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'Green energy is set to grow, not because it is more productive but because government mandates it and provides generous incentives'

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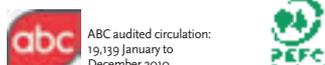
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Cover courtesy of Network Rail



Incentivising quick fixes may backfire

Innovation, innovation, innovation. Some believe that this is what is needed to shore up both a secure and a green energy future. A recent report from the Royal Academy of Engineering looks in this direction (see News, page 10), as does Professor Colin McInnes, writing in this issue (Opinion, page 20).

In a very important sense, this viewpoint hits the nail on the head (or, more appropriately, has its finger on the nuclear button). It's not good simply relying on established renewable solutions, however high-tech they may be. Heat pumps and photovoltaic (PV) solar panels, for example, offer an important shorter-term fix, but will they actually get us where we need to be – meeting those tough and necessary carbon targets in the UK?

So, is it far better for the money to follow the innovation, rather than subsidising the quick fixes? In other words, rather than providing incentives for (largely middle-class) households to install money-saving PV panels (with help from feed-in tariffs) or efficient

but complex and expensive boilers (helped by renewable heat incentives), should we not instead be concentrating all our efforts and funds on incentivising innovations to produce greener energy supplies (this is where the nuclear button arises) and renewable technologies that do not rely on gas-fired heat? (Subsidies might also be directed more at alleviating fuel poverty.)

In an ideal world we would fund all the short-, medium- and long-term fixes needed to meet those carbon targets. But this won't be happening any time soon. We need to go back to fundamentals and ask: what types of innovation should government, central and local, be incentivising and promoting? Should it really be PVs and heat pumps? Or should the money follow technologies that will make a genuinely major difference in terms of greening our energy supply and promoting heating (and cooling) solutions that don't rely on traditional fuel sources? I don't have the answers (and I'm not convinced that traditional nuclear power stations is one of them), but we must not be side-tracked by the status quo and avoid asking fundamental questions. Perhaps we should adapt the advice of Deep Throat in *All the President's Men*: 'follow the money'. In our industry's case, the money should be following the truly innovative.

Bob Cervi, Editor

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Industry figures in Queen's honours

A number of leading industry figures were recognised in the Queen's New Year Honours list.

Former CIBSE and HVCA president Graham Manly received the OBE for his long and outstanding service to the building services industry.

As well as his dual presidencies, Manly has also served as chairman of BSRIA – a unique treble. Formerly managing director of AG Manly, he remains a member of the boards at CIBSE and SummitSkills. Manly served as CIBSE president in 2004-05.

Tom Foulkes, formerly director general at the Institution of Civil Engineers, also received an OBE for services to engineering.

Mark Bew, a board director of URS Scott Wilson, received an MBE for services to the construction industry. Bew is a leading figure in the push for wider adoption of building information modelling (BIM).

James Wates, chairman of the Construction Industry Training Board and deputy chairman of Wates, was appointed CBE for services to construction and the charitable sector.

Turn to page 16 to read about Graham Manly's honour

Planned solar tariff cut deemed illegal by court

● The Appeal Court says the 'retrospective' cut to feed-in tariffs for solar panels was not provided for by Parliament

The government's feed-in tariffs (FITs) policy was thrown into disarray late last month when its attempt to overturn a High Court ruling against the plans was rejected by the Court of Appeal.

In December ministers had announced that, from 1 April 2012, the tariff for domestic photovoltaic installations would be cut by more than half to 21p. They said the change would apply to all installations completed on or before 12 December 2011.

Following a legal challenge against the change mounted by the industry, the High Court ruled that the tariff change was unlawful because it would be implemented before the end of a consultation on the plans. But in January the Department for Energy and Climate Change (DECC) applied to appeal against the High Court ruling.

However, on 25 January the Appeal Court refused the government permission to appeal. As the *Journal* went to press, DECC was considering whether to request permission to appeal against this outcome to the Supreme Court.

Appeal Court judge Lord Justice Moses said that the scheme relied upon people getting paid the rate that was in place at the time their solar electricity panels were installed and registered. He concluded that

any effort by the government to change that without forward notice was retrospective.

'The question, I respectfully suggest, is [...] whether Parliament conferred a power to make a modification with such a retrospective effect,' he said. 'It did not.'

Just before the Appeal Court decision was announced, DECC had sought to make a concession by announcing that the 1 April change to a lower tariff would apply to installations completed on or before 2 March, rather than the previous December deadline.

Renewable Energy Association (REA) chief executive Gaynor Hartnell said: 'In reality,

government is well aware that it would be incredibly unwise to reduce payments to renewable energy producers after they had commissioned their projects, as it knows what immense damage that would do.

'The government's action and the subsequent court case had together thrown the solar industry into a state of extreme

uncertainty, which was most regrettable. We now want to put this behind us as swiftly as possible, and work with government and supporters to secure a larger budget for small scale renewable energy generation.'

Friends of the Earth, which had opposed the cut in the High Court, said: 'This landmark judgement confirms that devastating government plans to rush through cuts to solar payments are illegal – and will prevent ministers from causing industry chaos with similar cuts in future.'

'This landmark judgement confirms that devastating government plans to rush through cuts to solar payments are illegal'

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BIOME IS FOCAL POINT OF NEW BAY PROJECT

The first phase of the Gardens by the Bay project in Singapore has been completed, with one of the two biomes – in the foreground – becoming operational. The project incorporates a liquid desiccant system coupled with the external supertree structures to provide dry air to the biomes – a system designed by consultancy Atelier Ten. The gardens will be fully open to the public in June.



Growing alarm over risks from smart meters

● MPs say only energy suppliers might benefit from £11.7bn programme

Serious concerns about the government's smart meter programme have been raised by the parliamentary body that oversees public spending.

The Commons Public Accounts Committee said the plan to put a smart meter in each of the UK's 53m homes by 2019 was 'challenging' and subject to 'significant uncertainty'.

Committee chair Margaret Hodge said there was a danger that only energy suppliers would benefit from the £11.7bn programme.

'Consumers will benefit from smart meters only if they understand the opportunity to reduce their energy bills and change their

behaviour,' she said. 'So far the evidence on whether they will do so has been inconclusive. Otherwise, the only people who will benefit are the energy suppliers.'

She added that there were no guarantees that energy suppliers would pass on savings to the customer, who will have to pay for the installation and operation of smart meters.

'The track record of energy companies to date does not inspire confidence that this will happen,' Hodge added.

The committee also questioned the ability of the government to meet its schedule, which is a year ahead of that required by the EU.

It expressed doubts about consumers' willingness to cooperate and questioned

whether the data communications service – expected to cost £3bn – will be ready in time for the start of the roll-out in 2014.

The committee stated that there were 'obvious risks' to cyber security associated with the wider use of smart meters. It also expressed concern that they would make it easier for energy firms to cut off 'vulnerable' customers.

However, the British Electrotechnical and Allied Manufacturers Association (BEAMA) claimed that smart meters would deliver £938m of savings in household electricity bills every year, with users worldwide cutting their consumption by 8.5%.

For more information visit:

www.parliament.uk/business/committees



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In Brief

FEARS FOR BREEAM STANDARD IN SCHOOL RENEWALS...

Education Secretary Michael Gove is considering dropping the requirement for new schools to use the environmental BREEAM standard, according to the UK Green Building Council. In response to the UKGBC's claim, CIBSE president Andy Ford and president elect David Fisk wrote to Gove, stating: 'The positive effect of using the BREEAM discipline in the design team is widely recognised by the construction industry and is a UK export success, enabling UK firms to compete with those using the US LEED rating tool. With energy costs rising, school budgets can ill afford to be hit by the costs of poorly designed buildings.'

... AMID NEW-BUILD DELAY

Separately, Gove has revealed that the Priority School Building programme, which was introduced when Building Schools for the Future was scrapped, will now be published later this month. Gove said the publication of the schools involved has been delayed because 'we want to be absolutely sure that marginal cases are fairly treated'.

HEATING SYSTEMS BRIEFING

The Energy Institute has published a free, low carbon heating briefing, outlining how heat fits into the UK energy system, plus the associated challenges, technology options and the incentives available. Heat makes up 76% of all the energy used in the domestic, services and industrial sectors, it says.

www.energyinst.org

CONCERN OVER METALS

By 2030, demand for 14 high-tech metals required in the production of six low carbon energy technologies are expected to be in short supply, with five metals identified as at a particularly high risk. The study was conducted to find out if a shortage in metal supply could slow down efforts to deploy low carbon energy technologies in the EU.

<http://etis.ec.europa.eu>

District heating is a capital energy solution for London



The Mayor of London, based at City Hall by the Thames, is consulting on district heating proposals

● Combined heat and power has been a major contributor to carbon savings, says report

Combined heat and power (CHP) and district heating schemes delivered most of London's carbon savings in 2010 and have the greatest potential for future deployment, according to a review of energy policies carried out by the Greater London Authority (GLA).

The series of reports published as part of the review reveal that CHP accounted for 50% of CO₂ savings, with 30% due to end-user efficiency and a further 10% from renewables.

Overall, new CHP projects have led to annual emissions savings of 36,392 tonnes of CO₂.

Heat networks could also meet as much as 27.5% of the city's total demand by 2031, according to the GLA analysis.

It also shows that decentralised energy provided cheaper energy at a lower capital cost than centralised renewables, while saving the most carbon per pound spent.

The review suggests that heat networks are needed to expand the choice of energy sources including surplus heat from industry, biomass CHP and energy from waste.

Combined Heat and Power Association director Graham Meeks, said: 'This [GLA] analysis conclusively demonstrates the importance of taking an integrated approach to decarbonising our urban areas.'

'Greater use of district heating will allow the UK to reduce energy costs and carbon emissions for more homes and businesses, while enabling the most efficient and effective use of valuable renewable energy supplies.'

In addition, as part of its Decentralised Energy Programme, the Mayor of London has produced a consultation document to announce the scope, intention and topics being considered for the London District Energy Manual.

For more information visit:

www.london.gov.uk/priorities/environment/climate-change/decentralised-energy

Councils get smart to cut energy

A European initiative to boost the collection of building energy data could save one UK council more than £1m a year.

The EU-funded, €7m SmartSpaces project, which will see 11 local authorities across Europe working in partnership with IT providers, was launched in Bristol.

The three-year project will invest in capturing and harnessing the data provided by automatic meter readers, which provide data on energy consumption every half-hour.

Bristol City Council has had them fitted to almost all of its 500 buildings.

The aim is to achieve better energy monitoring of all council buildings, improved communications to all staff about the energy usage of their building – and, ultimately, considerable energy savings.

Paul Isbell, energy manager at Bristol City Council, said he expected to reduce the council's energy usage by about 10%, leading to almost £1m of savings a year.

The eight countries involved

in the project are the UK, France, Germany, Italy, Spain, the Netherlands, Turkey and Serbia.

Bristol City Council leader Barbara Janke said: 'This is a truly significant project that could play a major part in reducing energy usage throughout Europe. As it is a public project, it will be an open-source system too, which means it can be shared with other companies and local authorities to then use in their own buildings.'

For more information visit:

www.bristol.gov.uk

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In Brief

PFI REFORMS 'STILL POSE RISK'

The government's plans for a new approach to using the Private Finance Initiative (PFI) to fund public sector schemes poses further risks, according to a committee of MPs. The Commons Treasury Select Committee says in a report that the new plans appeared to still carry some 'defects' associated with the established PFI system.

www.parliament.uk/treascom

HILSON MORAN BUYOUT

Hilson Moran, the engineering and environmental consultancy, has been bought by its management after 10 years under the ownership of Paris-based Altran Technologies. The firm employs more than 200 staff and has worked on such high-profile projects as the 'Gherkin' at 30 St Mary Axe in the City of London. The takeover was funded by the venture capital company Albion Ventures.

GETHING SUPPORTS FORDHAM

Sustainability expert Bill Gething is collaborating with building services engineering consultants Max Fordham to develop the work of its sustainability consultancy team. Gething, a former partner of Feilden Clegg Bradley Studios, is a visiting professor at the University of Bath.

INVESTING IN RENEWABLES

Companies have announced plans for almost £2.5bn worth of investment in renewable energy projects in the UK, with the potential to create almost 12,000 jobs across the country, according to the latest research from the Department of Energy and Climate Change. The figures were part of a report to the European Commission, which also showed that the UK has increased its renewable energy consumption by 27%.

www.decc.gov.uk



Domestic heating engineers 'may lack appropriate skills'

Normad_Sou/Shutterstock.com

Home heating revolution essential, says academy

● Report highlights lack of necessary skills among domestic heating engineers

The UK will not meet its carbon reduction targets without a total revolution in the way it heats its homes, according to the Royal Academy of Engineering (RAE).

In its report 'Heat: Degrees of Comfort', the RAE states that even with the most modern gas boilers and high levels of insulation, 'we cannot continue to heat so many homes by natural gas and still achieve the 80% cut in emissions'.

It also highlights the lack of appropriate skills among domestic heating engineers to work with renewables, heat pumps and other alternative heating technologies. It quotes a number of examples where poor installation of low carbon systems had left consumers paying more for their heating.

'To switch a large part of the domestic heating load to electric heating would greatly increase the demand on the grid and increase the challenge of meeting peaks in demand,' the report says.

'To attempt to meet the whole of such a load by renewables would require a level of installed capacity that would be almost impossible to build. Storage, whether of natural gas, biomass, large-scale thermal storage will be essential.'

Many renewable solutions are too expensive and paybacks too long for the mass market, it adds.

Professor Roger Kemp of Lancaster University, who chairs the Academy's Heat working group, said the government was only 'just coming to terms' with the complexity of managing the country's energy systems in a way that 'reduces CO₂, avoids expensive imports, ensures energy security, does not exacerbate fuel poverty, supports job creation and works with, rather than against, the competitive market'.

He pointed out that there were a number of technologies, such as micro-CHP, that could make a significant contribution to carbon reduction, 'but are incompatible with the 80% target' because they are not renewables.

For more information visit:

www.raeng.org.uk/heat

United States '10 years ahead' on smart grids

Creating a series of local 'smart grids' would substantially reduce the projected £200bn cost of upgrading the UK's national grid, according to energy suppliers and engineers.

At a recent CIBSE/ASHRAE Group webinar supported by the HVCA and held at London South Bank University, energy experts heard that the US was already 10 years ahead of Europe in developing a smart grid strategy.

It will produce a smart grid

standard for public review later this year and is now seeking international involvement.

Stephen Bushby from the US National Institute for Standards (NIST) said it was time to get away from the 'monolithic' format of central power generation. 'The electric grid ... is no longer fit for purpose and is inherently inefficient. The top 20% of generating capacity is only needed 5% of the time; so we develop all that expensive

capacity for it only to be used once every 20 days.' He said the future depends on harnessing smart technologies to smooth out the peaks and troughs in power demand, said Bushby.

The draft standard produced by NIST – with input from 700 parties in the US – envisages a grid that has major input from renewables and is a distributed system made up of micro-grids that can sell local power back into the national network.

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In Brief

WAITROSE REFRIGERANT 'FIRST'

Waitrose has installed what is claimed to be the world's first supermarket installation of a packaged chiller using HFO refrigerant, as part of an energy assessment. The Italian-made chillers were comprehensively tested before being supplied by Klima-Therm to the store in Bromley, south-east London. They will be assessed in comparison to a system using propane, in a store in the city of Canterbury. www.klima-therm.co.uk

CARBON SAVING ADVICE

The Carbon Trust has launched an online office tool aimed at helping save UK businesses and public bodies £500m and 2m tonnes of CO₂. By engaging employees in cutting energy use, paper waste and travel, Carbon Trust Empower has the potential to help a typical small business save more than 15% of its energy bill. www.carbontrust.co.uk

ASSET MAINTENANCE GUIDE

Building services research body BSRIA has launched a new guide, *Condition Surveys and Asset Date Capture*, aimed at those who have responsibility for maintaining buildings. The guide outlines the benefits of having a good knowledge of assets, and how to maintain them in an efficient and economical way. www.bsria.co.uk

UKDEA MEMBERSHIP HEATS UP

The UK District Energy Association (UKDEA) has reported a rapid increase in membership, with six organisations joining its ranks in the last month of 2011. Among those joining as full members were Leicester City Council, energy management company ENER-G and social housing provider Newport City Homes. www.ukdea.org.uk



Social housing renovations can take a long time to pay for themselves, says the report

Social housing sector 'fits and forgets' renewables

● Performance of renewable technologies are too often not monitored, says report

Many social housing providers are investing in renewable systems, but they don't monitor them and so do not know if they are performing well or giving value for money.

This was the conclusion of research carried out by the Centre for Infrastructure Management at Sheffield Hallam University into the use of renewables to alleviate fuel poverty.

Fin O'Flaherty, one of the authors of the research funded by the Eaga Charitable Trust, said it was still not clear which renewable systems offered the best return.

'There is often a limited understanding of how the technologies perform in use or what level of savings are being delivered to residents,' said O'Flaherty.

He added that the exercise was 'really about asking

how we can make going green socially inclusive' to ensure vulnerable households are not left behind.

Solar panels can save households between £340 and £420 annually, but still take between 15 and 17 years to pay back installation costs, according to the research.

Heat pumps also save money, but some residents complained to the researchers that the systems failed to sufficiently heat their homes.

The report is based on the findings of a two-year study, funded by the Eaga Charitable Trust, into the role that micro-generation technologies can play in alleviating fuel poverty in the UK. The study involved a review of existing research into micro-generation technologies in domestic settings,

and an evaluation of number of such schemes in the West Midlands and South Yorkshire, including analyses of energy generation and consumption data.

'There's often limited understanding of how the technologies perform in use'

For more information visit:

www.shu.ac.uk/news/release.htm?ID=1006

Contractors' body rebrand 'reflects wider appeal'

The Heating and Ventilating Contractors' Association (HVCA) will change its name to the Building & Engineering Services Association (B&ES) in March. The decision was backed by more than 90% of the membership.

HVCA president Bob Shelley said that a survey of members and their clients had shown that the existing name no longer covered the 'scope of services provided by association members, which is now much broader than simply h&v'.

This is the third time in its 107-year history that the association has changed its name. It became the HVCA in 1963 when most members 'thought of themselves as heating and ventilating contractors', but that is 'a description that few use now', according to Shelley.

'Today, our membership embraces many other specialisms, such as ventilation hygiene, refrigeration, air conditioning and heat pumps, and facilities management

services, all of which can be accommodated under the 'building and engineering services' description.'

HVCA chief executive Blane Judd said the change 'acknowledges the increasing clients' emphasis on an integrated, one-stop-shop approach to the procurement of building and engineering services, and satisfies their wish for a broader-based organisation that is able to respond to ever-changing requirements'.



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AWARDS

A NIGHT TO REMEMBER



BBC newsreader Huw Edwards will again host the awards

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Correction: awards judges

GRAHAM MANLY
Gratte Brothers



Graham is the business development director at building services company, Gratte Brothers. He was inadvertently left out of the list of judges in the January *Journal* (page 18) – many apologies to Graham for this omission.

