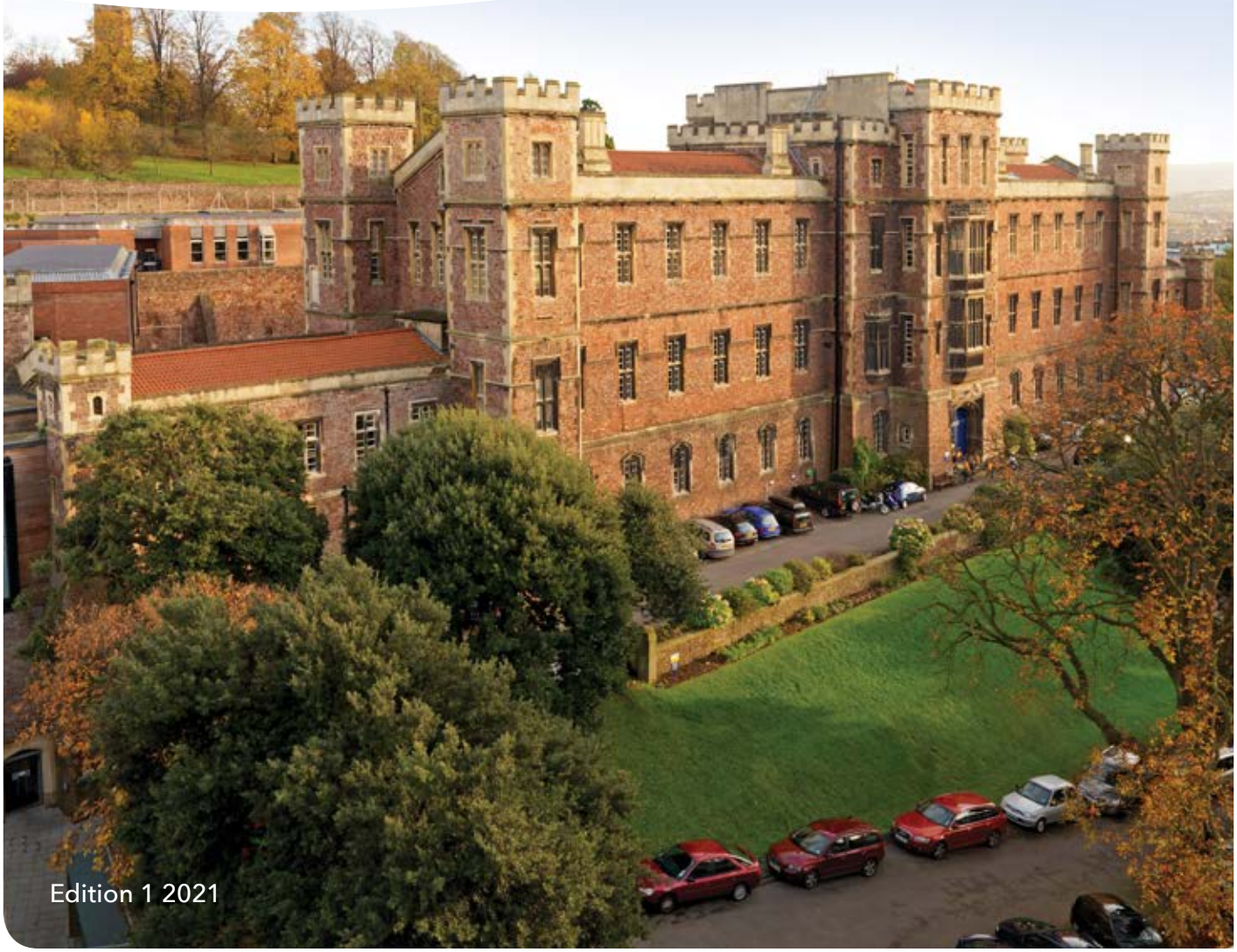
remeha ANDREWS WATER HEATERS POTTERTON COMMERCIAL HEATRAE SADIA PACKAGED PLANT SOLUTIONS

