CIBSE JOURNAL

The official magazine of the Chartered Institution of Building Services Engineers

SPONSORED BY remeha commercial

October 2015
www.cibsejournal.com

IN THE ROUND

Max Fordham transforms Theatre Royal, Glasgow after a bravura performance

HOTEL AND LEISURE SPECIAL

Heat pump CPD with this issue

See page 21


Every member of the Remeha family shares the same simple design.
That's why they're so easy to use and install. They also share many common traits: proven quality, outstanding reliability and exceptional efficiency. So whichever model you choose, whether the output is 9kW or 1202kW, you're assured of maximum energy and carbon savings. Plus, you will have the back up of the best support team in the business. Find out more about the Remeha family at remeha.co.uk or call us on 0118 978 3434.
It's a wonderful world, let's keep it that way.
remeha
commercial

Take a bow

The Theatre Royal Glasgow is a perfect example of why the necessary job of updating services can be a brilliant opportunity to make vast improvements to occupants' overall experience of a building.

The brief was to upgrade access to the theatre stalls, which had changed little since Victorian times. A site next door was earmarked for a new foyer, which would include access to theatre levels. The designers realised this could be a striking new public space, if only they could relocate the plantroom. A solution was found when discussions with the fire engineer revealed an access stairwell that was no longer required, and could be used to house all HVAC, thus freeing up space in the foyer. The design may look fantastical, but it was still a case of form following function.

The typical coffee chain store could soon be ground into history, if Costa's new eco-pod concept takes off. Numerous ceiling grilles blasting cold air onto the faces of customers are a far cry from this new naturally ventilated coffee shop. Design-wise it's impressive but the partnership between tenant and landlord is what really inspires – early discussions between parties enabled the investment necessary for energy savings, to be accounted for in Costa's rent. At last a green deal that works.

Alex Smith, editor
asmith@cibsejournal.com

CONTENTS

Creature comforts

Planning a weekend away? Taking out gym membership?

When it comes to evaluating a leisure centre or hotel, the efficiency of the building infrastructure is rarely the first factor that springs to mind. Yet, who chooses to work out in a gym that is too hot, or swim in a pool that is too cold, or shower in just a dribble of lukewarm water?

Whether consciously or unconsciously, we allow the effective building services in these facilities to form one of our top requirements for a five-star rating. Poor ventilation, inadequate heating and cold showers dramatically undermine the all-important comfort factor for visitors and guests. So, while the boilers, hot water cylinders, ventilation and air conditioning might not seem the most exciting elements in the building design, they can literally transform the visitors' experience.

Profitability is a key driver for hoteliers and leisure centre operators. This supplement highlights how investing in best-quality products and building services can support greater profitability.

Today's high efficiency technology requires reduced energy for operation with lower running costs, while more effective building services can also promote positive customer ratings for increased future custom.

Advances in design further support profitability: in the heating sector, for example, reliable, flexible installation solutions accommodate every requirement, speeding up installation and minimising disruption.

Maximising client comfort and safety is a main objective of the hotel and leisure industry, and one that investment in high performance building services can help achieve. Perhaps TripAdvisor should add a building services category to its ratings summary after all.

James Porter, National sales manager
Remeha Commercial

CIBSE JOURNAL Supplement

www.cibsejournal.com

Editorial
Editor: Alex Smith
Tel: 01223 273520
Email: asmith@cibsejournal.com
Senior reporter: Liza Young
Tel: 01223 273529
Email: lyoung@cibsejournal.com
Designer: James Baldwin
Technical editor: Tim Dwyer

Advertisement sales
Sales manager: Jim Folley
Tel: 020 7324 2786, jim.folley@redactive.co.uk
Sales executive: Darren Hale
Tel: 020 7880 6206, darren.hale@redactive.co.uk
Sales executive: Patrick Lynn
Tel: 020 7880 7614, patrick.lynn@redactive.co.uk
Senior sales executive: Paul Wade
Tel: 020 7880 6212
paul.wade@redactive.co.uk
Advertising production: Jane Easterman
Tel: 020 7880 6248
jane.easterman@redactive.co.uk

For CIBSE
Journal production manager: Nicola Hurley
Tel: 020 8772 3697, nhurley@cibse.org

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

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

Printed by: Warners Midlands PLC

CIBSE, 222 Balham High Road, London SW12 9BS
Tel: +44 (0) 20 8675 5211. www.cibse.org
©CIBSE Services Ltd. ISSN 1759-846X

Subscription enquiries

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

The 2013 US annual subscription price is £100. Airfreight and mailing in the US by Air Business, C/O Worldnet Shipping NY Inc, C/O Air Business Ltd / 155-11 146th Street, Jamaica, New York, NY11434. Periodical postage pending at Jamaica NY 11431. US Postmaster: Send address changes to CIBSE Journal, C/O Air Business Ltd / 155-11 146th Street, Jamaica, New York, NY11434.

Cover image: Andrew Lee

ABC audited circulation: 18,920 January to December 2014

SCENE STEALER

A psychedelic, swirling lobby stars in an extension to the Theatre Royal, Glasgow, and is central to the building's ventilation strategy. **Andy Pearson** went backstage to find out how Max Fordham updated a Victorian classic

The Theatre Royal, Glasgow, was ripe for refurbishment. Built in 1867, it was designed with separate entrances for the hoi polloi and the more well-to-do, with those in the cheap seats forced to make their way to the auditorium through various side entrances and back passages. More than a century later, nothing had changed.

Without passenger lifts, almost all audience seating was inaccessible to wheelchair users. Foyer space was limited and the bars were too small to service Glasgow's thirsty theatre-goers. Once inside the auditorium, the audience had to put up with a stuffy and, often, uncomfortably hot environment.

In 2008, Scottish Opera – which had bought the building in 1974 – set out to tackle the theatre's shortcomings, and acquired a plot of land adjacent to it. The following year, the company launched an architectural competition to design a £11.5m entrance pavilion that would improve accessibility and provide a new box office, foyers, bars and toilet facilities. Importantly, the winning entry would also have to greatly enhance the audience's journey from street to seat.

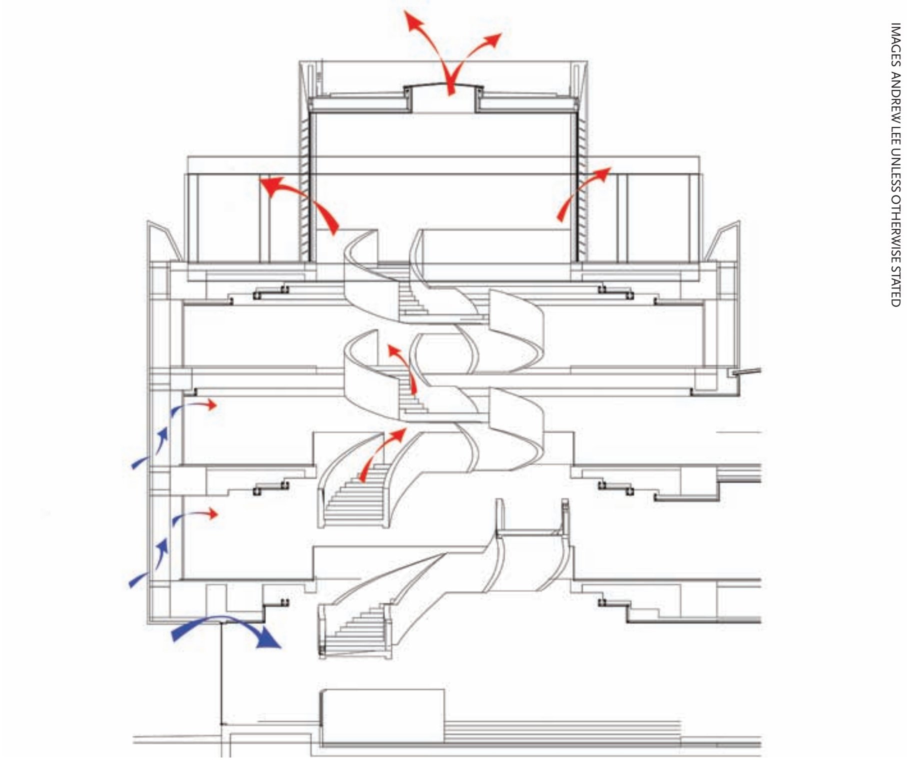
Local architect Page\Park won the competition with its proposal for a golden, drum-shaped entrance, featuring – at its heart – a sweeping double-helix staircase to provide a dramatic and egalitarian route to the auditorium. The scheme included lifts that ensured step-free access to all four levels of the theatre, while cafés, bars and a roof terrace all added to the visitors' experience.

In 2010, Scottish Opera appointed engineers Max Fordham to the team, to develop a low energy building services solution for the extension and devise a way to improve comfort conditions in the auditorium. This was all well and good – except the client needed the theatre to continue putting on productions throughout the improvement works. Crucially, its existing plantroom was on the site where the new entrance pavilion was to be constructed, and had to be demolished before work could get under way.

Mark Palmer, senior partner at Max Fordham, explains: 'The existing plantroom was located slap-bang where we wanted to build the new foyer, so we knew we would have to move the boiler room, the main air handling plant, electrical switchgear and the gas meters.

Improving comfort in the auditorium was key

The foyer's golden façade is in stunning contrast to the original theatre building



A chimney carries warmed air through the core of the drum and out through high level openings

IMAGES: ANDREW LEE UNLESS OTHERWISE STATED

The first thing the Max Fordham team did was to establish which services were installed, how they functioned and where they were routed around the old theatre, so that it could start to develop a means of maintaining them during the works. The subsequent investigation involved examination of record drawings, as well as extensive site surveys of the building and the category-A listed auditorium.

The engineer also took the opportunity to study CO_2 levels and temperatures in the auditorium during performances, to identify comfort issues and to establish where improvements were needed. 'Quite a lot of investigation had to be done to understand how the building was working, where the existing distribution routes ran and where it was possible to add new routes,' says Palmer.

At the same time, Max Fordham was developing a building services strategy for the new extension.

