CIBSE JOURNAL

CPD SPECIAL

# CPD DIRECTORY

The latest company listings from CIBSE

**Two new CPDs:**

**Delivering effective ventilation systems**

**Employing heat pump-augmented MVHR**

# Ventilation Solutions

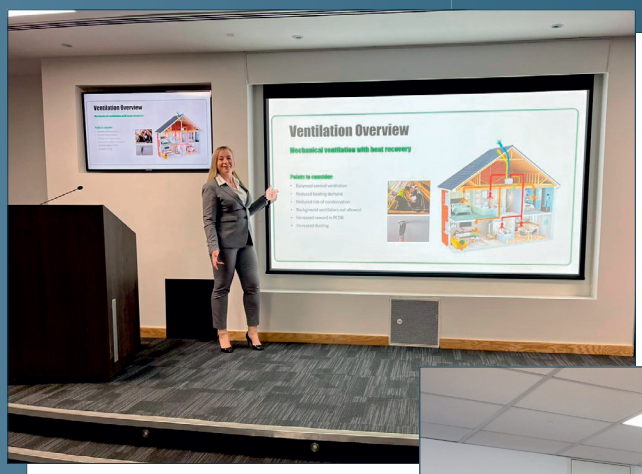
**Titon Ventilation Systems Division offers an array of CIBSE accredited Continuing Professional Development (CPD) courses for the residential ventilation market.**

Supporting specifiers, housebuilders and developers, Titon is able to offer guidance on understanding the importance of ventilation and offer expert advice for any residential application.

Titon has qualified and trained CPD presenters with many years of experience in the ventilation industry, so you can be assured of receiving the highest quality CPD presentations and seminars.

Titon's expert team can come to visit your offices or alternatively conduct our courses online. Should you wish to book a CPD presentation please contact Titon on:

**t**: 01206 814879 **e**: marketing@titon.co.uk **w**: www.titon.com/cpd





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We're exhibiting at the UK's leading construction show
Come to stand **E39** and meet our specialist ventilation team

Titon® ventilation systems

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# The evolution of the CPD Panel

The CPD Panel has had another busy year assessing submissions to the Directory of Course Providers. This is a continuous process that covers both new applicants and renewals.

The panel has also had to look at CPD policies. These are steered by the standards set down by the Engineering Council (EC) and the panel has to take into account regional requirements. There have been recent developments that have required careful consideration.

The audit of members' 2021 CPD records is once again under way and feedback is being given to those whose records were selected this year. Early in 2022, we introduced the new CPD recording system – mycareerpath – that allows users to reflect upon their activities. As this system comes direct from the EC, it helps us and, more importantly, our corporate members.

We hope this will ease the path followed by our members to obtaining EngTech, IEng and CEng status. We also implemented a policy requiring members to reflect on at least two activities every year and have committed to introducing more sustainability related CPDs in the near future.

Initial results from the current audit suggest that the new system is simpler to use and new policies are being followed. With this evolution towards mandated elements of CPD records comes a responsibility for the panel to make sure that the standards of assessment, and appropriate subject material, continue to develop the CIBSE Directory of CPD Course Providers.

The panel needs experienced members from right across the engineering spectrum. I joined more than 12 years ago and it is now time I moved on to allow younger people to take the panel forward. I am stepping down as chair and handing that baton on to Stephen Page.

We have increased the size of the directory substantially, and the annual audit has also been increased significantly to the current 10% of corporate members. Important decisions have been made regarding policy, and we have adapted these to account for regional requirements.

The panel, and its roles, are seen as a vital service for our members in the pursuit of knowledge and experience. I am proud of the progress we are making and the work done by all those associated with the CPD Panel, including our diligent sub-panellists. Thank you to all of you.

**JOHN ASTON FSLL, chair CPD Panel**

# Why CPD is more important than ever

I first became a member of CIBSE's CPD Panel in the spring of 2013. In that time, I've seen many developments, including the annual CPD audits of our members and the introduction of the sub-panel. After chair John Aston made the decision to step down, I decided to lead by his example and commit to taking the position of chair in 2023.

The CPD Panel review the presentations submitted by the industry to gain our 'approval'. We make sure our feedback ensures a CPD presentation has clear learning objectives and is not promoting a product.

The importance of CPD cannot be understated; it increases our competence and professionalism as practising building services engineers. Maintaining CPD records and discussing CPD activities with peers are great examples of reflective practices that help embed knowledge. At my company, Atkins, we agreed to webinars being recorded, so anyone in our team not available can watch the presentation later.

The panel's next step is to consider how we better inform and promote the learning around two major subjects in the industry: building safety and sustainability.

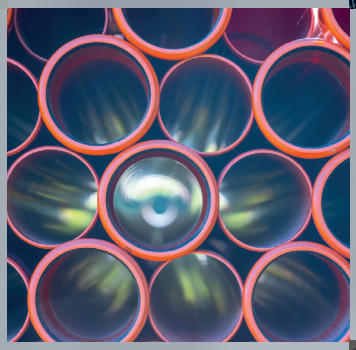
The Building Safety Act 2022 received Royal Assent on 28 April this year, bringing radical changes within our industry. It is worth reading up on the new Building Safety Regulator and how the golden thread will affect you.

In addition, we are all acutely aware of the impacts of climate change and must all strive to reduce our impact on the environment.

**STEPHEN PAGE MCIBSE, vice-chair CPD Panel**

For a list of all companies on the CIBSE CPD Directory, visit **www.cibse.org/cpddirectory**

***CIBSE Journal* has more than 200 CPD modules available to complete at www.cibsejournal.com Our website makes it easier than ever to continue your professional learning online**



# CIBSE CPD DIRECTORY

## This directory lists all the accredited organisations providing modules on a range of areas, including electrical, fire, lighting and sustainability

All the CPD courses in this directory have been approved by CIBSE. They are reviewed and assessed to ensure that the technical content is of a high standard and offers valuable CPD to delegates.

The directory of CPD course providers has been compiled to assist members of the Institution in identifying suitable courses in respect of their CPD needs.

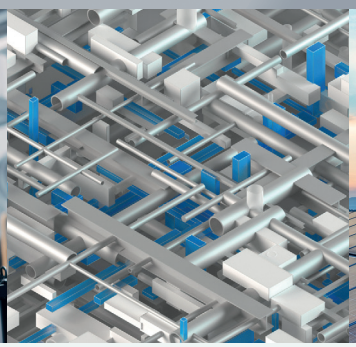
The directory embraces many different areas suitable for CPD and will continue to be updated to incorporate new entries and revisions.

Members of CIBSE are required by the Code of Professional Conduct to maintain their professional competence, but this should also apply to any professional working in the industry.

The directory will help you find suitable CPD to assist with your ongoing career development.

For guidance on what constitutes as different CPD activities and how to go about recording your CPD, visit **www.cibse.org/cpd**

Here you will find CIBSE's online portal – mycareerpath – which lets you record your CPD in one place and link your progress to set objectives.



## 2G Energy

**Phone: 01928 718533**
**Email: sales@2-g.com**
**Web: www.2-g.com**

2G Energy are a leading manufacturer of Combined Heat & Power (CHP) systems, producing and installing thousands of CHPs worldwide. Specialists in the supply of high-efficiency CHP systems for natural gas, biogas and hydrogen, with a power range between 20 and 4,500 kilowatts.

It is widely known that hydrogen as a fuel source provides one of the most viable pathways to a net zero world. It is possible to ensure the energy supplied is net zero by changing the gas input to green hydrogen. 2G Energy has been installing and operating 100% hydrogen CHPs worldwide since 2012, providing large proportions of an organisation's electricity and heat, while helping them reach their net zero goals.

Learn about how our pioneering technology works and how our technology has helped industry reach net-zero by signing up for our live and virtual hydrogen CPD approved by CIBSE. Email or call us directly to arrange a time suitable for you.

## ACV Heating UK

**Phone: 01383 820100**
**Email: uk.sales@acv.com**
**Web: www.acv.com/gb**

ACV has been designing, developing, manufacturing and distributing heating and hot water products for commercial and residential heating since 1922. It specialises in stainless steel products and is home of the patented tank-in-tank concept, which gives a safe, clean and reliable domestic hot water performance to match the largest of hot water demands. The company's motto 'Excellence in hot water' is not only reflected in its product range, but also in its technical support.

While heating requirements have decreased over the years, the demands of modern life have increased the need for a reliable, but economical and environmentally friendly, hot water supply.

ACV has been delivering CIBSE-accredited CPD seminars for many years, sharing its specialist hot water knowledge. Its course – **Domestic hot water (DHW) sizing principles** – looks at the disparity that can be found between hot-water sizing guides, and is suitable for anyone involved in the management of hot water in commercial buildings, including consultants, contractors, public health engineers and specifiers.

Previous course attendees said: 'Thorough overview of industry standards'; and 'very informative and useful content. The calculations shown were very useful.'

## Advanced Air UK

**Phone: 01842 765 657**
**Email: sales@advancedair.co.u**
**Web: advancedair.co.uk**

Advanced Air have been designing, developing, manufacturing, and distributing fire safety and air distribution systems for over 35 years. We're passionate about our industry, and love sharing our insight, knowledge, and ideas.

We offer two CIBSE-accredited CPD seminars – available in-person or online – ideal for construction contractors, specifiers, installers, and other industry professionals.

- **Fire & Smoke Damper Legislation, Installation and CE Marking**
  Covering fire dampers under BS EN15650/EN1366-2, smoke dampers under BS EN12101-8/EN1366-10, and an in-depth look at classification codes
- **Electronic Pressure Independent Control in Fan Coil Units**
  Covering motor technology, ECM vs Epic, the benefits of pressure independence in FCUs, and hints towards better FCU system design.

## AIC Heating UK

**Phone: +44 0300 303 4169**
**Email: sales@myaic.co.uk**
**Web: myaic.co.uk**

AIC are specialists in stainless steel and offer a complete range of commercial heating and hot water products up to 840kW output from a single boiler. This can be cascaded for higher output projects.

AIC also manufactures fully stainless steel hydraulic cascade systems up to 900kW to compliment the Nesta Chrome wall-hung boiler.

AIC Boilers and water heaters are built around our stainless steel fire tube heat exchanger, which have been designed and manufactured in-house.

The design ensures highest efficiency and reliability, and achieves NOx class 6 with high modulation ratio.

AIC have introduced a hybrid heat pump system including the unique Thermal Management Unit (TMU), which has been added to the product portfolio to help decarbonise existing buildings.

We can offer a CIBSE accredited presentation on firetube technology, which also explains why we exclusively use stainless steel in our heat exchangers.

# CPD PROVIDERS

For a list of all companies on the CIBSE CPD Directory, visit **www.cibse.org/cpddirectory**

## Airedale by Modine


■ **Phone: 0113 2391000**
**Email: connect@airedale.com**
**Web: airedale.com**


At Airedale by Modine we offer a choice of free-of-charge, hour-long, CIBSE-approved CPDs, covering a wide range of legislative, environmental and technological topics relating to cooling, ventilation and general HVAC.

We have significant experience in the data centre, healthcare, pharmaceutical and telecoms industries and our courses are suited to consultants and engineers in the HVAC industry, or looking to join the industry.