COMMERCIAL SOLUTIONS FROM **BAXI HEATING**

WHITE PAPER

REFURBISHMENT OF SCHOOL HEATING SYSTEMS



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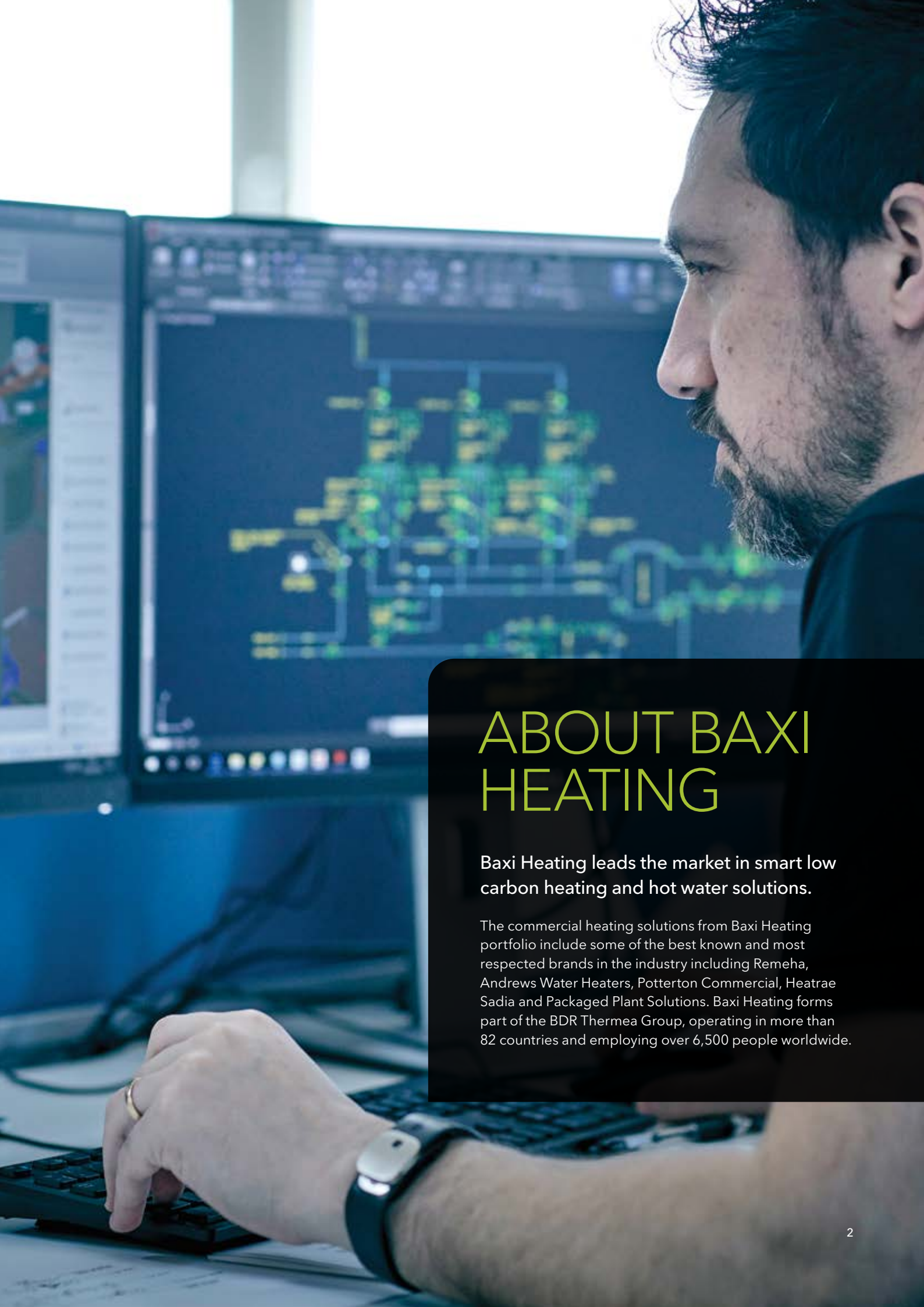


ABOUT BAXI HEATING

Baxi Heating leads the market in smart low carbon heating and hot water solutions.

The commercial heating solutions from Baxi Heating portfolio include some of the best known and most respected brands in the industry including Remeha, Andrews Water Heaters, Potterton Commercial, Heatrae Sadia and Packaged Plant Solutions. Baxi Heating forms part of the BDR Thermea Group, operating in more than 82 countries and employing over 6,500 people worldwide.

THE FUTURE OF HEATING IS NOW

The UK government has committed to a national target of net-zero greenhouse gas emissions by 2050. According to the Committee on Climate Change (CCC), the UK must achieve an average emissions reduction of around 15.5 MtCO2e (carbon dioxide equivalent) per year over the next 30 years.

This objective requires significant efforts across the whole economy, and we have made progress towards interim goals - 16 MtCO2e were saved in 2019. But there is more to be done. One of the UK's primary sources of emissions is heating. It accounts for a third of the country's greenhouse gas emissions and is, therefore, a significant target for decarbonisation.

Heating equipment manufacturers have risen to the net-zero challenge and are already developing innovative technologies and techniques. These include hydrogen boilers and air source heat pumps, as well as working on products to support the delivery of heat networks. No single technology can achieve net-zero carbon, so the availability of a range of options is crucial. The future of heat is on its way, but we need to take action now if we are to start meeting those annual reduction targets.

The need for action on heating systems is particularly pressing in the education sector. Our school building stock consists of around 33,000 buildings. Many are ageing, and their heating and hot water systems have seen better days. According to research from the Times Educational Supplement (TES), 57% of England's schools have faulty boilers or heaters. If these fail in winter, students must be sent home due to lack of heating.

What's more, heating and hot water make up a large proportion of most schools' costs – coming second on the budget after staff salaries. Old and inefficient heating systems add an unnecessary financial burden for this sector. The Carbon Trust Whole School Approach to Energy Savings report estimates that UK schools could save £60 million annually through improved energy management, including upgraded heating and hot water systems – often the most significant energy users in school buildings.

We must not miss opportunities to improve heating and hot water efficiencies in our existing schools. But we cannot wait for new heating technologies to be readily available and affordable. Replacing old heating plant with modern energy-efficient gas boilers is the most cost-effective and timely approach to reducing the emissions from this part of the public building stock. Taking steps now will save emissions sooner – and provide an immediate solution for schools that face inadequate heating and hot water provision.

