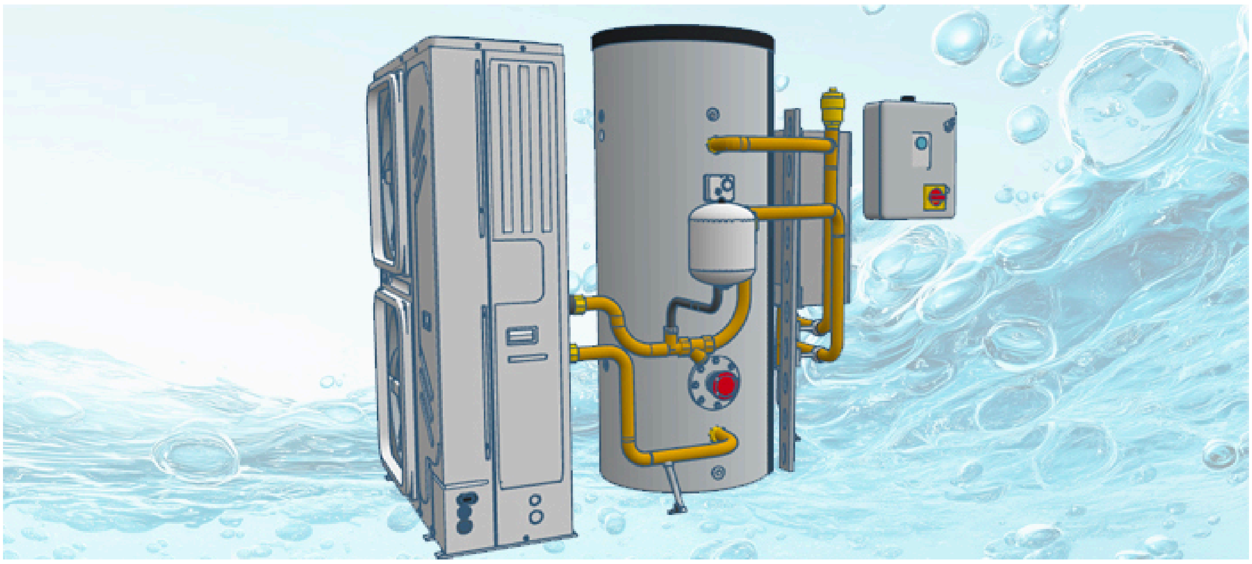
ADVECO NEWSLETTER

Welcome to Adveco's August newsletter,

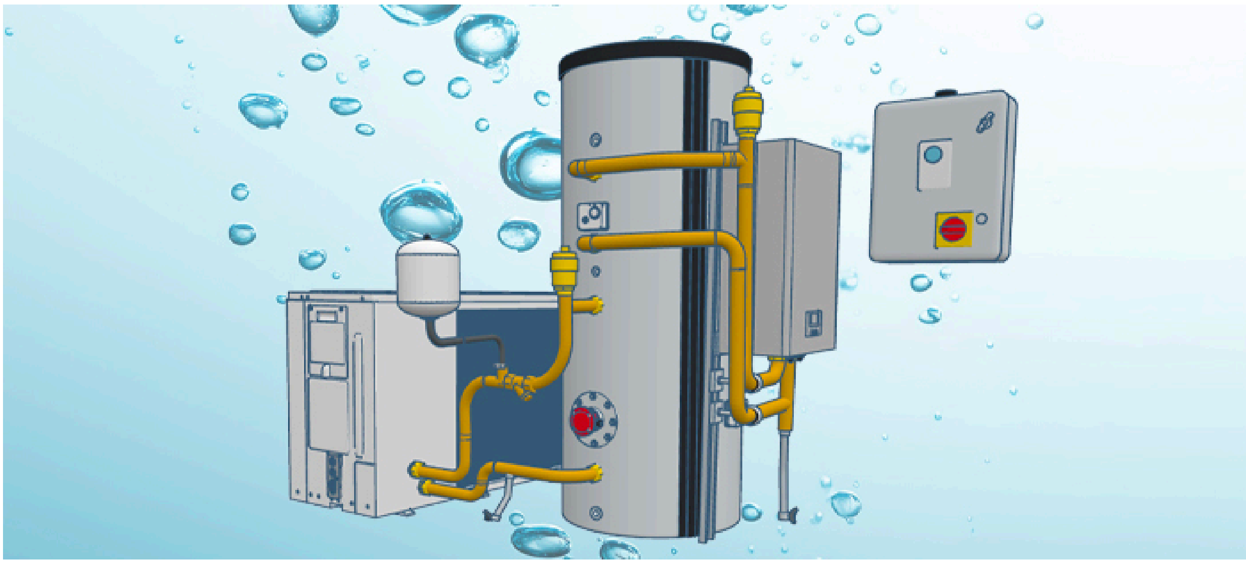
This month, we start with an exclusive first look at the next generation of our award-winning low-carbon FUSION packaged electric water heater system. We also consider the critical role indirect preheat vessels play in the creation of next-generation hybrid domestic hot water systems for commercial buildings.