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OBE for former president



Graham Manly, who was president of CIBSE in 2004/05, has been appointed an Officer of the Order of the British Empire (OBE), in recognition of his contribution to the building services sector.

A chartered engineer, Manly also served as president of the HVCA in 2008 and is currently chairman of its communications committee. Manly currently serves on the board of SummitSkills and is a member of the Institute of Refrigeration, and he was a former chairman of the Building Services Research and Information Association.

He was managing director of AG Manly and Co from 1982 until its acquisition by the Gratte Brothers in 2000, and is now the company's business development director, focusing on technical innovation.

Writers wanted

Edexcel is looking for building services engineers who are CIBSE members to write unit(s) for a Level 6 Professional Diploma in Construction and technically edit/review units. If you have experience of lecturing at degree or masters level and are interested in being part of an innovation in professional education, contact sara.furness@edexcel.com

Teamwork to the fore

● £1,500 cash prize awarded for winning world-leading eco-town development

Nine teams from the construction industry, ranging from town planners to building services engineers, competed for prizes totalling £4,600 at Teambuild 2011 in November.

The event, held at Eynsham Hall, Oxford, challenged teams of young professionals to plan, design and deliver a world-leading eco-town development. The event focused on developing skills in leadership and coordination beyond the sum of individual skills, reflecting the way teams must work together in the construction industry.

While some of the teams lacked architects and building services engineers, they competed instead with environmentalists, surveyors, civil engineers and builders. The winning team, Green Print, from BDP's London office, included two architects, one structural engineer, building services engineer and CIBSE member Jairo Jaramillo, an acoustician and a town planner. They won a cash prize of £1,500 from the Worshipful Company of Constructors.

The event was sponsored by ICE, CIBSE, CIOB, IStructE, the Worshipful Company of Constructors, the Worshipful Company of Architects, the Manly Trust, St Gobain and Speedy Hire.

Professor Brian Warwicker, who represented CIBSE as a judge at the competition, said: 'There were two only CIBSE engineers participating – let



Winning team... Richard Rooley, Jairo Jaramillo, Andrew Mackay and Brian Warwicker



Teambuild 2011... the organisers and participants

us see a few more next year! CIBSE members should start now by putting a team together for this year, hopefully we will see you at Teambuild 2012. How about an all-CIBSE member team?'

● If you are under 30 years of age, and have not previously participated in this event, visit the Teambuild website at www.teambuilduk.com

Right royal knees-up

The Society of Public Health Engineers' (SoPHE) eighth anniversary dinner was held at London's Kensington Royal Garden Hotel in November, attracting more than 250 guests from across the industry.

Guest speaker was Lindsay Gillespie, executive director of SummitSkills, who spoke about the organisation's objectives and activities. The success of the dinner has once again enabled £1,000 to be donated

to the WaterAid charity.

Chairman Chris Northey announced Robert Burgon, from the Scottish and Northern Ireland Plumbing Employers Federation, as a new honorary fellow of SoPHE, and presented a CIBSE Bronze Medal to past SoPHE chairman Martin Shouler. Anokhee Shah, from Arup, won the SoPHE Young Engineers Award 2011.

The evening was supported by: Andrews Water Heaters;

AO Smith; Blücher UK; Douglas Delabie; Geberit Sales; Girpi; Goodwater; Heatrae Sadia; Honeywell Control Systems; Horne Engineering; Hydrotec UK; Lochinvar; Oventrop UK; Pipex; Roth; Saint-Gobain; Wavin; and Zip Heaters UK.

To find out more about SoPHE in general, the group's technical events, or the forthcoming SoPHE Northern Dinner, please visit www.cibse.org/sophe

New CPD champion announced

● New winner announced by Institute as award goes annual

The CIBSE Continuing Professional Development (CPD) Panel has decided to award the title of 'CPD Champion' annually to a member who presents the best CPD submission. The winner for 2011 was Bryan Alston, who succeeded in impressing the panel by keeping his knowledge and skills up to date in a number of different areas. He will receive a voucher for a free one-day CIBSE course.

Bryan has been a CIBSE member and chartered engineer for more than 20 years. He achieved his BSc at the then Newcastle Polytechnic in 1985. In 1990 he gained membership of CIBSE and in 2004 became a fellow.

Through CPD, Alston obtained both an MSc in building services engineering and a teaching certificate. He recently became an air-conditioning inspector and has acquired both spoken and written language skills in Spanish.

On hearing of his award, Alston said: 'I consider that once qualified and being a professional engineer, you do not accept that you have achieved it, but through CPD you seek to widen your knowledge, educate and, as such, enhance your value to your employers'.

CPD is a requirement for all CIBSE members under the Code of Conduct. By the end of each calendar year you will need to complete an annual



Winner... Bryan Alston

CPD record demonstrating that you have fulfilled the CIBSE CPD requirements.

Visit www.cibsecpd.org and login using your CIBSE membership number and password to access our easy-to-use tool, which will also allow you to update and evaluate your CPD activities on a continuing basis as the year progresses. Further information can also be found in the CPD Guide at www.cibse.org

An excellent way of keeping up to date with your professional knowledge is via the Knowledge Portal (www.cibseknowledgeportal.co.uk), which gives free access to CIBSE members to the full range of CIBSE published guidance, including all the guides, commissioning codes, applications manuals, technical memoranda, lighting guides and more.

National recognition for heritage group website

The CIBSE Heritage Group has been given the accolade of a request from the British Library for the group's website (www.hevac-heritage.org) to be incorporated into the National Archive.

The website was begun in November 2001 to provide information for all those interested in the history of building services engineering. It has grown rapidly since this time, largely thanks to Frank Ferris, the group's webmaster, and CIBSE past chairman Brian Roberts, its main contributor.

The Heritage Group is the oldest of all CIBSE Special Interest Groups, having been formed in 1982. However, its origins go back even further, as it has its roots in the Archaeology of Building Services Working Party, which was established in 1973.

The website aims to provide a comprehensive record of people, products, patents, properties and publications relevant to this history of building services in order to increase the awareness of all engineers of the industry's history, from its beginnings in the 1700s through the 19th and early 20th century.

The Heritage Group is always aware that there may be systems, buildings or equipment out there of which it has no knowledge. CIBSE members are urged to contact the webmaster if they come across any relevant items that are not included on the website.

LinkedIn

Visit the CIBSE LinkedIn page at www.linkedin.org/company/cibse to engage in technical discussions with more than 4,000 fellow professionals, and keep up-to-date with the latest information from the Institution and the wider sector. You can also follow us on Twitter: @CIBSE

Working for a better deal

There is a huge amount happening around policy for the built environment at present.

The Green Deal consultation closed as the *Journal* went to press. Following a very well attended workshop in Balham in early January, CIBSE has raised comments about the assessment of buildings for the Green Deal, and the specification of Green Deal improvements.

Comments focused in particular on the competence and skills required to carry out assessments for commercial buildings, and to develop robust specifications for proposed Green Deal improvements.

For the full response go to

www.cibse.org/greendeal response

The Building Regulations 2013 Review was due to be issued for consultation before Christmas, but was still unavailable as the *Journal* went to press. This will outline a package of changes, to be introduced in 2013, which will include the latest changes to Part L. Given other developments around regulations, it is likely that the delayed release of the consultation indicates that the proposals are undergoing careful scrutiny.

The Energy Performance of Buildings Directive (EPBD) has been recast, and the recast fully replaces the original Directive in

EU law on 1 February 2012. From that date all references to the EPBD will refer to the recast.

The UK government has to adopt the necessary measures to implement the recast, which will include changes to size thresholds for Display Energy Certificates, by summer 2012.

We would expect the Department for Communities and Local Government to consult on the implementing measures, although there is no formal indication as yet that this will occur.

CIBSE will be keeping watch on both of these areas and will announce any new consultations as soon as they are released.



New members, fellows and associates

Members

Richard David Shaun Allen
Longfield, UK

Alice Allen
Hertford, UK

Kevin John Austin
Epsom, UK

Chandrashekar Balaraman
Sharjah, UAE

Steven James Barry
Tonbridge, UK

Neil Keith Billett
London, UK

Edward Horatio Borgstein
London, UK

Christiaan Rudolph Botha
London, UK

Christopher Allan Bowie-Hill
Bristol, UK

Fiona Boyce
London, UK

Ian Boyle
Polegate, UK

Ben James Braden
Edinburgh, UK

Timothy Bridge
Dereham, UK

Kevin Burke
Cardiff, UK

Christine Cambrook
Amersham, UK

Stuart Gary Carroll
Aylesbury, UK

Durgesh Chadee
Aldershot, UK

Simon Yiu Tsun Chan
Hong Kong, Hong Kong

Kam Kwong, Wilson Cheung
Hong Kong, UK

Michael Tze Kiang Chin
Singapore, Singapore

Ka WaChing
Hong Kong, Hong Kong

Anna Chrabol
London, UK

Bartosz Marek Chrabol
London, UK

Daniel Richard Clark
Southampton, UK

Julian James Cottrill
London, UK

Andrew John Cramond
Keston, UK

Tammam Alexander Crawford
Edinburgh, UK

Andrew Darren Cross
Londonderry, UK

Thomas James Davis
Richmond, UK

Paul Martin Dodsworth
Leeds, UK

Christopher William Eaton
London, UK

Paul Simon Feely
Wirral, UK

Stuart Finn
Northampton, UK

Chun Ho Fok
Hong Kong, Hong Kong

Chi Sum Carmen Fong
Kowloon, Hong Kong

Nicholas Tony Fraser
Cambridge, New Zealand

Scott William Gidley
London, UK

Simon James Goff
Exmouth, UK

Scott Barry Green
Sheffield, UK

Vera Grekova
London, UK

Jacob Hacker
London, UK

Nicholas Simon Hall
Bournemouth, UK

Branislav Halla
London, UK

Sam Hasston
Copenhagen, Denmark

Karl Andrew Hegarty
Belfast, UK

Kim Chuan (Joshua) Heng
Birmingham, UK

Phillip Hilton-West
Sunderland, UK

Wing Yan Hung
Fanling, Hong Kong

Damian Keitumetse Hyde
Eynsford, UK

Ayman Ijnaid
Doha, Qatar

Paul Richard Ingham
Bradford, UK

Ip Sing Yue N.T.
Hong Kong

Darren Anthony Jones
Worthing, UK

Benjamin David Jones
Brighton, UK

Denis Keaskin
Darwen, UK

Kevin Francis Killoran
London, UK

Matthew King
Nottingham, UK

Jelena Kotina
London, UK

Lai Yuen Lok
N.T., Hong Kong

Mathew Gordon Lambourn
Sheffield, UK

Ross Larner
Bristol, UK

Alberta Amerley Laryea
Hertfordshire, UK

Jamie Lavis
Bristol, UK

Paul Michael Lee
Gateshead, UK

Chee Tong Li
Hong Kong, Hong Kong

Jin Lu
London, UK

Iain Hume Maclean
Glasgow, UK

Harshit Mahida
Hertford, UK

Kin Ming Mak
Hong Kong, Hong Kong

Coinneach Malcolm
Inverness-Shire, UK

Kai-Yip Man
Taipei, Hong Kong

Esther Martinez Sanchez
London, UK

Matthew Anthony McDermott
Lancashire, UK

Scott McKeever
Huntingdon, UK

Dermot P Mcmorrow
Guelph, Canada

Minhajuddin Mohammed
London, UK

Amin Motiee
London, UK

Andrew Munro
North Yorkshire, UK

Daniel Narayanan
Easton, UK

Justin Lee Neil
Poole, UK

Chun Fung, Francis Ng
Hong Kong, Hong Kong

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Sunderland, UK

Vijay Pachare
Abu Dhabi, United Arab Emirates

Colin Page
St. Albans, UK

Andrew David Peverill
York, UK

John Pirouet
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Joe Pitt
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Brett Pollen
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James Christopher Rene
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Paula Renedo
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Gareth Edward Ridings
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Antonino Saporito
Bromley, UK

Karen Yvette Settle
Clacton-On-Sea, UK

Yehuda Louis Sinai
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London, UK

Andrew Stewart David Smith
West Midlands, UK

So Lai Pik
Hong Kong Hong Kong

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Farnham, UK

Scott Spencer
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Martin Richard James Stamp
Royston, UK

Vladimir Sys
St. Albans, UK

Zsigmond Sztankay
Glasgow, UK

Wai Man Tam
Hong Kong, Hong Kong

Jarrod James Tandy
Nottingham, UK

Rebecca Taylor
London, UK

Andreas Michael Tichopad
Episkopi, Cyprus

Arthur Tizard
Hitchin, UK

Simon Neville Richard Varo
Nantwich, UK

Edmund William Venables Vaughan
Maidenhead, UK

Simon Terence Waldron
Brierley Hill, UK

Mark Watt
Leeds, UK

Michael John Williams
Witney, UK

Richard Williams
London, UK

Tze King Wong
Hong Kong, Hong Kong

Wai Shun Wong
N.T., Hong Kong

Alexis Antony Zavros
Cambridge, UK

Dorota Fischhof
London, UK

Kevin Michael Hayward
Stoke-On-Trent, UK

Pritpal Singh Jandu
Leeds, UK

Marios A. Kosmas
Nicosia Cy-2052, Cyprus

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Cheddar, UK

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Ghasson Shabha
Stourbridge, UK

Paul Temperton
Newcastle Upon Tyne, UK

Matthew David Whittington
Dewsbury, UK

Licentiate

Olumuyiwa Seun Ajireloja
Harpenden, UK

Andrew John Davis
Ashford, UK

Darren Lee Denikewicz
Manchester, UK

Lewis Frampton
Bracknell, UK

Junior Joseph
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James Thomas Nicholson
Hull, North Humberside, UK

Mark Norton
London, UK

Ian Pallet
Romford, UK

Tynos Sangola
London, UK

John William Sung
Liverpool, UK

Lee Tabis
Birmingham, UK

Jason Williams
Tonypany, UK

FELLOWS

Jennifer Bousfield
Jennifer Bousfield is a senior engineer with Ove Arup and Partners and has 15 years' experience in the building services industry. She has a broad range of experience gained on multi-disciplinary projects and specialises in the design of healthcare projects. She is responsible for the development of strategic plans and conceptual designs, and the translation of these into appropriate implementation routes and the production of related construction documentation. She is an active member of CIBSE and currently is the sub-chairperson of the CIBSE Members Panel.



Andrew Charles Brookes
Andrew Brookes is an MBA-qualified regional director at URS/Scott Wilson and has been for seven years, with more than 25 years' experience in building services. He is passionate about passive building design and currently has a national role on key projects, as



well as heading up the education sector on a multi-disciplinary basis.

Susan Angela Hone-Brookes
Susan Hone-Brookes is currently the environmental design leader at Crown House Technologies, which is part of the Laing O'Rourke group. Master degree-qualified in sustainability and building energy design, with more than 28 years of building services experience, she is at the forefront of meeting the environmental challenges faced on new/ongoing projects. She also leads the business on all aspects of environmental corporate responsibility initiatives.



Anil Patel
Anil Patel is an associate at the Hilson Moran Partnership. He has been working on high-rise buildings and has recently completed the design of the tallest building in London. Anil passionately believes that the



Part L Regulations should be tightened with a clear direction ahead.

Ahmed Zobaa
Ahmed Zobaa is a senior lecturer in power systems with Brunel University. He has a broad range of experience in power quality, renewable energy, and energy management.



Stewart Wan
Dr Stewart Wan has more than 20 years' experience in project, design and operation management of sustainability, building services, intelligent systems, and information and communications technology infrastructure. He is currently a senior manager in construction IT with West Kowloon Cultural District Authority, and working on ICT strategic planning and construction IT for West Kowloon Cultural District development.



Hoi Fong Yung, Kowloon, Hong Kong

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SUBSIDISING WASTE



The current headlong rush into 'green energy' threatens to lead to more expensive, less efficient energy production, argues **Colin McInnes**



David Liff / Shutterstock.com

Today's policy goals on climate change ignore the lessons of engineering history. We seem determined to replace historical transitions toward fuels of greater energy density with diffuse energy production.

The move from wood to coal in the Elizabethan era was such a transition, as was (much later) the use of oil, methane (natural gas) and then uranium. Each one of these had a lower carbon intensity than the last, with methane releasing about half as much carbon dioxide as coal per unit of energy produced, and nuclear being essentially carbon-free.

That evolution has, so far, relied primarily on carbon-rich fuels. If we now want to displace carbon from energy production, we had better come up with something better and cheaper than coal – and, ultimately, oil. The answer is not, though, to abandon the pursuit of higher energy density.

The current 'green' policy imperatives are taking us back to the

use of diffuse energy sources that will require vast quantities of materials, land and subsidies, misallocating economic resources that we could use more productively elsewhere.

Many forms of green energy are spatially diffuse and intermittent, making them inefficient and inherently expensive. Therein lies the need for feed-in tariffs and other support mechanisms. Green energy is set to grow, not because it is more productive, like Watt's separate steam condenser, but because government mandates it and provides generous incentives. An energy transition that leads to more expensive, less efficient energy production is more of a regression than a revolution.

In choosing to make energy more expensive we should remember that, with James Watt's development of efficient steam power, hydrocarbon-fuelled machines replaced carbohydrate-fuelled human labour. In the late industrial revolution, this decoupled the costs of energy and

Energy can be delivered that is both cheaper and more abundant than at present



Green energy is set to grow, not because it is more productive but because government mandates it and provides generous incentives

labour for the first time in human history. Energy became cheap while human labour became more expensive, and so our prosperity soared.

Our entire modern economy is built on this remarkable decoupling. In contrast, our headlong rush into expensive green energy risks sacrificing jobs elsewhere in the economy: it also threatens large tracts of the British landscape and hits the pockets of those who can ill afford higher energy bills. As engineers, we should insist that energy policy sets out to deliver lower costs, security of supply, and now a transition to lower-carbon energy. This will require greater use of methane and uranium and less use of coal and, eventually, oil.

A number of new technologies could help us to achieve these transitions. For example, while modern power stations have come a long way since Watt's steam engine, we still generate much of the world's electricity by heating water and then extracting useful work. A recent exciting innovation has been the demonstration of energy conversion using supercritical carbon dioxide as a working fluid, akin to a jet engine running on hot liquid. Not unlike Watt's separate steam condenser, this offers a step-change in the efficiency of turning heat into useful work in future thermal plants.

Other recent innovations include China's new national programme to develop next-generation molten-salt thorium nuclear reactors. This high-temperature, low-pressure fuel cycle fissions all of its fertile thorium fuel and leaves only short-lived waste products with a half life of around 30 years. Again, this development could

be on a par with Watt's separate steam condenser.

It appears that, even now, some producers of rare metals are storing rather than discarding thorium, as a waste product, in anticipation of its use as a future nuclear fuel. Support for the energy sector, and in particular energy innovation, is of course essential. But we need to distinguish between supporting innovation and subsidising commercial-scale energy production.