Delivered by our experienced HVAC engineers, we are able to tailor courses to specific needs and can offer a mixture of practical and theoretical courses. We also offer all of our courses remotely. We have listed below a selection of our most popular courses, but feel free to contact us to discuss your needs:

- **F-Gas**
- **HTM 03-01 (2021) – revised guidelines**
- **Energy efficient design of air handling units**
- **Optimising variable primary chilled water systems in data centres**
- **Eco design: chillers and Tier 2**
- **Data centre chiller design/optimisation**
- **BS EN 1886: 2007: testing and classification criteria**

## Airsys UK


■ **Email: enquiries@air-sys.uk**
**Web: air-sys.uk**


Airsys UK, specialists in energy-efficient air conditioning technology, are pleased to offer their CIBSE-approved CPD covering free-cooling technologies for data centre and telco environments.

We provide an overview of the free-cooling options available for cooling IT facilities, ranging from remote telecoms sites through to server rooms and data centres. We provide a descriptive of the energy savings available for legacy and new-build facilities when using each type of system. We also give an overview of various system designs, their benefits, and predictive pPUE figures, to enable the best-fit solution for each situation.

Established in 1995, Airsys is a market-leading solutions provider for the telecoms, data centre, medical and utilities sectors, who think globally, but act locally. We deliver innovative, high-efficiency precision control thermal solutions.

With over 25 years' experience, combined with multiple manufacturing facilities and offices globally, Airsys are able to provide high-quality, complete cooling solutions, including design and consultation; installation; commissioning and maintenance.

If you're interested in booking onto our Free-Cooling Technology CPD, please contact us directly.

## Andel


■ **Phone: 01484 845 000**
**Email: help@andel.co.uk**
**Web: andel.co.uk**


Andel is an environmental company at the cutting edge of water, oil and gas resource control and management within the built and natural environments. Founded in 1992, Andel has steadily grown to become one of the global market leaders in specialist leak detection, flood defence, environmental protection and water sustainability solutions.

Andel provides a range of innovative, sustainable and cost-effective products to both the UK and overseas markets with international exports growing year on year and accounting for a significant proportion of total sales.

Andel offers two free CIBSE-approved CPD seminars:

- **Water and oil leak detection**
- **Gas leak detection**

Andel leak detection systems are the 'de facto' standard for many engineering consultants, architects and specifiers. This puts Andel in an excellent position to provide sound advice and support for any project that requires sustainable leak detection and alarm systems. A one-hour presentation over the course of a lunch break via Microsoft Teams will show the different technologies and techniques for sustainable leak detection to prevent damage, disruption and loss. The courses are ideally suited to groups of between five and 20 people.

## Armstrong Fluid Technology


■ **Phone: 0161 223 2223**
**Email: uksales@armstrongfluidtechnology.com**
**Web: armstrongfluidtechnology.com**


Armstrong Fluid Technology is a leading global player in HVAC. It designs and manufactures innovative fluid flow equipment and high-efficiency energy solutions for a broad range and scale of applications, including district energy, data centres, fire systems, gas transmissions, high-rise, and mixed commercial buildings.

The company's solutions deliver optimum lifetime building performance combined with the lowest first cost and life cost. Armstrong is committed to helping building owners, consultants, specifiers and energy managers find low-cost solutions for reducing energy consumption and carbon emissions within their portfolios. Its expertise comes from an understanding of end-to-end fluid systems and the integration of fluid dynamics, heat transfer, variable speed and demand-based controls, which is the focus of its CIBSE-approved CPD programmes:

- **A whole-life sustainable approach to pump and equipment selection without compromising on redundancy**
- **Meeting the needs of the building life-cycle through innovative approaches to variable speed pumping in HVAC systems**
- **Pump basics and variable speed pumping**

The company can provide free, one-hour 'lunch and learn' sessions at your offices or at any of its UK sites.

## Arrow Valves


**Phone: 01442 823123**
**Email: marketing@arrowvalves.co.uk**
**Web: arrowvalves.co.uk**

Arrow Valves manufactures and distributes innovative water-associated products designed to conform to the requirements of the latest water regulations. All of its team are BPEC qualified in water regulations, and its resident experts – Adrian Reeve and Richard Medlicott – have combined knowledge spanning more than 20 years in the industry.

During the free Arrow Academy training days, Arrow Valves delivers its two CPD-accredited **Water Regulations** and **Heating** seminars on rotation. In-house attendees also benefit from a factory tour and product demonstrations.

The seminars have been adapted for Zoom to keep everyone safe and comfortable during the pandemic. Alternatively, the seminars can be delivered free of charge from the comfort of your own offices.

Both seminars explore system design: the Water Regulations seminar covers interpretation and backflow prevention selection, while the Heating seminar covers hot water efficiency and safety.

## Baxi Heating


**Phone: 0345 070 1055**
**Email:commercialmarketing@baxi.co.uk**
**Web: baxi.co.uk**

Baxi Commercial Solutions is a sustainable business, committed to supporting the energy transition towards a zero carbon economy. It advocates a collaborative approach, focusing on high-efficiency residential and commercial heating and hot-water solutions that meet customers' needs.

The company offers a range of CIBSE-accredited CPD seminars to enable building services professionals to continue to develop their knowledge and gain invaluable CPD hours and points. Its seminars can be held on Microsoft Teams, at customer premises, or at one of Baxi Commercial Solutions offices.

The series includes:

- **CHP (combined heat and power) commercial buildings**
- **Road to net zero – heat pumps**
- **Hot water generation for commercial and industrial applications**
- **Plant room surveying – replacement and enhancement**

## Belimo


**Email: sales@belimo.co.uk**
**Web: www.belimo.com/uk**

Belimo is the global market leader in the development, production and marketing of actuator solutions for controlling heating, ventilation and air conditioning systems.

Sensors in HVAC Systems:

- **Sensor types used in HVAC systems**
- **Sensor connection & installation**
- **Temp/rel hum/$CO_2$/VOC/pressure/velocity/flow**
- **Sensor fundamentals**

Fire dampers in HVAC Systems:

- **Role of fire dampers**
- **Legislation, standards & testing requirements**
- **Fire Damper, demonstration of operation**
- **UK market situation**
- **Benefits of motorised fire dampers**

Evolution of pressure independent control valves:

- **The change from constant speed pump/control**
- **PICV, mechanical and new electronic versions valve systems to variable speed pumps/PICV**
- **Benefits of PICV and motorised fire dampers**
- **Temp/rel hum/$CO_2$/VOC/pressure/velocity/flow**
- **Cloud-based services & IoT**
- **Delta-T management ultrasonic**
- **Temp/rel hum/$CO_2$/VOC/pressure/velocity/flow**

CPD seminars can be held online or at a company's premises. Suitable for graduate to senior level staff.

## Carrier Commercial HVAC


**Phone: Paul Stack 07423 005 209**
**Email: paul.stack@carrier.com**

Carrier is a global leader in the design and manufacture of innovative HVAC solutions. In the UK the Commercial HVAC business is represented by two market-leading brands, Carrier & CIAT, suppling air conditioning, heating & air handling equipment solutions and support services. Willis Carrier invented modern air conditioning 120 years ago, launching an industry that would fundamentally improve the way we live, work and play. CIAT has over 80 years of expertise in manufacturing air handling solutions for the commercial, residential, healthcare and industrial sectors. Through Carrier & CIAT we offer a wide range of hydronic & airside CPD courses covering topics such as:

- Application & design of heat pumps, chillers,
- FCU & AHU indoor air quality,
- HVAC industry legislation.

All our presenters have a wide knowledge base and experience in the HVAC industry to enable them to deliver our range of CIBSE-approved CPDs with a consistent high quality delivery of the material.Our CPD material is regularly reviewed to make sure they continue to be engaging, of the latest relevance to the industry subject matter we are presenting and support learning to enable attendees to achieve the highest levels of information retention.

# CPD PROVIDERS

For a list of all companies on the CIBSE CPD Directory, visit **www.cibse.org/cpddirectory**

## Condair

- **Phone: +44 (0)1903 850200**
  **Email: uk.sales@condair.com**
  **Web: condair.co.uk/CPD**

Manufacturer of commercial and industrial humidity control systems, Condair is offering a selection of three CIBSE-approved CPD training sessions – either face-to-face, in a client's office, or via an online presentation.

The three CPD seminars are:

- **Humidification and psychrometrics** – offering an overview of humidification, an explanation of psychrometric calculations, and detailed analysis of humidifier product selection, demonstrating the pros and cons of each technology.
- **Dehumidification and drying psychrometrics** – covering dehumidification processes and calculations using a psychrometric chart, an explanation of dehumidifier types and technologies, product selection and sizing information, and a comparison of different technologies.
- **Using humidifiers for evaporative cooling in AHUs** – learn the psychrometrics of evaporative cooling, the benefits and limitations of using evaporative cooling in AHUs, and the three main AHU evaporative cooling strategies. Also analyse the energy consumption figures behind three real-life case studies, and compare the different technologies available.

## Dehn UK

- **Phone: Sean Passant or Robin Earl on 01484 859111**
  **Web: dehn.co.uk**

Dehn UK offers a wide range of lightning protection, surge protection and safety equipment, all meeting the high requirements of BS7671 and *BS EN 62305 Lighting Protection Standards*. Lightning risk assessments, designs and site surveys to meet relevant standards for accredited designers and Compex trained personnel.

Dehn UK now offers CPD on surge and lightning protection to upskill attendees and remain up to date on the latest changes to the standards. CPD can be delivered on site or via MS Teams online.

The Dehn UK office also has a dedicated training academy to offer a hands-on interactive experience and a chance to meet the experts from several standards committees. The two main seminars are up to four hours long covering BS7671 and BS EN 62305 all four books, with a shorter seminar covering lightning as a source of ignition for owners and operators of ATEX /COMAH sites.

## Delmatic

- **Phone:020 3184 2000**
  **Email: cpd@delmatic.com**
  **Web: delmatic.com**

Delmatic are international suppliers of advanced lighting management systems that reimagine and redefine lighting control. Delmatic's smart solutions mesh wireless and wired devices across physical or cloud networks, continuously monitoring, analysing and optimising lighting and connected building services performance.

Systems are designed to conserve energy, enhance sustainability, increase comfort, simplify installation, reduce capital and operational costs, and make advanced controls intuitive and accessible to all.

Delmatic offer a selection of CIBSE-approved CPD modules ranging from an overview of lighting management to focus sessions that provide in-depth study of topics, technologies and their application. Topics include:

- **Overview of lighting management**
- **DALI-2 technology, features and application**
- **DALI-2 emergency light testing and monitoring**
- **Smart, integrated solutions**
- **Graphical management and monitoring**
- **System architecture and application**
- **IOT, wired, wireless and mixed-mode solutions**
- **DALI-2 application: buswire/broadcast/wireless**
- **Open systems and interoperability**
- **Biodynamic tuneable-white control**
- **Heat maps, and spatial occupancy mapping**

## Domus Ventilation

- **Phone: 03443 715523**
  **Email: megan.bennett@domusventilation.co.uk**
  **Web: domusventilation.co.uk**

Established more than 30 years ago, Domus Ventilation manufactures high-quality and solution-based ventilation products for the domestic and light commercial building industry.

At the heart of the company's product range are high-performance mechanical ventilation systems, including HRXE-HERA and HRXE-AURA mechanical ventilation with heat recovery (MVHR) and the energy efficient CMX mechanical extract ventilation (MEV) units, which boast the best specific fan power on the market.

Domus Ventilation is also renowned for its award-winning ducting systems, which offer improved system performance through their exacting tolerances and engineered fit, which minimise pressure drops and virtually eliminate air leakage.

The company's reputation for quality products is further enhanced by excellent technical support from a dedicated, in-house team offering a range of services – from duct take-offs and estimations, to Revit MVHR and MEV system drawings – all free of charge.

Domus Ventilation also provides a detailed Specification Guide and offers several CIBSE-accredited CPD courses, including **Residential ventilation principles and building regulations**.