Baxi Heating regards the refurbishment of school heating systems as a vital step for school buildings. It will have an immediate impact for clients – reducing their energy bills and increasing system reliability. And refurbishment now can put these buildings on the road to the future of heating. That might mean a shift to hydrogen boilers or electric heat pumps, but whatever the technology of the future, progress will be much easier to achieve if firm foundations are laid now.

This Guide offers an overview of the reasons for and benefits of refurbishing school heating systems as soon as possible. The aim is to deliver better outcomes for occupants, with reduced operational costs through a focus on systems thinking from design to installation – and to take a step closer to our national emissions reductions target.

57%
OF ENGLAND'S SCHOOLS HAVE FAULTY BOILERS OR HEATERS

UK COMMITTED TO TARGET OF NET-ZERO GREENHOUSE GAS EMISSIONS BY
2050

16
MTCO2E WERE SAVED IN 2019

1. THE EXISTING SCHOOL BUILDING STOCK

UK schools are ageing. Around 65% of school buildings were constructed before 1976, and 46% were built before 1966. The rate of new school construction is low, so the existing stock will continue to overshadow the sector for many years to come.

The UK government has recognised the issues of ageing schools. In June 2020, the government announced a 'transformative'[1] ten-year school rebuilding programme. In February 2021[2], the first 50 schools scheduled for upgrades were announced with £1 billion in funding.

The government also announced in August 2020 that schools are included in a scheme for public sector organisations to fund energy efficiency and low carbon heating upgrades. The programme will attract £1 billion over 2020 and 2021.[3]

As the tables on dates of school construction show, schools embarking on a heating refurbishment programme face a range of challenges. Some may be dealing with the thick walls, cast iron radiators and poorly-fitting windows of a Victorian primary school. Others face the more modern, but equally problematic, secondary school buildings of the 1960s and 1970s whose design issues can range from poor insulation to overheating from large glazed areas.

It is factors like these that make use of some alternative heating technologies very difficult for schools. Poor insulation or overheated areas make it difficult to predict the effect of new heating techniques. Switching from gas to electric heating, for example, might involve rewiring work that cannot be carried out cost-effectively.

But a switch to highly energy-efficient, modern condensing gas boilers not only provides an affordable solution, it also means that students and teachers can feel the benefits of a better heating and hot water system sooner. What's more, working with experienced manufacturers and installers, it is sometimes possible to use existing pipework for projects where removal and re-piping are not possible (or is beyond the budget of the school).

UK SCHOOL BUILDINGS - DATES OF CONSTRUCTION	
Pre-1919	13%
1920 - 1944	8%
1945 - 1966	25%
1967 - 1976	19%
Post-1976	35%

(Source: Property Data Summary Programme Summary Report)

TYPES OF SCHOOL IN THE UK (NUMBER)	
Nurseries/early learning centres	3,714
Primary schools	20,832
Secondary/middle schools	4,207
Independent schools	2,408
Special needs schools	1,257
Pupil referral units	352
Total	**32,770**

(Source: British Educational Suppliers Association; figures correct at 2017)

10 YEAR SCHOOL REBUILDING PROGRAMME ANNOUNCED IN 2020

IN 2021 ONE BILLION POUNDS OF FUNDING CONFIRMED FOR FIRST 50 SCHOOLS

[1] https://www.gov.uk/government/news/pm-announces-transformative-school-rebuilding-programme

[2] https://www.gov.uk/government/publications/school-rebuilding-programme/school-rebuilding-programme

[3] https://www.gov.uk/government/news/greener-homes-jobs-and-cheaper-bills-on-the-way-as-government-launches-biggest-upgrade-of-nations-buildings-in-a-generation

2. HEATING IN SCHOOLS – DRIVERS FOR IMPROVEMENT

Any upgrades and refurbishments in UK schools must include a close look at heating and hot water systems. They are vital services and if they don't operate, schools can face term-time shut-downs.

Following from lengthy school closures during 2020 and 2021 in the face of the global pandemic, it is more important than ever that schools, once open, can remain fully operational.

Unfortunately, even where a boiler is functioning, that does not always indicate that the heating system is providing comfortable and productive indoor environments for teachers and students. Many studies on buildings over the past two decades have shown that temperatures that are too high or too low have a significant impact on cognitive performance, and this is particularly important in school buildings.

The World Green Building Council states that where school buildings are concerned:

> "Studies have proven that well-ventilated buildings with good indoor air quality, acoustics and enhanced levels of thermal comfort lead to better cognitive performance, sleep quality and a host of other tangible benefits." [4]

The National Education Union (NEU) states that: "temperatures in school classrooms should be at least 18°C"[5]. However, there are currently no legal temperature limits for school staff or pupils, beyond a requirement that they should be 'reasonable'. While new schools design can encompass thermal comfort, existing school buildings face numerous challenging issues.

Recently, in light of the COVID-19 epidemic, schools faced an extra challenge. The Department for Education (DfE) issued guidance on hot and cold water systems as well as increasing fresh air intake for school buildings. These requirements have an impact on the operation of heating and hot water systems.

The most up-to-date DfE guidance can be found at: **https://www.gov.uk/government/publications/actions-for-schools-during-the-coronavirus-outbreak**

It is fair to say that, with tight school budgets, maintenance of heating systems can be overlooked for extended periods (perhaps until failure). This can cause potential problems with hydronics and heating output that is uneven – too hot in some classrooms; too cold in others.