Significant subsidies for production consume economic resources that could help deliver future energy innovation. As the UK drives forward with an ambitious programme to deploy various forms of green energy, it is becoming clear that a combination of energy-dense, lower-carbon methane, partly from expanding reserves of shale gas in the UK and elsewhere, together with uranium, and later thorium, can be the key fuels of the future. This combination can provide the foundations of an energy policy to deliver future abundant, clean energy from compact power plants.

The era of cheap energy is over only if we choose so. If we use technical innovation to accelerate rather than supplant moves towards greater energy density, we can deliver energy that is both cheaper and more abundant. And, as a useful side-effect, we will help decarbonise our economy in the process.

● Professor **COLIN MCINNES**
FREng FRSE is Professor of Engineering Science at the University of Strathclyde and director of the Advanced Space Concepts Laboratory. A version of this article originally appeared in *Ingenia* magazine, published by the Royal Academy of Engineering. www.ingenia.org.uk

✉ Your letters

Not a limitless fuel for CHP

Paul Woods' article described the numbers behind comparing CHP and heat pump efficiency – showing that CHP can use natural gas to produce low carbon heat and electricity ('Power relation', December *Journal*, page 28).

However, it would be easy to conclude from the article that natural gas is a limitless resource. Unfortunately this is not the case. Discussions of CHP should not just compare carbon and cost with current conventional systems but should directly compare the use of natural gas as a heating fuel with other potential uses of this finite resource.

Therefore, on a basic level, CHP should never be compared to using 40% efficient grid electricity, as the natural gas consumed (forever) by the CHP system would not be used in a coal-fired power station; 50% would be a more appropriate figure for a modern gas-fired power station, even accounting for distribution losses.

But the argument is more far-reaching than this. The natural gas could alternatively be used in industrial processes (perhaps as part of a large-scale CHP installation) or manufacturing. Natural gas is a finite, high-entropy resource. Space heating and hot water have relatively low entropy requirements. Is it appropriate to waste this difference in entropy when other viable (similar cost, carbon emissions, etc) options exist?

Andrew MacKay

Seasonal data needed

The aquifer thermal energy storage (ATES) project described in 'Underground Solution' in the October *Journal* was very interesting, but it would be highly beneficial

to see what is the predicted seasonal performance of the system.

This should take into account not only efficiency of the heat pump itself, but also all energy input to run associated plant – including submersible pumps which are to deliver warm or cold water from the underground energy stores. It would also be of great benefit to see how this technology stacks up financially against gas-fired boilers sited within the building and serving the Greenwich Museum estate and traditional chillers.

With regards to the lifetime of the technology mentioned at the end of the article, although boreholes 'should have a life of minimum 30 years but probably longer', the major plant will require to be changed much sooner. This would include heat pumps, plate heat exchangers

and submersible pumps.

Michal Koscielniak

Wasteful transformers

The simple energy-saving measures reported for the 'Quick Wins' case study (November *Journal*, page 40) are fine, but the estimate of savings from disconnecting maintenance transformers is somewhat optimistic: 100 transformers each drawing 0.6 amps at 240 volts on no load does not equal 14 kW, but 14 kVA. Those reporting the figures have forgotten about power factor which, on no load, will be quite low. Transformers do waste energy. There must be an enormous standing loss in buildings all over the US due to their socket outlets ('receptacles') being 120 volts instead of 240.

Stuart Bridgman
Wellington, New Zealand



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MARK OF APPROVAL



Regulations requiring all construction products to be 'CE' marked will come into force this year. **Hywel Davies** looks at their implications

The Construction Products Directive (CPD) was one of the earliest outputs from the Single European Act, agreed by the then European community in 1986.

The CPD was adopted in 1989, and led to a surge in European standardisation, intended to deliver the single European market in construction products by 1992. The directive aimed to harmonise technical specifications throughout Europe, based on European Standards and European Technical Approvals (ETAs) for construction products.

This covered many materials used in buildings, including façades, but not heating and ventilating systems, lifts, fire safety products or electrical and lighting services. These were the subject of their own individual directives, perhaps most notably the Lifts Directive, but also the Gas Appliances Directive, the Boiler Directive and the Machinery Directive.

A product that met a harmonised standard or an ETA could be 'CE' marked and placed on the market in any European state. (CE stands for *conformité Européenne*). But the directive stated that such a product 'may' be CE marked. Rarely can so much discussion, debate and negotiation have hinged on a word. The UK implemented the directive exactly as worded, and did not require CE marking. Nor did Finland, Portugal or Ireland.

So began two decades of debate about the requirement for CE marking of construction products. The European Commission argued that the directive required the CE mark, and that the four countries not requiring it were in breach of EU law. UK lawyers argued that it was the Commission that was in breach.

However, this has now come to a resolution. The Commission was



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The CE mark, currently used for water heaters, will cover all construction products

determined to require CE marking of construction products, and last year got their way. The new Construction Products Regulation (CPR) was adopted in 2011. Notice the name: directive has become regulation. This is not a play on words, it has real significance.

A directive must be implemented by member states individually, by passing national legislation, or state by state legislation in federal or devolved territories, to implement the directive. In the UK this tends to be done by adopting the exact requirements and wording of the directive and nothing more, to avoid what is known as 'gold plating' of EU law, which is not permitted under UK law.

A regulation, on the other hand, requires member states to do

precisely nothing. A regulation has direct effect, that is to say, it is automatically part of the law of each member state once adopted, and there is no need for implementation measures, nor scope for interpretation of the directive.

So, now that we have the Construction Products Regulation, what does it mean for the services sector? The main provisions will come into force in July 2013. It covers all 'construction products', which are:

'Any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or parts thereof and the performance of which has an effect on the performance of the construction works with respect to the basic requirements for construction works;'

These 'basic requirements' are: mechanical resistance and stability; safety in case of fire; hygiene, health and the environment; safety and accessibility in use; protection against noise; energy economy and heat retention; and sustainable use of natural resources.

This final requirement is an addition to the original six 'essential requirements' of the CPD, which pre-dated both the Rio Earth Summit and Kyoto Treaty. Since then a whole new area of activity around sustainability and buildings has opened up.

However, detailed regulatory requirements for buildings vary between member states with, for example, frost resistance required in Finland or Sweden but not in Malta. So, the regulation applies across the EU, but the corresponding technical specification may need to allow for products having different levels of performance, although they all meet the standard.

And now they all have to be CE marked. But that does not mean they are necessarily identical products from state to state. If Europe has two (or more) levels permitted in the technical specification, then products may be CE marked if they meet one of the levels. They must be transparent about which level they meet, but they do not have to meet every level. So although a product may have CE marking, it may still not be suitable for particular applications or for use in some member states, even though the marking allows it to be placed on the market there.

Building designers, contractors, manufacturers and importers all have some responsibility for ensuring that a product used in a building has the correct characteristics for that particular application.

They may be required to provide the necessary test evidence to show that CE marking is valid. But with the various conditions and variations in national building regulations across Europe, CE might well mean 'check everything'.

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

MANUFACTURER'S VIEWPOINT



Together we need to forge a low carbon plan for the future, writes **Martin Fahey** of Mitsubishi Electric, sponsor of this column

Growing awareness and evolving values are driving government, businesses and individuals to demand more sustainable and socially acceptable energy technologies.

It is up to all of us in the building services industry to forge a plan together to ensure we're ready and fit for the future ahead.

Three primary goals are identified by the Department of Energy and Climate Change (DECC). They are:

- Reducing CO₂ emissions by 80% compared to 1990 levels by 2050;
- Ensuring energy supply meets demand; and
- Achieving a secure energy system for the UK.

We need to develop strategies that focus on fact-based arguments for alternative solutions to the traditional use of carbon-based fuels, ensuring the right system is used in every case.

A more important issue for government is fuel security; it's predicted that in the coming years, 70% or more of the UK's energy will be imported.

We now depend on international energy markets, including Norway, Qatar and Saudi Arabia, which face growing demand from emerging markets such as China and India. We need a more balanced supply in terms of both source and type.

Fossil fuels will remain a part of the mix for the foreseeable future, but we need to rely less on these.

When people and companies use renewable energy, they become more connected with their consumption; buildings with renewable technology not only provide some level of visible energy independence, but behind the scenes they also consume less primary energy.

The need to maintain an adequate heating level in homes, coupled with rising energy prices, has increased the number of households that need to spend more than 10% of their income on heating. Tackling this 'fuel poverty' means reducing the cost of running our homes' heating systems and introducing different technologies. Installing adequate insulation, as promoted by the Green Deal, is crucial too, and will make the transition to lower-carbon heating options much easier.

Some 82% of energy used in homes is for heating space and water. We believe that microgeneration will have a key role to play in meeting this demand.

Public attitudes are evolving,

along with the requirement to make energy consumption more visible, and this is creating a change in opinion in favour of renewable technologies. To make the most of this, we need to

In the coming years, 70% of the UK's energy will be imported

demonstrate to consumers and end users the environmental and financial returns of these solutions.

When it comes to heating, ventilating, cooling and powering buildings, there already exist scalable and publicly acceptable, low carbon alternatives, requiring minimum input from the end user. These readily available, renewable heating technologies already outperform today's more familiar systems against all the key criteria.

We can also be sure that today's children – tomorrow's consumers – will demand an economy that's low carbon and, in the face of increasing public and government pressure, our industry needs to continue the discussion to persuade all concerned parties to pursue the right energy solutions.

If you would like to join the debate, visit www.greengateway.mitsubishielectric.co.uk



STATION TO STATION

The long-term redevelopment of Birmingham New Street is presenting major challenges for the construction and services engineers involved. **Andy Pearson** takes to the tracks with them



PROJECT TEAM

Client: Network Rail
 Architect: AZPA
 Lead consultant: Atkins
 Delivery partner: Mace

A new atrium will be the centrepiece of the redeveloped station

All images courtesy of Network Rail

Construction is constrained by the condition of the existing 1960s concrete structure, the accuracy of the existing ‘as-installed’ drawings and the unknowns that appear as areas are opened up

Under Europe’s largest refurbishment project to date – the £600m Birmingham Gateway scheme – the city’s dilapidated New Street railway station is being transformed into a light and modern 21st century transport hub. In addition to remodelling the station, the plan is to redevelop the upper-level 1960s shopping centre, while a new John Lewis department store will be built at the south of the station along with a town square to the east.

The challenge for the designers and contractors is that the station and shopping centre have to remain open throughout the redevelopment. It is a task made all the more difficult by New Street’s position as a key hub on the country’s railway network. In fact, it is the busiest station in the UK outside London, with one train arriving or departing every 30 seconds.

To understand the scale of the task facing the project team it is useful to know the history of the site. The existing station, built in the 1960s, has an aesthetic based on raw, exposed concrete and soulless artificial light. The station includes 12 subterranean platforms, which are located in the gloom beneath the ground-level concourse. Daylight is absent from the concourse, which is situated beneath the 1960s Pallasades Shopping Centre and its accompanying concrete multi-storey car park. ‘The station is the gateway to Birmingham and currently it creates a really, really poor image of the city,’ says Ben Herbert, Network Rail’s communications manager.

In 2006, 50 years after it first opened, Birmingham City Council, Network Rail, the Department for Transport, regional development agency Advantage West Midlands and passenger transport executive Centro backed proposals to revamp the station. The architects AZPA won the design competition with a proposal to remodel the existing station and shopping centre and expand the station to three-and-a-half times its current size.

The new design features an enlarged concourse. This is lit from above by a giant atrium clad in ETFE, which has been punched through the centre of the Pallasades shopping centre. The refurbished platforms have been cleared of waiting rooms and clutter; they have lightwells to allow daylight to filter through from the concourse above.

Access to the platforms will be improved with the installation of 36 new escalators and 15 new public lifts, while new entrances and a new north-south pedestrian route running through the station will improve pedestrian access to the station and link it to the southern part of the city. To give it a new identity, the remodelled station will also be wrapped in a ribbon of shiny stainless steel cladding.

Work on the remodelling started on site in 2010. The station is being rebuilt in two phases over a five-year period to allow it to remain in use throughout. Phase One involves construction of half of the station’s new concourse on the ground floor of the Pallasades car park. At Christmas 2012, this new concourse will open and the existing station will close. Phase Two involves the redevelopment of the existing station and construction of the remainder of the concourse and the John Lewis store.

The scheme is due for completion in



An artist's impression of the new north-west corner entrance, which is currently under construction. It is due to open in December 2012

► 2015 when the two halves of the new station will be united. 'The construction work has been constrained by a commitment to keep the station operational, with minimal disruption to passengers,' says Azhar Quaiyoom, design and programme manager for construction group Mace. He is working in partnership with Network Rail as project manager, as well as being appointed principal contractor.

At the moment, the bulk of the work on

site involves the installation of enabling works and temporary works. Outside the station, utilities are being diverted and upgraded. South of the station, the final few floors of the 20 storey, 1960s residential block, known as Stephenson's Tower, are being removed to make way for the new John Lewis store. To the east, work has started covering over the railway tracks to create the new public square.

Above the station in the Pallasades shopping centre, engineers are busy trying to establish what services can be removed and what must be retained before the new atrium rises up through the centre of the shopping centre. Not all the services are marked on drawings, so the ceiling tiles have been removed to reveal a web of wires and cables, some of which have been tagged once their purpose has been established.

The task is made all the more difficult because investigators cannot enter the shops that are still in use. 'Construction is constrained by the condition of the existing 1960s concrete structure, the accuracy of

Heating and cooling Focus is on central plant room

A new central plant room is being constructed adjacent to the existing one, complete with new gas-fired boilers domestic hot water calorifiers, chillers and tanks for the sprinkler system. The Pallasades and John Lewis will have their own plant rooms.

Heating and cooling will be used in the station's air handling units and four-pipe fan coils to keep the back-

of-house and staff areas comfortable.

The station will also be fitted with a constant temperature water loop so serve the retail outlets. This is fed from five rooftop air source heat pumps with an additional connection to the main boiler through a heat exchanger. The system will allow retailers to take heating or cooling from the loop.

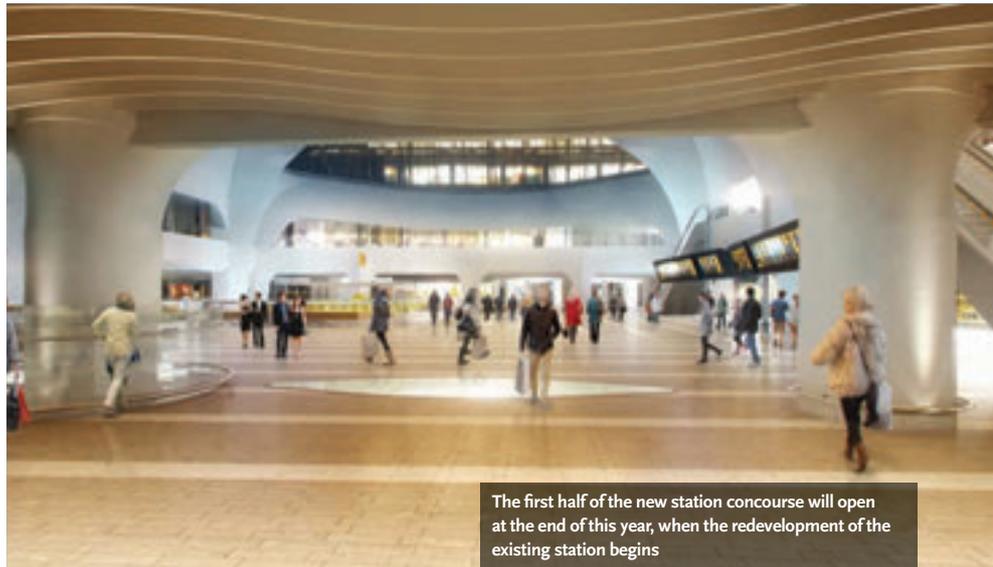
The plant room is also

home to the station's two independent 11 kV incoming electrical supplies and their transformers; each is capable of supplying sufficient power to run the station.

The new service spine is being constructed to the east of the service duct. A second south-north spine will be constructed under phase two to serve the eastern half of the development.



Artist's impression of the station entrance at night



The first half of the new station concourse will open at the end of this year, when the redevelopment of the existing station begins

the existing “as-installed” drawings and the unknowns that appear as areas are opened up,’ explains Quaiyoom.

Modular installation

In the adjacent multi-storey car park, the entire first-floor concrete floor slab has already been removed while the car park above has remained in use. In the newly created double-height space, away from the existing station, the western half of the new concourse is currently under construction.

In the echoing, concrete gloom of the empty car park, a team from contractor NG Bailey are hard at work installing a series of prefabricated services modules to form a new services spine. ‘There are quite a lot of modular services on this project because the logistical and programme constraints made them the most cost-effective option,’ says Quaiyoom.

The modules are delivered to site complete with lengths of pre-insulated pipework and rows of empty cable trays already installed. They are wheeled into place on a series of temporary steel rails,

before being winched high into position beneath the bare concrete ceiling. Once the services installation is complete, work will commence on constructing the new concourse shops that are located beneath the spine. ‘The year 2012 is all about fitting out this area,’ Quaiyoom explains.

The south-north service spine links the main plant room, located at the south of the site, with all 12 of the station’s east-west orientated platforms. Power, fire alarm, passenger and voice announcements, CCTV and data cabling systems will all be distributed to the each platform. The spine will also deliver piped services, such as heating for waiting rooms and hot and cold water for staff washroom facilities.

‘The spine will deliver everything to keep the station running,’ says Stephen Ashton, project director with responsibility for delivering design services for the construction phase for lead consulting engineer Atkins.

Services solutions

The station’s 12 platforms are also being

There are quite a lot of modular services on this project because the logistical and programme constraints made them the most cost-effective option



Modular services are installed in the car park next to the station, to form the new western concourse

refurbished. The challenge for the designers is that some of these are not scheduled to be refurbished until Phase One has opened, with the result that some systems will have to be maintained using an interim solution. 'Where we can we're trying to replace all the PAVA and CCTV systems across all platforms [with night-time working], but critical systems such as power, fire alarm and sprinklers will be half new and half existing at the changeover,' Ashton says.

An added complication is that the sub-surface platforms have the same fire and safety classification as an underground station; as a result, the engineers have to be in constant communication with local

building control and fire officers throughout the works. 'It's quite a complicated piece of work,' Ashton explains.

In addition to cabled and piped services, lift pits and openings for escalators are also being installed during the platform refurbishments. The lifts and escalators will not, however, be installed until much later in the project when the bulk of the construction works have finished. An impulse fan system is also being installed at platform level to remove smoke and diesel fumes.

Sustainability

As part of the funding criteria, the scheme had to achieve BREEAM Very Good status. 'This is the best rating we can hope to get from the refurbishment of a 60s concrete building with minimal insulation,' says Quaiyoom.

The BREEAM requirement has driven various initiatives, including the installation of a rainwater harvesting system, which will supply 60% of the toilet demand; the harvesting tank will also double up as an attenuation tank to help retain rainwater run-off on site. A low energy lighting solution based on LEDs will also be installed with daylight control to manage light levels.