And, as organisations are tasked with addressing sustainability, we examine the challenges that face the UK in terms of retrofitting HVAC systems across the commercial built environment and the roles that gas still has to play. Looking further forward, we ask if white hydrogen is the missing piece of the Net Zero puzzle...

New Arrival - FUSION, Enhanced Features & Lower Carbon Emissions



Here is a first look at the new iterations of the Adveco FUSION packaged electric water heater. We will be announcing a new series of variants which leverage larger, more effective heat pumps to increase system preheat for even greater reduction in carbon emissions compared to other equivalent direct electric or gas-fired alternatives. FUSION is feature filled, taking full advantage of the ADV-W air source heat pump, enhanced controls and greater choice of backup immersions...



FUSION

Preheat Vessels in Hybrid Water Heating Systems

Adveco considers the critical role indirect preheat vessels play in the creation of next-generation domestic hot water (DHW) systems in commercial buildings.

As commercial buildings transition to net zero, hybrid water heating systems that combine low-carbon sources like heat pumps or solar thermal with traditional boilers are increasingly critical. A key component often overlooked in this mix is the preheat vessel. Indirect cylinders, or calorifiers, serve as these preheat vessels, enabling efficiency, resilience, and flexibility within hybrid systems.
What Are Preheat Vessels?

Preheat vessels are insulated storage tanks, indirect cylinders, equipped with internal heat exchangers. Think of them as the battery in an efficient DHW system. They hold a reservoir of hot water, preheated upstream via a heat pump or solar thermal collector, and topped up as needed by a primary heat source like an electric boiler or gas heater. By separating heat generation from delivery, preheat vessels ensure a steady supply and greater thermal efficiency.

Preheat vessels matter in hybrid systems, not least because they optimise heat pump performance. Heat pumps produce water at moderate temperatures (45-50 °C) efficiently, but topping up to safe DHW temperatures (60 °C) demands energy and can reduce COP. A well-sized preheat vessel buffers this thermal swing, allowing heat pumps to run steadily and improve seasonal performance.

Correctly sizing indirect cylinders is a critical element of hybrid application design. Under-sizing cylinders, or preheat vessels, can leave heat pumps or boilers struggling during peak demand, leading to cold showers or over worked plant.

Under-sized preheat vessels limit heat pump runtime, forcing higher frequency cycling or boiler override. Heat pumps working against low volume tanks must reheat rapidly, straining performance and billing instead of leveraging slow, overnight reheat cycles.

A larger preheat vessel supports two hour reheat cycles overnight, ensuring readiness for morning peak, avoiding complaints of cold showers. Given electricity costs remain higher, this sizing strategy holds carbon benefit and operational control.

Correctly sizing prevents this, enabling gradual reheating during off-peak times, and maximising preheat vessel value. If oversized, the design generates unnecessary capital investment and will lead to greater operational costs as excess energy is demanded by the application to maintain temperatures.

Enabling Hybrid Resilience

Preheat vessels support hybrid setups by acting as a thermal buffer between low-carbon preheat and top-up sources (electric or gas). The integration of controls is critical for efficient management of heat sources, maximising energy use to lower peak power demands, operational cost and, depending upon primary heating source, the level of carbon emissions. Should primary technologies require maintenance or fail, preheat vessels deliver stored hot water, boosting uptime and reducing reliance on immediate heat generation.