## Fujitsu Air Conditioning


**Phone: 02087313450**
**Email:sales@fgac.fujitsu-general.com**
**Web: fujitsu-general.com**

Fujitsu is a global leader in design and technology. It manufactures a broad and innovative range of heating, ventilation, air conditioning, close control and chiller systems for residential and commercial environments.
**Multi-split systems** – Fujitsu has continued to build on its line-up, with 2, 3, 4 and 5-unit R32 multi-split systems, allowing control of several indoor units with one outdoor, and offering a large selection of indoor finishes.
**Fourth-generation VRF** – applications for its VRF systems include high-end residential, light commercial and larger commercial, ranging from small offices and schools to hotels. Fujitsu's VRF systems are versatile and reliable, and recent installations include the Hoover Building in West London and HMS Belfast on the river Thames.
**Applied Products** – the company offers cooling systems for technical applications such as server rooms and telecommunication plants. It provides energy efficient inverter-controlled DX and chilled water close-control units, with dual fluid and dual circuit options, along with free cooling. It also has a range of air handling units and air-to-water systems that are highly dependable for sustainable solutions.

Fujitsu provides services that allow users to control their air conditioning systems from their smartphones.

## Hamworthy Heating


**Phone: 01202 662500**
**Email: enquiries@hamworthy-heating.com**
**Web: hamworthy-heating.com/CPD**

Hamworthy Heating is a British manufacturer of energy efficient heating and hot water solutions to commercial buildings of all shapes and sizes across the UK. Since introducing the concept of modular boilers in the 1960s, the company has been at the forefront of the commercial heating market. It is committed to sharing its industry knowledge, expertise, and best practice to support plant rooms of today and the future. All Hamworthy CPD presenters have years of experience in the HVAC industry and all relevant professional qualifications.
Hamworthy Heating offers the following CIBSE accredited CPD courses:

- **Boiler controls – unwiring the jargon**
- **New Boilers on old heating systems: hydraulic design – a story of separation**
- **Best practice heating and hot water plant refurbishment**
- **Domestic hot water (DHW) best practice**
- **Energy saving in commercial heating and hot water: could you save a £million?**

Previous course attendees said: 'A lot of data and information covered in a short space of time ,which was executed very well by the speaker'; and 'very good; one of the best sessions I have been to.'

## Herz Valves


**Phone: 01483 502211**
**sales@herzvalves.com**
**Web: herzvalves.com**

Herz have been providing innovative solutions in the heating and cooling market since 1896 and have a full range of energy efficient products suitable for domestic, heating and chilled systems.
Herz have a range of CIBSE-accredited CPD seminars which can be presented either at a client's office, online or at the Herz office:

- **Balancing and commissioning in HVAC systems** Covering the first principles of Flowrate, pressure, resistance, pressure distribution and pump sizing. The application and selection of commissioning valves and the method of proportional balancing. Balancing DWH Systems, minimising Legionella risk and the application of thermal balancing valves.
- **Energy efficient balancing in variable volume systems** Covering valve authority and the effects on control valves. Bypasses, differential pressure effects and the application and benefits of DPCVs and PICVs in variable volume systems.
- **Heat Interface Units** The modern solution for apartment heating and domestic hot water services – covering the applications, uses and benefits of HIUs.

## Ideal Heating


**Phone: Richard Brown, head of specification sales, 07718 192161**
**Email: richard.brown@idealheating.com**

Ideal Commercial boilers is the UK's market leader of high efficiency commercial heating solutions. Operating from our Hull manufacturing plant and offices since 1906, we are one of the few true British manufacturers left in the heating industry. We offer a range of accredited CPDs.

**The Plantroom Survey CPD** Introduction to the various stages involved in surveying a plantroom. With particular focus on surveys for retrofit boiler installations, including access, risk assessments, pre-survey checks, and information on the best practice of commissioning.

**The Commercial Boiler Heat Exchanger Material CPD** Covering the history of boiler heat exchanger materials; why choosing the correct heat exchanger material is important; the performance and characteristics of aluminium and stainless-steel heat exchangers; and the importance of water treatment, system protection and proper commissioning.

Both CPDS are designed for mechanical and electrical engineers, building services engineers, building contractors and consultants.

# CPD PROVIDERS

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## Jaga UK

**Phone: 01531 631 533**
**Email: cpd@jaga.co.uk**
**Web: jaga.co.uk/cpd**

Jaga UK is the go-to company for dynamic heating and cooling convectors that optimise renewable energy. Providing high outputs with low flow temperature systems, Jaga's compact, energy-efficient emitters are the perfect heat pump partner. Jaga runs three free CIBSE accredited CPD seminars delivered in-person or via Teams:

- **Emitters: Considerations for Low Flow Temperature Heating (1 hour) – NEW FOR 2022** Launched in response to England's Building Regulations uplift, which stipulates a maximum flow temperature of 55°C for new and replacement wet space heating systems, this seminar offers guidance on selecting efficient heat emitters for heat pumps and low-temperature systems and avoiding large radiators.
- **Design and Specification of Trench Climate Convectors (1 hour) – NEW FOR 2022** This seminar covers the theory behind the design and specification of trench convectors for heating, cooling and ventilation. You'll learn the types of trench available, how they work, their applications, and how to select the right unit.
- **Ventilation in Schools (1 hour) – UPDATED FOR 2022** In light of the Covid-19 pandemic, this seminar outlines the importance of maintaining effective ventilation in schools, universities and other educational settings, the legislation around indoor air quality and the various ventilation solutions available.

## Kohler Uninterruptible Power

**Phone: 01256 386700**
**Email: uksales.ups@kohler.com**
**Web: kohler-ups.co.uk**

Kohler Uninterruptible Power (KUP) has extensive knowledge and experience of designing, specifying, configuring, installing, commissioning and servicing power protection solutions across a wide range of applications. It offers a number of free 'lunch and learn' technical seminars – aimed at consultants and electrical engineers – that can be held at a client's site or virtually. KUP also runs full-day UPS Training Academy courses across the UK, which are free to attend and CPD-certified. These are suitable for graduate engineers and those looking to refresh their knowledge of UPS. The courses are designed to improve understanding of the most recent power protection specification and selection requirements, and the latest technology available, while also offering invaluable CPD hours and points. Available lunchtime CPD modules include:

- **Designing resilient UPS systems**
- **True N+1 with DPA UPS systems**
- **Configuring a UPS battery system for resilience**
- **Configuring a UPS system – checklist**
- **UPS – fault clearance and neutral earthing**
- **How does a UPS react to a downstream fault**
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- **Earth leakage and UPS monitoring**
- **Remote Monitoring & Management**

## Lifescience Products

**Phone: 01608 811707**
**Email: info@lifescience.co.uk**
**Web: waterking.co.uk**

Lifescience Products are the industry experts in non-chemical hard water treatment technologies. Its accredited training seminar combines more than 20 years of R&D with real-world experience of the building services industry as manufacturer and distributor of the market leading Water-King range of water conditioners, Lifeline UV Disinfection systems, Leak-King leak detection equipment, flow controls and the Nova-Flo flood prevention device. The course provides an impartial and detailed insight into a field of technology that's often misunderstood.

Attending the 45 minute seminar should provide all of the information a public health engineer, mechanical engineer or plumbing contractor needs to specify and install a non-chemical hard water treatment device with confidence. The Various Methods of Water Treatment Including Physical Water Treatment presentation covers:

- **Hard water and its chemistry**
- **Requirements of Part L and heating compliance guide**
- **Methods of Treatment**
- **The problem with hard water**
- **Testing and technological advances**
- **Summary**

Lifescience offer in person training seminars, remote virtual presentations, and e-learning modules on the Lifescience Academy. Call us now to book your presentation or for expert technical advice.

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**Phone: 01295 269981**
**Email: info@lochinvar.ltd.uk**
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Lochinvar manufactures and distributes a wide range of equipment for commercial and industrial heating and hot-water applications. The current product range includes heat pumps, solar thermal systems, gas-fired water heaters and boilers as well as associated ancillaries.

Lochinvar has provided CIBSE-accredited CPD seminars for many years, and its aim is to maximise the value to its audience by frequently reviewing and acting upon attendee feedback.

Current sessions include:

- **Heat pumps for commercial heating and hot-water and cooling applications**
- **Sizing and selection of direct gas-fired water heaters**

Lochinvar is working on new CIBSE-accredited CPD content to offer insight into the latest industry trends and technologies. Keep an eye on the training section of its website to sign up for existing sessions and be the first to know about new content. Visit **lochinvar.ltd.uk/training/cpd-seminars**

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**Phone: 01480 432243**
**Email: info@munters.co.uk**
**Web: munters.co.uk/ukseminars**

Munters' CIBSE-approved CPD seminar gives a comprehensive introduction to humidity theory and dehumidification. Learn about the impact of moisture, combating seasonal fluctuations and how to achieve the most cost-effective and energy-efficient climate solution for you or your customer. The seminar lasts approximately one hour and covers:

- **Dehumidification theory**
- **Methods of dehumidification and its benefits**
- **Introduction to the psychrometric chart**
- **Calculating moisture loads**
- **Energy-saving technology and applications**
- **Dehumidification in industry – case study examples**

Suitable for consultants, architects, specifiers, installers and industry professionals, delegates can choose to hold this seminar in person at their own office or at Munters' UK office in Wyboston, or online via Microsoft Teams. If delivered in person during a lunchtime, Munters can provide a free lunch (subject to conditions; ask for details).

## Socomec

**Phone: 0333 015 3002**
**Email: info.uk@socomec.com**
**Web: socomec.co.uk**

Regardless of industry or sector, everyone is now required to undertake CPD. The updating of skills and knowledge is vital for keeping abreast of industry changes, maintaining professional competence, and ensuring that qualifications do not become obsolete.

Socomec offers 10 comprehensive professional development seminars delivered by highly experienced critical-system application engineers. Hosted online via Microsoft Teams or at your offices for between four and 40 participants, the seminar takes about one hour, and delegates will receive an individual presentation pack and a certificate on completion. Topics include:

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- The benefits of Lithium Ion batteries in UPS application.
- Earthing and neutrals within transformer and transformer-less UPS
- Residual current monitoring
- Automatic transfer switch essentials
- General introduction to UPS system
- The benefits of Modular UPS Systems.

## Swegon

**Phone: 01634 981400**
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**Web: swegon.com/uk/**

At Swegon, we are passionate about helping you feel good inside by creating the best possible indoor environments. Our selection of CPD seminars will help you understand the importance of IEQ, alongside learning how to approach, plan, build and create the ideal indoor climate.

Swegon covers a range of CPD topics including:

- Smoke and fire
- Room units
- Cooling & heating
- Air handling
- Air distribution

Attending one of Swegon's free seminars contributes towards your CIBSE CPD requirements. To find out more about Swegon's accredited CPD modules, visit **swegon.com/uk/cpd**

## Systemair

**Phone: +44 7475 886642**
**Email: david.mcdermott@systemair.co.uk**

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- **Low energy air conditioning with indirect adiabatic cooling** – alternative methods of air conditioning that can reduce or eliminate the use of refrigeration-based cooling.
- **Residential ventilation and MVHR** – introduction to different types of residential ventilation systems and how they are designed and integrated into a building.
- **Swimming pool ventilation and heat recovery** – technical seminar suitable for mechanical and electrical services engineers designing swimming pool hall ventilation systems or carrying out energy surveys on swimming pools.
- **Data centre cooling** – direct and indirect free cooling and its benefits.
- **Passivhaus ventilation systems** – design and comparison of ventilation systems for Passivhaus buildings.