The engineers have to be in constant communication with local building control and fire officers throughout the works. It's quite a complicated piece of work

Other sustainable initiatives include a natural ventilation solution for the main concourse. This uses openable vents incorporated into roof lights to induce the stack effect with cooler air drawn into the station through the various low-level openings. The vents will begin to open at 18C and will be fully open at 20C. The control of the vents is also linked to CO₂ sensors and will open if concentrations levels reach 1,000 ppm. The vents will also open to allow night cooling in summer.

Computational fluid dynamics analysis by Atkins demonstrated that the natural ventilation system will keep passengers comfortable throughout the year. The passengers, however, will have to wait until the station opens in 2015 before they'll be able to confirm whether this is indeed the case. **CJ**

Power proposal CHP may link to district heating

There is a possibility that the station could become the first run by Network Rail to have its own combined heat and power (CHP) system.

Birmingham City Council already has a district heating scheme in the north of the city and is keen for a new system to be installed as part of the redevelopment to serve the south of the city.

'There is an aspiration to

implement a CHP system from Birmingham City Council,' says Stephen Ashton of Atkins.

The CHP scheme is currently out to tender with the *Official Journal of the European Union*. Its adoption will depend on being able to develop a suitable business case for the site.

According to Azhar Quaiyoom of Mace, there is a market for power at the station

but not for the heat, although the demand for heat may change if regeneration starts to take off to the south of the station.

'We'll analyse the tenders that come back to see if there is a sound proposition that is viable that we can incorporate into the programme,' he says.

A site for the plant has been identified on the site's north-west corner.

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FABRIC

Insulating buildings may be a better way to increase efficiency cost effectively, rather than piling in renewable technologies

OF SUCCESS

The parlous state of the British economy is inspiring a more pragmatic approach to heating system design, according to experts. **Ewen Rose** reports

The heating industry must shift its focus from carbon saving to energy efficiency and affordability to meet new regulatory and economic targets, according to speakers at the New Solutions for Heating System Design conference hosted by the IMechE.

'Regulators have acknowledged that everything must be affordable – or it simply won't happen,' explained AECOM director Ant Wilson during his presentation on future changes to Part L of the Building Regulations.

'The agenda is now dominated by energy and security of supply,' he added. 'It is relatively easy to cut carbon by using lots of clean energy, but that is no longer acceptable as it dramatically pushes up costs.'

He explained that the planned revisions to Part L, due to take effect in 2013, will move the sector away from zero carbon towards a more realistic target of low-energy buildings.

The 'recast' European Energy Performance of Buildings Directive (EPBD), which has dictated the direction of Part L, now includes cost-optimisation criteria to avoid 'doing things that cost a fortune to deliver zero carbon'.

'The government says regulation should give certainty to encourage businesses to develop greener products and services, but says it will also be effective and proportionate and implemented in a way that minimises the burden on businesses,' he added.

The affordability imperative means that the planned new Part L will now only set

energy efficiency levels 10% higher than they are now. Overall, by 2019's version we will have improved energy efficiency standards that are substantially lower than originally forecast. 'We will be a long way from the original aim of zero carbon,' said Wilson.

The Green Deal is seen as key for the government because it takes away the 'financial burden' from end users. However, the conference heard there were problems looming if we use computer software that was originally designed for compliance checking to calculate the potential energy savings under the Green Deal.

'We need to improve SBEM and SAP,' said Wilson. 'We must have a more robust measurement methodology or people simply won't trust it to produce the accurate data that is needed to set the right level of repayments for the bill payer.'

The growing need for practical and cost-effective heating solutions prompted speakers to call for greater use of community heating schemes, combined heat and power (CHP) and thermal storage systems.

Frank Mills of consultants Sinclair Knight Merz said the country needed 'to spend its money more wisely by not having renewables on buildings'.

He proposed using off-site renewables in conjunction with 'private wire schemes' serving multiple users. He also advocated the use of thermal storage to overcome the problem of managing intermittent energy from renewable sources.



The government's cutback in the Renewable Heat Incentive for large-scale biomass is seen by some as a major setback for its development

► 'Thermal storage using ice or phase-change materials is a good application for renewables that often provides energy when you don't need it,' he said. 'This way you could store the energy for release into the building at the right time.'

Mike Landy of the Renewable Energy Association (REA) also pointed out that photovoltaic (PV) panels produce electricity in the middle of the day when people are not, generally, at home.

'You get your FiT payments, but if you could also use that electricity to heat the

house you would save even more money instead of sending it back to the grid for just 3p [the export tariff].'

Landy urged contractors to look at how this could be done. He added that solar had, generally, been a success in hot water applications, but there were still serious installation problems.

'The controls are critical because too often systems have been found working back to front so the panels release heat into the atmosphere,' he said. 'Commissioning and integration are vital. We have to look at these things in terms of whether they will still be working in 15 or 20 years' time.'

He said a combination of waste heat recycling and continuously running renewables would be a better option than 'banging on the gas for a short period to get the building up to temperature'.

Conference chairman David Frise, head of sustainability at the Heating and Ventilation Contractors Association, pointed out that contractors held the key because they were charged with integrating new technologies into old buildings. He said that the HVCA had developed an 'integrators' guide' in partnership with CIBSE, research body BSRIA and the Building Controls Industry Association, which is due to be published this year.

'Clients are now buying the performance, not the products,' said Frise. 'The Green Deal is putting this into a financial context. If we don't deliver the performance, the clients pick up the tab. Contractors are now in charge of the promise of carbon savings, but integration is the critical factor.'

He predicted an increasing role for district heating, but felt the 60% cut to the Renewable Heat Incentive (RHI) for large-scale biomass could be a big setback.

However, Simon Woodward from the UK District Energy Association said the new one penny tariff for large biomass boiler plant was a 'disincentive' to investment in this type of renewable scheme, but said it would create more interest in CHP. 'The original RHI price [for biomass] was too high, but now it is too low.'

He stressed, however, that subsidies should not be a reason for investing in a scheme. 'The government will continue to dabble, so your core business model needs to be robust. Green funding should just be cream on top.'

He advised that district heating was not suitable for low-rise housing because at least 30% of the heat is lost, but was ideal for dense urban areas. He said system ►

Embodied carbon Data lacking for heating systems

There is a growing demand for more to be done about embodied carbon. Currently, it is languishing in the 'too difficult' box, according to David Frise of the HVCA, who argued that there were massive improvements to be made during the manufacturing and construction phases of buildings and products that could dwarf all efforts to cut carbon during operational lifetimes.

Craig Jones from Sustain said it would become an even more important element of lifecycle assessments as the energy supply is decarbonised.

He said the embodied carbon in a new-build house is 500 kg of CO₂ per sq m, which is equal to about 13 years of operation. For a typical office, it is 800 to 1,000 kg per sq m, which is about 20% to 35% of 'whole life carbon' impact.

'If electricity is decarbonised, embodied carbon would become 50% more significant for a typical office – about 30 to 50% of whole life impact,' said Jones. The Department of Energy and Climate Change is aiming for the entire UK electricity supply to be 95% lower carbon by 2050, which would make the carbon emitted

during the construction phase of a building far more significant as very little would be created during operation.

Jones said there was very little embodied carbon data available for heating systems, but that could change significantly with the imminent publication of a series of standards recommended by the working party CEN TC350. These will increase pressure for businesses to make more environmental product declarations (EPDs), which require manufacturers to state the embodied carbon of their products.

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Innovation & Expertise



The photovoltaic solar panels are often not providing heat when it is needed

designers should look ‘to optimise the network and use existing structures’ such as tunnels and car parks, to transmit the heat to where it was needed.

‘Look closely at the energy density to make sure it makes financial sense,’ said Woodward. ‘There will be heat losses, but these can be minimised through good design.’

He also urged system designers and operators to resist the temptation to ‘pump water around at 130C’, and instead look to run the system at as low a temperature as possible.

The risk of building ‘white elephants’ to take advantage of government subsidies has increased in recent years, but Woodward called for the industry to take responsibility for developing robust business cases for all proposed plants.

He added that end-users should not be forced to pay more for ‘green’ energy. ‘Avoid the cost-recovery model. Connecting to a district scheme should not be at a green premium – it should not cost the user more than if they had their own individual scheme. There must always be a business case.’

The financial model for ground-source heat pumps (GSHP) is also improving, according to Brian Mark of Mott Macdonald. However, he criticised manufacturers for quoting very high and misleading coefficient of performance (CoP) figures.

‘The key factor is seasonal CoP over the heat pump’s lifecycle,’ said Mark. ‘If this is good, reduced carbon emissions will follow, but then you should check the cost/benefit model to make sure it is appropriate.’

Energy Savings Trust field trials had revealed that none of the installations had a higher COP than 2.5. ‘This means none were as good as just burning gas,’ said Mark. ‘Advanced applications could achieve more than 5 for heating and up to 20 for cooling,’ he claimed.

‘The RHI is wrestling with this. If you get the calculations wrong, you could get tariff payments for a while, but then find they have been taken away again.’

The industry average CoP for GSHP is just 2.3; yet, unless it is over 2.6, it can’t be classified as renewable, according to Mark. And this will not improve until installers understand system design better, he said.

‘Ground-source systems must be combined with the lowest possible temperature heating system. There is not much wrong with the technology; it is how it is applied that has been the problem.’ **CJ**



WHAT THEY SAID....

- It is relatively easy to cut carbon by using lots of clean energy, but that is no longer acceptable as it dramatically pushes up costs
- Controls are critical because, too often, systems have been found working back to front so the panels release heat into the atmosphere
- Clients are now buying the performance, not the products, and the Green Deal is putting this into a financial context
- If electricity is decarbonised, embodied carbon would become 50% more significant for a typical office
- The key factor for a ground-source heat pump is seasonal CoP over the heat pump’s life cycle
- Thermal storage using ice or phase-change materials is a good application for renewables that often provide energy when you don’t need it

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In this London Fire Brigade Station, biomass boilers have been retrofitted to meet all heating and hot water needs

HOT ADVICE

A new CIBSE document on heating systems has highlighted key issues around the refurbishment of existing buildings. **Tim Dwyer** reports

The recently published CIBSE Application Manual, *AM14: Non-domestic hot water heating systems*, ranges from initial design strategies through to design, installation, testing, troubleshooting and maintenance.

The manual excludes hot water generation for domestic hot water use. It does not attempt to cover craft-level skills; instead it focuses on information that is essential for the proper evaluation, design and

operation of the systems for the designer and building operator.

The range of content that makes up the manual could (with some effort) be sourced from the various publications of CIBSE, BSRIA, the Building Regulations, BRE and numerous British Standards. *AM14* manages to integrate all this information into a consolidated reference. Most of the document provides a well-illustrated commentary of the components that



Mazurkin Yuri Vasilievich / Shutterstock.com

AM14 provides a structured path through the process of updating heating systems

► combine to make up a heating system, from fuel storage through to chimney design. This information, combined with the sections on design and selection criteria, provide a significant reference for designers.

In light of the UK's national policies on the Green Deal and Green Investment Bank, and the imperative to refurbish rather than demolish, the section that covers refurbishment of building heating systems is apposite. It gives more focused coverage of the specific needs of heating systems, compared with the more general CIBSE document that covers refurbishment: *Knowledge Series 12 'Refurbishment for improved energy efficiency: an overview'*.

In line with the philosophy of its parent document, the refurbishment section of

AM14 provides a structured path through the process of refurbishment of heating systems. A decision flow chart is provided as a guide to the appropriate level of refurbishment (reproduced here as Figure 1).

A minor refurbishment is defined as one that may be carried out with minimal disruption to the operation of the heating plant; for example, adding de-aeration systems, metering devices or improved controls.

A major refurbishment is designated as work that that may cause major disruption to the operation of the heating system and would therefore take place outside of the main heating season or when the building is vacant. This would include such things as replacement of boilers and flues, primary pumps or complete system

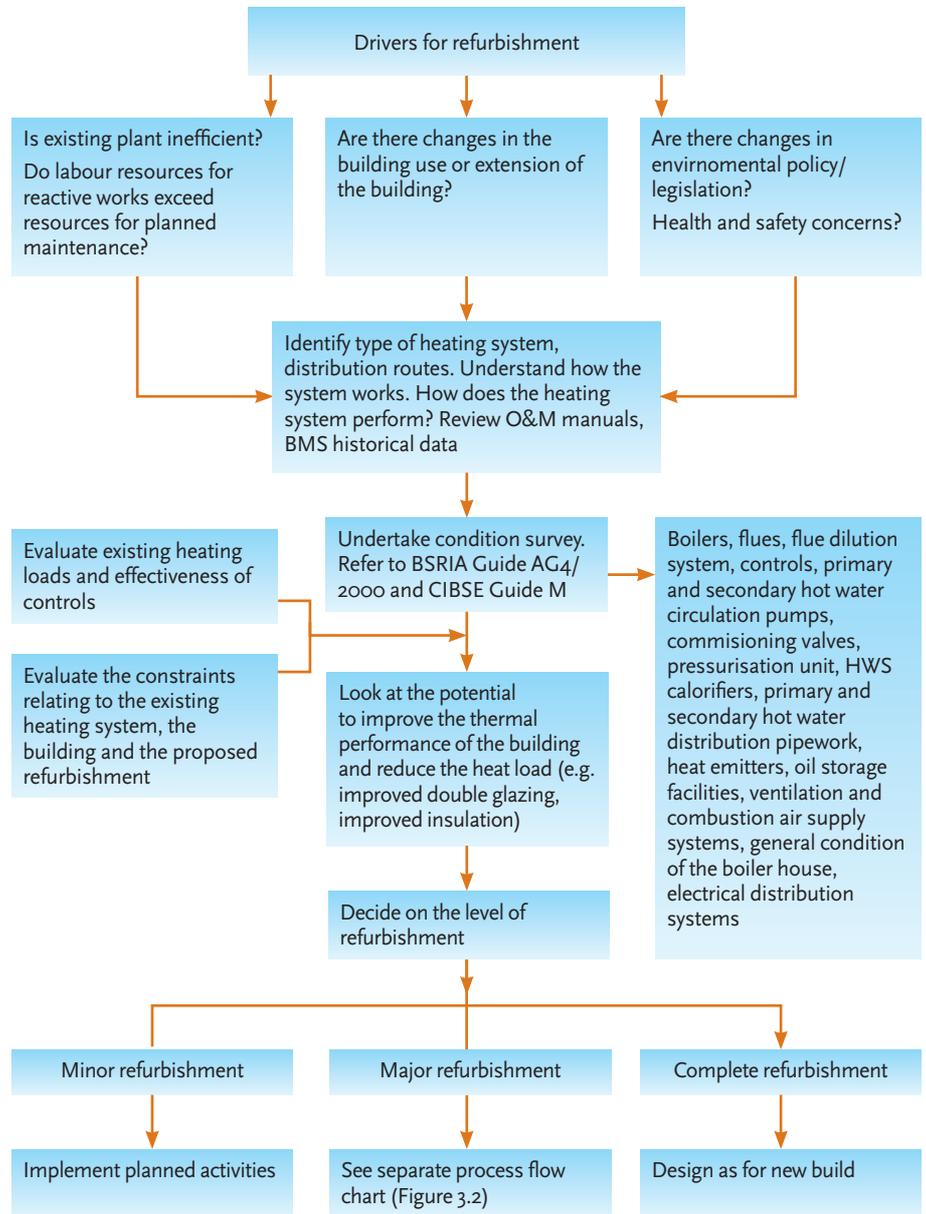


Figure 1: AM14 decision flowchart for refurbishing (Source: CIBSE AM14)

re-commissioning. Beyond this, a total refurbishment is one where the building might be undergoing a major structural change or a complete replacement of the heating systems. Some potential key constraints on the refurbishment process are highlighted – such as a lack of record drawings and equipment schedules, and issues around the integration of new systems and controls into existing ones.

AM14 does not present a set of specific solutions but highlights areas that need careful consideration when assessing the practicality and viability of a refurbishment project. New approaches to systems design will often mean that additional space is needed.

For example, biomass systems will require storage and access for delivery

that, in the case of replacing existing oil fired systems, may simply be a matter of reorientation of the existing areas. However, replacing or augmenting electrical or gas systems could entail a whole additional set of delivery, storage and chimney requirements.

Consequential constraints are included, such as the need to determine the operational changes when using condensing boilers on a traditional heating system to maintain heating outputs. The manual is mindful that in many refurb projects the heating requirement for the building is likely to be reduced when fabric and air leakage improvements are made, so compensating for a reduction in heat distribution capacity through lower flow and return water temperatures.

AM14 focuses on information that is essential for the proper evaluation, design and operation of the systems for the designer and building operator

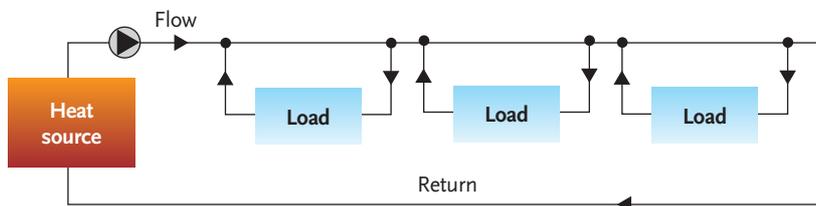


Figure 2: A simple single pipe system that would be a feature in many of the 5,000 listed UK schools. (Source: CIBSE AM14)

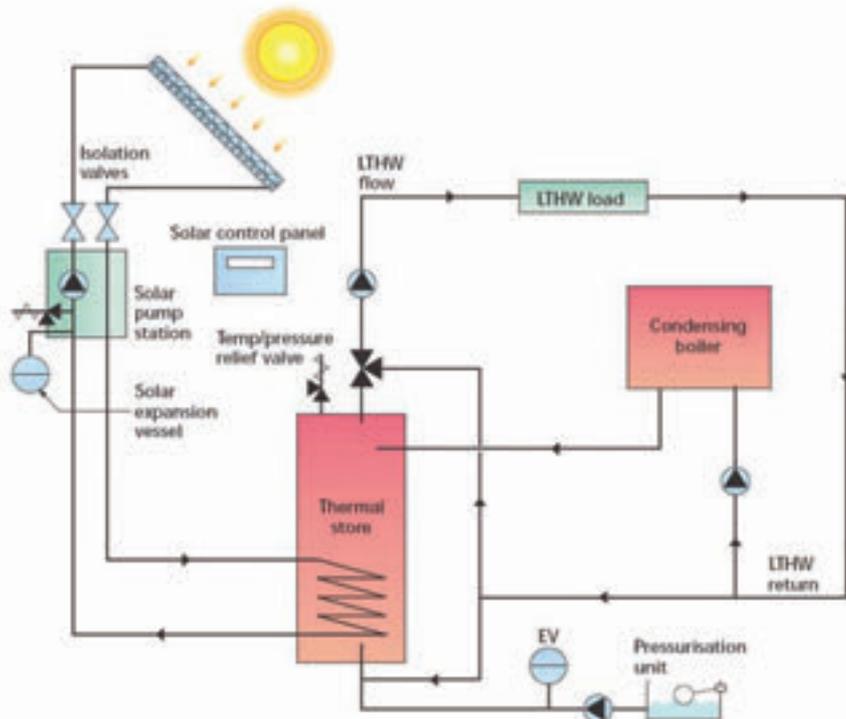


Figure 3: Example of solar thermal integrated into a condensing boiler heating system. (Source: CIBSE AM14)

AM14 AND RELATED CIBSE GUIDES

Most CIBSE members are familiar with the CIBSE Guides (particularly Guide A 'Environmental Design', Guide B 'HVAC & R' and Guide C 'Reference Data') that in themselves provide an invaluable source of information for designers and operators of building services. But, aside from all the other equally important guides, there are many more CIBSE publications that meet specific needs and, with the advent of the CIBSE Knowledge Portal (www.cibseknowledgeportal.co.uk), they are free and instantly available to CIBSE members. A prime example of this oft neglected wealth of information and knowledge is the wide range of application manuals that have been produced by CIBSE by drawing on the expertise of teams of industry specialists. This range has recently been augmented with the new AM14 – *Non-domestic hot water heating systems* guide.

