowledgeportal.co.uk



Specialists in Building Services Recruitment

Snr M&E Design Engineers | London & Hampshire | £45-50K | ref: 2990

Our client a blue-chip consultant is looking for candidates who are ideally Chartered and who have a proven recent track record within commercial projects. Fantastic opportunity!

Building Physics Engineer | London | temp to perm | ref: 3046

Ideally a graduate engineer, you will be experienced with solar analysis and geometry models. Candidates should be fully trained in TAS and have worked on hospital and retail projects.

Electrical Design Engineer | London | to £33K | ref: 2576

You will be degree qualified and fully proficient using dialux and amtech. Projects are varied and include education, custodial and healthcare.

Electrical Associate | London | to £60K | ref: 3011

You will be experienced in leading major residential and hotel projects. A strong commercial awareness is essential, as well as having the necessary skills to lead the electrical team and manage major clients.

Design Manager | Suffolk | to £70K | ref: 3030

You will ideally be Chartered and have a strong track record working for M&E contractors. A strong technical knowledge is essential along with a proven history in delivering projects on time and on budget.

Mechanical Design Engineer | London | to £35K | ref: 2883

We are looking for a qualified engineer with IES & Revit MEP experience. You will be comfortable attending meetings and working unsupervised. Career opportunity!

t: 02392 603030

e: cv@blueprintrecruit.com

www.blueprintrecruit.com



For a confidential chat,
Call us **8am to 8pm**

Senior Electrical Design Engineer | London
£50,000 Plus Benefits

Our client is a well-established, vibrant, architecturally led practice in Central London, well known for their cutting edge and modern design. They are currently seeking an experienced Electrical Design Engineer to work on projects, to include commercial, data centre and high-end retail. The consultancy continues to win profitable projects, and they are expanding their team to recruit the best talent. This is a fantastic opportunity to be involved with a practice who is renowned for pioneering projects and design within the built environment.

Associate Director | London
£70,000 - £75,000

An expanding international building services consultancy in Central London is seeking an Associate Director, with the view of becoming a full director within 12-24 months. You will be help run the Electrical design team and assist with management of all building services engineers on projects, ensuring the team undertake detailed design to required standards, deliver projects on time and profitably. The successful candidate will be encouraged to develop new relationships with their own clients, and through repeat business. This is a fantastic opportunity to join a practice that are enjoying profitable project wins.

Associate Mechanical Engineer | Oxford
£55,000 Plus Benefits

A privately owned building services consultancy are seeking an Associate Engineer to join their team, working on their major accounts and new pioneering projects. The successful candidate will assist in advancing client relationships and progressing existing projects. You will be responsible for leading a team of MEP building services engineers on a portfolio including residential, commercial and education projects. Experience in leading this type of project is essential and the ideal candidate will have strong commercial acumen.

Contact: george@conradconsulting.co.uk | 0203 159 5387
Find more jobs online at www.conradconsulting.co.uk



P.T. Morimura and Associates, Ltd. (PTM) is a long-established independent building services consultancy based in Tokyo Japan. Our International Group delivers best-practice mission critical designs for international clients who have facilities in Tokyo and throughout Japan. This role requires a Mechanical Engineering Consultant with solid electrical engineering capabilities and excellent customer presentation skills.

Candidates must have

- A degree (or equivalent) in the Mechanical Engineering
- At least 5 years' work experience post degree
- Some experience with mission critical systems

It is preferable for Candidates to have:

- A "quality plan" approach to projects, from concept plan to commissioning
- A qualitative appreciation of other areas of design (i.e. electrical services)
- A natural interest in and familiarity with all aspects of a project (interior design, space planning, architecture)
- Succession planning – shape and grow this role with your own development needs, and then actively train others in that role

Financial package will depend on experience with special attention given to:

- Experience of the latest mission critical facilities
- Experience of data centre and trading floor design including cooling system and CRAC selections
- Experience in preparation of fee proposals, giving presentations and other marketing activities
- Experience of Testing and Commissioning work
- Experience of fire suppression system including sprinkler and gas fire suppression system design
- Experience of BMS system design
- Familiarity with LEED certification or having LEED qualification

Tokyo is a diverse, multicultural and exciting place to live and work. The city offers a large English language based professional and social community. The position will allow you to work on range of cutting edge building projects and technologies located within Tokyo and Japans other major cities giving you an opportunity to develop your skill sets as well as the potential to learn Japanese and work in a foreign environment. Tokyo offers an excellent standard of living and is regarded as one of the safest and most desirable places to live in the world.

