

ADVECO NEWSLETTER

Welcome to Adveco's July 2024 newsletter,

Cloud, rain, and yellow heat warnings. British Summer is upon us once again, and there is the added carnival of a General Election this week. We have been tracking the various policies and considering the potential impact on the evolution of net zero, plus the future of hydrogen and green gas in general all month, so do look at our [blogs on the topic](#). We will continue to track developments and champion the commercial and public sector organisations seeking to make a difference whichever party holds power after July 4th.

This month we highlight the potential to further extend our FUSION packaged electric water heating system by upgrading the cylinder option to a twin-coil variant to either future proof for later heat pump inclusion or opt to integrate solar thermal. On the topic of heat pumps we also consider the role ASHPs can play in introducing sustainability into existing properties, as well as looking at the technology's evolution in terms of supporting water heating and what the future may bring.

We are also working hard on a new look for the website, so expect to see the site show signs of change over the coming month with more resources, plus new search and support tools planned to be rolled out in the coming weeks. Whether you are simply researching your options or want to speak to our team the website is always a great place to start your sustainable journey...

Integrating FUSION Packaged Electric Water Heating & Solar Thermal



For organisations considering, but not ready to commit to a heat pump-based system, FUSION T is available now with an option that delivers a twin-coil stainless steel tank and mounted ARDENT electric boiler and controls without the heat pump preheat. Businesses considering a transition from gas to electricity can be put off by the energy bill shock, with grid electricity continuing to be substantially more expensive than gas. These operational costs can also increase when using an air source heat pump as a DHW pre-heat source. This is due to the heat pumps having to work harder in DHW applications, reducing the coefficient of performance (COP) and requiring extra electrical energy to achieve the necessary higher working flow temperatures (50-55°C preheat).

This iteration can futureproof the system, but also allows for solar thermal to be introduced into the lower coil as the system preheat.

With FUSION now supporting capacities up to 750 litres with 24 kW heat output, it is suitable for solar systems designed for small to medium-sized buildings. While solar thermal systems will typically be designed to evenly split capacity between the preheater and after heater, this single-cylinder FUSION scenario uses Adveco's smart controls to 'cheat' the system in favour of the solar thermal input. Adveco can deliver a 600-litre solar capacity application in a 750-litre tank for an extremely compact all-electric, low-carbon emission, solar water heating system with a minimal rooftop or façade footprint. FUSION's controls optimise top-up heating from the boiler as the pre-heat fluctuates across the year.

With Adveco's high-efficiency, robust flat plate collectors and compact protective drain back vessels to preserve operational qualities of the solar fluid, a well-designed and installed all-electric solar thermal system offers organisations a proven, low-maintenance renewable investment with accelerated return on investment. Using FUSION plus solar thermal preheat for electric water heating systems will offset a minimum of 30% of the annual UK DHW energy demands. For some UK regions, especially in the South and West, this percentage is much higher. In the summer months, solar thermal can potentially meet all a DHW system's energy demands, especially in the case of smaller commercial businesses and offices.

As part of the range update for FUSION new specifications are now available on the [website](#) or via the product handbook...

GET THE FUSION HANDBOOK

Introducing Sustainability Into Existing Buildings



The implementation of low-carbon water heating is one of the fastest, low-impact means of introducing sustainability into an existing commercial building. A considered, well-designed replacement system will reduce carbon emissions by at least half compared to equivalent-sized gas-fired water heating and likely by much more as the electricity grid continues to become greener. Efficient, robust and relatively low maintenance, the latest generation of renewables represents a solid investment in the future of a building and the comfort it supplies to those visiting or working there.

The government's renewable technology of choice is the heat pump, of which the easiest and lowest cost to implement is the air source heat pump (ASHP). The technology uses a reverse refrigerating circuit to extract heat from the air, even when ambient temperatures drop during the winter months. The efficiency of a heat pump is measured by its COP (coefficient of performance) which defines how much energy it uses compared to the heat energy it generates. The higher the number the better. The COP will fluctuate with external temperatures so it's always best to use the seasonal COP which averages the efficiency across the year. As the ambient temperatures drop the heat pump will demand more electrical energy to run the compressor to maintain necessary operating temperatures. This is where heat pumps have a weakness because they were designed to operate at low working flow temperatures (35°) to supply radiators and underfloor heating, not the more stringent heating requirements of water (+60°C) required to prevent legionella.