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# Delivering effective ventilation systems

## This module considers alternative methods of ventilation and a new generation of products that can deliver high levels of performance

The Ecodesign regulations for ventilation units provide the standards that are employed across the EU and the UK to determine whether a manufacturer's system can be formally marked as meeting reasonable levels of operating efficiency. Undoubtedly, these standards have encouraged developments in products so that they can meet requirements. However, an unintended consequence of universally applying such prescriptive rules is that it can restrict the acceptability of alternative methods and products that are able to deliver a higher level of performance. This CPD will explore how this can provide unexpected levels of performance from a new generation of ventilation units that may, on first inspection, not meet Ecodesign requirements.

In Great Britain and Northern Ireland, the Ecodesign for Energy-Related Products (ErP) Regulations 2010 are the underpinning legislation to set efficiency standards for ventilation units. EU regulation 1253/2014[1] implements Ecodesign requirements for ventilation units and enables products to be CE marked. The EU legislation provides the basis of the UK's post-Brexit requirements for the UK Conformity Assessed (UKCA) mark. (Until 31 December 2022, practically all EU-recognised, CE-marked, goods can continue to be placed on the market in Great Britain.)

The ErP requirements for non-residential applications of bidirectional VUs (BVUs) are defined by a reference model of being cased with internal intake and extract fans, a heat recovery system, a clean fine inlet filter and a clean medium filter on the exhaust-side, as illustrated generically in Figure 1. The EU regulations' most recent phase was implemented in 2018, as summarised in Table 1.

Key parameters in assessing the energy efficiency of ventilation units are the specific fan power (SFP – see boxout) and the thermal efficiency of the heat recovery device. The standard includes specific requirements for control and the heat recovery performance.

The shaded area of Table 1 (overleaf) is used to determine the limiting SFP for a unit. The electrical power input – including that used by any motor control equipment – is considered at the maximum flowrate in the manufacturer's declaration for the unit and is not the power marked on the fan nor, potentially, the power consumed at the best efficiency point for the fan. In the case of a BVU (such as in Figure 1), this would be the sum of both the supply and extract fan powers.

The efficiency bonus, E, in the BVU table is added to the total allowable SFP to provide an allowance for the additional pressure drop through the heat recovery device. The filter correction, F, is a value that is subtracted from the allowable maximum SFP if a BVU is missing one – or both – filters. Effectively this expects that the BVU will require the filters when it is installed. In some circumstances, this could be considered as a penalty for not »

### FAN POWER

**Specific fan power ($P_{SFP}$ or SFP) is a standardised measure of how much total power is required by the fan to move air through either the VU alone at set parameters, or the whole connected system, and is expressed variously as $W \cdot L^{-1} \cdot s^{-1}$, $kW \cdot m^{-3} \cdot s^{-1}$ or (multiplied by 1,000) as $W \cdot m^{-3} \cdot s^{-1}$.**

**Typically, SFP = (total electrical power, W)/(air volume flowrate, $m^3 \cdot s^{-1}$)**

» employing filters that may not potentially be needed in areas with good air quality.

The 'nominal flowrate' – $q_{nom}$ – is the 'declared design flowrate' so the manufacturer has the freedom to determine such conditions, depending on specific design choices (for example including or excluding a pressure reserve to overcome any 'clogging' as the unit becomes dirty). The 'nominal flowrate' is delivered at the maximum-rated fan speed.

These ecodesign requirements do not apply to VUs that operate below 30W power consumption per air stream or under special conditions, such as corrosive environments or high temperatures.

A greater level of heat recovery performance typically provides an increased pressure drop, owing to the narrower passages in the heat exchanger unit. This leads to a higher electrical energy use, for both the intake and extract fans. However, greater heat recovery performance will recover additional heat energy that can reduce space heating loads. The energy balance between both is – aside from system characteristics – strongly affected by climate.

In an effort to provide increased energy efficiency, hybrid ventilation systems have been developed that integrate both natural and mechanical ventilation modes. These employ high-efficiency fans and optimised, segregated, automatically switchable internal air paths designed to benefit from maximising the application of natural ventilation, hybrid-mixing ventilation and low-energy mechanical ventilation with heat recovery. These include low pressure-loss heat exchangers to utilise space heat gains to temper incoming outdoor air. The heat exchanger trades thermal effectiveness for a low pressure drop, as illustrated in Figure 2.

During the summer months, hybrid ventilation – such as the example of Figure 3 – employs the fan to boost the natural ventilation and optimise indoor comfort. During winter, the hybrid system mixes warm internal air with outdoor air to deliver mixed tempered air, and can also utilise the heat recovery function to save energy. The mechanical ventilation combines with openable windows to expel stale air and ventilates the space with outdoor air.

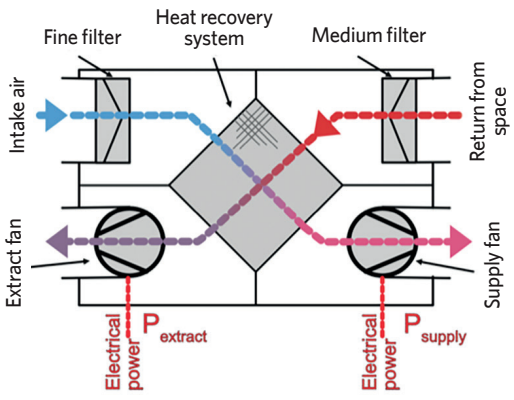


**Figure 1: Sketch of generic bidirectional ventilation unit (BVU)**

| ErP stage | | | ErP 2018 |
|---|---|---|---|
| Variable speed drive fan | | | Required |
| Filter pressure switch | | | Required |
| Heat recovery system (HRS) with thermal bypass facility | | | Required |
| Minimum required thermal efficiency of heat recovery, $\eta_t$ | Plate heat exchanger or thermal wheel | | 73% |
| | Run-around coil system | | 68% |
| Efficiency bonus (E) $W \cdot m^{-3} \cdot s^{-1}$ | Plate heat exchanger or thermal wheel | | $(\eta_t\text{-}73) \times 30$ |
| | Run-around coil system | | $(\eta_t\text{-}68) \times 30$ |
| Filter correction (F) $W \cdot m^{-3} \cdot s^{-1}$ | Both medium and fine filters fitted | | 0 |
| | Missing medium filter (EN 779 M5)* | | 150 |
| | Missing fine filter (EN 779 F7)* | | 190 |
| | Both filters are missing | | 340 |
| Maximum $P_{SFP}$ $(W \cdot m^{-3} \cdot s^{-1})$ (using reference configuration) | Plate heat exch., thermal wheel | $q_{nom} < 2m^3/s$ | $1{,}100 + E\text{-}300 \times q_{nom}/2 - F$ |
| | | $q_{nom} \geq 2m^3/s$ | $800 + E - F$ |
| | Run-around coil system | $q_{nom} < 2m^3/s$ | $1{,}600 + E\text{-}300 \times q_{nom}/2 - F$ |
| | | $q_{nom} \geq 2m^3/s$ | $1{,}300 + E - F$ |

**Note that the 'filter correction' references the obsolete EN 779. Filters would now be specified to BS EN ISO 16890.[2] Examples[3] may be ePM2.5 65% for a fine filter and ePM10 55% for the medium filter.*

**Table 1: ErP requirements and maximum SFP value for VY with supply and extract air (bidirectional airflow)**

However, as might be suspected, such systems do not conform with the standard operation that would be expected of a BVU by EU regulation 1253/2014. To determine the optimum trade-off between higher electrical energy use and higher heat recovery, dynamic simulation models may be used. A study[4] undertaken on behalf of a manufacturer compared the performance of hybrid and traditional MVHR units, by modelling systems for a newly constructed school in London. The study included models both with and without heat recovery.

The calculation was completed using both the simplified building energy model (SBEM) and a dynamic simulation model (DSM) to evaluate the sensitivity of the applied modelling methods on the $CO_2$ emissions and to produce an energy performance certificate (EPC) rating. The characteristics of a selection of

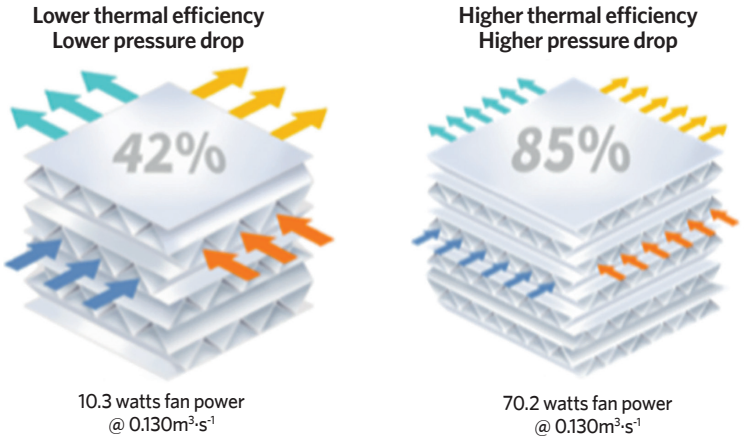


**Figure 2: Average fan power consumed by plate heat exchanger as used in a hybrid unit, compared with that used in a traditional MVHR unit, at stated airflow rate and thermal efficiency, modelled for Birmingham, UK, simulated year-round operation** (Image source: Monodraught)

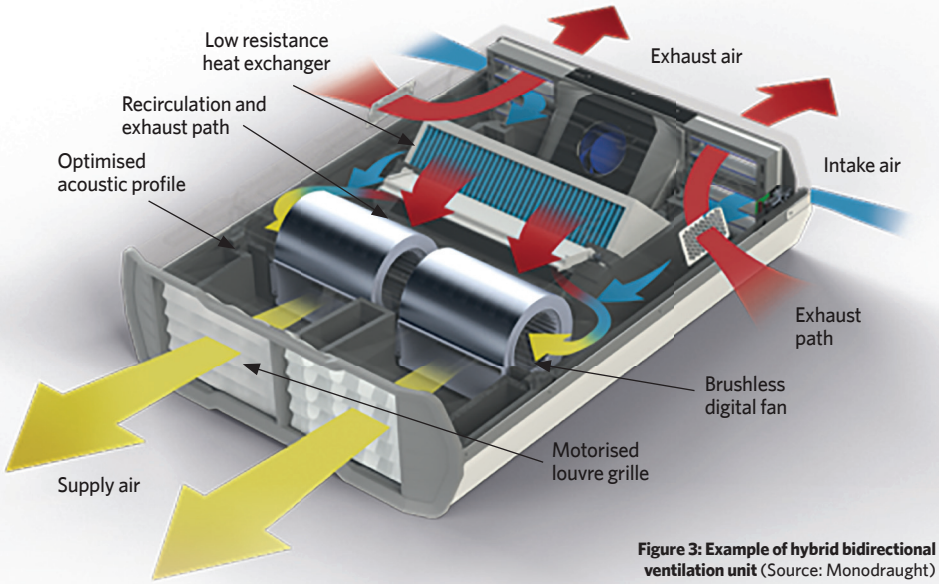


**Figure 3: Example of hybrid bidirectional ventilation unit** (Source: Monodraught)

the modelled systems included in the study are summarised in Table 2.

Systems 1 and 2 represent older hybrid ventilation units that provide a mixing function to mix room air with incoming fresh air to temper the supply ventilation air temperature but have no heat recovery device.

Systems 3 and 4 are optimised hybrid ventilation units similar to that shown in Figure 3. System 4 additionally includes a heating coil. It is notable that despite System 3 including a heat recovery device, the SFP is lower than that of System 1, which has no heat recovery.

Systems 5 and 6 are both high-performance MVHR units but with different SFP values.