For more information and to apply contact: Simon, s-forrest@ptmtokyo.co.jp



Intermediate Mechanical Design Engineer
London, Permanent,
£28,000 - £33,000pa + benefits

One of the most well-known and respected building services consultancies in the UK has a fantastic opportunity for an Intermediate Mechanical Engineer to join their London team. This award winning consultancy has developed some outstanding client relationships and as a result of continued project wins they are now in a position to add to their team. This opening offers unlimited career progression coupled with the scope to work on a varied and interesting portfolio of projects in the UK and internationally.
BAR993/JA

Rail - MEP Design Engineer
(Electrically biased)
London, 60k-70k+Benefits&Travel

Our client currently has an opportunity for an electrically biased MEP design engineer to work in conjunction with them on a major rail infrastructure project in London. The role will involve working closely with a team of MEP design engineers to progress the design process through to project completion. Successful candidates should be a chartered engineer with a minimum of 12 years post-graduate experience, 5 of which should be from within the rail sector.
BAR1002/PA

For further information and to apply, please
call us on **+44 (0)203 176 2666**
or email **cv@b-a-r.com**

Thinking of your future www.b-a-r.com

Events & training

NATIONAL EVENTS AND CONFERENCES

Fire Risk Solutions for Timber Structures
3-4 December, London
Examining the findings of timber frame fire testing.
www.frts2012.com

National Insulation Association annual conference and exhibition
4 December, Birmingham
An in-depth look at the issues in the sector.
www.nationalinsulationassociation.org.uk

BAU 2013
14-19 January, Munich
Dubbed a world-leading trade fair for architecture, materials and systems.
www.bau-muenchen.com

Lighting Masterclass
31 January, Norwich
The Society of Light and Lighting Masterclass season continues its tour.
www.sll.org.uk

CIBSE Building Performance Awards
5 February, London
Find out who the 2013 winners are at this prestigious industry event.
www.cibseawards.org

Ecobuild 2013
5-7 March, London
Sustainable design, construction and the built environment.
www.ecobuild.co.uk

ThinkFM 2013
10 June, London
This year's focus is 'the leadership challenge'.
www.ecobuild.co.uk

CIBSE GROUPS AND SOCIETIES

For more information visit
www.cibse.org/events

Direct Gas-Fired Water Heaters – sizing and applications
4 December, London
Presentation by Lochinvar.
Steve.vaughan@aecom.com

LED lighting: advantages and pitfalls
4 December, Derbyshire
One building a minute' presentations.
www.cibse.org/events

An insight into electrical supply, security of supply and smart grids
6 December, London
A Home Counties North West region event.
www.cibse.org/events
m.goodwin@munham.co.uk

West Midlands Annual Dinner
7 December, Birmingham
Annual dinner for CIBSE West Midlands region.
chiahualau@hoarelea.com

17th Edition of the Wiring Regulations
13 December, Venue TBC
Joint CIBSE and IET event, hosted by the South West region.
Millham.orchard@fiscali.co.uk

Taking Control
13 December, London
Society of Light and Lighting event with speakers from Artistic License, Multiloop Technology, and Harvard Engineering.
sll@cibse.org

Building Information Modelling (BIM)
10 January, Bristol
A south west region event.
Millham.orchard@fiscali.co.uk

Air conditioning inspections and CFC update
15 January, Northampton
East Midlands region joint meeting with the Building & Engineering Services Association (BESA).
www.cibse.org/events

Introduction to Soft Landings
16 January, Birmingham
A West Midlands region evening seminar.
Nigel.Marriott@gmtreble.co.uk

Integrated Building Management Systems
30 January, Birmingham
A West Midlands region event. Speaker: ADT.
Nigel.Marriott@gmtreble.co.uk