Generic heating systems are outlined to assist in identifying the underlying systems in buildings. These range from the one-pipe systems (see Figure 2) that were so popular in schools in the first half of the last century and remain in many thousands of listed buildings; through to widespread two-pipe systems and manifold systems used in more modern zoned chilled ceiling and fan-coil applications.

The manual's coverage of refurbishment articulates the techniques for evaluating the whole life costs and payback for systems

Being able to identify the system on site is more challenging than the simplified schematics may suggest; but AM14 does provide some guidance on the methodology required to successfully evaluate existing installations. Starting with a list of the performance information

that may be gleaned from a one-off visit – such as schematics, equipment schedules, original commissioning data and connections with other systems – AM14 then expands into the basics of longer-term evaluation and continuous monitoring, and how the data might be analysed.

The feasibility for refurbishment (rather than replacement) will, of course, depend on the condition of the existing heating plant. AM14 outlines the principal components that would be included in a condition survey and indicators that signal the need for further investigation such as corrosion, signs of poor boiler combustion, leaks and excessive noise.

The practicality of any refurbishment heating option must depend on the load requirements of the building both in terms of simple heating loads and the capability of the renewed systems to meet the specific demands of the heating distribution systems. The manual provides a brief summary of the necessary calculations and identifies the relevant resources that can be used to establish loads and distribution temperatures to meet the requirements of the building.

Recognising the increased emphasis on reducing the environmental impact of the heating plant, there is an important section outlining the main low carbon technologies that are likely to be considered. This includes not only the technologies themselves (such as solar thermal, CHP and biomass) but also how, in general terms, they may be integrated into existing systems (as shown in Figure 3).

The manual's coverage of refurbishment articulates the techniques for evaluating the whole life costs and payback for systems and identifies appropriate performance criteria for replacement boiler plant.

This 125 page document provides an accessible reference that describes a logical sequence of processes and underpinning knowledge for engineers to design efficient heating systems. There may be opportunities in future editions to develop some case studies that cover experience of refurbishment as well as potentially including sections on domestic hot water generation but even in this first edition the collected wealth of guidance and information is a worthy addition to the CIBSE technical resource. **CJ**

PROF TIM DWYER is CIBSE Journal technical editor and a teaching fellow at University College London

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'Free-cooling' chillers using inverter technology, which are said to boost efficiencies (Image courtesy of Hitema)

PERFORMANCE BOOSTER

Inverter technology can be effectively used to produce chiller units with even greater efficiencies than previously considered possible, writes **Maurizio Burba**

In the refrigeration and air conditioning sector, attempts are made to reduce the energy consumption of all systems by improving the management of cooling power, optimising the use of water-glycol flow and providing greater temperature accuracy.

The use of screw compressors is common amongst high-capacity chillers (those greater than 300 kW) and this article will explore the use of inverter speed control technology to reduce their power consumption during part-load operation.

Inverter technology

An inverter is an electrical device that varies the voltage and frequency of the power supplied to a motor. Inverters widely use film-polyester capacitor configuration that have good longevity and low current distortion. The compactness and longevity of inverters can be further improved by cooling >

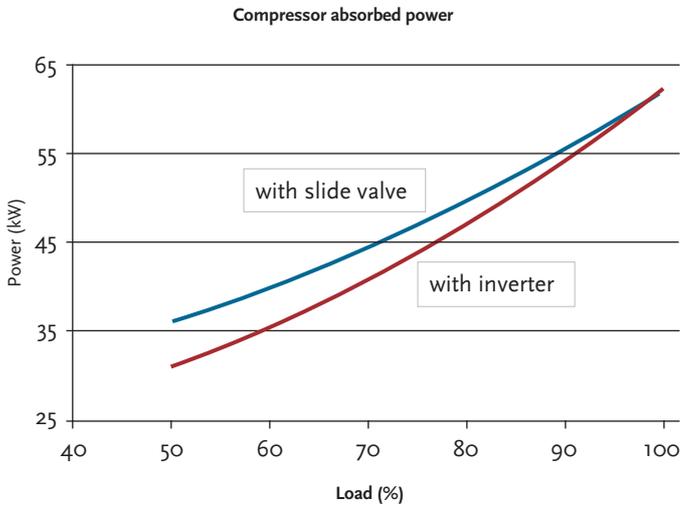


Figure 1: The absorbed power of the inverter controlled compressor when installed with an inverter is lower, compared with a standard screw compressor with a slide valve

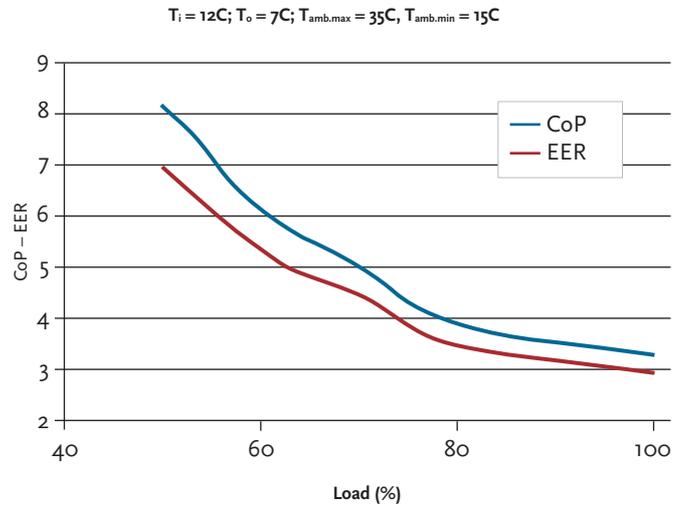


Figure 2: Performance of an example air cooled chiller with R134a refrigerant, with an inlet water temperature of 12C and an outlet water temperature of 7C

Using a slide valve the gas flow is less controllable compared to the inverter controlled counterpart

► them by direct contact with the liquid refrigerant line.

As the frequency of the supplied power is altered (typically between 30 Hz and 70 Hz), the compressor speed will change proportionally.

The main advantages of this technology are:

- The starting current is effectively equal to zero since the speed and power consumption is directly proportional to frequency;
- Cooling power can increase beyond the normal maximum as the screw compressor can rotate with higher speed with frequencies up to 70 Hz (compared to normal 50Hz supply);
- The electrical consumption at partial load between 30 and 50 Hz is reduced compared to a standard screw compressor with a slide valve capacity control. This results in a measured absorbed power being reduced by up to 15%;
- Superior control of water outlet temperature fluctuating less around the set point temperature. Typically tolerances of around +/- 0.5C are possible; and
- Reduced mechanical compressor wear, as the machine will rotate for most of the year with reduced speed.

The efficiency of the compression process can be maintained across the range of loads using both inverter technology and automatic volume index (Vi) control. (Vi is the ratio of the volume of gas in the compressor when the suction port closes to the volume of gas when the discharge port opens).

Performance of an example chiller with inverter controlled compressors

Figure 1 shows lower absorbed power of the screw compressor when installed with an inverter, compared with a standard screw compressor with a slide valve.

Using a slide valve, the gas flow is less controllable compared to the inverter controlled counterpart. With a standard compressor the capacity changes are in steps (eg, 100%, 75%, 50% and 25%); whereas in the inverter solution the speed decreases proportionally and the gas flow is modulated linearly.

Figure 2 shows the real data performance for an example air cooled chiller. The coefficient of performance (CoP) is the ratio of the chiller cooling capacity to the compressor power input. The energy efficiency ratio (EER) is the relationship between the cooling capacity of the chiller and the total power consumption of the refrigeration unit (compressors + fans).

Figure 2 illustrates the beneficial effect on the efficiency of the chiller unit as the ambient air temperature and the load on the chiller reduce from 100% load in a 35C ambient (worse case), to a situation where the load on the chiller is 50% and the ambient temperature is 15C. The EER for the unit at 50% load in a 15C ambient is more than double (-7) the value compared to when at 100% load in a 35C ambient temperature (-3) (and so qualifying for 'Class A' efficiency categorisation).

These values of CoP and EER compete well with other available technologies (eg, centrifugal compressors). Inverter

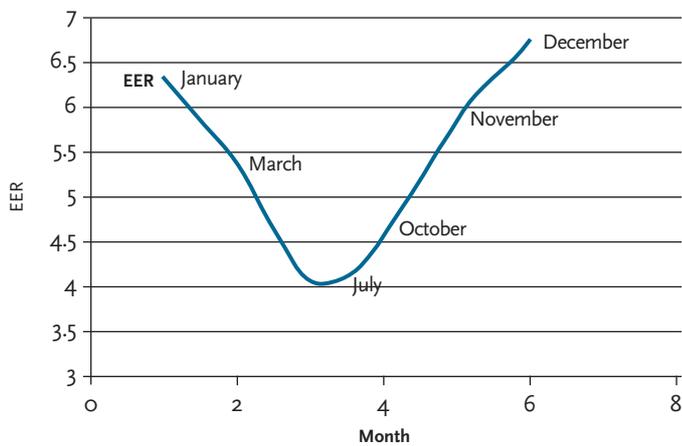


Figure 3: The EER value trend of a chiller without free cooling when operating with a fixed water outlet temperature

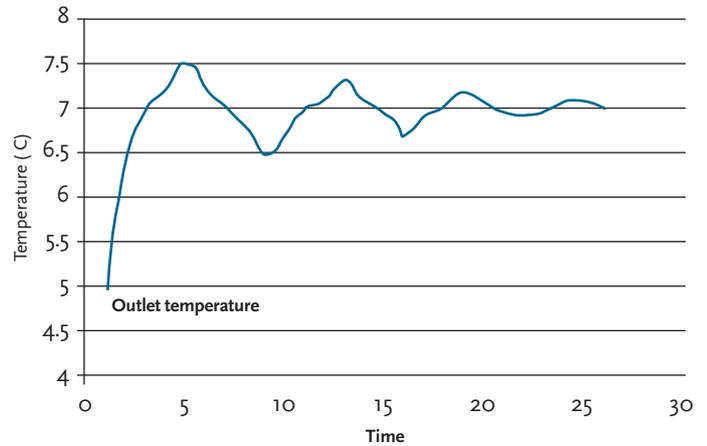


Figure 4: The outlet water temperature trend. Inverter control achieves much greater water accuracy than is possible through control with a standard screw compressor

screw compressors can attain COP > 8 and EER > 7.

Figure 3 shows the EER value trend of a chiller without free cooling when operating with a water outlet temperature of 5°C. This example chiller is designed for 680 kW at full load. During the warmer months of the season (June-August) the required load is 100%, whilst during the colder period (November-March), when ambient temperature is much lower, the chiller load is estimated between 50% and 60%.

In the hotter months, during the most demanding ambient conditions, EER has a minimum value of 4, whilst when the chiller load is around 60%, the EER values are typically between 6 and 7, much higher than a standard chiller. All these values relate to the maximum ambient temperature for each month, so these EER are considered a *minimum*.

Figure 4 shows the outlet water temperature trend. Inverter control achieves much closer water temperature control than is possible with a standard screw compressor. In this example the water temperature fluctuation is only +/- 0.5°C. The set point value is established more rapidly than might be expected using traditional chiller control.

The ESEER is the EU index used to classify chiller performance (and differs slightly from the UK SEER that typically takes more account of peak load operation); and for chillers with inverter control led screw compressor (and variable volume index, Vi), the increase for this example ESEER is around 15%.

Inverter controlled air cooled condenser fans

Inverters are also applicable to axial fans, and so can control the air circulated through the condensers in air cooled chillers in place of simple on/off or step control to steadily reduce the air flow and achieve improved condenser control. The benefits will not only be in improving the efficiency ratios by around 10%, but also by reducing noise levels for significant periods of time when the system is running at part load (typically up to 6dBA).

Conclusions

There are many opportunities to apply innovative solutions to reduce the absorbed power requirements of refrigeration hardware in commercial air conditioning and data centre facilities. The optimum operation of refrigeration equipment at part loads is especially significant in conditions where the average annual ambient air temperatures are between 5°C and 20°C – typical of the vast majority of European conditions. For even lower ambient temperatures, the combination of inverter technology, coupled with that of free cooling – whereby chilled water can be produced using only fans' energy – can be effectively used to produce chiller units with even greater efficiencies than previously considered possible. **CJ**

● **MAURIZIO BURBA** is managing director of Hitema. www.hitema.it A version of this article first appeared in the October 2011 edition of *REHVA Journal*. www.rehvajournal.com

“ Inverter control achieves much closer water temperature control than is possible with a standard screw compressor

BIG CLEAN-UP

Are tests for deadly bacteria in water systems a help or a hindrance, and what can be learnt from the American experience? **Ewen Rose** reports on the questions posed at an international CIBSE/ASHRAE webinar

Concerns over growing threats of contamination in water heating systems have been aired by experts in the field. Simon French, a legionella expert from the Heating and Ventilating Contractors' Association (HVCA), told a recent webinar that European countries had been trying to establish a robust system of risk assessments that provide control measures based on log books and auditing.

'We have been at it for years, but we still walk into buildings all the time that have never had a risk assessment. The issue is who actually polices the system,' French told a recent webinar conference on legionella, organised by the CIBSE/ASHRAE Group and hosted by University College London.

The growing market for solar thermal water heating has also increased fears that legionella – the bacteria that causes forms of pneumonia such as Legionnaires' disease – will proliferate in systems because of water being stored at temperatures in the 'danger zone', French said. As a result, many indirect hot water systems and renewable pre-heat cylinders need regular pasteurisation as a precautionary measure. This is a highly energy intensive process and building owners are keen to find

alternatives because of rising energy costs, he added.

David Pepper, managing director of manufacturer Lochinvar, which supported the webinar, said there was an argument for completely reversing the conventional solar water heating process to eliminate the risks posed by stored hot water.

'It is now possible to engineer a system where the pre-heated water from a solar thermal system is not the same water as that which is distributed at the hot water draw-off points,' said Pepper. 'This is achieved by transferring heat from the thermal store to the stainless steel indirect coil, which is then used as feed water for a traditional water heater.'

Robert McLeod-Smith, chairman of the UK's Legionella Control Association, confirmed that there had been wide discrepancies in test results from water samples and that this had made the job of legionella control specialists more difficult. However, he added that it was an important way of establishing that legionella was at least present in a water system.

Bill McCoy, who chaired the ASHRAE committee on the proposed new American Standard 188P on preventing legionellosis (the term used to cover the group of diseases caused by legionella bacteria) said: ➤



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All US buildings with water towers, like this one in Manhattan, will be affected by the new ASHRAE standard

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Testing samples from hot water systems is vital for preventing bacteria contamination

▶ “Test results should not be relied upon for regulatory control. The precision of test data is nowhere near good enough for making critical decisions.”

He added: ‘Many of us feel that more testing – done properly – would have contributed to fewer deaths. However, many of us know for certain that the inaccuracies in tests have confused the picture and the positive predicted value is so dismal that there is very little correlation between detected levels and cases of legionella.’

Webinar participants generally agreed that innovation in the field of testing and hazard control would still be an important part of protecting people from Legionnaires’ disease in the future and would be accommodated within the standard as a possible means for the responsible person to validate their hazard control. ‘New methods will fit into the management process as they emerge; this is better than setting prescriptive standards for testing that are possibly open to corruption,’ added McCoy.

Instead, 188P focuses on helping those responsible to establish a robust control system. It includes examples of process flow diagrams; hazard analysis procedures; verification and validation summaries; and a hazard analysis of critical control points (HACCP) plan document (see below).

‘Validation is critical because you must make sure that the hazard control measures do actually work and verification is the evidence that the plan is actually being implemented,’ said McCoy.

ASHRAE also believes there is no requirement for new laws to support the standard because existing US federal occupational health and safety laws cover the protection of employees and visitors to buildings. As well as the mammoth damages claimed, these laws also carry the threat of prison sentences. It is anticipated that litigators will use the new ASHRAE standard as a reference point for deciding whether the right processes were in place before an outbreak.

If 188P is adopted it could have an impact on how water systems are managed and maintained in over five million US buildings. ‘All healthcare buildings and all buildings with cooling towers will have to have this process put in place,’ said McCoy. ‘A very small number will not need a water management plan, but only a very small number and the person responsible will need to reassess this every year.’

Other contributors to the webinar said that many building managers would not have the necessary expertise to implement solutions or adopt a management standard like 188P and so would need to seek outside help. ASHRAE confirmed that it expects there to be ‘a scramble for expertise’ when the standard is adopted.

‘Over time the market will develop, but that is not a matter for the standard committee as there is no requirement for an outside expert as part of the team,’ said McCoy. ‘We decide what needs to be done and the market will deal with the supply and demand issues.’ **CJ**

ASHRAE standard Proposed new ‘188P’ will target legionellosis

Due for publication later this year, the proposed new 188P standard covering the prevention of legionellosis associated with building water systems, will be approved by the American National Standards Institute (ANSI) – which means local building authorities can adopt it directly into their state regulations.

Standard 188P outlines the process by which building operators should manage hazard levels. The relevant manager will be required to take ‘formal’ responsibility for controlling legionella in building water systems – including potable water, not just

cooling systems. There are similarities with the UK’s long-established Code of Practice L8, but there are also significant differences because L8 is heavily reliant on risk assessment.

‘That implies a quantitative approach, but legionella cannot be assessed that way – it needs to be assessed in terms of hazard,’ said McCoy. ‘L8 spends a lot of time trying to document things that can’t be documented. Our standard is about quantitative assessment of hazard and hazard control, not risk.’

The standard sets out how they should establish a team with assigned

responsibilities and how that team should operate a system of hazard analysis of critical control points (HACCP).

‘The standard says what to do, but it does not say how to do it,’ explained McCoy. ‘We don’t think it should be prescriptive because the site-specific measures are the most critical factors and it is, therefore, very hard to standardise a recommendation for control.’

‘If you try to be prescriptive you create more problems than you solve,’ he added and pointed to the numerous guidance documents

already available with specific recommendations for technical aspects of water treatment, including chlorine concentrations and temperature control.

However, McCoy outlined the importance of the building team establishing their own control limits for legionella in their water systems and then confirming and validating those limits.

Every known hazard must be identified and the frequency and methods of monitoring established along with the corrective actions that should be taken if limits are exceeded, he said.