Replacing any ageing, non-condensing boiler plant with high-efficiency modern heating and hot water systems, and adding appropriate controls, can transform an older school building's energy performance. In our experience at Baxi Heating, it can reduce energy use by as much as half with an associated fall in emissions and costs.[6]

At the same time, ensuring a more reliable and efficient heating provision contributes to a more comfortable and productive environment – improving concentration and wellbeing.

It is vital to consider a range of factors when starting on a school heating system refurbishment. At Baxi Heating, we have many years' experience on a wide range of heating refurbishment projects in schools of all ages and sizes. We encourage early engagement with our team of in-house experts, so that we can support the project from design all the way to successful completion and into maintenance.

We take a holistic view of the heating ecosystem in a building – and help to balance client needs against outcomes and budget.

[4] https://www.worldgbc.org/better-places-people/green-healthy-schools

[5] https://neu.org.uk/advice/cold-weather-and-classroom-temperature-england

[6] Modern Building Services magazine, July 2019, page 30 The Great British Heating Refurb, by Paul Arnold, Product Manager, Remeha https://cloud.3dissue.com/176015/176416/205864/MBS0719/index.html

3. HEATING & HOT WATER SYSTEM REFURBISHMENTS – FACTORS TO CONSIDER

In 2021, schools also face the possibility of extended school days and shorter holiday periods to compensate for shut-downs during the year. This means that finding a convenient time for a heating system refurbishment will prove more challenging than usual.

It therefore makes sense to plan ahead for a heating and hot water system refurbishment to ensure that these vital school services are delivered with minimum disruption to school life.

While it can be tempting to view heating and hot water as a 'boiler' issue, it is more valuable in the long-term to consider the whole heating and hot water system. Given the age of most of the building stock, it is fair to say that many heating systems were not designed initially with retrofitting or refurbishment in mind. Careful planning is, therefore, key to success in these projects.

When installing any heating system, there are several important factors to consider to ensure a system performs as it should in terms of efficiency and comfort. While older buildings cannot perform to the same standards as new-builds, there are steps to ensure a heating system in a refurbishment project operates at optimal efficiencies.

FLUES AND VENTILATION

Consideration of flues for gas boilers can sometimes be left until the end of a refurbishment project, but this is not the best approach. There are a number of factors affecting flue choice and position, and it's much better to consider these at the outset.

For example, modern pre-mix boilers have a pressured flue that generates condensation due to the flue gas temperatures. If the existing system is non-condensing or partially-condensing (as it's likely to be if the boiler has not been updated for some time) then a new flue will be required or modifications will be needed to the existing flue.

It can be tempting to keep the old flue to avoid the cost of replacement, and simply replace a non-condensing boiler with another non-condensing option. While this might save some initial capital costs, it is vital to consider the long-term higher energy costs of a non-condensing boiler when compared with a condensing system. The higher operational energy costs and retention of an old flue may simply delay an inevitable change for a short time.

Bringing in flue specialists early on in the project is very helpful as they can offer practical advice on the best approaches for installing a flue and can often make suggestions that can make a project viable.

Ventilation in the plant room is also another important factor to think about early in a project. Ventilation is required by law and there are a number of Standards that installers have to follow. This means that it is a good idea to ensure that the design and installation team see where a new boiler might be placed, so that they can check that the correct level of ventilation can be supplied.

ACCESSIBILITY

Often, one of the most difficult aspects of any refurbishment project is how easy it is to get into an existing plant room, remove old equipment and then bring in new boilers and related kit. Taking a close look at the school building at the planning stage of refurbishment is essential to identify any low ceilings or narrow staircases that have to be negotiated.

It is also important to bear in mind that it is not just the boiler footprint that needs to be calculated. Access space and walkways should be included to make future maintenance safer, quicker and more achievable. Many schools have to make their maintenance budget work hard, so if the process can be made more straightforward, then heating and hot water systems can have a longer and more effective lifetime.

TIME CONSTRAINTS

Time constraints are always an issue for school refurbishment projects, and they are associated with accessibility. Can equipment be installed and commissioned during the holidays, for example? Easy installation and quick set-up help enormously on these projects. For complex systems, it is possible to consider a modular approach or prefabricated rigs that can be delivered to site, ready to 'plug-and-play'.

Combined with accessibility issues, time constraints may dictate whether the project involves a boiler replacement, using existing pipework; or a more involved project that removes existing pipework before replacement.

SIZING AND FABRIC

Sizing of a heating and hot water system impacts on the long-term running costs and performance. With retrofit projects, it can be tempting to replace a heating system on a like-for-like size basis. However, the school building and its occupancy patterns may have changed considerably over time.

There may be more students attending a school, for example, or the building may now be used during evenings and weekends for community events and activities. Modern educational equipment, such as computers and screens, create greater heat gains that must be taken into consideration. Also, some schools have shifted to using external suppliers for food provision, so domestic hot water requirements in kitchen areas could have fallen considerably over the years.

All of these potential changes need to be examined for each project since oversizing a system without taking these considerations into account will cost more in capital and operational costs.