Originally, it was proposed that the pavilion would be serviced independently of the theatre. After exploring the different options, however, it became apparent that it would be better to integrate the foyer services – including life safety – with the existing systems,

'As soon as you start to look at these things, you realise it doesn't make sense – from a building services point of view – to have separate plant in the foyer that doesn't interface with the rest of the building,' says Palmer.

This meant the new plantroom would need to service both the existing theatre and the new foyer – but where could it go on the confined site? The solution was stumbled upon after discussions with the fire engineer, when it became apparent that the vastly improved access created by the swanky extension would make one of the theatre's fire-escape staircases redundant.

The foyer's staircase helps draw warm air away

> The existing plantroom was located slap-bang where we wanted to build the new foyer
> *Mark Palmer*

PROJECT TEAM

- **Client:** Scottish Opera
- **Architect:** Page\Park
- **Building Services Engineer:** Max Fordham
- **Cost consultants:** Capita
- **Main contractor:** Sir Robert McAlpine
- **M&E contractor:** Vaughan Engineering

The engineers realised that by removing the stairs from the stairwell and casting new floor slabs at each level, they would be able to develop this space as a vertical, five-storey plantroom and main distribution riser. 'The new plant space in the existing building provided an ideal access to all levels and avoided the need for costly, temporary services installations – it was a stroke of luck,' admits Palmer.

Because it was in the existing theatre, the found space had the additional advantage that it could serve as both an interim plantroom during the foyer's construction and, later, as the final plantroom. As soon as the new floors were constructed, new plant – including switchgear and boilers – were installed, commissioned and connected to the existing systems to enable the auditorium to function while construction of the foyer went ahead.

'The converted staircase allowed us to build the permanent plantroom in the existing building, before we started work on the foyer,' explains Palmer.

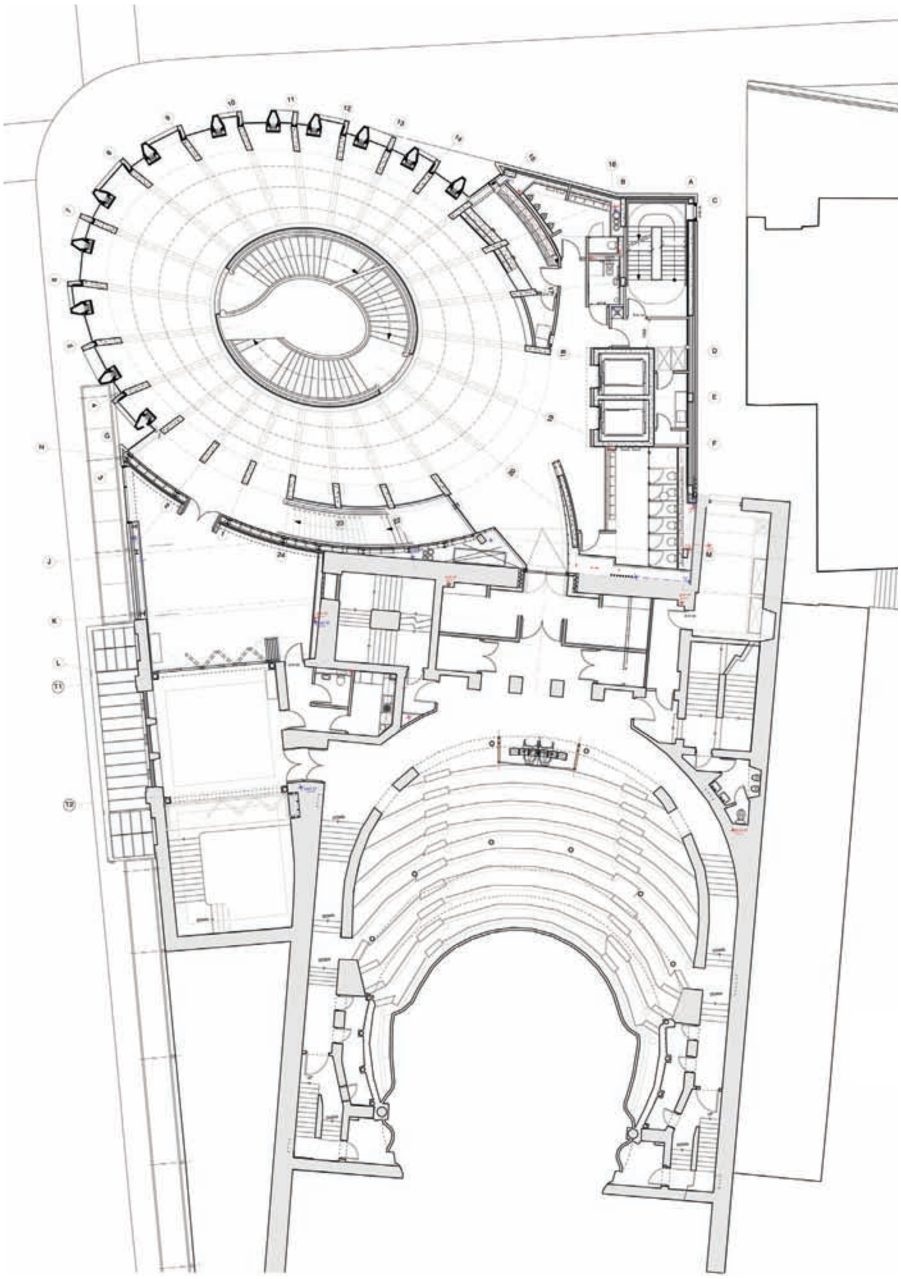
The old circuits and new plant were kept separate as far as practical. For example, plate heat exchangers were installed between the new boilers and the retained low temperature hot water (LTHW) circuits so that, should a problem occur with the ageing existing system, it could not be attributed to the new works. 'We made sure there was a clear interface between the new and the old,' says Palmer.

The one major item of plant that could not be installed was a new auditorium air handling unit (AHU), because it was to be located on the roof of the, as yet unbuilt, new foyer. As an interim solution, the auditorium air distribution ducts were kept supplied with $12m^3/s$ of fresh air by a fan and heater battery temporarily located on the roof of the existing theatre.

One of the biggest challenges in developing the services strategy was devising a solution for what Palmer describes as the new foyer's 'peaky' occupancy pattern, when 1,400 theatre-goers gather in its bars before the show and during the intervals.

Max Fordham's strategy has been to keep the solution as simple as possible, with natural ventilation and a responsive heating system. 'Natural ventilation provides free cooling and fresh air, and the heating responds as soon as the temperature starts to rise,' says Palmer.

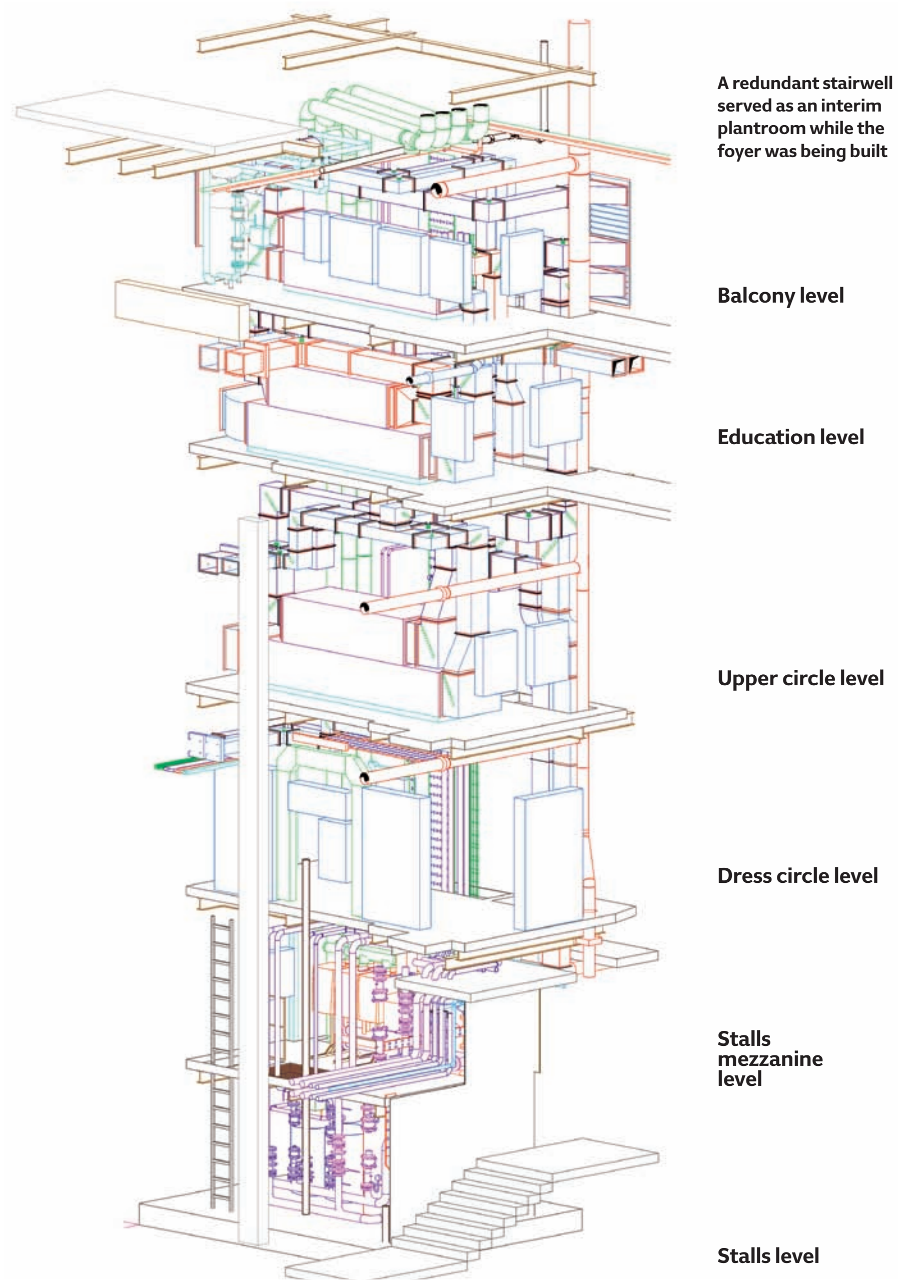
'The occupancy is so peaky and short-lived that, if mechanical ventilation was used, you would end up putting in some very big plant that would spend most of its life switched off.'