This additional electrical energy required to raise temperatures comes from the grid and remains far more expensive than gas. In the past three years, electricity prices have fluctuated and climbed from three to nearly five times the cost of gas. This means transitioning to low-carbon technology can deliver considerable increases in operational costs if not approached with care and consideration.

Heat pumps have a valid role to play, but for water heating, they need to be used as part of a wider process to ensure cost-effective, efficient operation. This hybrid approach employs the ASHP as a source for preheating cold water flowing into the system to 45°C. This is more than achievable for most heat pumps, maximising the efficiency and reducing the energy required to run the unit. This warmed water is then fed into a cylinder where a second heating source tops up the water temperature to a safe 65°C for use throughout the building. This top-up can come in the form of a gas water heater, gaining very low operational costs, but a less meaningful reduction in carbon emission, typically around 30%. To maximise emission reduction, an electric boiler is preferred, although operational costs will climb, smart controls will optimise the two heat sources to minimise energy demands and provide control over operational costs.

With a hybrid system, there will be an increased plant, with a heat pump, boiler and larger cylinder needed to account for slower system reheat after peak demand. Compared to traditional gas water heating this can be a concern when retrofitting as space holds value. The latest generation of renewables, from monobloc ASHPs to electric boilers, are increasingly more compact, while smart controls maximise storage optimising cylinder size.

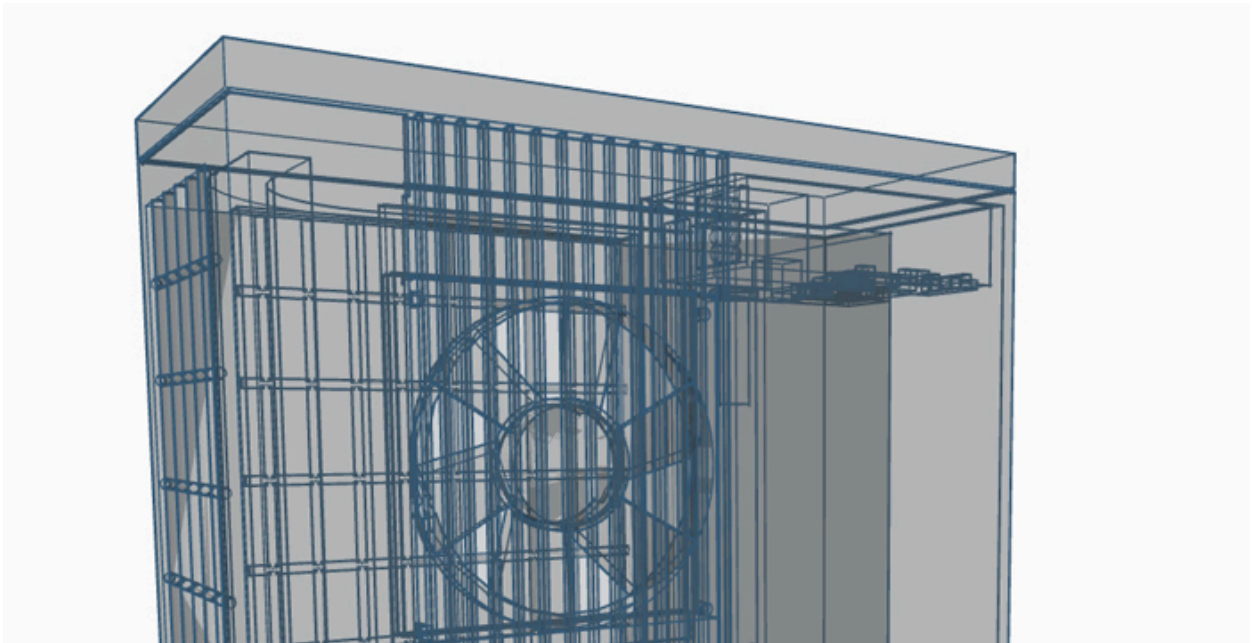
For smaller to mid-sized organisations with basin-led hot water demands Adveco has redefined this approach with its award-winning FUSION electric water heating system. Conceived as a direct replacement for old gas systems, FUSION mounts an electric boiler onto a cylinder with prebuilt pipework. The controls and sealed multiple immersions within the boiler ensure resilience and means almost completely nullify damaging limescale in hard water areas. For soft water areas, the stainless steel cylinder provides anti-corrosion protection. The optional addition of an electric immersion also provides redundancy with short-term backup to guarantee service should repair be required. FUSION excels with a twin coil cylinder variant that enables a monobloc heat pump to be connected to preheat the water. With the latest options supporting storage capacities of up to 750 litres, there is a variant for most small to mid-sized organisations which is quick and easy to install for minimal operational disturbance.