Furthermore, when sizing for condensing boilers, it is vital to bear in mind that they modulate, adapting to meet peak and low loads for more efficient energy use. It's therefore essential to know the maximum and minimum heat demand for a project to achieve accurate sizing calculations.

One final point to bear in mind is that school refurbishment projects may take place over an extended period of time. It is important to be aware of future planned changes to the building fabric. For example, if double-glazing is being added to the building after the heating system refurbishment, this should be borne in mind as it will have implications for heat loads. The same applies to building extensions and changes of use.

GAS PRESSURE

Most modern boilers require a gas pressure of 17mb (millibars). Registered Gas Safe engineers will not commission any plant that falls below this minimum gas pressure when all of the appliances in a heating and hot water system are on 'high fire'. This would effectively render a heating and hot water system unusable.

For a heating refurbishment project, it is therefore important to think about any equipment additions to the system and to check that they do not affect the minimum pressure. These additions might include extensions, new circuits or calorifiers, for example. Gas pressure boosters can be applied if needed, to ensure that the pressure is at an acceptable level.

WATER CONDITION AND SYSTEM CLEANING

Water quality has a significant impact on the performance of heating and hot water systems. Protecting the new heating system from older pipework will pay dividends in the long-run.

While it is sometimes possible to re-use older pipework in a refurbishment project, this needs to be considered in light of factors such as the age and condition of the existing system. The same applies to heat emitters such as radiators. Updating these will support better heating throughout the building, and allow more energy efficient operation.

Ideally, air and dirt separators should be specified as part of the system to ensure proper long-term operation. It is also useful to consider the use of a Plate Heat Exchanger (PHE) to achieve hydraulic separation between the boiler circuit and heating circuit.

CONTROLS

Controls are an important element of heating systems, and they have a significant impact on energy efficiency and occupant comfort.

It may be possible to maintain the existing controls strategy on a heating refurbishment project. However, it is a good idea to consider new approaches to controls to reflect the performance of modern heating technology. For example, if an old boiler was operating at higher temperatures, it's advisable to adopt a new control strategy. This might include updating the sequencing of boilers, to suit the new equipment and any changes to heating and hot water demands created by usage patterns.

Controls do not have to be elaborate – the simpler, the better in a busy school environment. For instance, installing a weather compensator will provide a more accurate prediction of load, and hence control. And the addition of Thermostatic Radiator Valves (TRVs) offers more focused control for classrooms that teachers can set to their preference for optimised comfort.

AIR QUALITY AND THE ENVIRONMENT

Air pollution is now regarded as hazardous to health, particularly for children's developing lungs. Poor air quality can cause long-term respiratory problems such as asthma and heart-related conditions. Many local authorities in the UK now have Air Quality Management Areas (AQMAs) in force which means that they are monitoring certain pollutants such as NO_x, with the aim of reducing their impact on the local population.

The Medium Combustion Plant Directive (MCPD) covers combustion plants with a thermal input between 1MW (megawatt) and 5MW. Natural gas boilers of this size must meet a maximum NO_x emission level of 100mg/Nm^3 (100 milligrams per cubic metre).

Low NO_x boilers are therefore the obvious choice to consider when refurbishing a school heating system. Modern boilers can offer ultra-low NO_x options, along with higher efficiencies. Planning for any specialist requirements in this area early in the project will save headaches later.

With all of these factors in mind, it is critical that manufacturers, consultants and contractors work together to evaluate the various options to overcome installation challenges to provide optimal heating outcomes. Our next section looks at why it is essential to take a step back and consider the heating system as a whole before making any specification decisions.

4. SYSTEM THINKING – A HOLISTIC APPROACH

Before finalising decisions on what heating technologies to apply (covered in Section 5) it is useful to take a holistic look at the school heating system.

As all designers and installers know, every building has its challenges. Without careful consideration of a project, it is easy to make assumptions about what might be the best solution.

Whatever improvements in performance or energy-efficiency might result from refurbishment, they must be within the school's budget and meet its immediate and long-term needs. The three key factors to balance are:

TIME

How urgent is the need for refurbishment? How much time is there to complete the work? This will impact decisions on what areas of the heating system to refurbish, and what products are best suited to achieve desired outcomes.

BUDGET

This is a significant factor for schools and looking at what offers the most beneficial impact within budget is critical. On the other hand, it might be tempting to specify lower-cost upgrades when a slightly higher spend would produce better short- and long-term outcomes for the school.

OUTCOMES

What outcomes are most important to the school? If an old heating system is continuously breaking down, then replacement with modern and reliable technology is top of their requirements. However, there may be other factors that the client has in mind, such as changing the heat distribution system because old iron radiators are no longer considered safe in a school environment.

Heating is an ecosystem that includes a range of essential equipment, such as the pipework and radiators on the distribution side. However, the boiler is essentially the heart of the system, generating the heat. It is the most expensive and challenging aspect of a refurbishment to tackle, but it is the one that can have the most impact, so it is important not to avoid it.

Baxi Heating and its portfolio of brands – Remeha, Andrews Water Heaters, Potterton Commercial, Heatrae Sadia and Packaged Plant Solutions – have a wide range of experience in school refurbishment projects. It is tempting to make a large number of changes to the heating system in a single project – to save time and make an immediate impact. However, by taking a step back and viewing the system as a whole, it is possible to find solutions that make the most impact for the client.