Air is drawn into the space at each floor level from perimeter vents concealed in the façade's protruding gold fins. The theatre is next to a busy main road, so to prevent traffic noise entering the space – and to minimise breakout noise – the vents open onto an acoustically attenuated air duct, concealed within the foyer furniture. The duct directs the fresh air to high-level openings within the furniture. A motorised volume control damper, under the control of the BMS, regulates the quantity of air admitted to the space in response to internal temperature and CO_2 levels.

This natural ventilation solution is helped by the foyer's spiral staircase. It acts as a

CREDIT: VAUGHAN ENGINEERING



chimney to carry warmed air up through the building's core and out through openings in the high-level lantern light at the top of the extension. The same ventilation strategy is used for smoke ventilation in the event of a fire.

An LTHW fan convector unit, concealed at low level in each wall unit, provides heat to the space. There are 12 bays on every floor, each of which has a bespoke joinery cabinet with integrated heating and natural ventilation ducts and grilles, plus power and data connections for public use.

Services to the bays are distributed at high level on each floor, concealed behind two concentric timber rings that form a feature of the ceiling. The outer ring carries the main services, while the inner ring houses an extensive architectural lighting installation. The rings appear unconnected, to keep the coffered concrete soffit clear of cabling. To maintain this separation, two steel conduits were cast into the slab of the floor above, to carry the wiring.

The foyer has no mechanical cooling; instead, the design relies on the thermal mass of the pavilion's concrete frame and floor slabs to limit sudden temperature rises when occupancy levels jump up during show intervals.

'It is a large, heavyweight space and it can absorb these occupancy peaks to maintain comfort with minimal mechanical intervention – and, therefore, minimal energy consumption,' says Palmer.

When construction of the new entrance was complete, the new auditorium AHU was installed on its roof. To help improve comfort levels, the air handling unit is coupled with a chiller and a heat-recovery system to improve air quality and energy efficiency in the auditorium, without changing the look of the space.

'We had to stick with the existing auditorium air distribution system, which supplies fresh air through a series of vents on each floor,' says Palmer. 'This could have created pockets of stratified air; however, by installing a new extract system, we were able to improve the air distribution.'

Palmer says early feedback from theatre-goers and staff suggests the solution is working well. The acid test will come, however, when Max Fordham obtains the first year's energy use figures and monitoring results, to see how the conditions in the auditorium now compare with conditions pre-refurbishment.

How do you run a luxury hotel with spa-like facilities in a sustainable way? Hoare Lea's **Julie Godefroy** shares lessons learned from a post-occupancy evaluation at London's South Place Hotel

SUITE SUCCESS

A boutique hotel in central London, with 'spa-like' bathrooms, represents a challenge for operators with aspirations of sustainability.

These five-star luxuries are notoriously wasteful in terms of water and energy, with copious amounts of hot water required for oversized baths and rain-shower fittings. There are also loads from restaurants, a gym, conference spaces and dining rooms to consider, as well as the heating and cooling requirements of demanding visitors, who are paying up to £1,200 a night for the privilege of staying at the hotel.

The operators of South Place Hotel didn't shy away from the task, however, and – after the building was completed in 2012 – they appointed Hoare Lea to undertake a post-occupancy evaluation (POE). Innovate UK – formerly the Technology Strategy Board – funded the project, which included an 'enhanced handover' and POE over two years, with a review of user feedback and energy and water consumption.

We found that simple energy analysis – using 'walk-arounds', interviews with users, and even TripAdvisor reviews – is very valuable, while commissioning and careful handover are crucial because hotels do not stop, offering fewer windows of opportunity for works after opening.

The hotel

South Place, a boutique hotel located between Liverpool Street and Moorgate, in central London, comprises 80 bedrooms, two restaurants, a gym, conference spaces and private dining rooms. It has enjoyed high occupancy rates since it opened in September 2012, and is ranked one of city's favourite hotels.

South Place is owned, and was developed, by Frogmore for D&D London, which operates a number of restaurants.

The project was procured under a design and build contract, with the architects novated and the MEP engineers staying client-side.

Frogmore intended to create a best-practice hotel and – driven by local planners at the London Borough of Islington – the energy and sustainability strategy included a requirement for BREEAM Excellent, standard B-rated Energy Performance Certificate (EPC) and 40% improvement on Building Regulations Part L 2010.

The design approach followed the energy hierarchy, with highly efficient envelope and services, a 70kWe combined heat and power (CHP) unit, and fan coil units for heating and cooling in the bedrooms.

High user satisfaction

Feedback from staff was gathered through interviews and building use studies (BUS) surveys. More informal methods were used with hotel guests, based on comments provided either directly to staff or on travel review websites, such as TripAdvisor. These sites are also used by the hotel to monitor guest satisfaction, and the feedback generally correlated well with that received from the staff.

From the early design stages, interior designer, Conran and Partners, was mindful of the interaction between finishes and services, as well as boutique branding and customer experience.

The firm worked closely with the engineers, hotel consultants, and control manufacturers, so the building's architecture and interior design have generally received good feedback. Guests and staff have commented on the hotel's 'wow factor', 'modern and stylish' design, and attention to detail.

As well as achieving high rankings on travel-review websites, the building was rated highly in staff surveys, with an overall BUS satisfaction score in the top 10% of performers in its category (see graph on page 10).

Topics frequently mentioned by guests in travel reviews include the general quality, design, and atmosphere of the hotel and bedrooms; high-quality service; hotel location; and luxury features, including 'huge beds', 'spa-like' bathrooms with huge baths, and 'rain showers'.

This strong customer feedback represents a clear challenge to sustainability aspirations in the high-end hotel sector. Operators with a strong desire for energy, water and cost savings should maximise the efficiency of lower-impact uses to guests and, potentially, consider greywater recycling systems in larger buildings.

As in all dense urban locations, space was at a premium and it proved challenging to balance the needs of revenue-generating front-of-house, back-of-house and staff areas. This is particularly important for industries involving long shift work, and for establishments where amenities – such as canteen and rest areas, and secure cycle storage – can help retain sought-after staff.

The inclusion of experienced staff in the design process was useful, but actual operation will always be subject to changing business practices; for example,

PROJECT TEAM

- **Developer:** Frogmore
- **Hotel operator:** D&D London
- **Project manager:** Gardiner & Theobald
- **Architects:** Allies and Morrison
- **Interior architects:** Conran and Partners
- **Mechanical, electrical, public health (MEP):** Hoare Lea to contract, then NG Bailey
- **BREEAM:** Hoare Lea Sustainability to contract, then Capita Symonds for McLaren
- **Contractor:** McLaren
- **MEP contractor:** NG Bailey

the success of the hotel's bars has led to a higher number of evening events than initially expected, requiring careful management to avoid disturbance to other areas.

A canopy roof was installed over the courtyard bar, reducing sound transmission to the surrounding bedrooms while increasing the bar's revenues by creating a covered area suitable for use in varying weather.

Bedrooms on the two top floors have openable windows – which work in conjunction with sensors that deactivate the fan coil units – and guests use them, even in this busy urban location. The hotel regards this feature as a strength in its offering, because some guests request windows that open.

Guests regularly comment on the gadgetry and controls in the bedrooms, which are now largely enjoyed as part of the 'modern, high-tech' experience. Bespoke control panels were developed by the manufacturer in collaboration with Conran and Partners. These required a period of adjustment and fine-tuning, and a simple user guide – and a 'room in' service offered to guests on arrival – help with operation (see examples of control panels on page 11).

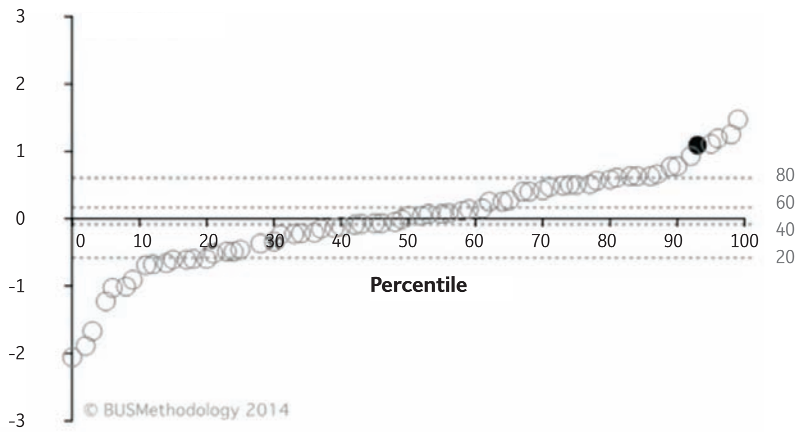
Staff consistently noted the work of the facilities manager, and the building's BUS score for 'response to request for change' is the best in its category. This is expected to contribute significantly to overall satisfaction and efficient operation.

> Early input from an experienced hotel manager will help prioritise conflicting needs and demands for space

Energy and water

Overall gas consumption is similar to CIBSE Guide F Good Practice levels, and would be better than Good Practice if all heat was produced by boilers, rather than partly from CHP. A third of it is used for catering and is therefore unregulated.

Electricity consumption – mainly by fans and pumps, small power, and catering – is significantly (about 80%) higher than Good Practice benchmarks. This may be attributed to a number of



The user satisfaction survey showed a very high rating from the staff (Building Use Studies) factors, including a relatively small and old benchmark database (1999), high occupancy rates, and the high-end and highly serviced nature of the hotel.

While inefficiencies are kept to a minimum by the FM team's proactive energy management, the contribution of each factor is difficult to assess because of the relatively limited benchmark data.