ASHRAE is, in effect,

adopting a method that was developed by the US Army (and later adapted by NASA and the food safety industry) and applying it to a building-related issue that is spiralling out of control.

About 120,000 people are thought to have died in the US since the cause of the disease was established more than 30 years ago.

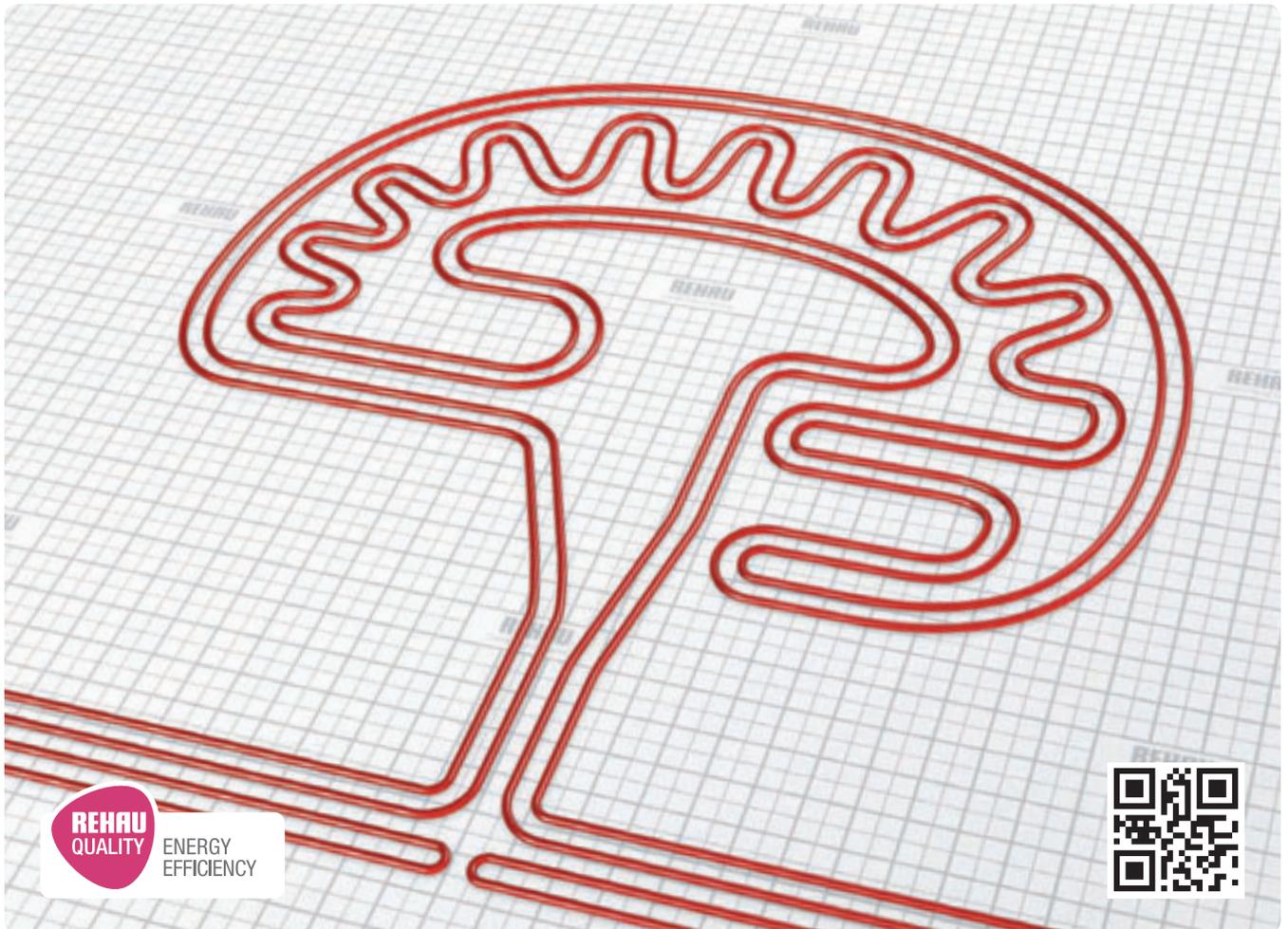
‘This is an astonishing number of deaths for a wholly avoidable disease,’ said McCoy.

He added that there had been a 217% increase in annually reported cases from 2000-09, and each case costs the US taxpayer \$34,000 to treat.

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HEALTHY INNOVATION

A new procurement system could be the prescription for better illumination on NHS wards. **Jill Entwistle** reports

The average hospital is felt by some users to be one of the environments least conducive for healing – especially when it comes to lighting. Wards often lack natural light, despite the fact that everyone from the Romans through to Florence Nightingale and Le Corbusier has recognised its importance in well-being.

Hospital artificial lighting is often reliant on over-bright fluorescent downlighting, not only using more energy than necessary but also not altogether helpful when most of the building's occupants are recumbent

on their backs. Night lighting can also be hit and miss. In her research paper submitted for the SLL Young Lighter of the Year award, Jemima Unwin described nurses using laptop screens as light sources to make notes by, and holding torches in their mouths in order to accomplish two-handed tasks such as administering injections.

So the fact that a top priority for Rotherham NHS Foundation Trust was 'a step change in the patient experience' when it planned a major refurbishment is, to say the least, heartening. What is also



The lighting solution applied came at the same price as a more traditional approach, according to experts

“A biodynamic setting allows the patient to be awakened more naturally with a gradual rise in light level

encouraging is that the new procurement method it has been trialling could prove a much better way of achieving that goal. While budget is always a driver, the aim of Forward Commitment Procurement is to allow the process of innovation more breathing space, rather than immediately dragging everything down to the bottom line (see box below).

An initiative from the Department for Business Innovation and Skills, the step-by-step approach, is designed to encourage suppliers to help manage the risk that thinking outside the box might involve in terms of time and money. Rather than telling suppliers what to do, the process is about communicating the desired outcome and allowing companies to arrive at the solution.

So how did the process translate in terms of Rotherham, a 500-bed acute hospital, looking for a low-carbon rethink of the ward environment? It began in 2008 with what was effectively a workshop that allowed Rotherham to set out what its goals

were, and for suppliers to respond with possible concepts. For many suppliers – there were initially 30 – it didn't get much beyond this because they didn't grasp the aim of the exercise and simply reworked existing ideas. The idea of souping up a traditional bedhead system with the installation of LED lighting was missing the point.

However, Andrew Bissell, director of consultancy Cundall Light4, realised that a piecemeal approach wouldn't work and that a rethink of the ward environment was needed. He also saw that this required skills and specialities beyond lighting.

‘I took the view that ultra-efficient lighting means getting the daylight in, getting the interior design right, and getting the right source in the right place for the right solution. I took a holistic view and started pulling a team of people together. We were the only ones who turned up with a team and said; ‘We are going to redesign the space because that way we can improve patient experience

A rethink of the ward environment was at the centre of plans to renovate the hospital



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Cundall and architect Austin Smith Lord formed a partnership called Integrated Medical Interiors (IMI), which became a consortium that now comprises Osram, Fagerhult, Intechno/Jung, Wandsworth, Leisure Technique (off-site construction) and Ecophon (acoustic specialist).

The winning concept they came up with was the IMI Pod, a prefabricated modular unit which offers storage as well as lighting

and can be configured in a variety of ways, ranging from single to six-bed options. The integral lighting addresses the full range of needs of both patients and medical staff: reading light, medical examination light, resting and ambient scenes, as well as a biodynamic setting which allows the patient to be awakened more naturally, with both a gradual rise in light level and colour temperature changes according to the time of day.



Rotherham hospital Anatomy of the lighting changes

Indirect biodynamic light/bedhead unit (Fagerhult): 2 x 54W T5 fitting with prismatic louvre lighting the back leaning wall and ceiling. Colour temperature (lamps are 2700K/6500K) shifts according to time of day.

Examination light (Fagerhult): Two 1 X 49W T5 (3000K) asymmetric fittings located on either side of the bed, at the edges of the recessed part of the pod, and angled towards

the bed centre. The white-painted micro-lamella louvre camouflages the fitting when not switched on. Measuring 1797mm long, the fitting has a light opening of 1500mm, with the remaining 243mm covered with a plate housing an LED reading light. Shielded to prevent glare, the 700lm fitting has a fixed angle to optimise illumination for reading.

Night light (Fagerhult): Two LED cove lights (350lm)

recessed into the MDF board and positioned 500mm above the floor on each side of the bed. Colour temperature will be warm and fittings are dimmed to a suitable level.

Visitor light (Fagerhult/Osram): Two LED narrow-beam (12 degrees) fittings (700lm) are located either side of the bed above the patient table, recessed into a cone for design and glare protection. All fittings are Dali-controlled.

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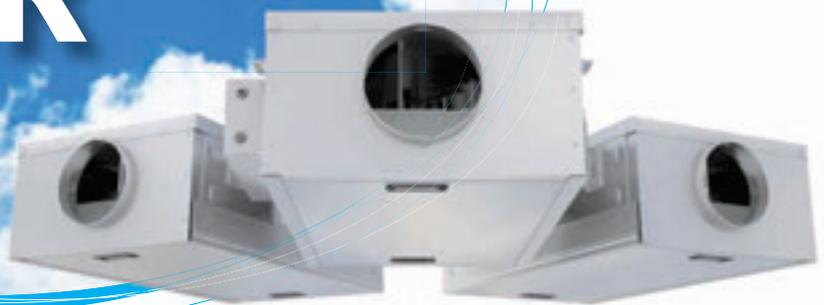
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Cordell Light4

For the hospital's refit, the project team devised the IMI Pod, a prefabricated modular unit which offers storage as well as lighting and can be configured in a variety of ways ranging from single to six-bed options

As with all the settings, this can be overridden by the nurse should the patient need to be left to sleep. Control is via two handsets, which account for the visual acuity and ability of the patient, and feature easily understood pictures – chair for visitor scene, book for reading.

The pod is also future-proof. The control system can potentially be linked to handheld devices using android or Apple systems and, while the sources are currently half LED and half fluorescent, that balance will shift to favour LEDs as they improve.

By year three, it should be 100% LEDs, and by year seven it should be half LEDs and half OLEDs. It already cuts energy use by 30%, according to IMI. 'Technically we have to show continuous improvement in energy efficiency and maintenance,' says Bissell.

IMI has been named as a group one supplier for any future ward refurbishments, which will involve 26 wards over a seven-year period. The installation of a working four-bed bay by the end of this year will allow for patient feedback – two mock-ups have already provided staff reactions. The full refurbishment is scheduled to start in April/May 2012.

'Huge amounts of interest' have also been shown by other UK and international hospitals, says Bissell.

The real clincher for the concept is that it comes in at the same price as a traditional

solution. 'If you just looked at this as lighting, then we would be more costly,' says Bissell. 'But we haven't put everything into one light fitting, we've put it into a ward design. We've gone beyond the scope of the lighting.'

'What we said was, what if we design the patient environment as a complete solution and include the storage, and look at changing the angle of the beds – to give the

patient a view or prevent them staring up the gown of the patient opposite, for

Nurses were using laptop screens as light sources to make notes

instance – and we do this offsite? Then as an offsite single product it's the same cost as screwing everything to the wall, which is what you get now.

'It is a huge leap of faith and it's involved a huge amount of trust, but everyone believes this needs to happen and it's the right thing to do,' concludes Bissell.

'The point is this process gives you a blank piece of paper and leads to better quality lighting than we currently have.' **CJ**



ADVANTAGES OF THE IMI POD

- Same investment as traditional build
- One-week reduced construction period per four-bed bay
- Energy consumption savings of 30% – existing lighting load: 4.2 kWh per day; 1515.5 kWh per year. Proposed lighting load: 2.7 kWh per day; 996.5 kWh per year
- Maintenance savings of 85%
- Future-ready modular design

Source: IMI



Forward Commitment Procurement (FCP)

Give the supply chain time to innovate:

- Think ahead, signal long and medium-term direction of travel to the market
- Communicate forthcoming needs and procurements in advance of formal procurement

Allow room for innovation:

- Communicate needs in outcome terms – throw away the catalogue and state what

you want, not what you think is available or affordable

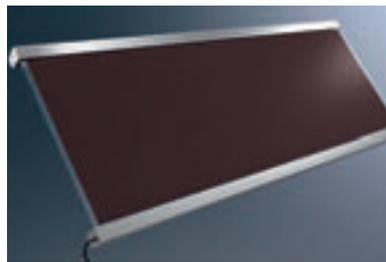
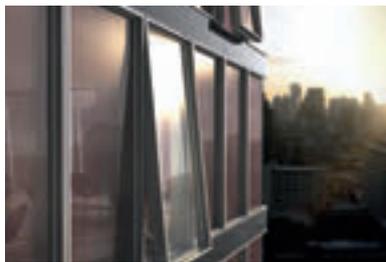
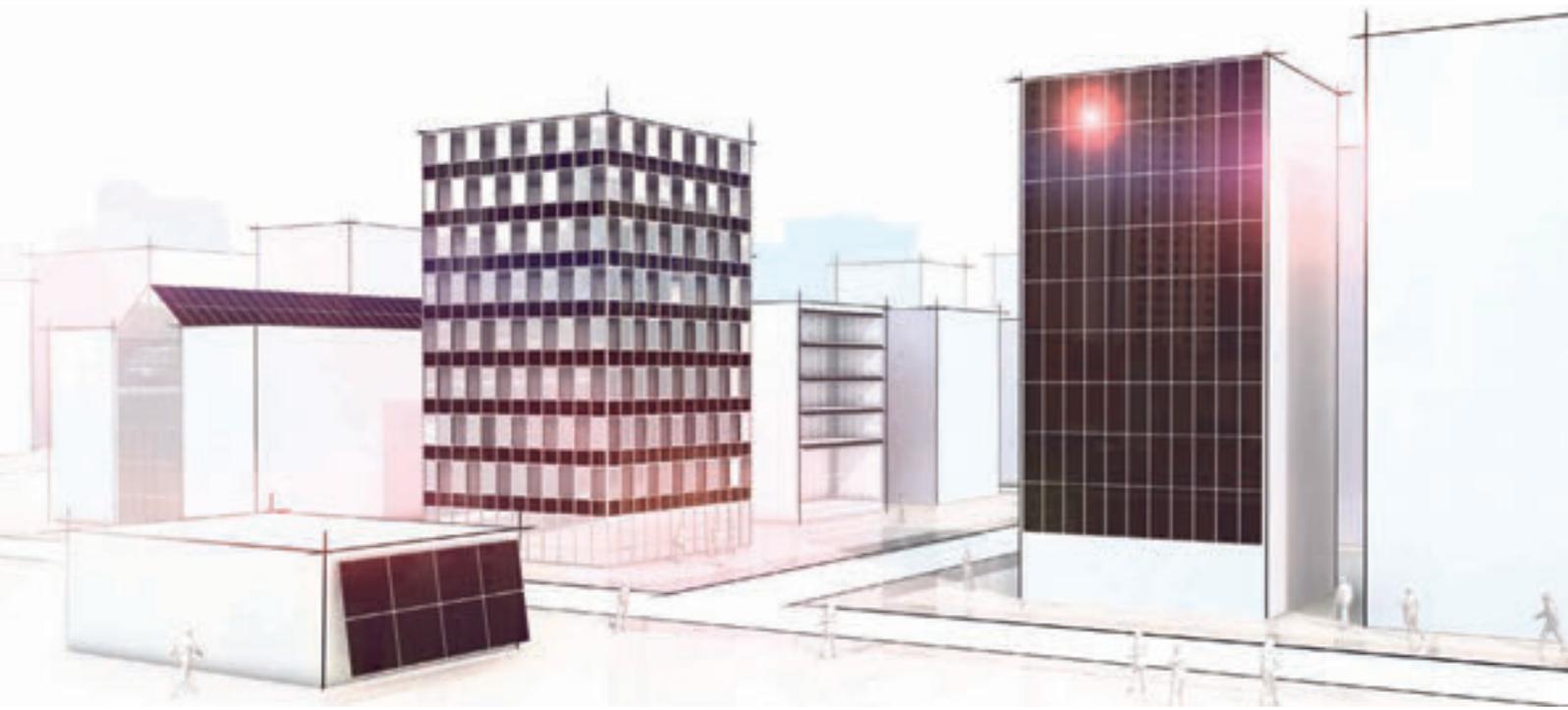
- Look for progressive improvements and future proofing

Invite feedback from the supply chain:

- Market consultation allows requirements to be tested and problems ironed out in advance of procurement

Source: BIS

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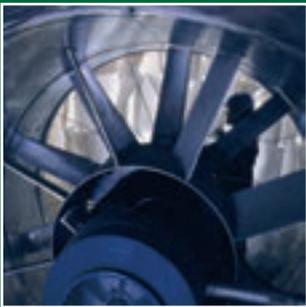


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The performance of fans in ducted air systems

This module considers how the efficiency of fans in ducted air systems can be compromised by the 'system effect'

When a ducted air system is designed, the air flow rate and pressure drop is calculated and a fan is selected to match the system requirements. The calculated design fan power must not exceed the requirements of the local regulations; however, this calculated power may not reflect the actual power consumed when the fan is installed.

(This module is part of a series of *CIBSE Journal* CPD articles (August, October, November and December 2011) that are all available from cibsejournal.com/cpd. Please note that in the series we have variously used both 'Q' and 'q_v' to denote air volume flowrate – preferably, 'q_v' should be used.)

Regulation and standardisation of fan power for buildings

The Building Regulations¹ in the UK limit the installed power that may be consumed by fans in ventilation systems. In an attempt to capture the associated parasitic power consumption, the limits are given in terms of specific fan power (SFP). The SFP of an air distribution system is the sum of the design watts of the system supply and extract fans, including losses through switchgear and controls (such as inverters), divided by the design air flow rate through that system, and has the unit of W/(litre · s⁻¹).

Table 1 provides an extract relating to the requirements for centralised fan systems from the regulations for non-domestic

Ventilation system type	Specific fan power W/(litre·s ⁻¹)	
	New buildings	Existing buildings
Central mechanical ventilation system including heating and cooling	1.8	2.2
Central mechanical ventilation system including heating only	1.6	1.6
All other central mechanical ventilation systems	1.4	1.8

Additional allowances are added for heat recovery and other specialist components

Table 1: Maximum specific fan powers in air distribution systems in buildings to comply with England and Wales Building Regulations 2010

applications (the full document also includes values for distributed fan-powered systems).

These required values are far lower than those traditionally found in buildings² and so cannot simply be considered 'business as normal'. Meeting the requirement in the Building Regulations is dependent on both the design of the distribution network and the choice of the fan (and its associated motor and controls). The underlying British Standard, BS EN13779:2007 *Ventilation for non-residential buildings – Performance requirements for ventilation and room-conditioning systems*, provides extensive and accessible information on the determination of SFP. The design of the ducting, dampers, diffusers and so on is, of course, the primary route to reducing excessive energy use (as discussed in the October 2011 CPD in *CIBSE Journal*). However, without applying the most effective fan technology, those efforts to reduce air power used in the system will be somewhat wasted. In terms of whole life cost (and total life carbon emissions), there is

a limit to how low the SFP can go before the capital cost of the equipment outweighs the operational savings in lower pressure drops – this is discussed at length in *CIBSE TM30 Improve life cycle performance of mechanical ventilation systems*.