All the units that were modelled were commercially available from UK companies.

In the SBEM modelling, all units were defined to provide night-cooling operation for 200 hours (maximum) per month. The heating source was a condensing gas boiler with a SCOP of 0.965. System 1 and 4 employed a heating coil in the unit. The remainder of heating was provided by a room-based radiator system.

| Performance parameters | | System 1 | System 2 | System 3 | System 4 | System 5 | System 6 |
|---|---|---|---|---|---|---|---|
| Daytime flowrate | $m^3 \cdot s^{-1}$ | 0.130 | 0.130 | 0.130 | 0.130 | 0.130 | 0.130 |
| Daytime SFP | $W \cdot m^{-3} \cdot s^{-1}$ | 170 | 45 | 85 | 156 | 310 | 720 |
| Night-time flowrate | $m^{-3} \cdot s^{-1}$ | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 |
| Night-time SFP | $W \cdot m^{-3} \cdot s^{-1}$ | 400 | 165 | 130 | 194 | 720 | 720 |
| Heat exchanger | % | None | None | 42 | 42 | 80 | 81 |
| Heating coil | kW | 3.0 | N/A | N/A | 3.5 | N/A | N/A |

**Table 2: Summary performance characteristics of hybrid and MVHR ventilation units**

| Model | System 1 | System 2 | System 3 | System 4 | System 5 | System 6 |
|---|---|---|---|---|---|---|
| **SBEM** | | | | | | |
| TER $kgCO_2 \cdot m^{-2}a^{-1}$ | 13.3 | 13.5 | 13.6 | 13.5 | 13.5 | 13.6 |
| BER $kgCO_2 \cdot m^{-2}a^{-1}$ | 11.7 | 11.2 | 10.9 | 11.1 | 11.6 | 12.6 |
| $CO_2$ savings | 12.0% | 17.0% | 20.0% | 17.9% | 14.1% | 7.4% |
| EPC AR | 24 | 23 | 22 | 23 | 24 | 26 |
| EPC category | A | A | A | A | A | B |
| **Dynamic simulation model** | | | | | | |
| TER $kgCO_2 \cdot m^{-2}a^{-1}$ | 13.0 | 13.1 | 13.1 | 13.0 | 12.3 | 12.3 |
| BER $kgCO_2 \cdot m^{-2}a^{-1}$ | 11.1 | 11 | 10.4 | 10.4 | 10.4 | 11.4 |
| $CO_2$ savings | 14.6% | 16.0% | 20.6% | 19.8% | 15.4% | 7.3% |
| EPC AR | 26 | 26 | 24 | 24 | 24 | 27 |
| EPC category | B | B | A | A | A | B |

**Figure 4: Target emission rate (TER), building emission rate (BER) and energy performance certificate (EPC) rating of simplified building energy model (SBEM) and dynamic simulation model (DSM) compliance calculations**

The results showed an average $CO_2$ saving of around 16% across all VUs compared with the emission of a notional building. The best performance, as illustrated in Figure 5, was System 3, which provided more than 20% savings in both the SBEM and the dynamic simulation model calculation. This hybrid system has a lower pressure drop through the lower-efficiency heat exchanger that delivers a thermal efficiency of just 42% compared with the ErP requirement of 73%.

In terms of EPC, the SBEM method was not as sensitive to the individual variations between the unit efficiencies that were generally in a very good category, and all the units provided an 'A' for the EPC rating, except System 6 (with its high SFP).

The dynamic simulation model calculation provides more detail, penalising the units without heat recovery so that their EPC rating slipped back to 'B'.

Ventilation designs that have lower-efficiency heat recovery performance – or in the case of natural ventilation, do not include heat recovery – may be viewed as performing poorly. However, the analysis reported in this article indicates that, when the climatic conditions and the building's own internal heat gains are included, the thermal efficiency can become less important than the fan power, as demonstrated by the SFP. As with the assessment of many building systems, this suggests that a holistic approach is essential when analysing the options for ventilation, in order to deliver the most effective solution.



This article drew on the modelling and commentary as reported in *Compliance modelling for Monodraught HVR Zero systems* – available from **www.monodraught.com/landing-page/7165**

Turn to page 20 for references »

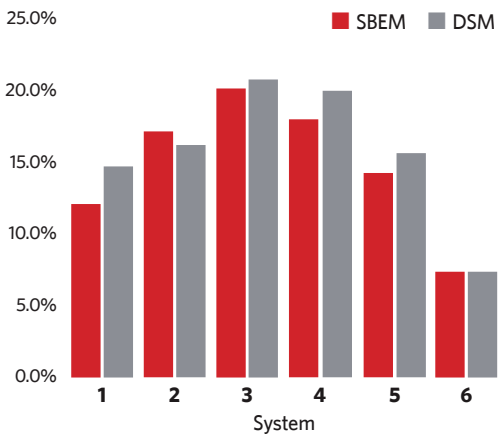


**Figure 5: $CO_2$ emission savings compared with the emission of NBM notional building**

# Module 206

November 2022

» **1. What is the last general date that CE-marked goods can be placed on the GB market?**

- ☐ A 1 December 2022
- ☐ B 31 December 2022
- ☐ C 1 January 2023
- ☐ D 1 May 2023
- ☐ E They can continue until the manufacturer runs out of stock

**2. Which of these is not noted in this article as being an attribute of a BVU?**

- ☐ A Clean fine filter on inlet-side
- ☐ B Clean medium filter on exhaust-side
- ☐ C Heat recovery system
- ☐ D Intake and extract fans
- ☐ E Networkable for control optimisation

**3. Which system includes a heat recovery device but was noted as having a SFP lower than the system with no heat recovery?**

- ☐ A System 2
- ☐ B System 3
- ☐ C System 4
- ☐ D System 5
- ☐ E System 6

**4. What was the thermal efficiency of the heat exchanger of the system with the lowest $CO_2$ emission savings compared with the TER?**

- ☐ A 20%
- ☐ B 42%
- ☐ C 81%
- ☐ D 80%
- ☐ E 85%

**5. In the dynamic simulation model, what was thought to cause the reduction in EPC rating for some systems?**

- ☐ A They could not be modelled appropriately
- ☐ B They had no heat recovery
- ☐ C They relied on condensing gas boilers
- ☐ D They used only one filter
- ☐ E They included a heating unit

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**References:**

1 Commission Regulation (EU) No 1253/2014 of 7 July 2014 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for ventilation units.
2 *BS EN ISO 16890-1:2016 Air filters for general ventilation. Technical specifications, requirements and classification system based upon particulate matter efficiency*, BSI 2016.
3 **bit.ly/CJNov22CPD21** – accessed 1 October 2022.
4 Report on study conducted by GTA Consultancy on behalf of Monodraught – available form Monodraught.

# Carbon & economic comparison for hot water systems using heat pumps, direct electric and hydrogen blends.

**Author: Biatur Mandia, MEng**

Rinnai's Biatur Mandia, also chair of the CIBSE Yen NW, compares three low carbon systems using electric, Heat pump, and hydrogen blends. This comparison guides the selection process and can be used to learn about existing and emerging technologies. The complete study is shown in the Rinnai H3 accredited CPD presentation.

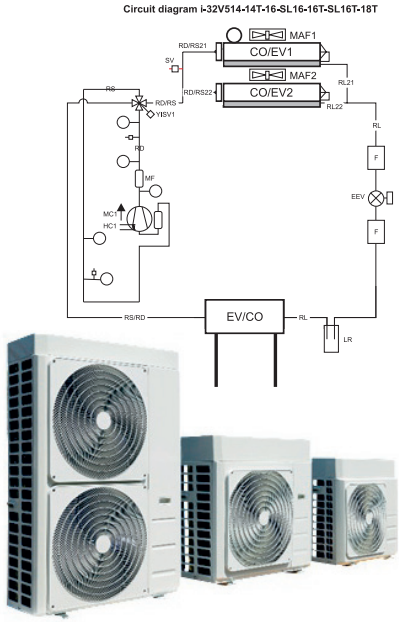
## Introduction

This CPD will show the savings achieved using three low-carbon systems. The first system is a gas combustion continuous flow water heater that can run on hydrogen blends up to 20 %, as shown in figure 2. The second system is defined as a hybrid and consists of a heat pump and gas water heater 20% hydrogen blend ready, as shown in figure 3. The third system is the all-electric and consists of a heat pump and direct electric cylinder, as shown in figure 4. The study uses "notions" of buildings from previous real-life projects to compare each system. The notion establishes the building's peak loading conditions, temperature, and recovery times. In this article, a gym health centre is used as a notion. The comparison focuses on detailed schematics, carbon emissions and capital & operation costs of each system.

## Low Carbon technology

The primary technology used in the three systems are: Heat pumps, considered low carbon technology because they use electricity to move heat from one location to another. The fundamental idea is to move heat from one place to another using a refrigerant fluid. The refrigerant evaporates at one location, absorbing heat, then condenses at the location where the heat is delivered. Figure 1 shows the working schematic of the air-to-water heat pump. The 4-way valve can reverse the cycle and switch to cooling mode. The air-to-water heat pump was a key technology in the Heat and Building Strategy (1).

*Figure 1; heat pump working principle*




Direct electric heating has no emission at the point of use. However, this type of system plays a minor role in the Heating and Building Strategy because it puts a lot of pressure on the electric infrastructure (2) (3).

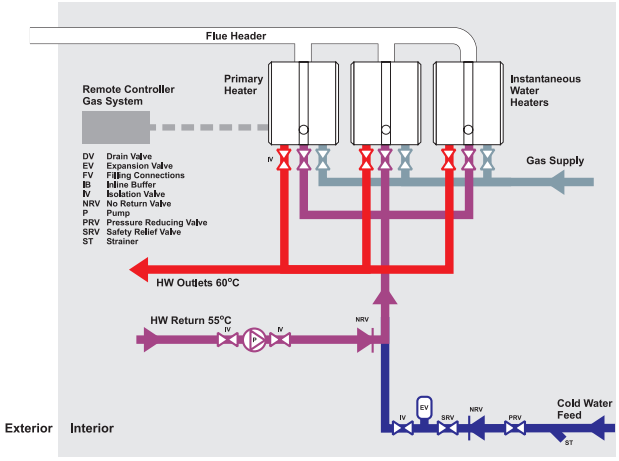
Hydrogen could replace natural gas over the coming years. Critical decisions on the role of hydrogen in heating are coming in the next 2-3 years (2). Hydrogen has a solid potential to become a zero-carbon energy source because it does not produce carbon at the point of use. Green hydrogen is still considered expensive, but current developments are decreasing the costs (4) (5). To facilitate the transition and development of the gas network, the UK government will continue to work with the Health and Safety Executive to enable up to 20 % hydrogen blending on the network by 2024, subject to the success of testing and trials.

## Type 2 buildings- Gym health centre

This notion has 12 showers, and 4 wash hand sinks. The three low-carbon systems were sized accordingly to the specific requirement of the notion. The cost of the heat pump was also considered during the selection process. Three designs were generated as follows.