The CHP unit was specified with thermal stores, which were omitted in the contractor's final installation. This, plus modulation issues, reduced its operation in the first two years. However, the contractor and MEP contractor did remain involved long after practical completion, and the CHP now runs as initially intended – for a minimum of 12 hours a day – and with quality-assurance certification. It should now contribute to the majority of the thermal load.

Unsurprisingly – given the enthusiastic feedback on the luxury bathrooms and rain showers that use 20 litres per minute – water consumption is high, with 350-400 litres used per bedroom, excluding restaurant uses. This is higher than CIRIA benchmarks, but in line with benchmarks from the FM team and other luxury hotels.

Water-efficiency measures were implemented in incremental steps while monitoring guest feedback, and they are expected to have led to significant savings – about a 15% reduction in flow rates from shower and basin taps – without having any detrimental impact on the guest experience.

Lessons learned

- Commissioning and careful handover are crucial. This is a common POE finding, and one that is compounded because hotels do not stop, offering few windows of opportunity for works
- People matter. There is enormous value in motivated project teams, team-member continuity and pro-active FM
- Quality checks – such as BREEAM post-construction review, thermography surveys, and airtightness tests – can be useful indicators and need to be carefully procured and programmed to maximise their value
- Keep things simple
- Detailed energy analysis is time-consuming. Simpler analysis – using walk-arounds, user interviews and main meter data – is very valuable. Large numbers of sub-meters can be a challenge in commissioning, reconciling and prioritising data for analysis
- Energy consumption is difficult to predict, particularly with high, unregulated loads and limited benchmark data on hotels
- Early input from an experienced hotel manager will help prioritise conflicting needs and demands for space.

References:

1 *Productivity in Buildings: the Killer Variables Updated*, A Leaman, Drawing on material developed jointly with Bill Bordass, supporting the Usable Buildings Trust, 2005

2 *Strategies for Better Occupant Satisfaction*, Adrian Leaman and Bill Bordass, Presented to the Fifth Indoor Air Quality Conference, 1997

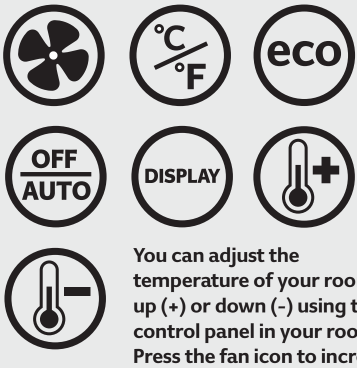
3 C657, *Water key performance indicators for offices and hotels*, CIRIA, 2006

4 *Water Management and Responsibility in Hotels*, Green Hotelier, March 2013, **http://bit.ly/1OQCjSw**

JULIE GODEFROY is a sustainability associate at Hoare Lea

User guides for bespoke control buttons

Air conditioning user guide

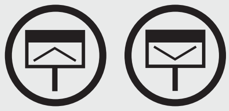


You can adjust the temperature of your room up (+) or down (-) using the control panel in your room. Press the fan icon to increase or decrease the fan speed. The 'eco' setting provides an energy-efficient means of keeping the room to your preferred temperature.

One of the control panels

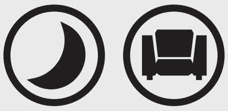
Light settings user guide

LED bedside reading light

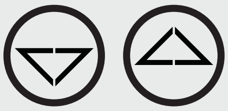


Draws the blackout blinds up and down

Lights off/ lights on



Night-time setting to allow wayfinding, for example to the bathroom; ambient light setting for reading and relaxing



Dims and brightens the light settings

Do not disturb: This will also mute the bell outside your door

The bath setting provides low-level lighting for a relaxing soak

The lighting in your room has been programmed to provide various levels of illumination. The lighting throughout South Place Hotel uses low-energy or LED bulbs.

Who says no-one notices building services?

Comments on TripAdvisor

'The power points were all in the right place.'

'Lighting in the room was the best for any hotel in the city that I've experienced.'

Feedback on bedroom controls:

'James Bond feel.'

'Electric blinds clever and working (for a change...).'

'Touch panels weren't always responsive enough, though I like the idea very much.'

'As a lover of technology, this hotel was perhaps the most impressive I've ever experienced. Thankfully, it is not so technically challenging that I couldn't manage to work them all.'

Surf's up in Snowdonia, the unlikely setting for the first application of a revolutionary wave-generating technology from Wavegarden. **Andrew Brister** waxes his board and heads off to Surf Snowdonia, to find out what makes it possible for someone to ride a 2-metre wave in the heart of the Welsh mountains


Expert surfers can expect rides of up to 20 seconds long

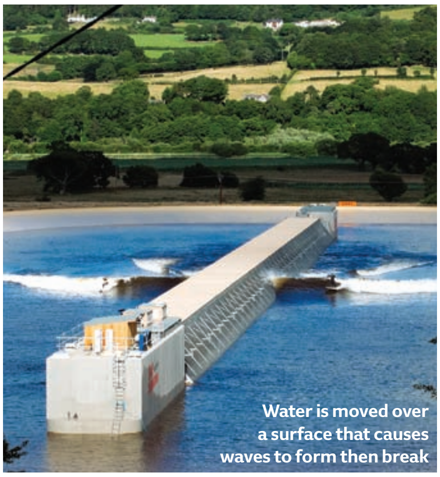
Packing for Snowdonia just got a bit gnarly. Hiking boots? Check. Rain gear? Check. Surfboard? What? Yes, that's right. You can now ride the world's longest man-made surfing wave on a visit to Surf Snowdonia, a £15m leisure development in the lush, green, Conwy Valley in north Wales.

The lagoon at Dolgarrog is on the edge of Snowdonia National Park, one of the most beautiful regions of the UK. It has been built on the former site of an aluminium rolling and casting works, owned by global giant Alcoa, which opened in 1907 and closed its doors 100 years later. The derelict, brownfield land that remained offered little prospect for development before it was bought by the property division of crane-hire company Ainscough, in 2012.

Now, Conwy Adventure Leisure, in partnership with Ainscough Strategic Land, has cleaned up the site and created a stunning facility that is expected to attract more than 75,000 visitors a year. The 300m-long lagoon features the longest man-made surfable waves on the planet, and can accommodate 36 surfers at any one time: six advanced surfers, six intermediate, and 24 beginners.

Those not riding the waves can visit the Surf Side Café Bar, where there is also a 50m-long viewing gallery and a retail outlet. There is a family activity area, with a soft-play shack for toddlers and children under the age of 12, plus a second viewing gallery overlooking the 'Crash and Splash' lagoon, which is due to open this autumn.

On-site accommodation is available in the shape of wooden camping pods, which come equipped with underfloor heating and electric sockets. They are serviced by a shared, heated shower and toilet block.


Water is moved over a surface that causes waves to form then break

Surf's up

The surf lagoon is the first application of Wavegarden's wave-generation system, developed in northern Spain over the past 10 years by a group of hydrological, civil and mechanical engineers – who also happen to be passionate surfers. The facility generates consistently powerful waves that interact with contours on the bed of the lagoon to provide different wave profiles at different points in the lagoon. The waves are variously overhead (1.9m), waist high (1.2m) and knee high, with the highest wave peeling for up to 150m. The waves are generated at a rate of one every 90 seconds – that's 40 an hour.

From the expert, central area of the lagoon, two identical waves break simultaneously, left and right, with rides of up to 20 seconds long. Once the waves reach the beginners' area, at each end of the lagoon, the left and right-hand waves transform into smaller, more playful white-water waves – the perfect size for all ages to learn and improve their skills.

A unique, honeycomb shoreliner at the edge of the lagoon ensures the power of

the wave is dissipated efficiently and the water quickly becomes flat again. This enables the rapid turnaround of the wave-generating machinery.

Understandably, Wavegarden is tight-lipped about the mechanics behind the technology, but engineer Alex Oñatibia was prepared to reveal some of the secrets of making waves.

'Different methods of producing man-made waves have been tried,

MAKING WAVES

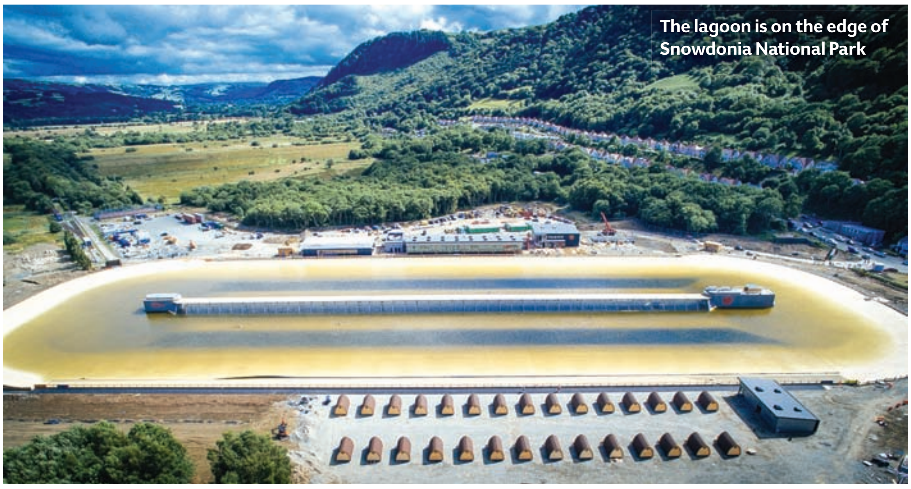
including linear and "endless" circular waves, which have all been tested on various bottom surfaces. This has involved many models, on different scales,' he explains. 'Preliminary computer simulations were nearly always used, but the majority of the tests were also run on real-size models.

'The underlying aim was to achieve the simplest, most efficient and reliable technology possible. Our research and development has remained focused on creating the new technologies required to minimise energy consumption, thus limiting the costs of ongoing maintenance and continued investment.'

Wavegarden creates waves in the same way an ocean does. A mass of water is systematically moved over a surface that causes the wave to form and then fold on itself – just like a wave breaking over a reef or sand bar. The difference is that Wavegarden's patented technology can regulate the size and speed of the waves, making them engaging for different skill levels – from beginner to ripper.