In our next section, we look at the modern heating technologies and techniques that can be applied in refurbishment projects.

5. MODERN HEATING TECHNOLOGIES AND TECHNIQUES

The array of issues to consider and choices to make when organising a school heating refurbishment is daunting. But modern heating equipment and techniques can address a number of these challenges simultaneously.

While there are low- and zero-carbon heating technologies on offer, many older school buildings may not be suitable for these options. The low temperature heating provided by heat pumps, for example, may not offer the performance required in buildings that are not air-tight or that cannot be further insulated without significant cost.

However, there is a range of energy efficient modern gas boilers to suit the accessibility, timing and sizing requirements of any school heating refurbishment project. Modern boilers and accompanying equipment also offers the highest standards of performance in terms of reliability, efficiency and reduced NO_x emissions.

CONDENSING BOILERS

Energy efficient; low NO_x; available as floor-standing or wall-hung to accommodate a range of spaces; can be installed as a cascade system; available with a variety of features to make them easy to manoeuvre in tight spaces.

Replacing inefficient or non-condensing boiler plant with modern high-efficiency condensing boilers is one of the most practical and cost-effective means of cutting energy consumption. It lowers energy bills and creates the comfortable, productive learning environment required by schools.

There are two main types of condensing boiler: floor-standing and wall-hung. On projects requiring a lower heat output, wall-hung boilers are a popular choice due to their compact, lightweight design which helps to overcome access and space constraints. They are now available in sizes up to 160kW, given an excellent choice for specifiers.

Floor-standing condensing boilers are very useful for projects where a basement plantroom has low ceilings. Modern boilers also offer features that are specifically designed to make refurbishment projects easier. For example, the addition of castors for manoeuvrability of floor-standing boilers; or inclusion of internal lights for easier servicing.

CASCADE CONFIGURATIONS AND MODULAR BOILER ARRANGEMENTS

Spreading the heating load over several modulating boilers is a more efficient approach than relying on a single larger unit. This set-up that improves the modulating capability of the boilers – allowing the heating system to respond more accurately to heating loads and reducing energy waste.

Modulation is particularly useful in school buildings with fluctuating heat demand (often the case where there are large areas of glazing, for example, causing classroom overheating even in cooler months).

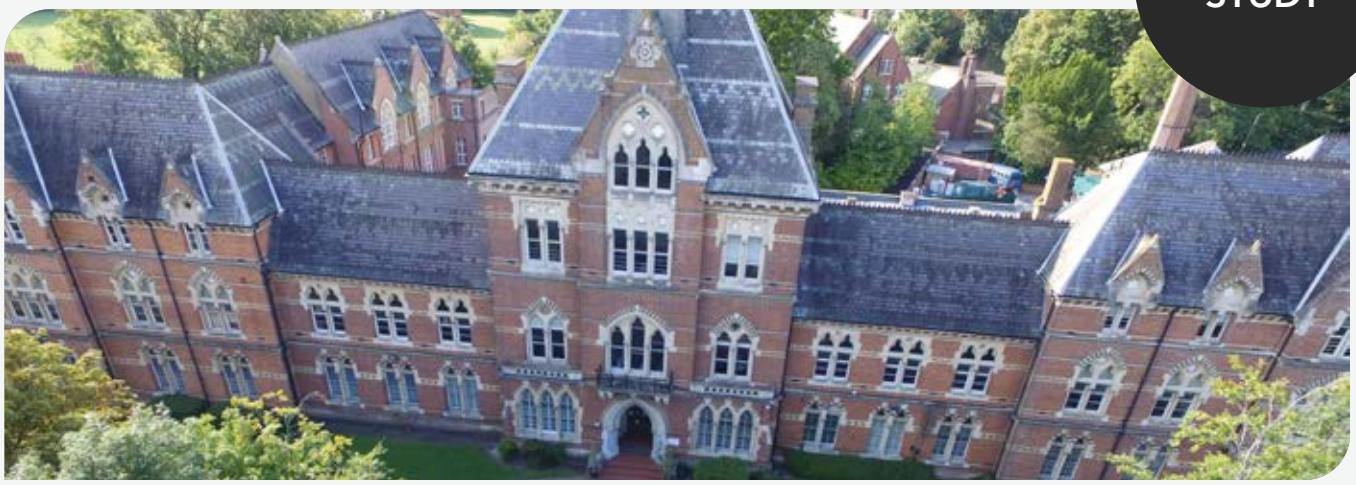
Cascade configurations also provide built-in redundancy, making total heating breakdown far less likely. Maintenance is less disruptive as boilers are easier to isolate, remove and replace. This leads to a longer lifetime for the equipment that the school has invested in.

Where space is at a premium, floor-standing modular configurations can prove an advantageous approach. The Remeha Gas 220 Ace, for example, has been designed with these design challenges in mind. Based on an aluminium monobloc platform, the boiler is lightweight and very manoeuvrable. In a multi-boiler configuration, the 220 Ace has a small footprint and easier installation than a stacking cascade arrangement.

THOMAS MORE CATHOLIC SCHOOL, PURLEY

Uses Remeha **Gas 610 Eco Pro**

CASE **STUDY**



When the old boiler plant began to fail, an immediate boiler plant was required.