Indirect cylinders/preheat vessels can connect to boilers, heat pumps, and solar thermal, supporting renewable integration. A perfect example of this is FUSION Packaged Electric Water Heating

The Adveco FUSION system integrates a preheat vessel with an FPi32 ASHP (6 – 10 kW) and electric boiler (9 – 12 kW), supplying continuous hot water up to 60°C for light commercial settings. The preheat vessel ensures the heat pump operates in its efficient zone, while the boiler handles peak topping to meet safety and anti-legionella needs.

The pre-configured preheat vessel removes sizing guesswork, balancing cylinder volume against expected usage. With capacities from 200 to 500 litres and a 10 bar rating, it addresses varied demand profiles from student accommodation to public sector sites.

An additional advantage of using an indirect approach in FUSION is the system’s ability to counter limescale formation by confining water movement through a controlled loop and the electric heating within the boiler. Limescale formation, so long the bane of electric water heating elements in hard water areas, is essentially nullified for reduced maintenance. And with minimal corrosion and low wear, system efficiency is maintained, ensuring greater reliability and a longer operational lifespan of the system.

Designing with Preheat Vessels in Mind

- *Calculate Peak Demand*

Usage patterns, including simultaneous draw off, are used to determine the minimum volume.

- *Ensure Compatible Top-Up Sources*

Preheat vessels must pair effectively with both renewable preheat, heat pumps, and topping units. Control strategies must prioritise heat pump use while deferring boiler activation until needed.

- *Size for Overnight Reheat*

Aim for 2-3 hours of reheat at base heat pump output to ensure full utilisation.

- *Utilise Packaged Solutions*

Off-the-shelf systems like fusion pre-size preheat vessels, reducing complexity and installation risk
In the quest for net zero water heating, preheat vessels occupy a central role in hybrid systems, bridging renewables and backup heat, smoothing demand, extending system life, and ensuring carbon-led savings. Undersize them, and heat pumps underperform; oversize them, and capital is wasted. The expert answer? Rely on right-sized, packaged preheat vessel systems that align with your demand profile and carbon goals.

For commercial projects, the message is clear: to maximise hybrid efficiency and avoid net zero compromises, act like Goldilocks when choosing the right preheat vessel, not too small, not too large, but just right.

HOT WATER CYLINDERS

Gas Water Heating Retrofit - A National Challenge

Without a doubt, one of the great challenges that faces the UK is the retrofit of HVAC systems across the commercial built environment. According to the Department for Business, Energy, & Industry

Strategy (BEIS) there were 1,755,000 recognised non-domestic buildings in England and Wales at the end of March 2024. Many of these buildings will have been constructed to lower energy efficiency standards and currently account for 23% of the UK built environment's operational emissions, of which as much as 30% can be attributed to aging domestic hot water (DHW) systems.

Of these buildings, just 14.6% were constructed after 1996, and considering the rates of new construction, it is easy to see why the UK Green Building Council (UKGBC) estimates that 80% of buildings that exist today will still be here in 2050. This means the large majority require some or considerable retrofit over the next 25 years if improved performance for sustainable operation is to be achieved.

The vast majority of these buildings will be gas-connected and will have used a gas water heater, a tried and trusted technology that continues to offer a lower cost – in terms of capital and operational expenditure – means of meeting high temperature demands seen in commercial organisations.

This has meant that, despite the drive for decarbonisation, like-for-like retrofit continues to be popular. The advantage at least is that the latest generation of gas water heaters offer greater efficiency when burning gas and transferring heat to water, through improved construction of the burner and heat exchanger and smarter operation that maximises heating to hot water demand and reduces lost heat in flue gasses. Given existing systems will have long operational lives, we often see systems operating longer than 20 years and, in the extreme, more than 40, replacing them with anything new is advantageous for all involved.

When replacing gas-fired water heaters, there are a number of key considerations to take into account, so it is important to look at replacement appliances and ensure they can meet the needs of your project. A good proposition for retrofit will meet a broad checklist of requirements if it is to be suitable for universal retrofit.

First and foremost, give consideration to the location. At a macro scale, where doers the building site geologically as this sets parameters based on the water quality. Hard water areas are better served by indirect heating to reduce limescale, whereas soft water locales will be prone to corrosion, so more robust construction from stainless steel or enhanced porcelain application would be recommended. At the very local scale, does the new unit fit through a standard door? Does it need to navigate steps? So how heavy is it? Would two smaller units be more easily installed, meeting the same hot water demands and possibly be lower cost when compared to a single large unit?