'The groundbreaking technology is based on an innovative hydrodynamic "wave foil", which moves along the bottom of the lake, displacing water, and a revolutionary lagoon design – which, together, create two perfect, 1.9m barrelling waves at the same time,' says Oñatibia.

'The wave-foil generator has been proven to be more reliable, and to require significantly less energy, than existing wave-generating technologies and those that are still in conceptual design stage.'



The lagoon is on the edge of Snowdonia National Park

There can be 40 waves an hour, with the highest peeling for 150m

Can the man-made experience ever really match the thrill of nature? Oñatibia thinks so. 'We are able to emulate close-out sections and play with the foil speed in order to create alterations like in nature. However, our wave will always be more predictable than waves in the sea, but that is what really makes our facility outstanding – perfect and consistent waves all day long.'

Surf Snowdonia uses rainwater to fill the lagoon – all 33,000m³ of it. The rainwater travels from two Snowdonia mountain reservoirs to power RWE's hydroelectric plant at Dolgarrog, before filling the lagoon. So the water that generates the waves is also helping to power 20,000 households in Wales each year.

'The water-treatment system is based on particle filtration achieved by sand filters and UV disinfection,' says Oñatibia. 'However, the water from the reservoirs has been tested many times and is very nearly drinking quality before it reaches the lagoon.'

Of course, the difference between fresh and salt water is the buoyancy. While this would be noticeable if you were to float, statically, in the water, there is little difference when surfing.

'Surfers travel at about six to seven metres per second and can increase their speed with different manoeuvres,' explains Oñatibia. 'In reality, surfers are gaining advantage of the power of the wave to slide on the water, they do not float. So we can conclude that fresh water doesn't affect the surfing experience. More than 60 professional surfers have already tried the Wavegarden technology without raising this particular issue.'

The UK's avid surfing community and a stunning Welsh location have come together to allow the developers to create the first Wavegarden facility in the world – and it is to be the first of many.

Another lagoon is already under construction in the USA – in Austin, Texas – and will open its doors in 2016, while six other facilities are currently being developed around the world and there is finance committed for another 22 projects. Discussions are also in progress over many other potential lagoon locations.

Floodlighting has not been installed at the Surf Snowdonia facility in Wales, but Wavegarden has trialled floodlit night surfing at its R&D facility in Spain. And for those who are wondering, the answer is 'yes': you do still have to wax your board in fresh water.

> Our waves will always be more predictable than waves in the sea, but that is what makes our facility outstanding – perfect and consistent waves all day long

Rainwater from two reservoirs is used to fill the 33,000m³ lagoon

TAKING THE GRIND OUT OF PROCUREMENT

Collaboration between landlord and tenant was essential in creating Costa's first zero energy coffee shop. **Alex Smith** finds out how open minds and an enlightened design team redefined how the coffee chain procures its stores

A new Costa outlet in Telford is causing a stir, with owners Whitbread claiming it is Britain's first zero energy coffee shop. This may be difficult to substantiate – no operational data is yet available – but on paper (and in dynamic simulations) the design appears to offer substantial energy savings.

The building form of the concept store – called the 'eco-pod' – is based on passive design principles. An overhanging, curved timber roof shades the large windows, so solar gain is minimised, while the soft-wood façade is highly insulated to keep interiors warm in the winter and cool in the summer. Passive ventilation from Breathing Buildings ensures the energy used to power fans is kept to a minimum, and underfloor heating and cooling provided by a ground source heat pump provides stable temperatures. (See panel, 'An integrated design'.)

While the low-energy credentials, which include rainwater harvesting, are impressive, the procurement method is even more so. The landlord and tenant were involved in design decisions before the lease was signed, which is highly unusual.

The unit, at Wrekin Retail Park, is leased by Costa from the landlord, Hammerson. Usually, tenants are provided with a shell unit, which they fit out with services using their own project teams. As a result, the team working on the retail unit have no idea how the building is going to consume energy, so the design could be unsuitable for the building's end use.

This coffee shop is different. Costa and Hammerson discussed designs that would meet the retailer's requirements before any contracts were signed. Collaboration was essential because Hammerson needed to know what energy savings would be made so it could set a rent that would allow it to recoup its investment from PVs and other low-energy measures.

'We are getting the savings in energy bills and they are getting the return on investment,' explains Oliver Rosevear, energy and environment manager at Whitbread. 'There needs to be an understanding about the energy that will be saved before we agree to pay an enhanced rent.'

The low-energy design was brought to

PROJECT TEAM

- **Landlord:** Hammerson
- **Tenant:** Costa (owned by Whitbread)
- **Architect:** Emission Zero
- **Project and cost management:** Projex Building Solutions
- **Building frame design and build:** Fordingbridge
- **Ventilation:** Breathing Buildings

Costa by architect Emission Zero and project manager Projex.

Simon Kirton, Emission Zero's architectural director, said it was essential to consider mechanical services at the shell design stage to estimate energy use accurately.

'Services have to be considered as part of the holistic design process. The fabric has so much influence on the way the building is serviced – they can't be designed separately,' he says.

Unusually for an architect, Emission Zero uses dynamic thermal modelling to help it understand how different criteria affect the energy performance of a building.

To predict the new coffee shop's energy use, Emission Zero was given access to half-hourly data from three Costa stores. 'We were considering natural ventilation and passive floor slabs, and their accurate specification was dependent on energy profiles of the building. Knowledge of the heat gains was crucial, and access to energy data enabled us to see exactly what was used and when, in any season,' says Kirton.

The data enabled Kirton to identify areas of high energy use. For example, the profile of

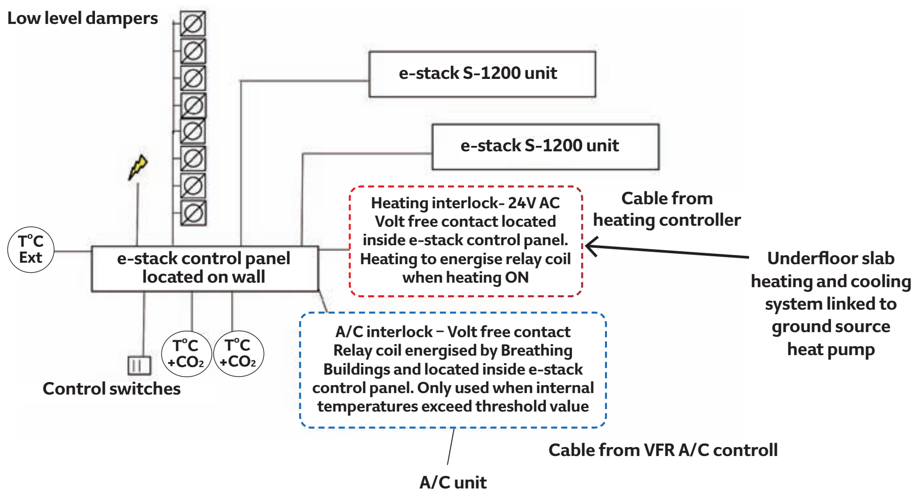
An integrated design

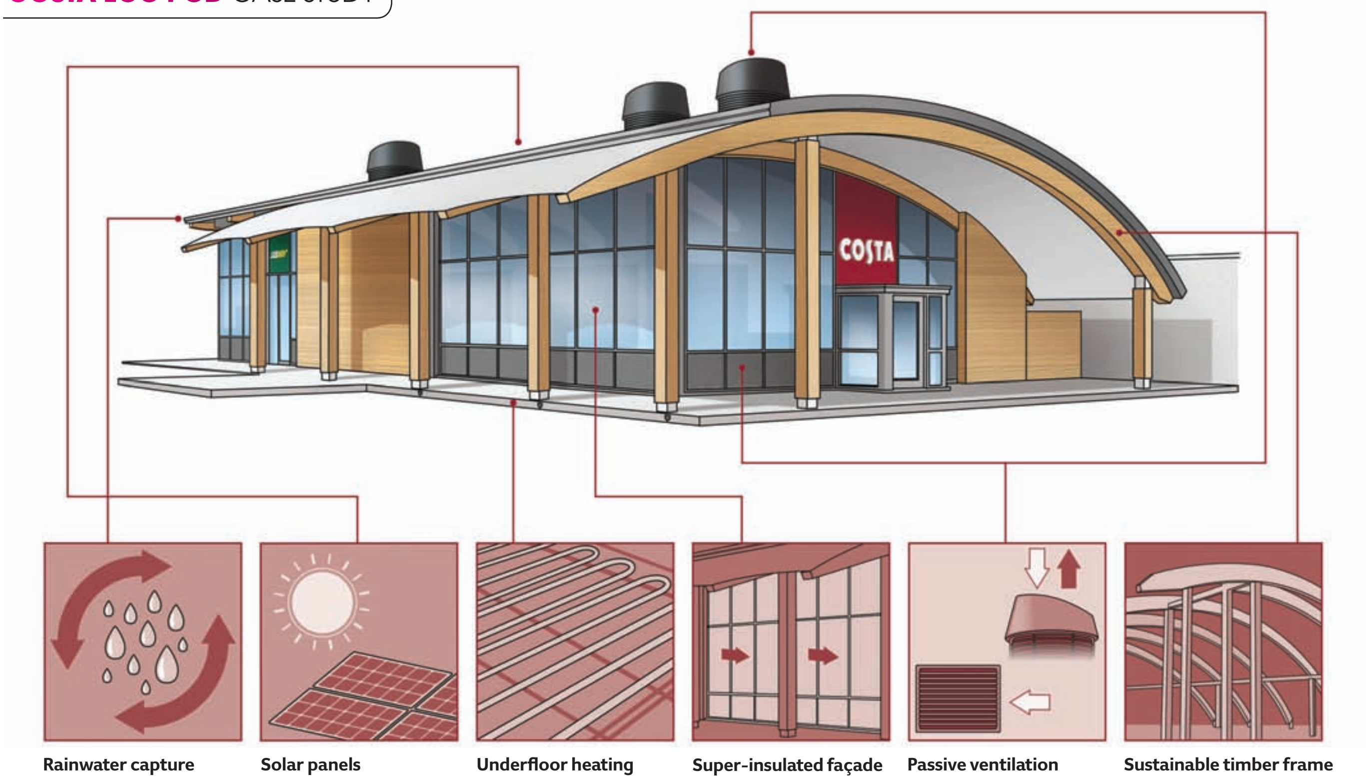
Costa's concept store is dependent on components working together effectively.