The project had to be carried out during term time, requiring speed and minimal disruption. In common with more than 5,000 school buildings in England, Thomas More Catholic School is a listed building. Surveyors and M&E project contractors Faithorn Farrell Timms LLP (FFT) saw that their first obstacle would be access.

Cowley Group recommended two high-efficiency Remeha Gas 610 Eco Pro 14-section replacement boilers to meet the heat demand. A significant benefit to the project was that the new boilers were light enough to lift into the plantroom – and narrow enough to fit through the doorways.

> “The primary entrance to the basement level plantroom is via a very narrow and fragile Victorian case iron staircase.”
>
> Abigail Blumzon
> Project manager

PREFABRICATED RIGS

Designed and pre-assembled heating systems that can be delivered to site ready to operate.

A prefabricated rig is effectively a mini plant room system that is custom-designed for the needs of a particular project. It is designed and assembled offsite by the manufacturer and can include boilers, pumps, low loss headers or plate heat exchangers. A prefabricated rig can also be manufactured with ancillary items such as dosing pot and pressurisation unit.

For Local Authorities upgrading the heating systems of a number of their schools, these prefabricated rigs can be made and delivered in a relatively short time-frame. Standard rigs can be available with a lead time of 4 to 5 weeks.

Because the heating system components are assembled offsite and delivered as a single unit, only minimal on-site installation and commissioning are required. This reduces disruption (so projects can be carried out in shorter half-term holidays, for example). It also cuts down on the number of people working on-site, which is a safe solution allowing for social distancing measures. Hot works can also be avoided.

BIM (Building Information Modelling) tools and 3D Computer-Aided Design (CAD) systems are used to design each module. Early visualisation enables consultants, contractors and clients to collaborate on the system design and evaluate its functionality before any work takes place. As these bespoke systems are produced under factory conditions, clients have the reassurance of factory quality assurance and pre-release testing.

With a pre-fabricated rig, clients also receive a clear Operation and Maintenance (O&M) manual to ensure that information on the equipment installed, including safety and maintenance issues, is readily to hand.

ARCHBISHOP ILSLEY CATHOLIC SCHOOL, BIRMINGHAM

Uses Remeha **Quinta Ace** and Andrews Water Heaters **ECOflo**

CASE **STUDY**

Reliability and energy efficiency were key considerations at this large secondary school and sixth form college.

The old plant serving the school's sporting facilities needed replacing. Heating engineers Spa Gas selected five Remeha Quinta Ace 160kW boilers with a combined output of 800kW. They decided to install the boilers on a Remeha cascade system to meet a fixed project schedule.

For hot water supply, the team selected an Andrews Water Heater ECOflo. This fully-condensing direct fuelled water heater supplies hot water to the school's sports facilities.

> "The ability to cascade the five boilers not only resulted in a neat, compact installation but also made the project simpler and faster."
>
> Mark Fry
> Director at Spa Gas

HOT WATER CYLINDERS AND WATER HEATERS

Energy efficient; delivering hot water separately from a heating system if required; also useful where there is a high demand for hot water such as shower blocks.

Hot water is necessary for hygiene and comfort. Schools with sports facilities and shower blocks can have a high demand for hot water, but school kitchens also need to be appropriately and efficiently supplied at peak times.

It is possible to use a boiler to provide both space heating and hot water. In some projects this may be appropriate. However, with overheating-prone buildings of the 60s and 70s, hot water will likely be required when heating is not. Installing a dedicated and separate water heater to cater for demand generally results in lower running costs and energy consumption. Furthermore, water heaters can provide hot water for storage or instantaneous use, depending on the type of demand.

Using a separate system for hot water also means that designers and installers can more accurately match the school's hot water demand, reducing the likelihood of an oversized system. This issue is important because oversized systems have a higher capital outlay. When assessing hot water requirements, it is essential to establish:

- demand points
- outlet temperature
- required flow rates
- basin capacity
- length of peak period
- number of fills

These factors dictate the size and type of water heater best suited. Andrews Water Heaters offers a useful sizing calculation tool (Size-it) that makes sizing easier and also provides the latest legislative guidance for correct product specification.

QUEEN ELIZABETH'S HOSPITAL SCHOOL, BRISTOL

Uses Remeha **GAS 220 Ace**

CASE **STUDY**

Two ancient cast-iron sectional boilers needed to be replaced during the summer shutdown period.

The school has a high heat demand of 1,250kW so floor-standing boilers were specified. Consultant Geoff Bevan specified five Remeha Gas 220 Ace boilers with a plate heat exchanger. The boilers were delivered on an offsite-fabricated cascade system to meet the high heat demand in an exceptionally compact footprint. The PHE maintained hydraulic separation between the boiler circuit and the heating circuit, preventing debris and contamination entering the boiler.

PLATE HEAT EXCHANGERS (PHEs)

Enable the heating and hot water system to operate separately (complete hydraulic separation); particularly useful when adding a new boiler while retaining existing pipework. Small footprint for installation in smaller spaces; cascade arrangement can provide higher volumes of hot water.

PHEs are increasingly used in refurbishment projects to achieve hydraulic separation between the boiler circuit and the heating circuit. This prevents debris or contaminated water entering the boilers, reducing the likelihood of damage and extending their life.