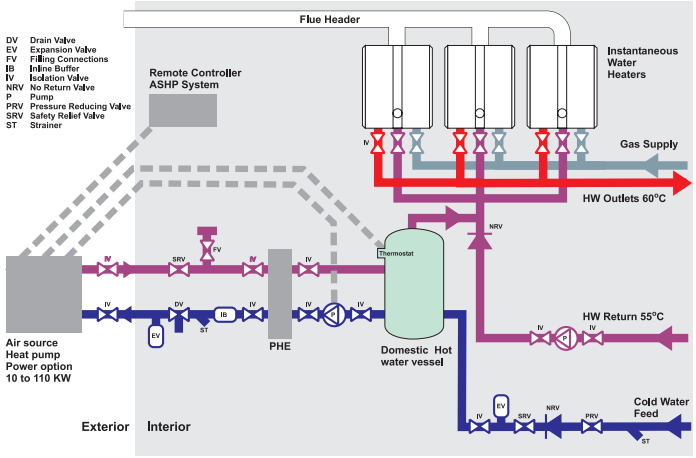
- Combustion – 3 x instantaneous water heater 56kW, as shown in figure 2
- Hybrid – 28 kW heat pump and 3 x instantaneous water heater 56kW, as shown in figure 3
- Fully Electric– 28 heat pump kW and 2 x 48 kW direct electric heater, as shown in figure 4.

*Figure 2: Combustion System*



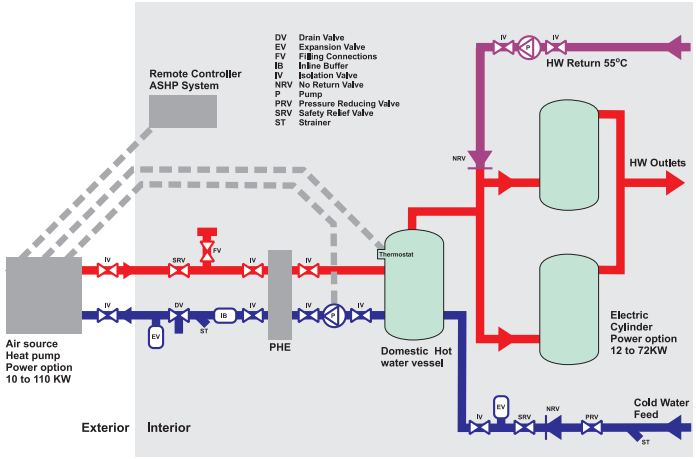

The heating load is met by using three appliances. Coldwater goes into the water heater and exits at 60, and water returns at 55 C.

*Figure 3: Hybrid System*




The heating water from the heat pump goes through the plate heat exchanger, which separates heating water from domestic water. The gas water heater provides the power for peak loading conditions.

*Figure 4: All Electric system*




The left side of the schematic is similar to the hybrid setup; it consists of a Heat pump and plate heat exchanger. Direct electric heating provides the additional power required for peak loading conditions.

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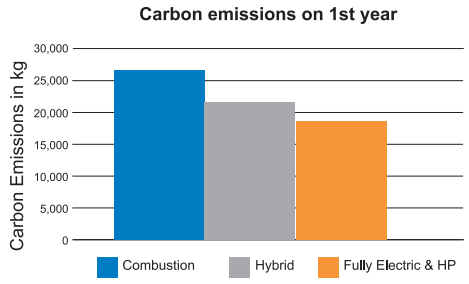
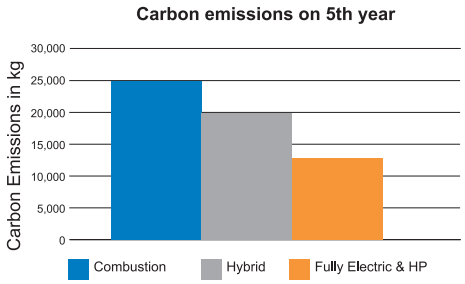
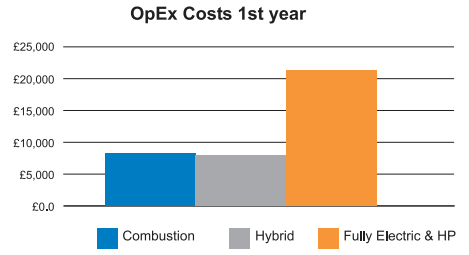
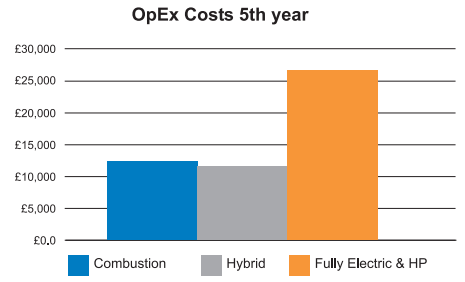
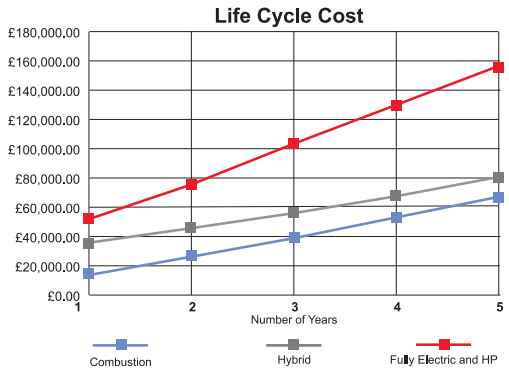
# Carbon & Cost Comparison




The carbon & price factors were taken from the UK Gov publication (6) (7). Inflation was applied for the next five years. For more info, the CPD presentation shows the complete calculations and assumptions.

Life cycle costs (see left) of the three systems, including capital and cumulative operational costs.

## Discussion and conclusion

The electric system is still the most expensive system to run. Heat pumps can decrease the running cost but have a massive impact on capital costs. The life cycle chart shows the capital and the cumulative operational costs. This graph evaluates the total investment of each system.

The combustion system is the cheapest option in a life cycle of 5 years, as shown above.

The hybrid system was considered the best option for running costs; hybrid is also an excellent compromise to achieve carbon savings when mindful of costs and operational performance. The electric option produces less carbon, with more savings coming in the next five years thanks to the planned grid improvement. The gas network might also become greener through a mix of hydrogen and biomethane; however, long-term development is not included in 5 years, and only a 20 % hydrogen blend was considered from 2025. It is important when considering these options that economic, practical and technological considerations are made and that multiple de-carbonisation pathways are evaluated relative to system performance needs.

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The complete study is shown in the Rinnai H3 accredited CPD presentation; please enquire engineer@rinnaiuk.com to attend the accredited CPD.

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# Questions of innovation

UK manufacturers answer questions on the decarbonisation of building services plant and what designers can do to reduce waste and increase energy efficiency

**Amy Sedgwick, assistant commercial product manager at ACV**

"Condensing boilers offer buildings greater efficiency in their gas usage for heating"

**How can the latest Part L revisions help reduce overall costs and increase energy efficiency?**

The latest revisions present an excellent opportunity for both customers and installers alike. Promoting lower temperature rates, the revised regulations ensure boilers are more efficient. Section ADL2 of the regulations states that: 'All parts of the system, including pipework and emitters, should be sized to allow the space heating system to operate effectively in a manner that meets the heating needs of the building, at maximum flow temperature of 55°C or lower.'

This is closely linked to the science underpinning condensing boiler technology, offering buildings greater efficiency in their gas usage for heating and hot water. It also helps a building be ready to transition to low carbon heating in the future.

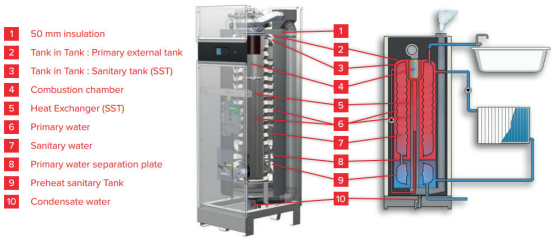
Following the steady increase of capital costs of equipment, and increased market prices, condensing boilers, such as the Heatmaster Evo, offer a compliant system that provides valuable installation and maintenance cost savings.

**What are the benefits of investing in tank-in-tank as a heat exchange technology?**

Tank-in-tank technology reduces static heat losses, contributing to overall better energy consumption and cost management. Tank-in-tank is a domestic hot water storage exchanger (DHW), completely immersed in a steel outer tank containing primary water. Manufactured from stainless steel, the wall of the inner tank acts as a heat exchanger between the primary circuit, which is connected to the boiler, and the DHW storage tank. Because of the large surface area for increased heat transfer and high storage temperature of the tank-in-tank system, the volume of water can be significantly reduced, which in turn, helps to cut costs and direct emissions.

It can help to significantly avoid leakage, sludging, and scale build-up, all of which can have a detrimental effect on boiler efficiency.

Heating and hot water are available from one single combination unit, and capital costs are much reduced.




**Peter Double, managing director at Andel**

"Demand for leak detection in the built environment grows year on year"

**Which big trends do you see emerging in leak detection in 2023?**

Sustainability, reducing emissions and increasing the use of renewables will continue to be a hugely significant trend in 2023 and beyond. Climate change poses a massive challenge to us all and the ambitious UK government target of net zero carbon by 2050 will be a key consideration for all businesses in all industries. Demand for leak detection in the built environment grows year on year. This provides a great opportunity and driver for R&D, innovation and embracing new technologies to continue to deliver the optimum sustainable solutions to customers.

Hybrid environmental monitoring systems and water sustainability have become important developments in our leak detection product portfolio. Enhanced, hybrid, multi-function control systems provide customers with a new level of leak detection and environmental monitoring, providing simultaneous and automatic zonal isolation of water, gas and/or oil supply if an alarm is triggered.

Protecting natural resources and reducing environmental impact are key to sustainability. Water flow monitoring and motion sensor systems provide sustainable water conservation solutions, protecting natural resources, saving on costs and earning Breeam credits. Digital gas leak detection systems can reduce environmentally damaging refrigerant gas escapes, earn Breeam credit and provide environmental and H&S-compliant solutions for the full range of commercially used gases.

Andel is a multi-disciplined company providing a range of sustainable solutions to protect both the built and natural environments. As an environmental company, Andel has taken the initiative to become net zero carbon by 2025.

This means becoming more energy efficient, reducing $CO_2$ emissions, eliminating fossil fuels, reducing waste and implementing a forensic approach to measuring the environmental impact of our business. Consequently, sustainability is crucial for our own operations, supply chain and, importantly, for the products and services we offer.

**Darren Townend, commercial product manager at Hamworthy Heating**

"Under the new framework, decarbonising heating is key to cutting emissions across commercial buildings"

**What are the best methods for building decarbonisation in the UK?**

The UK government has a net zero goal in place for 2050, which requires greenhouse emissions to be reduced to as close to zero as possible.

To help support the transition towards the Heat and Buildings Strategy, which is fundamental to the net zero goal, the uplift of Building Regulation *Conservation of fuel and power: Approved Part L* is the legislative method adopted to ensure new buildings will be fitted with low carbon heating.

Under the new framework, decarbonising heating, largely driven by government funding and regulations, is key to cutting emissions across commercial buildings. For instance, if we look past the building fabric, which we assume is in place, and focus solely on the heating system, the latest regulations state that a heating system must be designed to work at 55°C flow. This enables a system to work with a heat pump, or at least be heat pump-ready.

If a new boiler is still used, then the low return temperature will allow the boiler to condense which, as the name condensing boiler suggests, will allow it to operate in its most efficient state, as intended. Both options can play a significant role in helping to achieve the net zero goal.

The good news here is that by simply complying with the latest Building Regulations Part L, you're already on the right track to building efficiency.

Furthermore, by using government funding, you're committed to complying with the building efficiency regulations set out. Here, only projects using low carbon heating (heat pumps) are eligible for funding, as announced in the Heat and Buildings Strategy.

Looking beyond the technology, we also need to look at the bigger picture. Given the current requirements to limit energy consumption, good heating system design is an essential requirement to ensure that systems operate both efficiently and safely, and make effective use of energy. For more guidance, CIBSE AM17 is an important reference to support the design and application process.