Its control system, designed by Breathing Buildings, integrates the ventilation system with the underfloor heating and cooling (linked to a ground source heat pump), and supplementary air conditioning.

Breathing Buildings supplied three internal mixing e-stacks and three mushroom terminations, as well as glazed-in dampers. The ventilation system works in one of two modes: displacement ventilation in summer and mixing ventilation in winter. In summer, perimenter vents at a low level provide incoming air, while roof vents exhaust warm air. The night-time purge to cool the building is timed to happen between 8pm and 6am.

When external temperatures are greater than 18°C there is floor slab cooling. When they reach 23°C, the ventilation is closed down and cooling is supplied by a supplementary split air conditioning unit. In winter perimeter vents at low level are closed, while roof vents bring in pre-heated fresh cool air. The night time purge is not operated. The floor slab heating turns on when internal temperatures fall below 17°C.





Costa's eco-pod in Telford – the UK's first 'zero energy' coffee shop

convection ovens was very high; when Kirton investigated, it found that staff were turning on the ovens at the start of the day and not switching them off until they left.

Looking at the energy profiles of various appliances gave Emission Zero the idea for capturing heat from fridge condenser units, to prevent it from being recirculated in the store. To minimise the heat gains, Kirton designed a cowl for the fridges that exhausted the warm air out of the building.

The design process involved all relevant parties, including Hammerson, Costa and the specialist subcontractors, such as Breathing Buildings, which designed the natural ventilation system.

Kirton described it as an iterative process: 'It takes longer to work through, but these iterations allow everyone to have knowledge of the process. For example, we can look at the effect of a change on performance in the specification of the glazing.'

Having a quantity surveyor (QS) who understands low-energy buildings is essential, says Kirton. 'Typically, low carbon projects start out wonderfully, but when it gets down to the nitty gritty – at the value-engineering stage – vital specifications get changed because the QS often has no idea of the impact their decisions have on performance.'

Conclusion

Rosevear says the green lease arrangement with Hammerson has enabled them to incorporate low-energy features, such as PVs, for the first time on a leased Costa store. He says that the PVs are makinga significant contribution to the 50% lower energy use compared with a typical Costa store.

The Telford store is now being monitored and, depending on results, Costa will roll out the design both on more Hammerson retail parks, and with other landlords prepared to work with the same lease model.

After four months, Kirton claims the store is performing as the models suggested. As the building is still being monitored, the controls can be altered to account for the change in seasons, when the slab requires less night-time purging.

Kirton says the store should continue to be monitored for performance. He is keen for more landlords and tenants to discuss building requirements and is exasperated that it isn't happenning more.

'I find it quite shocking that nobody has done this before. It should be joined-up thinking, but sadly it's not the case,' he says. 'At the moment, the building gets designed, and then the engineers look at it too late in the process.'

Rosevear believes the collaborative approach between all the partners broke down barriers: 'Tenants and landlords tend to work for themselves – but this approach had to be "open book".'

TAKING CONTROL WITH EASE

When it comes to designing efficient heating systems, specifying inherently efficient plant is only part of the equation. Effective control with easy configuration of mixed heating systems is vital, and is addressed by Hoval's new TopTronic® E system controller

It is a fundamental engineering principle that for heating plant to deliver optimum efficiency it needs to be controlled effectively. Traditional control systems can be very complex and, inevitably, a system that is difficult to commission and use increases the risk of poor control – resulting in poor performance.

This situation becomes even more complex, with a higher level of associated risk, when multiple conventional and low carbon heat sources are used in a mixed heating solution, typically in a cascade configuration.

Hoval's new TopTronic® E is an entirely new system controller, developed from the ground up, to address these issues. As such, it delivers a completely new level of simplicity, modularity, connectivity and user experience without compromising on control functionality.

TopTronic® E is built in to the latest generations of Hoval boilers, calorifiers, heat pumps and other heat sources with the ability to control one or multiple sources with a single unit or in cascades with up to 8 units. In doing so, it eliminates the inconvenience and risk of trying to work with different controllers for different appliances and system configurations.

Working alongside the new TopTronic® Supervisor, TopTronic® E can also be used within a fully scalable system for the real-time visualisation, monitoring and optimisation of district heating networks

Ease of use and expansion

Crucially, despite its powerful underlying technology, the TopTronic® E provides a user-friendly interface employing plain language to provide a step-by-step guide during commissioning of the entire system. It will also flag up any possible issues during the commissioning process so that they can be quickly remedied. Furthermore, the TopTronic® E concept features 'plug and play' modular hardware that allows easy extension of an existing new system with additional Hoval components (e.g. solar thermal panels or an additional water heater). The new modules are simply plugged in to the main board and they are ready to go.

Connected control

TopTronic® E also features an integral Internet connection to enable monitoring and optimisation of the system remotely through a simple computer interface which also informs the user when routine or reactive maintenance is required. This is a particularly valuable feature in applications where the end client does not have suitably qualified staff for monitoring heating plant. In addition, for smaller applications, day-to-day control can be via a smartphone app.

Where required, TopTronic® E will also integrate with a building management system using ModBus or KNX interfaces and is also 'smart grid' ready.

Enhanced control for optimum efficiency

With improved energy efficiency becoming an increasingly important element in meeting the UK's carbon emissions targets, enhanced control of heating systems clearly has a vital role to play. With the launch of the TopTronic® E, Hoval is enabling specifiers to deliver effective and user-friendly control that complements the inherent efficiency of the heating plant.

Further information: www.hoval.co.uk

Hoval




A
B
C
D
E


Professional development

The *CIBSE Journal* CPD Programme

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

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

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

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

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

Integrating centralised hybrid heat pumps with independent room units for energy-efficient concurrent heating and cooling

This module looks at how independent room units are successfully integrated with centralised hybrid heat pumps for energy efficient heating, cooling and hot water

This CPD will consider how modern variants of water-loop room systems are successfully integrated with centralised hybrid heat pumps to provide year-round energy-efficient heating, cooling and hot water, with reduced life-cycle cost and environmental emissions.

There are numerous global applications of four-pipe and two-pipe water distribution systems serving room terminal units – most typically, fan coil units (FCUs) comprising a filter, coil(s), possibly condensate drainage and a fan – that provide heating and cooling to rooms. In CIBSE TM43, a simple analysis of the CO_2 emissions for a fan coil unit system installed in an office-type 'example building' compare favourably with most other HVAC systems. If used with a well-designed fresh-air air-handling unit (AHU), a fan coil unit system will comply with Building Regulations, and is surpassed only by more expensive and less flexible systems, such as chilled beams/ceilings.

Four-pipe systems have two independent water circuits – one with chilled water for room cooling, the other with hot water for heating. All terminal units in four-pipe systems are equipped with two independent coils, and can cool or heat according to space requirements. Four-pipe systems are extensively used in temperate climates such as the UK's, particularly where there is no clearly defined seasonal operation. No summer/winter changeover is required, as cooling or heating can be produced at all times, and the control of the temperature of each room is independent of others.

In comparison, a single, two-pipe, water circuit can be used either for space heating or for cooling, but not both at the same time. A summer/winter 'switch' is used for a seasonal changeover so simultaneous cooling and heating in the same system is not possible. Successful operation of 'changeover' two-pipe systems in climates such as that of the UK is likely to be challenging and rarely applied.

Both four-pipe and two-pipe systems are typically served by either a chiller and boiler combination or a heat pump arrangement.

In commercial or institutional buildings, cooling and heating loads often coincide. Traditional systems – with separate chillers and boilers – do not allow the recovery or shifting of heat from one space to another. A hybrid heat pump allows this energy potential to be recovered and usefully applied.

Hybrid heat pump technology

A hybrid heat pump is a packaged heat pump equipped with a flexible and versatile heat-recovery system, which offers the options to deliver cooling only, heating only, or cooling and heating at the same time.

Each unit is equipped with three heat exchangers: the so-called 'main heat exchanger', where chilled water is produced; the heat recovery or 'secondary heat exchanger', where only hot water can be produced; and the condenser/evaporator, where heat rejection or heat absorption takes place. This last heat exchanger can be a finned coil, in the case of air-cooled units, or a refrigerant-to-water heat exchanger, in the case of a water-cooled unit. In each operating mode, only two heat exchangers are activated.

When only chilled water is required, the unit will operate like a normal chiller – the heat will be removed from the main heat exchanger and rejected at the condenser (A1 mode in Figure 1).

When chilled water and hot water are required at the same time, the unit will switch to heat-recovery mode – the heat removed at the main heat exchanger producing chilled water will be rejected to heat recovery, producing hot water (A2 mode in Figure 1).

If the chilled water requirements are satisfied, but there is still a demand for hot water, the unit will switch to heat-pump mode, using the third heat exchanger as the evaporator and rejecting the heat to the main heat exchanger, or to heat recovery, producing hot water (A3 mode in Figure 1).

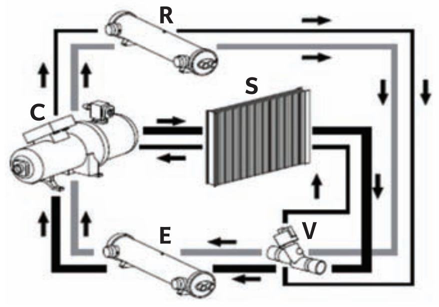
The unit can change its operating mode, according to system requirements.

If the unit is equipped with two independent refrigerant circuits, each circuit can operate in A1, A2 or A3 mode independently from each other. The control logic of the unit will optimise the operation of each circuit to minimise the energy consumption.