BREEAM: Planning law and carbon reduction commitment update
5 February, Derbyshire
An East Midlands region evening meeting.
www.cibse.org/events

Lighting Design – Why Maintenance Factors Matter
13 February, Birmingham
A West Midlands region event. Speaker: Thorn.
Nigel.Marriott@gmtreble.co.uk

Humidity Control – Solving Building Performance Issues Worldwide
13 February, online
Humidity problems associated with three 'real world' building types.
tim@timdwyer.com

Modern CCTV System Design
21 February, Bristol
The very latest developments in the security industry.
millham.orchard@fiscali.co.uk

CPD TRAINING

For more information visit
www.cibsetraining.co.uk
or call the events team
on 020 8772 3660

Heat Pumps
3 December, London

Building Drainage Explained
4 December, London

Practical Controls for HVAC Systems
4 December, London

Introduction to BS7671:2008 Requirements for Electrical Installations
5 December, London

Part L Building Regulations
6 December, London

Introduction to Facilities Management
6 December, London

Taking Control 13 December, London

The future of lighting will be put under the spotlight during the Society of Light and Lighting's event, Taking Control, to be staged at the London Transport Museum in Covent Garden.

This pre-Christmas event includes a chance for the science behind the ideas to be demonstrated.

Wayne Howell, technical director of Artistic License, will talk about 'The future of lighting protocols', which will include a discussion of DMX512 vs DALI and their relative merits.

Brian Cuthbertson, managing director of Multiloop Technology, will be demonstrating the niche market for 'Unashamedly analogue lighting systems in this digital world'.

Analogue control is rarely mentioned in the digital

world, but it need not be old fashioned, as Cuthbertson will explain. The latest state-of-the-art analogue systems will be introduced.

The third and final speaker, Michael McDonnell, technical director of Harvard Engineering, will discuss dimming HID and LED products.

The doors open at 5.40pm for 6pm start.
www.sll.org.uk



Wayne Howell

Air Conditioning Inspections for buildings
6 December, London

Smoke Control: Matching the Method to the Building
11 December, London

Energy Strategy Reports
12 December, London

Gas Safety Regulations
13 December, London

Inspection and testing of electrical installations and portable equipment
13 December, London

Practical Project Management
15 January, London

Earthing and Bonding Systems
15 January, London

Building Electrics Basics 1
16 January, London

EPC Training – two day course
21 January, London

Introduction to Building Services
22 January, London

Mechanical Services Explained
22 January, Birmingham

Building Electrics Basics 2
23 January, London

Low and Zero Carbon Energy Technologies: undertaking feasibility studies and understanding design considerations
23 January, London

SBEM Training
24 January, London

DEC Training – two-day course
28 January, London

Fire Safety in Purpose-Built Blocks of Flats
30 January, London

Energy Surveys
30 January, London

Introduction to Legionella Control
31 January, London

Air Conditioning Basics 1
31 January, London

Send your event details to
cbailey@cibsejournal.com

CIBSE BUILDING
PERFORMANCE
AWARDS 2013



RECOGNISING EXCELLENCE
IN MAKING BUILDINGS WORK

Tuesday 5 February 2013
Great Room, Grosvenor House, London

»» EXPERIENCE
BUILDING PERFORMANCE
EXCELLENCE

JOIN THE CELEBRATION

► **NOW BOOK YOUR TABLE** at the building services event of the year

VISIT: www.cibseawards.org



► Host & entertainment from Gyles Brandreth ► Charity casino ► Just twelve gold tables available on a first come first served basis

HEADLINE SPONSOR:



SPONSORED BY:



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.

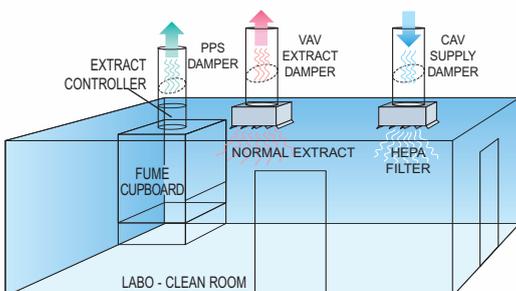


DPM PRESSURE SENSOR

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

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.



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



DPC CONTROLLER

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

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

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