**Charlie Mowbray, commercial product manager, Groupe Atlantic UK, ROI & NA (parent company of Ideal Heating Commercial)**

"More efficient heating systems mean less energy is needed"

**How will industry retrofit low-carbon heating in existing buildings?**

The UK government has identified heat pumps as a leading technology in the battle towards decarbonisation and meeting net zero, with heat networks also set to make a significant contribution when retrofitting existing buildings and housing stock.

The key to most efficient use of a heat pump in existing buildings and housing stock is the standard of the building fabric and the design of the heating system to which it is connected. Heat pumps typically operate at lower temperatures than a boiler or old heating system.

In addition, heat pumps run with smaller temperature differentials (delta-T, the difference between flow and return temperatures). Where boilers typically operate with delta-T between 11°C to 25°C, a heat pump is usually designed to operate at a delta-T of 5°C. This means simply fitting a heat pump to an existing heating system is unlikely to give optimum performance of either the heat pump or the heating system – resulting in poor thermal comfort for the occupants, higher running costs, or both. Any heating system needs to be correctly surveyed and probably upgraded to ensure compatability with heat pump technology. This may include pump and pipe sizing, heat emitter sizing and even building fabric upgrades.

More efficient heating systems and improved building fabric mean less energy is needed for heating and hot water, helping organisations to reduce their direct emissions as they edge towards decarbonisation, and allowing businesses to save on their energy bills.

*CIBSE AM17 Guidance Document – Heat pump installations for large non-domestic buildings (2022)* – is a useful reference document aimed at building service designers that provides and consolidates best practice guidance with the aim of supporting the design and application of large heat pump systems for new build and existing buildings.

**David Bennett**
**Munters Centre of Excellence Manager for Energy EMEA**

"A holistic approach to energy savings provides the best solution to the current energy issues we face"

**How can buildings be made more resilient to cope with extreme weather?**
For existing chillers that provide cooling to one or more AHU, extreme weather may present a problem. Many older chillers were originally designed and based on lower ambient temperatures. With higher temperatures seen this summer and in recent years, these chillers are often unable to cope. A way to mitigate this without replacing the chiller is to retrofit a wet pad system like the EPCC. This effectively reduces the ambient temperature onto the condenser coil to lower the ambient temperature seen on the face of the coil. In addition, it's also possible to increase the air flow and reduce energy on the fans by fitting EC power plate fans, which can have speed modulation with head pressure.

**What can the HVAC industry do to reduce energy bills in new and existing buildings?**
Designers can install EC fans in combination with good controls. Existing buildings will benefit the most from the retrofit of EC fans primarily because it's extremely hard to replace old fans while adhering to Building Regulations (for example L2 Building Regulations). Replacing belt drives with EC fans that have the best control functions enables you to tailor fan usage to occupancy and conditions. Fans can be switched to run low when required, and only increased when you need them to be. This is where the majority of the energy savings can be achieved. Having a holistic approach to consider the entire system, not just one single component, ensures the most energy efficient solution.

**Richard Raeburn, senior application engineer at Tridonic**

"Wired solutions suit the needs of new build projects, while wireless is ideal for retrofit"

**What are the best batteries to use in lighting?**
Lithium iron phosphate (LiFePO4) batteries are more environmentally friendly and have a higher specific energy than nickel cadmium (NiCd) or nickel-metal hydride (NiMH) batteries, allowing for smaller cells. Their low self-discharge delivers a longer shelf life, while their simple charging regime gives higher system efficacy. This newer technology also offers excellent thermal and chemical stability, which results in cooler batteries in higher-temperature applications.

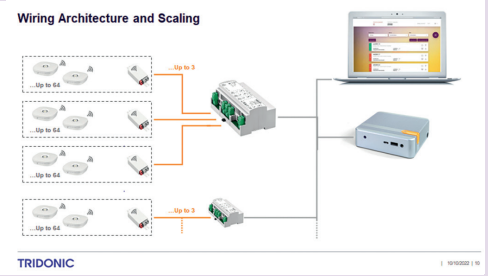
**How does this emergency technology contribute to building compliance and sustainability?**
Tridonic's sceneCOM EVO lighting controller helps buildings meet the three main criteria essential for most modern buildings – making them safe, smart and sustainable. Using Tridonic's EM PRO devices connected to our lighting control system enables 24/7 monitoring, delivering smart and safe operation. SceneCOM EVOs dashboards allow for immediate reporting when a failure occurs.

**Is wireless lighting as complex to install and commission as it is perceived?**
Wired solutions suit the needs of new-build projects, while wireless is ideal for retrofit where further wiring could cause disruption or may not be possible. Wireless brings the benefits of integration into a lighting control system. Comparing wireless lighting to wired options is no more complicated. Both are installed in the same way in terms of connection.

Wireless is in many cases easier to commission than traditional wired dali systems. Assigning groups, scenes and control elements are commissioned using the same format, whether the system is wired or wireless. Casambi's 2,500+ wireless partners make the choice easier by making wireless system components readily available.

Tridonic's LiFeGuard and Blackbox features provide protection of the LiFeO4 batteries and deliver invaluable information for fault diagnosis.

This, along with lumDATA from Tridonic's DALI 2 PRE and D4i drivers, provides information enabling a holistic overview of the operation of all luminaires.



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# Employing heat pump-augmented MVHR

## This module considers the application of mechanical ventilation with heat recovery (MVHR) with heat pumps for adaptive ventilation, heating and cooling in housing

As climate change increases, housing will need more thoughtful assessment to reduce overheating risk while providing good levels of year-round comfort. Ideally, in temperate regions, efficient heating systems alongside passive design features such as shading, exposed thermal mass, and natural ventilation would provide appropriate internal conditions. However, in many situations, as cooling requirements rise, this may not be sufficient. At the same time, the airtightness standards for modern housing provide good-quality envelope design that do not provide the sometimes-fortuitous ventilation effect arising from the infiltration in the leakier buildings of the past. So, as reported in a recent EU publication,[1] older properties that are refurbished with modern standards of thermal insulation and improved fabric airtightness will need to ensure that the upgraded space is supplied with adequate ventilation. The recently introduced Building Regulations for England Approved Document part O1 *Overheating Mitigation of the Building* requires that dwellings should include reasonable provision to limit unwanted solar gains in summer and, where that is not sufficient to maintain acceptable temperatures, to provide an adequate means to remove heat from the indoor environment.

A potential solution – for new or refurbished residences – is to employ a unitised, packaged balanced ventilation system, with total (sensible and latent) plate heat exchanger, which can be combined with an air-to-air heat pump to provide both ventilation air as well as heating and cooling of the incoming air. The system continuously monitors the temperatures of outdoor and indoor air (estimated by extract sensors), so that the operational mode for the system may be optimised to provide the desired indoor temperatures. Operation is based on an adaptive temperature profile (see boxout 'Adaptive comfort') that takes account of the prevailing mean outdoor temperature – as well as occupant preferences – to provide a desired system set-point temperature.

Field tests were undertaken in houses in Luxembourg and in Modena, Italy, to establish how well this system could meet the comfort requirements of the occupants. (The installed mechanical ventilation with heat recovery unit for the Modena house is shown in Figure 1.) The thermal performance of the systems have been more fully reported[2] by Bart Cremers, and his report has been abstracted to provide the basis of the discussion of the installations described in this article. In a real application, such as a normally occupied house, it is challenging to determine a set of measurements that are representative of a standard comfort index (see the boxout 'Assessing thermal comfort when avoiding


**Figure 1: The installed MVHR unit in the Modena house**

» overheating'). The tests reported in this article employed air temperature sensors (outdoor; supply after recovery; supply after conditioning; extract; and exhaust), humidities (outdoor; supply after recovery; extract; and exhaust), measurements of both the supply and extract air streams (flowrate; fan speed; fan duty), and electrical consumption. All parameters were recorded over one year (18 July 2021 to 17 July 2022) every five minutes and summarised in hourly averages for further analysis.

The Modena house, in a humid subtropical climate zone, was built in 2017 and consists of three floors with total floor area of 270m$^2$. The insulation is within passive house limits, with a U-value of 0.132W·m$^{-2}$·K$^{-1}$ for the walls and 0.123W·m$^{-2}$·K$^{-1}$ for the roof. There are no other heating or cooling units used, other than the technology described in this article. The house in Luxembourg, an oceanic climate that is typically 1K to 2K cooler than London, was built in 1981 and renovated in 2020, with a total floor area of 185m$^2$. Typical U-values for this house are 0.14W·m$^{-2}$·K$^{-1}$ for the walls and 0.20W·m$^{-2}$·K$^{-1}$ for the roof. No other heating systems are used aside from the system under test.

A recent review[3] undertaken by Spiekman *et al* has indicated that occupants have been shown to find it challenging to determine the optimal operation mode. In the normal operation of these systems, the various operational modes are automatically chosen by the control algorithm, based on the actual and the desired conditions.

During the cooler periods of the year, the temperature of the incoming outdoor air is initially raised by the heat recovery ('avoided heating' in Figure 2). If the adaptive controller requires a higher temperature, the coil will act in heating mode (supplied from the air-to-air heat pump) and will further increase the temperature of the supply air ('active heating' in Figure 2).

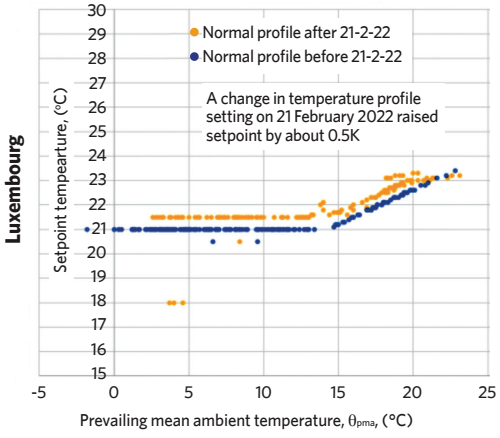


**Figure 4: Desired indoor temperature as a function of the prevailing mean ambient temperature θpma for the house in Luxembourg**

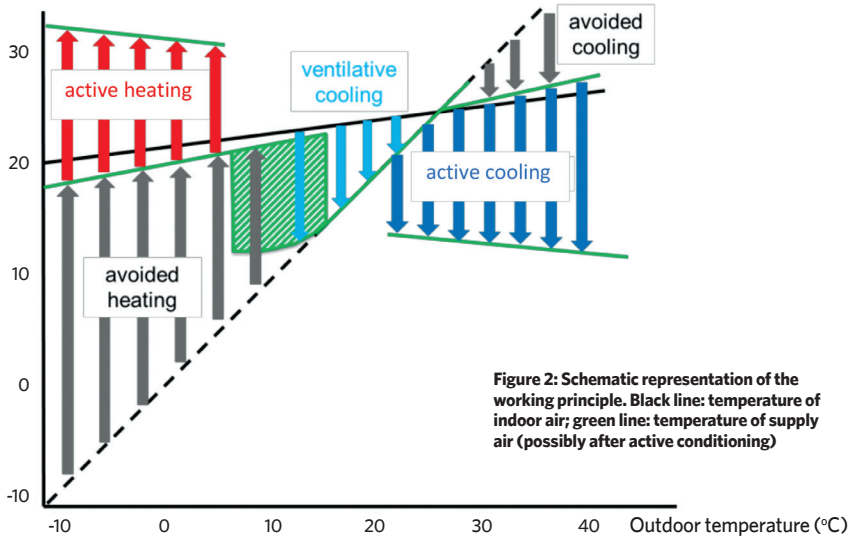


**Figure 2: Schematic representation of the working principle. Black line: temperature of indoor air; green line: temperature of supply air (possibly after active conditioning)**