Traditional systems, including chillers or traditional heat pumps have a typical energy efficiency ratio (EER – ratio of the cooling output to the total power input) of approximately 3 (air-cooled) and 5.2 (water-cooled), or heat pump coefficient of performance (COP – ratio of the heating output to the total power input) of approximately 3.2 (air-sourced) and 4.5 (water-sourced).

Hybrid heat pumps can deliver typical values for a total efficiency ratio (TER – ratio of sum of cooling plus heating outputs to total power input) in the range of 7 to 9.

The secondary heat exchanger of the hybrid heat pump can be connected to the domestic hot water primary circuit. Air-sourced units with semi-hermetic R134a screw compressors can operate with outdoor air temperature down to -10°C



- Only cold water production in the main exchanger (A1)
- Cold water production in the main exchanger and hot water production in the secondary exchanger (A2) (recovery unit)
- Only hot water production in the secondary exchanger (A3) (recovery unit)

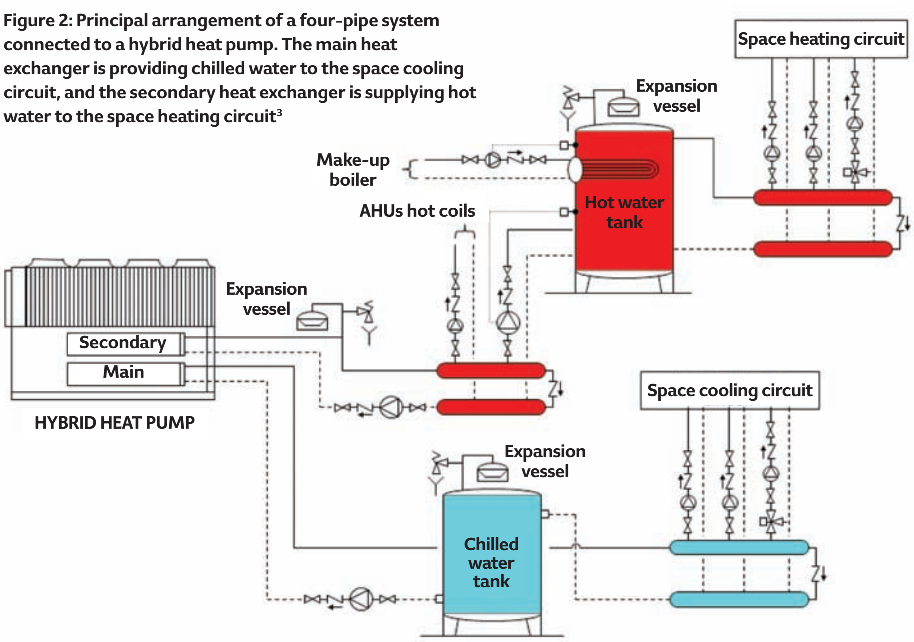
Figure 1: Working principle of the single refrigerant circuit in a hybrid heat pump (E = main heat exchanger; C = compressor; V = expansion valve; R = secondary heat exchanger; S = condenser/evaporator)[3]

while maintaining economic hot water production up to 50°C.

In a four-pipe system (Figure 2), the main heat exchanger only provides chilled water to the circuit dedicated to space cooling, while the secondary heat exchanger supplies hot water to the circuit dedicated to space heating. Air-sourced R410A units with scroll compressors have been designed to produce hot water at 45°C during normal operation with an outdoor air temperature of -10°C in winter.

A make-up boiler is indicated in Figure 2, as it may be necessary, in some cases, to top up the heating capacity, or the hot water temperature.

Figure 2: Principal arrangement of a four-pipe system connected to a hybrid heat pump. The main heat exchanger is providing chilled water to the space cooling circuit, and the secondary heat exchanger is supplying hot water to the space heating circuit[3]



Meeting the heating loads

Traditional flow water temperatures of 80°C are not available from heat pump technology, so the fan coil units must be designed to provide the appropriate heat output at flow water temperatures closer to 45°C.

Example application

In Milan, a 40-year-old, four-storey office building was refurbished and extended to create a further two floors. The project replaced the existing two-pipe heating and–cooling plant – comprising a liquid chiller and a boiler – with a hybrid heat pump capable of producing both chilled water and hot water, independently and simultaneously.

The L-shaped building had different exposures, so areas had very different heating and cooling loads, with concurrent opposite loads, particularly in mid seasons.

Cooling was required from external temperatures of -5°C (15% max load) to 35°C (100%), heating from -5°C external (100%) to 18°C (20%).

The old two-pipe system was replaced by a more versatile four-pipe system that supplied 263 FCUs and two AHUs from a hybrid heat pump (Figure 3) with a nominal cooling/heating capacity of 550 kW/396kW.

The actual measured performance of the system was compared with a model of a traditional system that used a liquid chiller for cooling and a condensing boiler for heating.

The quantity of heat available from the secondary heat exchanger is enough to provide the heating requirements of the building from external temperatures of 18°C down to around 6°C. For lower outdoor temperatures, the heating and cooling loads of the building will be covered by the hybrid heat pump operating one refrigerant circuit in 'cooling and heat recovery' mode (A2 operating mode in Figure 1) and the other circuit operating in 'heating only' mode (A3 operating mode in Figure 1). Because of the Milan climate, no additional boiler was needed for winter top-up, so no gas connection was required for the building.

From 35°C to 18°C external temperature, the unit operates as a chiller (A1); from 18°C to 6°C, it operates in 'cooling and heat recovery' mode (A2); from 18°C to -5°C, it provides cooling/heat recovery and acts as a heat pump (A2 and A3).

By undertaking a 15-year life-cycle cost

Figure 3: Hybrid R134a screw compressor heat pump – 550kW cooling capacity with 7°C chilled water at 35°C ambient, 396kW heating capacity with 45°C hot water at -5°C ambient

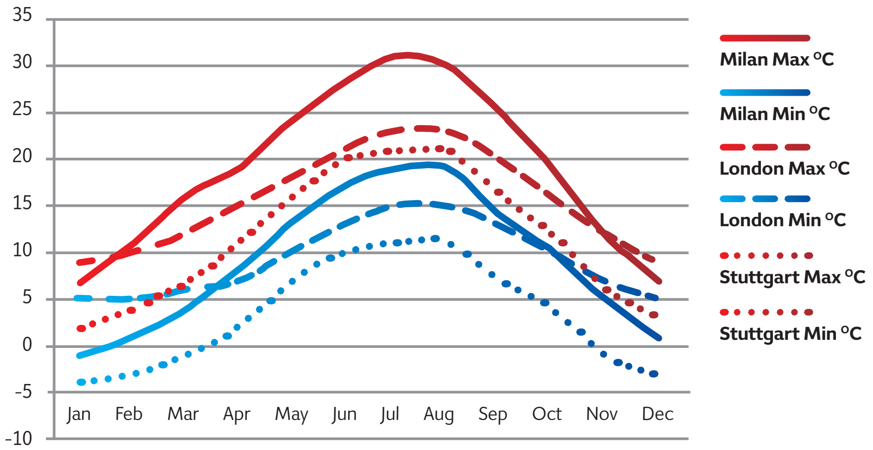


Figure 4: Average minimum and maximum external temperatures for Milan, Stuttgart and London (based on monthly data) (Data source: www.worldweatheronline.com)

(LCC) analysis of the two solutions, the capital cost of the hybrid heat pump solution is 28% higher, but it offers a payback period of 1.2 years, while the lifecycle cost is 23% lower.

A similar system comparison was performed by modelling the same building in the more extreme climatic conditions of Stuttgart, Germany. (For a comparison of outdoor air temperatures, see Figure 4.) Stuttgart has a significant number of hours with external temperatures lower than -5°C, even during daytime, with a recent minimum recorded temperature of -12°C. In these conditions, all-year-round use of a heat pump is not possible, and a condensing boiler was added to the model for operation when outdoor temperatures were below -5°C. The modelled behaviour of the system is similar to that of the real case in Milan, with the principal difference being that when the free heating is not available to cover the heating load of the building, the hybrid heat pump will operate as a heat pump (A3 operating mode) down to -5°C outdoor temperature.

The capital cost of the new Stuttgart system is 54% more expensive than the traditional system, but provides a payback period of significantly less than two years, and LCC will be reduced by 25%, assuming 15-year operation. In Stuttgart, there are more hours where simultaneous heating and cooling are required, and where the heat recovery mode (A2) can be applied.

The heating energy available as free heating reduces the amount of primary energy needed to satisfy the heating loads of the building, thus resulting in the potential reduction of CO_2 emissions, as shown in Figure 5.

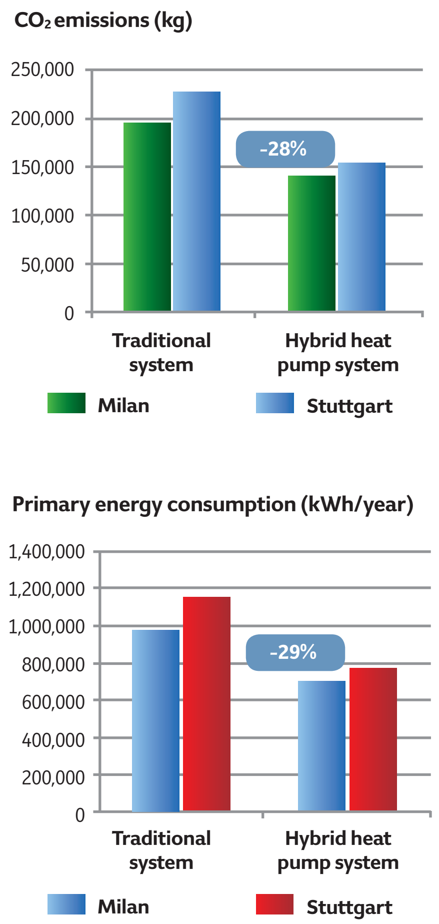


Figure 5: Comparative CO_2 emissions and energy use[3]

Conclusions

The use of a hybrid heat pump can provide a significant improvement to the environmental performance of a building with disparate loads, by reducing running costs and lifecycle costs, plus primary energy use, and so cutting environmental emissions. With appropriate systems, this can be successfully implemented across a wide range of climatic zones.