Beyond the actual water heater itself, how much pipework needs adapting or replacing? Are there isolation valves on the current heaters? Do they hold, or are they passing? And can you make the new pipework from the existing valve, or do you have to cut back further than the valve? An appliance that offers multiple connection points offers the best means of replacing an old water heater quickly without major alterations to pipework, reducing both system downtime and pipework costs. On this basis, it would also be sensible to consider a shorter unit. Although an appliance's capacity may be reduced, efficiency gains can more than make up for the difference.

The replacement should also take into account proximity to a drain to pipe away condensate or provide for drain-down maintenance. The other core consideration, and one with direct safety implications, is ensuring the flue is fit for purpose and correctly installed. Aluminium flue, for example, has an expected lifespan of around 15 years. If the old water heater is close to or older than this, it is imperative that the flue also be replaced. Old non-condensing negative draught flue is also not suitable for new condensing appliances, and it is important to remember that changes to regulations may make original terminal location unsuitable. Always check flue connections and kits available for the replacement water heater to ensure it can meet or improve on the existing installation.

To ensure system longevity, the value of investment and ongoing efficiency look for advanced features such as onboard energy and water use metering, remote connection such as Wi-Fi for app-based control and management, or connectivity to the building management system (BMS) for remote fault alarm and monitoring/control.

Most modern gas appliances will also support a 20% hydrogen blend without modification, providing a bridge to future green gas alternatives available from the grid. If the intent is to increase the building's sustainability before the mid-2030s, then the DHW system can be expanded with the integration of a Heat Pump or Solar Thermal system acting as a pre-heat source. Operating at a lower temperature to maximise heat pump efficiency, water is preheated to 55°C and can then be topped up by the gas-fired water heater, which uses less gas for a system with greater carbon reduction. Solar thermal can be used in the same manner as a preheat, but with higher water temperatures can potentially offset all energy demands in the summer months. A minimum average of 30% of the total energy for the year required by DHW can be offset.

For true carbon reduction, we would propose employing a renewable pre-heat and then replacing gas for an Electric Water Heater. With a variety of floor and wall-mounted Electric Boilers available up to 100 kW, most typical commercial applications can be serviced in a more environmentally friendly way. Operational costs will be expected to be higher while grid electricity remains more expensive than gas, but installation is far simpler and cost-effective with no flueing necessary and absolutely zero NO_X emissions.

GAS WATER HEATERS

Is White Hydrogen The Missing Piece Of The Net Zero Puzzle?

Hydrogen is seen to be one of the key elements in meeting net zero goals by 2050, enabling a clean transition from natural gas, a carbon-emitting fossil fuel. Several technologies have been mooted for the creation of grey and green hydrogen, but is there a simpler natural answer in the shape of geological white hydrogen?

Trillions of tons of hydrogen gas are likely buried in rocks and reservoirs beneath Earth's surface. And just a fraction of this hidden hydrogen beneath the Earth's surface could power the globe for

200 years, but researchers are working to identify where these natural resources lie.

Geological hydrogen, also known as natural, white, or golden hydrogen, is hydrogen gas that is generated naturally within the Earth's crust. Unlike other forms of hydrogen that are produced through industrial processes (such as grey or green hydrogen), white hydrogen forms continuously through various geological and chemical phenomena. This makes it a potentially renewable and low-carbon energy source.

White hydrogen is primarily formed through two main processes: serpentinization or radiolysis of water. Serpentinization is the most significant process, accounting for an estimated 80% of the world's natural hydrogen production. It involves the reaction of water with iron-rich minerals, such as olivine, at high temperatures and pressures deep within the Earth's crust. This reaction releases hydrogen gas. Radiolysis of water occurs when radioactive elements in the Earth's crust split water molecules due to ionising radiation, releasing hydrogen.