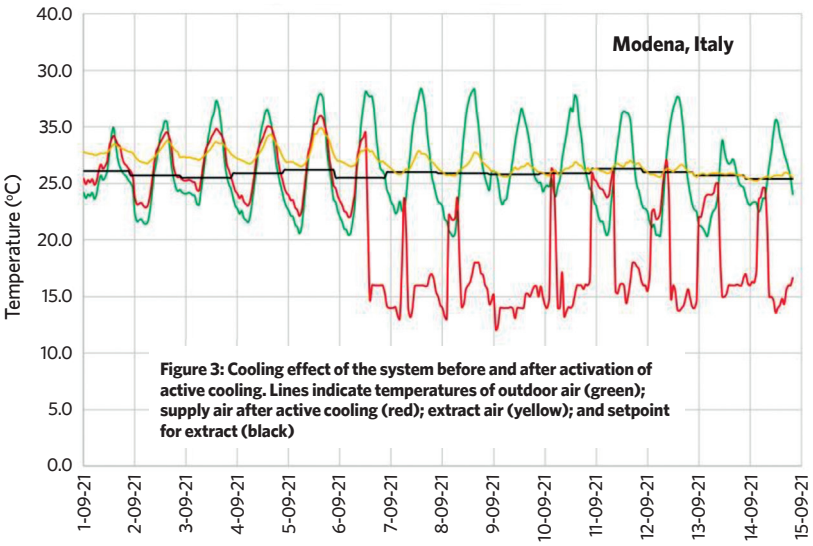


**Figure 3: Cooling effect of the system before and after activation of active cooling. Lines indicate temperatures of outdoor air (green); supply air after active cooling (red); extract air (yellow); and setpoint for extract (black)**

When temperatures outside are warmer than inside, the heat exchanger reduces the temperature of the incoming outdoor air to approach the cooler indoor air temperature ('avoided cooling' in Figure 2 ). If there is a need for further cooling, the coil (supplied from the air-to-air heat pump) will operate in cooling mode, providing both cooling and, potentially, dehumidification ('active cooling' in Figure 2).

During the periods of the year with mild temperatures, heat recovery automatically reduces as the temperatures inside and outside approach each other, or totally shuts off, with the adaptive controller activating a bypass in order to bring in cooler air. This period is shown as 'ventilative cooling' in Figure 2.

The cooling effect of the installation on the indoor climate in summer can be demonstrated by the example period shown in Figure 3 (in Modena). During the first five days, the ventilation system including recovery was operational, but the active cooling had been switched off. The supply temperature during the day was brought to the indoor level (effect of cold recovery), but the extract temperature remained at a high level, with extract temperatures up to 30°C. During nights, the bypass was activated to bring in the cool outdoor air, with the resulting supply air temperature being close to the outdoor air temperature.

After five days (6 September 2021), the active cooling was put into use. The heat pump brought the supply air to approximately 15°C. The cooling effect on the indoor climate can be seen during the course of a couple of days, with a gradual decrease in extract temperatures. After four or five days, the extract temperature had reached the desired setpoint of 26°C and remained at that level.

Extract temperatures for Modena ranged from 22°C (winter) to 27°C (summer) and 20°C (winter) to 25°C (summer) for Luxembourg. In Italy, both

## ASSESSING THERMAL COMFORT WHEN AVOIDING OVERHEATING

**CIBSE TM 52[4] *The limits of thermal comfort: avoiding overheating in European buildings* provides guidance on assessing the maximum temperature that would be acceptable for thermal comfort where mechanical conditioning is employed. TM 52 acknowledges the practical challenges of continuously monitoring the six constituent variables of the predicted mean vote (PMV) with sufficient accuracy. Therefore, it recommends that the procedure for testing for overheating in mechanically-conditioned buildings is to monitor the operative temperature regularly in a number of representative spaces in the building.**

**Assuming occupants' clothing has an insulation value of 0.5 CLO in summer, the recommended maximum temperature is 26°C. CIBSE TM 59[5] clarifies that 'all occupied rooms should not exceed an operative temperature of 26 °C for more than 3% of the annual occupied hours'. This provides a proxy for a PMV of less than +0.5 (that is, the top end of the PMV band that is deemed comfortable by BS EN 15251:2007[6]).**

active heating and active cooling had been used, while in Luxembourg active cooling was hardly needed.

Figure 4 shows the desired indoor temperature related to the prevailing mean ambient temperature, $\theta_{pma}$, as an example, for Luxembourg.

During the heating season (when $\theta_{pma}$< 14°C) the setpoint is constant at 21°C. During the intermediate season, the setpoint rises, as the $\theta_{pma}$ increases, to 23°C.

In Italy, the typical flowrate was 300m$^3$·h$^{-1}$, but lower values of 190$^3$·h$^{-1}$ occurred during night settings and higher values up to 480m$^3$·h$^{-1}$ when there was a high requirement for active heating or cooling to condition the indoor climate. In Luxembourg, the typical flow rate was 200m$^3$·h$^{-1}$, but lower values of 80m$^3$·h$^{-1}$ were used when there was no occupation and higher values up to 300m$^3$·h$^{-1}$ when more heating or cooling was required.

Figure 5 shows the energy signatures for the systems that indicate the daily thermal energy output related to the daily averaged outdoor temperature. Active heating is displayed in red, and active cooling in blue. The differences between the Italian house and the house in Luxembourg are clear – in Luxembourg, active cooling is rarely needed, but active heating is used more frequently.

## ADAPTIVE COMFORT

**The adaptive comfort model sets the required indoor temperature by current (and recent past) measurements of outdoor temperature. CIBSE Guide A explains that, as well as the preferred internal temperature depending on the occupants' state, it will be influenced by the type of building (naturally ventilated; mixed mode; or air conditioned) and the occupants' opportunity to employ operable windows and blinds, as well as a means of generating local air movement (other than the window). As reported[7] by the US Center for the Built Environment (CBE), people accept and even prefer a wider range of temperatures than is suggested by the PMV (deterministic) model. This difference is explained by psychological and behavioural adaptation. The recently published TM68: 2022 *Monitoring indoor environmental quality* notes that the adaptive model is widely used, including in BS EN 16798-1,[8] CIBSE TM52 and TM 59 and ANSI/ASHRAE Standard 55.**

The actual values vary day to day, arising from a varying solar thermal gain, from occupation variation and from the chosen daily scenario. For example, the controller provides a selectable daily scenario to reduce or block the heat pump during a part of the day – for instance, at night. The Italian house also shows a pronounced cooling season where the thermal cooling output is likely to include components of both sensible and latent cooling. For the Modena house, heating is required until outdoor temperature has reached a level of 13°C, whereas for Luxembourg it is 16°C.

It can take a couple of days for a very warm house to cool after the cooling has been switched on for the first time, and then the heat pump can maintain a comfortably cool environment. When outdoor temperatures are lower than indoor temperatures (for example at night), the heat recovery bypass activates to use simple ventilative cooling, which can be complemented, when needed, with active cooling from the heat pump.

The size of the heat pump in combination with the outdoor airflow rate decides the maximum thermal input that can be delivered to the house. In practice, the combination of a unitised MVHR system in conjunction with an air-to-air heat pump integrated by the adaptive controller, is potentially suitable for providing year-round filtered, outdoor air and active conditioning in nearly zero-energy buildings and those built to passive house standards. Variants of the system can, for example, include ground- or water-sourced cooling (direct or through using a heat pump), or local energy networks.

The use of automatic adaptive temperature control reduces unwanted heating and cooling, and the inclusion of the heat pump lowers heating energy consumption while providing the capability to prevent overheating.



Turn to page 34 for further reading and references. »

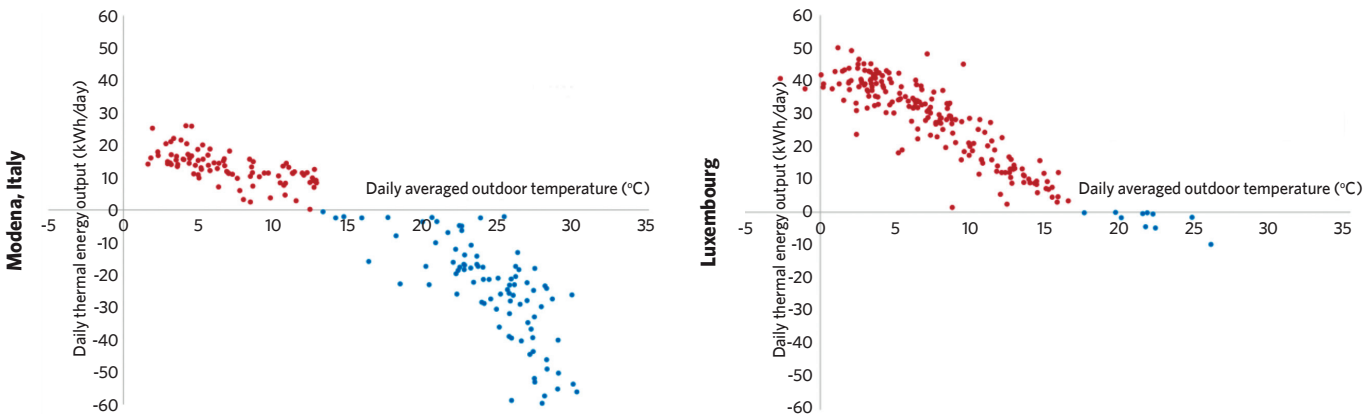


**Figure 5: Energy signatures (daily thermal energy output as a function of daily averaged outdoor temperature) for heating in red and for cooling in blue for the houses in Italy and Luxembourg**

# Module 207

November 2022

» **1. Which AD of the England Building Regulations specifically considers overheating mitigation?**

- ☐ A Part F1
- ☐ B Part F2
- ☐ C Part L1
- ☐ D Part L2
- ☐ E Part O

**2. How often were the parameters recorded in the system tests?**

- ☐ A Every 30 seconds
- ☐ B Every minute
- ☐ C Every five minutes
- ☐ D Every 10 minutes
- ☐ E Every 15 minutes

**3. What was noted as the extract temperature in winter for Modena?**

- ☐ A 15°C
- ☐ B 20°C
- ☐ C 22°C
- ☐ D 25°C
- ☐ E 27°C

**4. Typically how long did it take a warm house to cool down to comfortable temperatures when the cooling had been switched on?**

- ☐ A 30 minutes
- ☐ B Two hours
- ☐ C 12 hours
- ☐ D One day
- ☐ E Two days

**5. Which CIBSE TM is most likely to be useful when assessing overheating and comfort in homes?**

- ☐ A TM 52
- ☐ B TM 59
- ☐ C TM 65
- ☐ D TM 67
- ☐ E TM 68

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**References:**

1 *Recommendation and guidelines on Energy Efficiency First: from principles to practice*. European Commission 2021.

2 Cremers, B, *The monitored performance of the combination of balanced ventilation with active -conditioning by an air-to-air heat pump*, 42nd AIVC Conference, October 2022 – **bit.ly/CJNov22CPD31** – accessed 12 October 2022.

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4 CIBSE TM 52:2013 *The limits of thermal comfort: avoiding overheating in European buildings.*

5 CIBSE TM 59:2017 *Design methodology for the assessment of overheating risk in homes.*

6 BS EN 15251:2007 *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics*, BSI 2007.

7 **bit.ly/CJNov22CPD32** – *accessed 1 October 2022.*

8 BS EN 16798-1:2019 *Energy performance of buildings. Ventilation for buildings. Indoor environmental input parameters ....*, BSI 2019.

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