- The examples and core explanation of the hybrid heat pump system in this CPD were based on work undertaken by Janes, M *et al* of Rhoss SpA.

References:

1 CIBSE TM43 *Fan coil units*, 2008.

2 CIBSE TM53 *Refurbishment of non-domestic building*, 2013.

3 Janes, M *et al*, *Energy efficiency in the modern buildings: Energy saving through the application of hybrid heat pumps with simultaneous and opposite loads – a case history and a numerical simulation for a four-pipes system*, Rhoss SpA, Italy, 2014.

Turn over page to complete module

Module 83
October 2015

KLIMA-THERM

1. In Figure 1, when the unit is working in a mode to produce simultaneous heating and cooling, which labelled component will not be in use?

☐ A Compressor
☐ B Condenser/evaporator
☐ C Expansion valve
☐ D Main heat exchanger
☐ E Secondary heat exchanger

2. What is the approximate potential total efficiency ratio for the hybrid heat pump system described?

☐ A 3
☐ B 3.2
☐ C 4.5
☐ D 5.2
☐ E 8

3. In the example building in Milan, what is the minimum external temperature that would mean the system is likely to be operating as only a chiller?

☐ A 35°C
☐ B 30°C
☐ C 25°C
☐ D 20°C
☐ E 15°C

4. Which CIBSE TM will specifically provide extensive guidance on fan coil units?

☐ A TM43
☐ B TM46
☐ C TM50
☐ D TM53
☐ E TM55

5. In the model of the Stuttgart application, what was the estimated payback period for the combined hybrid heat pump and boiler?

☐ A 1 year
☐ B 2 years
☐ C 3 years
☐ D 4 years
☐ E 5 years

Name (please print) ....

Job title ....

Organisation ....

Address ....

....

....

Postcode ....

Email ....

Are you a member of:

☐ CIBSE

If so, please state your membership number

(if available) ....

☐ Other institution

(please state) ....

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

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

If you do NOT want to receive information about Klima-Therm, the sponsor of this CPD module, please tick here: ☐

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

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

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

MAXIMISING COMFORT AND SAFETY WITH REMEHA BOILERS

Historic Abbey Hotel

We all like our creature comforts, so it is no surprise that achieving effective, reliable heating and hot water with minimum disruption is a prime concern for hotel owners and leisure centre operators.

Condensing boilers provide a particularly effective, affordable solution - and none more so than the Remeha range. With their proven high performance, exceptionally high efficiencies and ultra-low NOx emissions, they deliver on all fronts for lower operating costs and a reduced carbon footprint. They are versatile too, with outputs from 8.9 to 1303kW and a flexible design that lends itself to quicker, easier installation solutions, making them the number one boiler of choice.

Reliability, minimum disruption and energy savings for historic Abbey Hotel

When the time came to refurbish the heating system at the Grade II listed, 18th century Abbey Hotel in Bath, four Remeha Gas 210 Eco Pro 5-section boilers were specified to replace the ageing heating plant in a complete redesign of the plant room. Thanks to the compact dimensions and back-to-back installation design of the Gas 210 Eco Pro, Glenn Fry of Neptune Building Services in Gloucester was able to configure the plant room layout to accommodate the high-efficiency boilers in the restricted space during a high occupancy period of 95% with no discomfort to the guests.

> **WE RECOMMENDED REMEHA BOILERS BOTH FOR THE RELIABILITY AND HIGH EFFICIENCIES OF THE PRODUCTS AND FOR THE EXCELLENT SERVICE THE REMEHA TEAM OFFER THROUGHOUT THE PROJECT.**
>
> SCOTT MORGAN, DIRECTOR, PHD MECHANICAL LTD

Mr Glenn said "As a result of this refurb, the hotel stands to make realistic energy savings in the region of 40% which equates to up to £10,000 annually."

Reliable, constant temperature and £7,000 energy savings for Aspire Leisure Centre

Sometimes, maintaining the correct temperature is an essential safety requirement rather than a preference. Take Aspire Leisure Centre in Middlesex. This leisure facility is run by the spinal injuries charity Aspire in the grounds of the Royal National Orthopaedic Hospital in Stanmore. When the nine existing boilers required replacing, reliability was of the essence in order to maintain the water temperature at a constant 31°C for the safety of the users. Heating contractors PHD Mechanical Ltd recommended installing seven Quinta Pro 115kW replacement boilers in cascade. This not only overcame the space constraints in the restricted plant room but provided an effective solution to accurately matching the heat output demand and the need for greater reliability. The changeover was completed in one day with no disruption to the centre. Since installing the Remeha boilers, the pool has remained at the correct temperature with plenty of hot water for showers. The Aspire Charity has benefitted from energy savings equating to £7,000 in just six months.


Aspire Leisure Centre

> **THE KEY AIM OF THE HOTEL OWNERS WAS TO DELIVER EFFECTIVE, RELIABLE HEATING AND HOT WATER THROUGHOUT THE HOTEL WITH MINIMUM DISRUPTION. THE REMEHA BOILERS, WHICH HAVE A REPUTATION FOR RELIABILITY AND QUALITY, ALLOWED US TO DO JUST THAT.**
>
> GLENN FRY, NEPTUNE BUILDING SERVICES, GLOUCESTER

Remeha Commercial – setting the standard for excellence and reliability.

If you have a project you'd like us to look at, call us on 0118 978 3434 or email us at boilers@remeha.co.uk

www.remeha.co.uk

remeha commercial

Telephone: 0207 880 7633 **Email:** Greg.Lee@redactive.co.uk

Mikrofill provides LPHW equipment at Premier Inn

Conveniently situated just off J16 of the A1(M), in Peterborough, is a beautifully presented Premier Inn hotel that is benefiting from a huge programme of redevelopment.

Front-of-house improvements include a new restaurant, coffee shop and bar area, and there has been serious investment in plantroom technology. The existing oil-fired plant made way for the installation of two LPG Ethos FS350 boilers and indirect HWS Extreme loading cylinders. The stainless steel condensing boilers provide a collective output of 686kW at 80/60°C, a seasonal efficiency in excess of 95% and NO_x levels of 31mg/kW.

As well as generating heat for the hotel's 99 bedrooms and numerous conference suites, the boilers provide LPHW to a bank of three Extreme loading cylinders. The functionality of these ensure the boilers maintain condensing mode, while each cylinder produces more than 2,500l/hr at 60°C.

The installation was carried out by experienced building services contractor Pipetech Mechanical.

● **Call 03452 606020 or visit www.mikrofill.com**

Wroxall Abbey gets new HWS solution from Mikrofill

Dating back to the 12th century, and once the country seat of Sir Christopher Wren, Wroxall Abbey is one of the most beautiful luxury hotels in Warwickshire.

Given the hotel's high demand for domestic hot water, the decision was taken to improve the circuit's performance and efficiency. Based on previous product experience, Heatek Building Services proposed to remove the existing direct-fired units and install numerous indirect Extreme loading cylinders. The Extreme combines the advantages of both an instantaneous hot-water heater and storage system, ensuring condensing boilers operate at their maximum efficiency.

The 85-bedroom hotel now benefits from the Extreme's hot-water production, which is more than 4,700 litres an hour and 1,200 litres over a 10-minute period at 60°C. The cylinders also feature an on-board pasteurisation function to encourage a healthier hot-water system.

The Extreme is constructed from stainless steel and is available in 200-, 300- and 500-litre formats, all of which have a maximum primary input of 120kW, producing a continuous secondary flow in excess of 34 litres a minute, at 60°C.

● **Call 03452 606020 or visit www.mikrofill.com**

Long-life boiler gets upgrade at the Radisson

Atlantic Boilers, of Lancashire, has supplied a new Class 5, low-NO_x condensing boiler to the Radisson Blu Hotel, in Portman Square, London, to replace its existing system, installed 30 years ago. In the 1980s, the 272-bedroom hotel – in the heart of the city's West End – installed six of the first ever condensing boilers in the UK, supplied by Atlantic Boilers. Not only were these boilers highly efficient, but they continue to operate after three decades.

The new G Series Optimigas boiler has been added to the boiler plant, which serves the bedrooms, restaurant, conference rooms and gym at the hotel. It was installed by GLP-HVAC Installations & Facilities, of Southend-on-Sea. The latest technology includes a low-NO_x, pre-mix modulating burner and results in further fuel savings of up to 15%. The G Series has a net calorific value (NCV) efficiency of up to 98%, Class 5 low NO_x, as per EN656, and the added benefit of being a dismantled version for boiler rooms with difficult access.

● **Call 0161 621 5960 or visit www.atlanticboilers.com**

CIBSE BUILDING PERFORMANCE AWARDS 2016

In association with: CIBSE JOURNAL

Recognising the people, products and projects that demonstrate engineering excellence in the built environment

BOOKINGS OPEN FOR THE AWARDS DINNER

WINNERS ANNOUNCED ON WEDNESDAY 24 FEBRUARY 2016 GROSVENOR HOUSE HOTEL, LONDON

- Celebrate excellence and achievements in building performance
- Secure a front row seat with a Gold table package
- Network with more than 700 awards dinner guests
- Try your luck at the charity casino
- Be entertained by our host Louise Minchin, Journalist and Presenter

SHORTLIST ANNOUNCED:

3 November 2015

BOOK NOW
www.cibse.org/bpa

Awards host Louise Minchin

FOLLOW US:
@CIBSEAwards | #BPA2016
www.cibse.org/bpa

Headline sponsor: Imtech

Sponsored by: Andrews Water Heaters, b-a-r beeby anderson recruitment, GB Gratte Brothers, Remeha commercial, RS, Space Air Daikin, Spirotech, Vaillant Commercial Systems

For sponsorship enquiries please contact jim.folley@redactive.co.uk or 020 7324 2786


“When the ref
said early
bath, I wasn’t
going to argue.”