The first phase of the EU ecodesign requirements for fans³ (the ErP directive), which will be implemented in January 2013 (with more stringent requirements following in 2015), provides a standardised methodology to determine a fan's expected performance relative to benchmarks, and specifies limiting minimum fan efficiencies based on the type of fan. This includes the fan sizes that would be typical in HVAC applications (with an electric input power between 125 W and 500 kW). The development of these requirements has also encouraged the creation of ISO 12759:2010 – *Efficiency Classification for Fans*, which categorises the performance of fans into banded efficiency ratings (Fan Efficiency Grade), with the aim of providing

more transparency and improved coherence across manufacturers. The end goal is to help prevent fans being sold on the basis of having potentially low capital cost but subsequently consuming excessive amounts of power owing to low practical operating efficiencies.

Across an operating range of 50% to 100% of full load, properly selected motors that drive the fans have a reasonably flat efficiency curve. However, the same cannot be said of most fans that may typically have an efficiency curve similar to that shown in Figure 1.

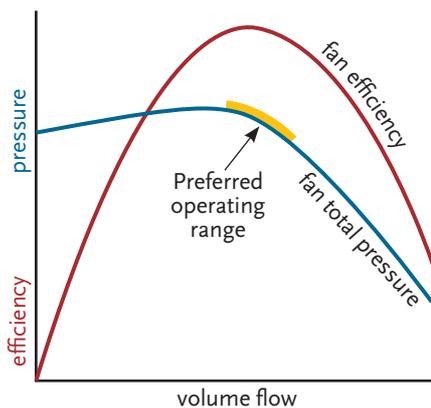


Figure 1: Fan efficiency varies significantly with operating point

This will mean that if the characteristics that determine the resistance to air flow in the system alter (through dirt, blockages or control mechanisms), the operating point may well shift from the preferred operating range and the fan operating efficiency may be significantly reduced. Such a reduction in fan efficiency is likely to reduce, or even negate, any savings that might be expected when using dampers to reduce flowrate.

The 'air power', P_u , is given by the product of volume flowrate and system pressure loss, $q_v \times p_f$. However, the electrical power input, P_e , can be far removed from this, and is expressed in BS EN ISO 5801:2008⁴ as

$$P_e = \frac{q_v \cdot P_f}{\eta_r \cdot \eta_b \cdot \eta_T \cdot \eta_m \cdot \eta_c} \text{ where}$$

- P_e is electrical input power in watts;
- q_v is flow rate, in cubic metres per second;
- p_f is fan pressure in pascals;
- η_r is fan impeller efficiency;
- η_b is fan bearing efficiency;
- η_T is transmission efficiency;
- η_m is motor efficiency; and
- η_c is control efficiency.

So, there are clearly many contributing factors requiring consideration in the assessment and selection of the whole fan assembly that will influence the power consumption of the fan. Practically, however,

this detailed assessment may be thrown to the wind by not taking sufficient care of the fan's relationship with the local ductwork system, the so-called 'system effect'.

The installation of the fan in the system

Fan curves are produced by the manufacturer by testing a fan in standardised conditions as prescribed by the relevant standard (such as BS EN ISO 5801). The test rig ensures that the air entering the fan has an even (as opposed to turbulent) flow pattern, otherwise the fan will not produce a repeatable performance (leading to reduced flowrate and pressure), and it will create increased noise and vibration.

Internationally there are four standard test configurations, as shown in Figure 2, that attempt to represent the range of basic fan applications. Category D is the one most likely to be closest to the representation of fans in many ventilation and air conditioning systems. Centrifugal fans in air handling units or plenums are likely to be represented by manufacturers as category B, and roof exhaust fans by category A.

Where a duct forms part of the test rig, circular ducts are used with standard transformations converting the rectangular outlet from a centrifugal fan smoothly, and with little energy loss, to a circular duct.

The test duct would normally include a 'straightener' (particularly important for axial flow fans) downstream of the fan outlet (such as the low loss honeycomb straightener shown in Figure 3) that will stop the swirl in the air so that measurements of pressure and velocity may be reliably taken. In a real application, the lack of such a device may mean that the air continues to swirl for many duct diameters' length and, potentially, adversely affect the reliability of flow measuring points and alter the expected pressure loss through the duct, duct fittings and components.

In all the test categories where there is a length of duct shown (see Figure 2), it is sufficiently long so that it simulates a long, straight duct in real life. However, in real life it is very unlikely that there will be a long, straight unobstructed duct at either the inlet or outlet. The manufacturer's quoted performance is contingent on the application being similar to the method of test. However, it can be difficult for the designer to calculate the effective 'derating' of the fan due to the so-called 'system effect' of the variations from the idealised test. In many cases the system effect will only truly come to light as the system is commissioned.

Category A – Open inlet and outlet (ie, no ducting)



Category B – Open inlet and ducted outlet



Category C – Ducted inlet and open outlet



Category D – Ducted inlet and ducted outlet



Figure 2: Standard fan testing configurations (Source: FMA Guidance Note 1⁵)

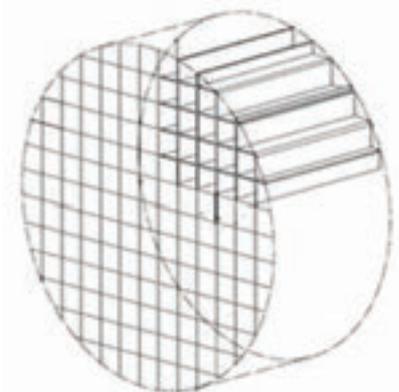


Figure 3: AMCA flow straightener (Source: BS EN 5801)

The fan system effect

The number of specific possibilities for the installation of fans in ductwork systems is infinite, and so the variations that may lead to the poor performance of fans are equally numerous. The degradation in performance can be principally attributed to uneven or spinning air at the inlet to the fan and obstructions or inappropriate connections at the fan inlet or outlet. Of course, this sounds simple (or even flippant) and easy to overcome through proper design and installation. However, the practicalities of site installations and time constraints inevitably mean that there are often sacrifices made when the fans are installed.

There are many publications and websites that provide details of poor fans and how their installation might be improved (for example, <http://goo.gl/uwqUy>). There is some guidance, such as the Air Movement and Control Association's (AMCA) Publication 201, that provides numerical

factors in an attempt to quantify the system effect that could be taken as increasing the system resistance to take account of typical fan system effect. The impact will be dependent on the specifics of the application.

When the Fan Manufacturers' Association (FMA) published the *Fan and Ductwork Installation Guide* in 1993, it compared some of the AMCA 201 values with work undertaken at the UK government's National Engineering Laboratory (NEL) (as foretold by A.N. Bolton⁶ in 1990 in one of the rare UK publications that considers this area). As an example, considering inlet bends (some similar to those shown in Figure 4a), the NEL experiments determined values of 'pressure loss' for tube axial, vane axial and backward curved centrifugal fans and compared them with AMCA's data.

There was reasonable agreement with the tube axial fans, but the losses for the vane axial and backward curved centrifugal were significantly different. That is not to say that either was 'right' or 'wrong', but the important message is that the determination of fan system effect is highly dependent on the particular situation – that is, the details of the duct and fitting fabrication, the manufacture of the fan, and the dynamics of the air.

CIBSE TM42 – *Fan Application Guide* (created in conjunction with the FMA) has collected together examples of fan installations, and just one of the many examples is shown in Figure 4. The fan in Figure 4 (a) has a ducted input (and probably a ducted output), so is likely to be referred to as a category D application. However, it is clear that the inlet is being compromised by the bend immediately before the fan inlet, with turbulent flow – indicated by the red areas – affecting the pattern of air entering the fan. Ideally, there would be a straight length of duct at the entry to the fan (AMCA 201 recommends that bends near the fan's inlet be located at least three duct diameters upstream of the fan, and notes that they can affect the fan up to five diameters upstream).

Inevitably, there will often be a need for a bend and, if that is the case, the arrangement in Figure 4 (b) would be preferable – a small change producing a significant benefit in fan performance that is likely to halve the effective loss in available fan output. (Downstream of the fan, AMCA's data for building services applications suggests a straight duct of at

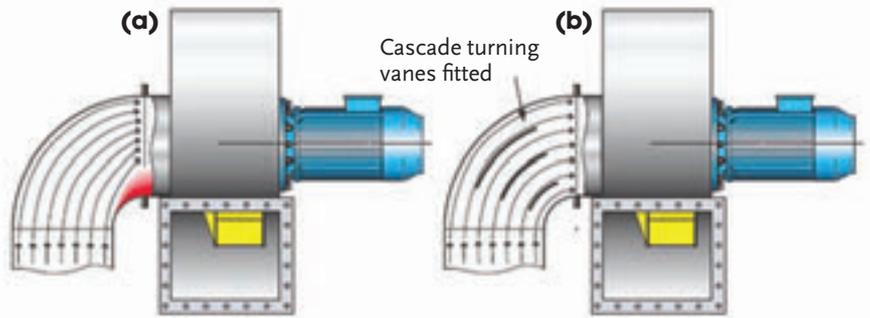


Figure 4: Examples of reducing system effect (Source: CIBSE TM42, 2006)

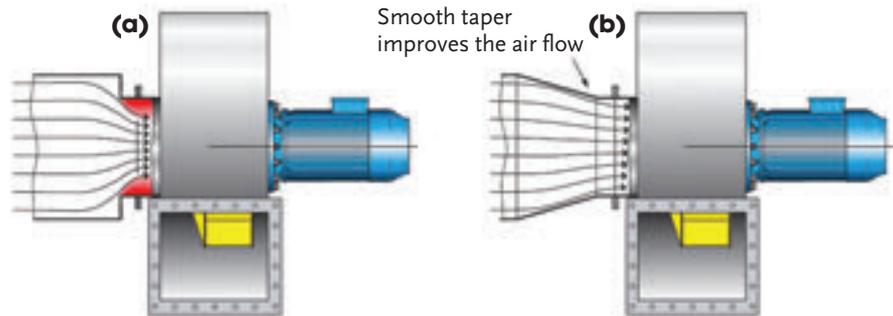
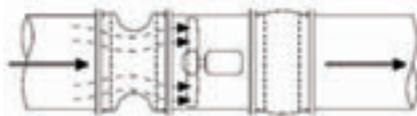


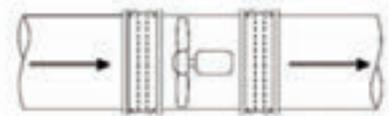
Figure 5: Improving a straight entry to a centrifugal fan (Source: CIBSE TM42, 2006)

Flexible connections



WRONG

Flexible connectors should not be slack, as this will cause 'necking', which will starve the impeller blade tips of air, reduce fan performance and increase noise (starves the blades).



RECOMMENDED

Flexible connectors should be just long enough for mechanical isolation and should be taut.

Figure 6: Example of guidance from manufacturer⁷

least 2.5 duct diameters from centrifugal fans prior to a bend, and half this distance for vane axials.)

Even straight entries, such as that in Figure 5 (a), can be significantly improved by adding a 15° taper, as in Figure 5 (b). Fan manufacturers supply some excellent guidance based on the experience of applications, such as that in Figure 6, and will be able to provide specific data that relates to their fan geometry.

If the system effect cannot be avoided, AMCA 201 (or similar) provides a means of estimating its impact on the performance. And later this year, a new ISO standard on Fan System Effects is scheduled for publication (being developed as ISO/NP TR 16219). But, pragmatically, the best solution is to understand the possible consequences of swirl, bends and obstructions on fan performance, and to use good practice to design them out and ensure that they are installed with proper consideration of the system effect.

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Further reading:

The Carbon Trust has freely downloadable guides that give useful guidance in this area – *Energy savings in fans and fan systems* (GPG383) and *Energy-efficient mechanical ventilation systems* (GPG257) – see www.carbontrust.co.uk The CIBSE Knowledge Portal provides instant access to CIBSE TM42 and CIBSE TM30 – see www.cibseknowledgeportal.co.uk

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Module 37

February 2012



1. What is the maximum specific fan power (SFP) allowable to satisfy the England and Wales Building Regulations for a central mechanical ventilation system with both heating and cooling?

- A 1.4 W/(litre·s⁻¹)
- B 1.6 W/(litre·s⁻¹)
- C 1.8 W/(litre·s⁻¹)
- D 2.0 W/(litre·s⁻¹)
- E 2.2 W/(litre·s⁻¹)

2. Which of these is unlikely to be included in the calculation of fan power, according to BS EN ISO 5801:2008?

- A Fan bearing efficiency
- B Fan impeller efficiency
- C Fan motor speed
- D Motor efficiency
- E Transmission efficiency

3. Which international test category is most likely to reflect a centrifugal fan in an AHU?

- A Category A
- B Category B
- C Category C
- D Category D
- E No category is suitable

4. According to this article, when the data for the NEL tests was compared with AMCA's data (in the early 1990s), which fan type had reasonable agreement?

- A BC centrifugal
- B FC centrifugal
- C Roof fans
- D Tube axial
- E Vane axial

5. Following a centrifugal fan with its outlet transformed into a 400mm diameter duct, what straight length of duct does AMCA suggest before any obstruction or change in direction to avoid a significant system effect in a general building services application?

- A 200mm
- B 400mm
- C 600mm
- D 800mm
- E 1,000mm

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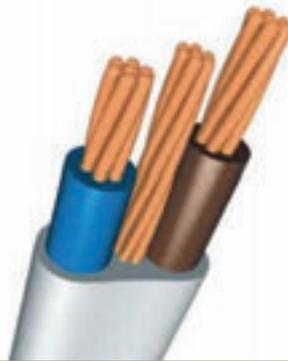
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Celebrating two decades of CableCalc Level P with a free version of new twin and earth calculations

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

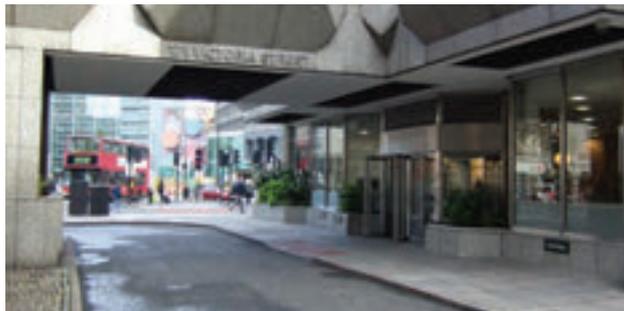
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Cooling system for John Lewis head office

Weatherite Building Services has developed an excellent working relationship with the John Lewis Partnership over a number of years – so it was no surprise when the retailer chose WBS to provide a new cooling system for its head office at 171 Victoria, London. The work is part of a long-term programme to refurbish the building's HVAC equipment, aimed at enhancing the working environment for the partners, while improving energy efficiency and reducing carbon emissions.

● For more information call 0121 665 2266 or email rboswell@weatheritegroup.com



New range of Climaveneta's NX compact liquid chillers launched

The NX range of scroll compressor liquid chillers, from Climaveneta UK, combines excellent energy efficiency with a compact design and a choice of models to suit a range of applications. These include shell and tube or plate heat exchanger options, as well as low-noise or super-low-noise versions, and units with partial heat recovery. Cooling capacities range from 159kW to 352kW. All models feature built-in hydronic units and use microchannel aluminium condenser coils to minimise refrigerant volumes.

● For more information call 0871 663 0664 or visit www.climaventa.com



Potterton packaged boiler plant for residential resource centre

Potterton Commercial, part of Baxi Commercial Division, has supplied a modular, condensing packaged boiler plant to Bristol City Council for use in the Bush Residential Resource Centre, a residential short breaks centre for children with learning difficulties. Formerly sharing a heating system with a school on the same site and before this was demolished, it was necessary to install a dedicated space heating system for the centre, which was carried out over the summer break last year.

● For more information call 0845 070 1055 or visit www.pottertoncommercial.co.uk

Morocco in the heart of London



HygroMatik's C22 and C10 Comfort Plus DS CompactLine Steam Bath Generators

have been fitted within The Spa, a Moroccan spa in London. The Spa aspires to capture the very essence of Morocco by offering authentic Moroccan cleansing and purifying treatments. The C22 CompactLine steam generator was installed in the hammam. The humidifier increases the temperature from approximately 25°C to 45°C. HygroMatik's C10 CPDS provides the steam for the two-seated Rhassoul. The treatment consists of a purifying and detoxifying ritual using lava clay.

● For more information call 02380 443127 or visit www.hygomatik.co.uk



Rucking with the best: MHS Boilers at new centre of excellence

MHS Boilers has supplied three 120kW Thision L boilers and 10 m sq of its Solatron S2.5 flat panel solar collectors to the recently opened Parc Eirias Events Centre in Colwyn Bay, North Wales. The Thision L boilers were installed in a wall-mounted cascade frame with a low loss header. The centre provides a venue for community, cultural and sporting events. The £6.5m project now comprises a large multi-purpose indoor centre for recreational use, as well as a conference centre.

● For more information visit www.mhsboilers.com

End of life is a serious matter for air conditioning

Mitsubishi Electric has released details of its new recycling programme for its range of air conditioning and photovoltaic modules to ensure that the maximum amount of raw materials can be recovered and returned back to the supply chain. The company has developed a comprehensive 'end of life' recycling programme with Overton Recycling of Stourbridge, with a free-of-charge collection of air conditioning equipment to Mitsubishi Electric customers, subject to conditions.

● For more information visit www.recycling.mitsubishielectric.co.uk



Topvex Series from Systemair

Topvex is a series of efficient heat recovery units designed for commercial buildings or similar premises. The units are designed to meet energy requirements and have EC (electronically commutated) fans fitted as standard for low SFPs (specific fan power). To simplify the installation and commissioning, the units are included with 'plug and play' controls. The range covers ceiling void units and top or side connection units, with the choice of either cross-flow plate or rotary thermal wheel heat exchangers.

● For more information email info@systemair.co.uk

Dynamic insulation 'spot on' for green deal, thanks to teamwork

Nuaire, a market leader in the design and manufacture of commercial and domestic energy-efficient ventilation systems, and Energyflo, experts in dynamic insulation technology for both new-build and retrofit projects, have teamed up to complete an innovative carbon reduction retrofit project for Willmott Dixon and South Cambridgeshire District Council. Willmott Dixon, main contractor for the project, was looking to explore different retrofit technologies in a bid to improve energy efficiency and reduce carbon emissions.

● For more information call 08705 121400 or email info@nuairegroup.com



Water supply pipe sizing and drainage design software

This software has five applications in one product, covering popular topics: Pipe sizing water supply systems (with integrated LU conversion, head loss relative to pipe material selection, and 'industry standard' tabulation), assessment of 'tail end' water demand (based on probability), sanitary design flow (including mixed occupancy assessment), eaves gutter sizing, and storage capacities for rainwater harvesting. Priced at £95 + VAT, supplied as a binder enclosing CD and user guide, the product will appeal to mechanical design professionals, PH Engineers, and trainees.