For larger buildings, a more bespoke system is likely to be required, although the basic premise remains the same, using ASHP preheat and a secondary energy source, preferably electric. It may also be possible to integrate solar thermal technology as a mid-heat to further cut energy demands, by as much as 30% annually to further offset operational costs and reduce emissions.

When it comes to water heating every building, from structure to usage, is different. So before embarking on any major renovation to a water system, it's always sensible to gather data on current system use and especially the peak demand periods. That is easily achieved through non-invasive water metering which takes approximately a month to collate necessary data to accurately model the building's requirements. From this data, a thermotical system design can be produced. One that delivers on the building's demands whilst optimising the equipment necessary which translates usually into lower up-front investment and a better grasp on future operational costs. That is truly valuable as it enables more accurate planning and budgeting before making any initial move towards a more sustainable operation.

ADVECO CHILLED WATER SYSTEM TANKS

What Next For Air Source Heat Pumps?



As we have seen, heat pumps are expected to be a core element for the provision of sustainable buildings services, whether space or water heating as the country transitions to net zero operations. They can offer significant carbon emission reduction over traditional gas boilers, and have emerged as a compelling option for generating hot water in UK commercial buildings. Despite this, there continues to be a discrepancy, often at the highest levels, when communicating requirements and obligations between residential (domestic) and commercial installations. Obligations that, amongst others, demand balances in legionella risks and other water quality issues. There remains a challenge within the HVAC industry to provide better guidance on the use of heat pumps, especially for water heating, when achieving low carbon and ultimately net zero targets. T

ASHP technology presents unique considerations. ASHPs can be a good fit for buildings with moderate or low hot water demand, but those with higher hot water requirements, typically seen in many commercial scenarios require either a larger ASHP unit or a hybrid approach that blends other technologies, such as electric boilers or solar thermal to meet peak demands. The efficiency of an ASHP is also affected by ambient air temperature and the water temperature an application must achieve. Efficiency can drop during colder periods as well as when a unit is pushed to deliver higher temperatures, requiring the unit to consume more electrical energy to achieve desired working flows.

And we have already touched on the need for high temperatures in domestic hot water (DHW) systems for commercial buildings, which must maintain a minimum temperature (60°C) to prevent Legionella bacteria growth. For this reason, and to optimise the efficiency of the heat pump, the preferred application of ASHP has been to exclusively supply the pre-heat for water. This has notably driven a resurgence in undersized system storage, especially in like-for-like replacement of gas water heating, as larger thermal storage is now required to offset slower reheating after periods of peak demand.

Greater system complexity with external units and larger thermal storage demands also means ASHP-based systems will require more space and capital expenditure than traditional gas systems. They will also cost considerably more to operate. The overarching advantage is the technology reduces carbon emissions, but many smaller businesses will continue to struggle to balance this against higher replacement and operational costs. The challenge then is to efficiently deliver high-temperature water with a heat pump without necessitating complex system designs and major structural alterations. Standard heat pump components are generally unsuitable for very high

temperatures, demanding larger specialised compressors and heat exchangers which add to the size and weight of a unit. High temperatures also require a change in refrigerant to achieve suitable efficiencies.

The current default refrigerant in most ASHPs on the market is R-32 (Difluoromethane) which has been popular due to its efficiency and lower global warming potential (GWP) compared to prior R-410A refrigerant. Its ability to deliver DHW temperatures is realistically limited to 50-50°C before loss of efficiency is too great. For this reason, the next generation of ASHP is embracing R-290 (propane) which offers greater efficiency at moderate DHW temperatures and has the capability to reach DHW temperatures of 70°C with the bonus of an ultra-low GWP for an extra tick in the box for being better for the environment. R-290 is however highly flammable, and more strictly regulated, so expect more low-GWP hydrocarbon blends with R-290, such as R-1270 (Propene) or R-161e (C3H8) which can achieve higher DHW temperatures while maintaining reasonable safety profiles.