While the existence of natural hydrogen has been known for some time, recent discoveries have revealed that significant quantities may exist beneath the Earth's surface, challenging previous assumptions that it was scarce. New research suggests the planet holds around 6.2 trillion tons (5.6 trillion metric tons) of hydrogen in rocks and underground reservoirs. That's roughly 26 times the Amount Of Oil Known To Be Left In The Ground (1.6 trillion barrels, each weighing approximately 0.15 tons) — but where these large-scale hydrogen stocks are located remains unclear.

That said, white hydrogen deposits have been identified in a number of locations around the globe. A massive deposit was discovered in the Lorraine mining basin in northeastern France. Researchers, initially looking for methane, found hydrogen concentrations increasing with depth, reaching 14% at 1,100 meters and 20% at 1,250 meters. This deposit is estimated to contain up to 46 million tons of hydrogen, which is more than half of the world's current annual grey hydrogen production.

The only white hydrogen field currently being commercially exploited is in the village of Bourakébougou, Mali. This deposit was accidentally discovered in the late 1980s while drilling for water. The extracted hydrogen is used to generate electricity for the local community.

There were also indications of white hydrogen in the Monzón area of Spain in the 1960s, and more recently, exploration has been re-initiated. The Pyrenees mountain range is estimated to have the potential to yield millions of tons of white hydrogen. The first white hydrogen well in the US has been drilled in Nebraska, and exploration is ongoing in regions like the Mid-continental Rift System. The Australian government has also issued licenses for the exploitation of white hydrogen, with a potential deposit in the southern region of Australia thought to be large enough to power the city of Adelaide for 40 years. Other potential sites include the Bulqizë chromite mine in Albania, and sites in Oman and Russia.

Here in the UK, companies are actively exploring potential sites for white hydrogen around The Lizard, Cornwall; Greenock to Aberdeen in Scotland; and Omagh in Northern Ireland. Any discoveries and resultant development of white hydrogen could significantly contribute to the UK's goal of achieving net-zero emissions by providing a clean and potentially abundant energy source by 2050.

The discovery of white hydrogen reserves could be a game-changer for the clean energy sector. It offers a potentially continuous and cost-effective source of hydrogen that does not require energy-intensive production methods or emit carbon dioxide. This could be a crucial factor in transitioning away from fossil fuels in various sectors, including transportation, heavy industry and commercial heating.

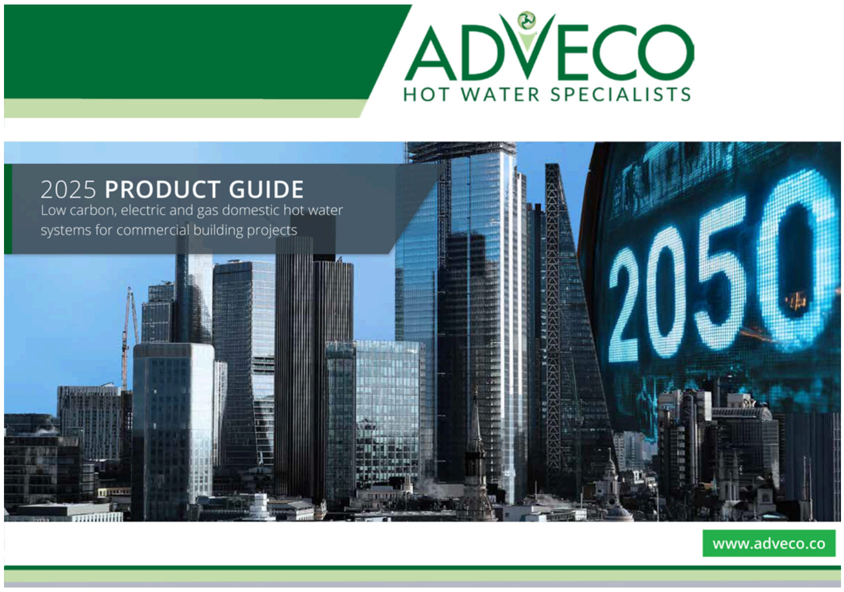
However, challenges remain. The processes of how white hydrogen is generated and accumulates are not fully understood. The commercial viability and scalability of extraction methods are still being explored, and a deeper understanding is needed to ensure efficient and cost-effective extraction and distribution on a large scale.

NET ZERO

Adveco 2025 Product Guide

Get the handy guide to Adveco's current product range for 2025

2025 PRODUCT GUIDE



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