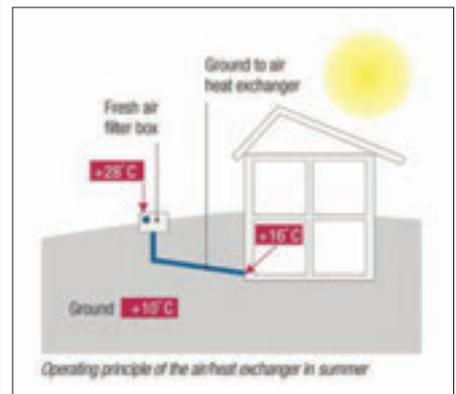
● For more information visit www.phoffice.co.uk/design-software.php



RHI-compliant meters and advice now available from MWA

With £860m made available by the UK government to support its Renewable Heat Incentive (RHI), non-domestic renewable heat generators and producers of biomethane are required to measure their output. In order to claim rebates they require RHI-compliant meters that are accurate and approved. MWA Technology, the UK's leading meter stockist, has made available a broad range of leading branded heat meters for measuring renewable heat from ground, air, methane/biogas and wood. These brands include Itron, Kamstrup, Grundfoss and others.

● For more information call 0121 327 7771 or visit www.mwatechnology.com



Natural ventilation partnership brings unique offering

A unique natural ventilation combination from Passivent and REHAU can provide a low energy cooling solution for the commercial market. The Passivent/REHAU solution combines the former's passive stack natural ventilation with the latter's AWADUKT Thermo ground-air heat exchanger, and is particularly appropriate for buildings with deep floor plans and/or restricted external facades. Passivent's natural ventilation uses inlets on exterior walls and/or windows to draw fresh air into the building, exhausting the 'used' internal air through high level façade ventilators and/or roof mounted terminals.

● For more information call 0161 905 5700 or email projects@passivent.com



Rinnai water heaters excel in light commercial heaters

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

● For more information visit www.rinnaiuk.com

Keraflo launches next generation water tank technology

Keraflo, renowned for high-quality float valves, has launched the latest technology in monitoring and tank control: Tanktronic. Tanktronic provides system designers, installers and building services professionals with an integrated solution for water storage tank monitoring and management. It can be used to gain accurate readings of water levels, tank volume and temperature, and also be used to manage and control tank filling. Keraflo has built on more than 25 years' of expertise as a specialist mechanical valve manufacturer for water storage tanks.

● For more information visit www.keraflo.co.uk



LG leads the pack in technical service, sales and warranty

As part of a major re-branding of its UK air conditioning business, LG is now offering one of the industry's most comprehensive technical service and support packages on the market. It has also extended its product warranty to five years. These radical changes will give LG's installer partners a competitive edge in today's marketplace. LG UK Air Conditioning and Energy Solutions Division is launching three groundbreaking new products – Multi V III, Multi V Water and Multi V Space.

● For more information visit eu.lgeaircon.com



The highest standard for Enniskillen's new acute hospital

Prysmian's FP Plus cables, with enhanced Insudite insulation, were used exclusively for the fire system installed in the New Acute Hospital for the Southwest in County Fermanagh, Northern Ireland. The hospital is scheduled to be completed in June 2012 and will provide 312 patient beds overlooking the picturesque Wolf Lough greenfield site. The £276m project is a major investment in Northern Ireland, improving the level of health care services for the Western Health and Social Care Trust and its near 300,000 population.

● For more information call 023 8029 5029 or email cables.marketing.uk@prysmian.com

Panasonic heating and cooling systems set for growth

Panasonic Home Appliances Air conditioning Europe (PHAAE) has announced that it plans to grow its heating and cooling systems business in Europe in the next financial year. In order to do this, PHAAE has pledged to expand its product offering, further invest in research and development (R&D) and expand its distribution channel by recruiting new distributors. As part of PHAAE's continued commitment to the heating and cooling market it has invested in an R&D facility in Langen, Germany.

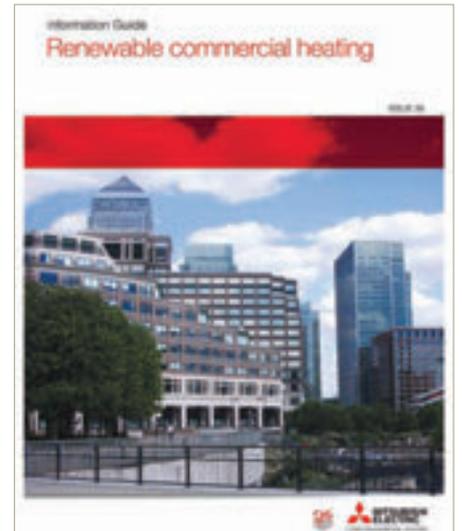
● For more information call 01344 853390 or visit www.panasonic.eu



Advanced boiler control with the Paramount three

The new Paramount three wall-hung, high efficiency condensing boiler from Potterton Commercial offers the most flexible boiler control technology available in the UK market, while incorporating all the physical attributes of its predecessor, the Paramount two, in terms of size, appearance, outputs and condensing high efficiencies. The Paramount three's advanced control system means that it can control three heating zones and one domestic hot water cylinder. This ensures compliance with Part L2 stipulation, which requires heating installations to be zoned and accurately controlled.

● For more information call 0845 070 1055 or visit www.pottertoncommercial.co.uk



Free CPD guide focuses on renewable commercial heating

Mitsubishi Electric has published a free, independent, CPD-accredited guide looking at renewable heating systems to inform consultants, contractors and heating engineers about the key issues facing all those involved in designing, building and maintaining our commercial buildings. The guide, which is also available as a download, has been developed by the company to enhance its customers' knowledge in this important area. According to the Carbon Trust, heating and hot water can account for up to 60% of a building's financial energy costs.

● For more information visit www.commercialheating.mitsubishielectric.co.uk or email commercialheating@meuk.mee.com

Victaulic helps train tomorrow's building engineering services installers

Construction, built environment and plumbing students at Barking and Dagenham College are learning about grooved-end pipe-joining techniques and improving their job prospects. A leading manufacturer, Victaulic, supplied a hydraulic grooving machine and all the pipe and fittings needed to run a short course, and support college staff. Around 150 students will follow the programme, and some have already been taken on by major contractors. Instructor Jim Alder said: 'With Victaulic's input we've put on something that's cost-effective for the college and useful for students.'

● For more information visit www.victaulic.com



New HWAM stove range from Euroheat

Wood biomass solutions provider, Euroheat, has introduced a selection of stoves to its HWAM range. The 3100s are modern in design and extremely energy efficient, providing an attractive centrepiece to a room, which can also contribute to reducing gas bills. Elliptical, with a side-hinged door and outer glass frame, HWAM's new stoves are available in two sizes: the 3110, which can be hung on the wall or installed on the floor; and the 3120, which is slightly taller and freestanding.

● For more information visit www.euroheat.co.uk

Wilco-Stratos GIGA – helping specifiers meet tomorrow's environmental targets today

Wilco has launched the Wilco-Stratos GIGA here in the UK. It's another highly efficient pump product – the first high-efficiency glanded pump – and it's targeted specifically at the building services and industry sectors. The Wilco-Stratos GIGA offers building designers, specifiers and architects the chance to easily optimise the energy costs and environmental balance of a building or industrial complex. With its hydraulic output and specification, the new Wilco-Stratos GIGA is ideal for commercial, industrial and residential buildings.

● For more information visit www.wilco.co.uk



Remeha Quinta Eco Plus: a revolutionary commercial heating and hot water system from the pioneers of condensing boiler technology

New from Remeha Commercial is the 'super condensing' Quinta Eco Plus, a revolutionary commercial heating and hot water system that delivers outstanding energy efficiencies and significant carbon and financial savings in an affordable, replicable solution. The Quinta Eco Plus consists of the market-leading Remeha Quinta

Pro commercial condensing boiler and the Eco Plus, a Passive Flue Gas Heat Recovery

Device developed by Remeha and Zenex Technologies. The Eco Plus recovers waste

energy equivalent to around 15% of the gross input, passing it back into the heating system, to radiators, UFH or DHW. The Quinta Eco Plus achieves maximum condensing at all times, offering

a new level of attainable efficiency of 97% GVC at 82/71°C for buildings. The Quinta Eco Plus is pre-plumbed and configured within a rigid mobile frame for ease of installation. With its compact, modular design, it meets the individual requirements of existing and new buildings.

● For more information call 0118 978 3434 or visit www.remeha.co.uk



Dimplex heat pump gives green energy to old battery

On a spectacular headland overlooking the Isle of Wight's famous lighthouse, the Needles Old Battery has been at the forefront of technological development for nearly 150 years. So when it came to installing a new heating system to meet 21st century energy efficiency requirements, the National Trust, which owns the site, opted for an air source heat pump from Dimplex. The LI 16 TE air source unit provides heating and domestic hot water for the visitor tearoom and National Trust offices at the popular visitor attraction.

● For more information call 0845 601 5111 or visit www.dimplex.co.uk



Dimming of luminaires with ABB KNX universal dimmers

i-bus KNX universal dimmers from ABB were voted Product of the Year in the KNX UK Association annual awards. According to the model, they feature a phase control or phase-angle control that can be set to suit the lighting

load. Incandescent and fluorescent lamps can be dimmed using the universal dim actuators via a phase-angle control. LV halogen lamps with conventional transformers are also dimmed using phase control, while those with electronic transformers are dimmed using phase angle control.

● For more information call 0845 869 5908 or visit www.knx.org



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● For more information visit www.aircraftairhandling.com



Mitsubishi cuts the cost of replacing older R22 VRF air conditioning systems

Mitsubishi Heavy Industries (MHI) has developed 'R22 Renew' to cut the cost of replacing older R22 VRF air-conditioning systems to comply with refrigerant legislation. With R22 Renew it's possible to retain the existing R22 pipework, and often to re-use the existing indoor units, as part of a new R410a VRF system with a new FDCR outdoor unit from MHI. Legislation is already in place to phase out old ozone-depleting R22 refrigerant.

● For more information call 0207 421 6208 or visit www.mitsubishiircon.eu



Westfield Stratford City

Westfield Stratford City is a huge hub comprising 300 shops, 70 restaurants, a 17-screen cinema, three hotels and the UK's largest casino. It currently holds the title of the largest urban shopping centre in Europe and was built at a cost of £1.45bn. Grundfos Pumps worked closely with Imtech Meica to provide the final pump solution, which included pumps that will ensure the supply of the chilled water, as well as maintaining the low temperature hot water requirements.

● For more information call 01525 850000 or email uk-sales@grundfos.com

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See: Taking Control - CIBSE Journal Dec 2011

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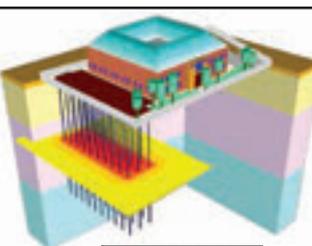
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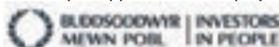
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Job Title: Head of Facilities Management
Location: Bournemouth
Salary: c£46,800

BH Live is a leisure and cultural trust established in 2010 to promote participation in leisure, culture and events across 6 sites in Bournemouth including the nationally recognised Bournemouth International Centre (BIC), the Grade II listed Pavilion Theatre and the award winning Littledown Centre. Our aim is now to build on our success and firmly establish BH Live as a leading organisation in the sector and secure a national reputation for excellence.

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If you have the experience of facility management of a significant building with strategic skills to prepare, monitor and implement major capital and revenue programmes as well as managing a multi skilled team/contractors, and ideally a member of the Chartered Institute of Building Services Engineers, please apply by sending your CV with a covering letter outlining how you meet the role requirements to recruitment@bhlive.co.uk. For an informal discussion please call Steve Piper, Head of Venues for BH Live on 01202 456506.

For further details please go to www.bhlive.co.uk
Closing date: 10 February 2012

Senior MEP Design Engineers
Saudi Arabia, Riyadh, 32k SAR (pcm)
+ Accommodation

Our Client, an international multi-disciplinary consultancy, requires a Senior Electrical Design Engineer to deal with design queries on site. The successful candidate will be working on a large exhibition center in the Riyadh's financial district, and as the client's representative, you will be liaising between the design and construction teams. This position requires a degree qualified engineer, and ideal applicants will have experience both in the UK and in the Middle East.
BAR731/PA

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Our client is a prominent property consultancy who currently has a requirement for Electrical Design Engineers, looking for ad-hoc work to supplement their current work load. The successful candidate will become part of an Electrical Survey team and will be required to conduct due diligence, acquisition, condition, and dilapidation surveys and reports. Proven good communication skills and the ability to work on your own/in a team environment alongside clients and other consultants are essential.
BAR673/CM

Electrical Building Services Engineer

North London, £30,000 - £35,000

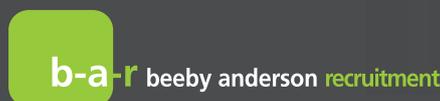
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BAR742/JA

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BAR740/JA

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Senior Mechanical Design Engineer | London | to £50K+ | ref: 2833
Our client has recently secured two major data centre projects. We are looking for a Mechanical design engineer, ideally with Chartered status. You will have significant experience with mission critical projects and have an excellent technical knowledge!

Senior M&E Design Engineers | Surrey | to £45K+ | ref: 3857
A major multi-disciplinary consultancy is looking for two, ideally Chartered, design engineers. You will lead a team on UK and international projects.

Intermediate & Snr Mech Design Eng | Cambridge/Oxford | to £40K+ | ref: 4797
We are looking for Mechanical design engineers for an award winning M&E consultancy. You will ideally be degree qualified and have progressed to IEng or CEng status.

Design Manager | Heathrow/Gatwick | £NEG! | ref: 2053
Our client is looking for an experienced design manager to lead a multi-disciplinary team. You will have a strong background within the construction industry and ideal candidates will have airport project experience. Experience working with project architects would be useful.

Executive Electrical Design Engineer | London | £NEG! | ref: 2052
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Intermediate Mechanical Engineer

- Minimum 4 years UK postgraduate experience of mechanical building services design, including site experience and ability to site survey
- Knowledge of Low/Zero Carbon Technologies, EPC, Part L
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CMC Corporate are advising the company and further information can be obtained from Simon Scott at CMC Corporate, 01491 829181 or 07850 894998, e-mail simon.scott@cmc-corporate.co.uk



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Events & Training

NATIONAL EVENTS AND CONFERENCES

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

Maintenance and sustainability
16 February, London
 A one-day conference looking at contractors, energy savings, case studies and Guide M.
www.cibsetraining.co.uk/conferences

The ACR Show 2012
13-15 March, Birmingham
 Free advice on the latest technical and legal developments in the field of air conditioning and refrigeration.
www.thearcshow.com

Collaborative Working: an introduction to BIM-enabled cooperation
27 March, Bristol
 What will this new BIM-driven world look like and who will be leading it?
www.architecture.com

All-Energy Show 2012
23-24 May, Aberdeen
 A free-to-attend event for all with a business/professional interest in renewable and sustainable energy.
www.all-energy.co.uk

AECB Annual Conference
29-30 June, London
 Details to be announced.
www.aecb.net/conference.php

SOCIETY OF LIGHT AND LIGHTING

SLL Masterclasses – One Building a Minute
22 February, York
 This series brings speakers from Philips, Thorn, Tridonic, Trilux and Wila together to discuss refurbishment.
www.sll.org/events

Lighting the Olympic Games
27 February, London
 A discussion-panelled event from the stakeholders of the Olympic Delivery Authority on the innovative lighting design over the life of the programme.
www.sll.org/events

CIBSE GROUPS AND REGIONS

Sealed systems
02 February, Norwich
 Details to be announced.
jonathan.page@mim.uk.com

Carbon Trust
06 February, Cardiff
 Details to be announced.
jno@neiloliver.plus.com

Society of Public Health Engineers
07 February, London
 Cold water pressure boosting – design considerations relating to water hammer and over sizing.
www.cibse.org/sophe

Daylighting for partially sighted people
08 February, London
 Speakers: Paul Littlefair, Anthony Slater and Geoff Cook.
graham.phillips220@ntlworld.com

South West Region annual dinner
10 February, Bristol
 To be held at the Thistle Hotel. Full details to be confirmed.
 Contact Richard Knight:
millham.orchard@fiscali.co.uk

Society of Public Health Engineers joint event with IHEEM
22 February, Edinburgh
 Water treatment in healthcare applications.
www.cibse.org/sophe

Home Counties North East
28 February, London
 Legal aspects of building services. Meetings close with informal discussions over cheese and wine. All technical meetings earn one- and-a-half hours of CPD points for attendees.
miller@prettys.co.uk

Home Counties North East
20 March, London
 Low Carbon Comfort – arrangement of boiler rooms.
James.bourne@atkinsglobal.com

CPD TRAINING

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Electricity at Work Regulations explained
07 February, London

Electrical distribution design
08 February, London

How to specify a ground source energy system
09 February, Manchester

2010 Part L Building Regulations
14 February, Birmingham

Understanding and application of psychrometric charts
14 February, London

Introduction to building services
15 February, London

Control of door release arrangements (half-day)
15 February, London

Unvented and other types of efficient hot water system
16 February, London

ISO50001: A new standard for energy management
21 February, London

Mechanical Services Explained (three days)
22-24 February, Bristol

Introduction to renewables
22 February, Leeds

Preparing FM and maintenance contracts
23 February, London

Display Energy Certificates training
27 February, London

Fire detection and alarm systems for dwellings BS 5839 Part 6:2004
28 February, London

CIBSE ASHRAE Technical Symposium: buildings systems and services for the 21st century

18 to 19 April 2012, Imperial College, London



Christian Richiers

Building services are becoming increasingly integrated systems as designers wrestle with challenging performance targets and ever more complex buildings. This symposium is intended to bring to the fore the latest practice and research and provide a glimpse of future developments from across the world. This second CIBSE Technical Symposium,

in conjunction with ASHRAE, will encourage the participation of both young and experienced researchers and industry practitioners to share experiences and develop networks. If your company is interested in sponsoring the 2012 Symposium, please email nhughes@cibse.org. For further information about the symposium itself, please visit www.cibse.org/events

Building (Scotland) Regulations Section 6 (Energy)
02 March, Aberdeen

Gas Safety Regulations: explaining and designing for compliance
06 March, London

Inspection and testing of electrical installations
07 March, London

Getting ready for Green Deal 2012
07 March, Coventry

Customer care: the key to profitability
08 March, London

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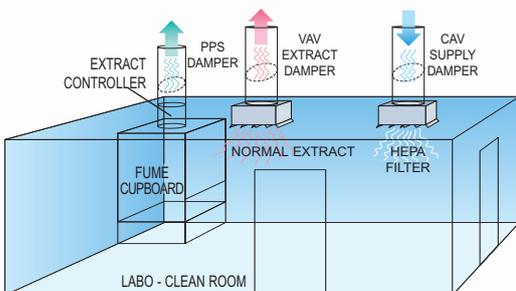


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