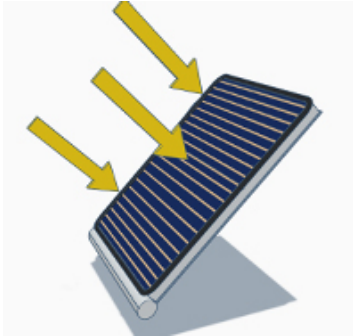
There is a growing demand amongst specifiers for a singular heat pump application that can meet high-temperature demands creating a ready market for the next generation of ASHP. Our research with R-290 propane units indicates that whilst the refrigerant enables large 40-50 kW units to achieve a promising coefficient of performance, 2.4 at 65°C working flow/7°C ambient, there remains a propensity for output to fall steeply when the exterior temperature drops, lowering COP to as little as 1.8 at 70°C working flow and -5°C ambient. This brings the units back in line with smaller, lighter R32 models. First-generation R-290 units are large and heavier, as much as ½ tonne for 40 and 50 kW models, which can introduce new limitations in terms of where and how the ASHP can be safely installed. They also tend to be noisier which is a particular consideration should the building in question have a residential aspect such as a hotel, hospital, care home or school/university dormitory.

Looking further into the development cycle, R513 is a relatively new refrigerant which, potentially offers a safer, more balanced performance at higher temperatures with a relatively low GWP (570) making it well-suited for DHW. R513 ASHPs are set to be compact and lightweight due to a smaller compressor and fan assembly, making them easier to install. Critically they are likely to be cheaper to specify. There will be radical changes in the choice of refrigerants available to commercial heat pumps. The EU is accelerating efforts to ban 'forever chemicals' including those which fall under the umbrella term per- and polyfluoroalkyl substances, or PFAS, which includes R32. Such legislation could be in place in a matter of a year or two, with expectations that the UK would follow.

So where do we stand today? In truth, the current generation of R32 ASHPs offers an extremely viable way to introduce low-carbon, renewable technology into buildings and the technology meets all current BREEAM requirements. With carefully designed, balanced DHW applications R32 heat pumps lend themselves well to hybrid approaches, reducing emissions from existing gas-fired applications or helping offset direct electric demands from topping up heat with electric boilers in indirect systems. They can also work in close conjunction with solar thermal as a mid-heat, which maximises the efficiency of the heat pump as it works with the cold in. Investments in R32 will likely see continued support well into the 2030s before legislation drives the next generation of heat pumps likely based around hydrocarbon refrigerant blends.

Whichever way legislation drives the development of heat pumps, the advantages in carbon reduction and energy offsetting mean even complex systems can be cost-effective despite higher capital investment. In terms of DHW demand in commercial buildings, we need to accept and embrace hybrid approaches now and well into the future as the optimal path to net zero commercial buildings.

Sustainable Electric Hot Water



Solar Thermal

A proven and extremely reliable technology, solar thermal offers a clear path to reducing CO₂ emissions and offsetting expensive electric costs for organisations using large amounts of hot water. Adveco's collectors with drain back provide a low maintenance option to help achieve sustainability goals.

[FIND OUT MORE](#)



Air Source Heat Pumps

The FPi32 & L70 ranges of commercial Air Source Heat Pumps (ASHP) for the provision of preheat in domestic hot water applications. Adveco ASHPs can be supplied as a part of a bespoke hybrid, or all-electric system, as well as an element of a prefabricated plant room system.

[FIND OUT MORE](#)



ARDENT Electric Boiler

ARDENT is designed to serve as an indirect water heater or heating system. Wall-hung and floor-standing variants for those seeking to avoid a reliance on gas energy supplies. In hard water areas the ARDENT electric boiler can be used to dramatically reduce the costly build up of damaging limescale.

[FIND OUT MORE](#)

Adveco 2024 Product Guide

Get our handy reference guide to Adveco's current product portfolio. Don't forget these are just the start of our offering, acting as the building blocks for your bespoke hot water systems...

[2024 PRODUCT GUIDE](#)



Discover Adveco's expanding range of low carbon and renewable products

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[Solar Thermal Systems](#)

[FPi R32 monobloc Air Source Heat Pump](#)

[L70 Air Source Heat Pumps for larger projects](#)

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01252 551540



Enquiries@adveco.co

Adveco Ltd. is the hot water specialist with more than 50 years of expertise in the building service industry. Adveco Ltd 2024. Unit 7 & 8 Armstrong Mall, Southwood Business Park, Farnborough, Hampshire, GU14 0NR