If gas-fired water heaters are not a suitable or feasible option, due to design or flue restrictions, an instantaneous PHE can be a useful alternative.

However, PHEs also need protection from the effects of poor water quality, so use of water treatments such as magnetic filters or air/dirt separators is recommended.

LOW LOSS HEADERS (LLH)

Maintain the correct flow of water to the boiler (or boilers) to ensure efficient and effective operation.

A Low Loss Header regulates the heating system so that the boiler receives the minimum required water flow rate for efficient operation. Variable flow rates can be caused by a number of factors, including use of Thermostatic Radiator Valves (TRVs), modulating pumps, DHW coils or system control valves.

Maintaining a regulated flow of water is essential when using boilers in a cascade configuration. LLHs also prevent pump damage caused by overload and wear and tear, and avoid pressure fluctuation in the pipework.

Baxi Heating LLHs also offer air/dirt separation, and optional magnetic filtration can be included to help ensure good water quality in the heating system.

Specification and sizing of both Plate Heat Exchangers and Low Loss Headers depends on the type and size of your heating system, as well as the flow-rate requirements of the boilers. Our team of in-house experts at Baxi Heating can offer advice on specifying the correct technology and sizing for your project.

[7] https://www.worldgbc.org/news-media/better-places-people-research-health-wellbeing-and-performance-green-schools

CONCLUSION

As the World Green Building Council states:

> School is a place a child has to go, no matter the indoor environmental conditions. And young children are impacted by indoor environmental factors, like poor air quality, more than adults. We must make a school environment healthy for students to help them thrive."[7]

Our schools can act now to improve the performance of their vital heating and hot water systems. By upgrading older, inefficient (or non-functioning) boilers now, the sector can improve conditions for students and teachers while reducing building operating costs.

School buildings are often challenging projects for refurbishment. Consultants and installers can face an array of issues from working in a listed building to dealing with extremely tight project deadlines. Pre-planning the project is vital for success. Only by working together, with manufacturers who offer a range of solutions, can the team deliver successful outcomes.

While the list of issues to consider seems daunting, it is possible to address multiple problems with straightforward solutions. Modern heating and hot water equipment provides flexible solutions that support the project, rather than hamper it.

Baxi Heating has many years of experience helping project teams achieve outstanding results in schools projects. From design to installation and beyond, we consider ourselves a partner in meeting the refurbishment challenge.

MODERN PRODUCTS TO ANSWER YOUR HEATING AND HOT WATER REFURBISHMENT CHALLENGES

BAXI HEATING SOLUTIONS			
	AREAS TO CONSIDER	SOLUTION	BAXI HEATING PRODUCTS
Flues and ventilation	• New flue will be required if switching to a condensing boiler from a non-condensing boiler • Check the location of the replacement boiler and ensure the required ventilation is available in that space	Talk to the experts early in the project – they can help to find a solution	Room sealed flue / conventional flue headers provided as options
Accessibility	• Ceiling heights • Floor space for maintenance • Doorway and stairway sizes	Prefabricated rigs; wall-hung boilers; integrated castor wheels for boilers	Comprehensive boiler range, cascade and bespoke rigs offered as space saving solution
Time constraints	• Project carried out during summer break • Phased projects • Project during term requiring minimal disruption	Prefabricated rigs	Complete Packaged Plantroom design and manufacture, prefabricated solutions and off the shelf cascade resolutions
Sizing	• Do not assume current boiler size is correct • Calculate heating and hot water loads accurately • Avoid over-sizing	Condensing boilers; cascade approach; wide modulation; separate water heaters; plate heat exchangers	Andrews Water Heaters Size-It software; PHE sizing; Potterton Sirius three
Gas pressure	• 17mb minimum required • Check for new accessories added to system	Pressure boosters if required	Available on larger floor standing pressure jet boiler only
Water condition	• Is pipework also being refurbished? • If not, consider separating systems • Encourage cleaning of hydronic systems	Plate heat exchangers; hydronic system separation; separate water heaters; Low loss headers	Plate Heat Exchanger / Low Loss Header (Air Dirt Separator) available as standard
Controls	• Vital for energy-efficient operation • Smart kit offers built-in controls and remote monitoring potential • TRVs for classroom control	TRVs; modern boilers with built-in controls	Range of boiler sequencing / weather compensation controllers available
Air quality and the environment	• Is the school project based in a busy town or city? Or one with an AQMA in place? • Identify areas around the project – are they close to high emissions? • Consider low-NO_x solutions • Does the school have consistent heating and electricity requirements?	Low NO_x condensing boilers; CHP plant combined with condensing boilers and/or water heaters	Range of boilers with NO_x emissions as low as 16 mg/kWh (Remeha Gas 320)

FURTHER READING

1. **Water quality**
   To find out more about water quality requirements and heating systems, see:
   https://mediacdn.remeha.co.uk/-/media/themes/remehauk/sagittarius/products/qunita-ace-30-115/manuals/remeha-water-quality-treatment.pdf?v=1&d=20190409T100641Z

2. **Sizing**
   The Size-It online tool is designed to help with selecting the right boiler for your project:
   https://www.sizeit.co.uk

3. **To see the full range of Baxi Heating products and all of our brands, see:**
   https://www.baxiheating.co.uk/about-us/our-brands

GET IN TOUCH

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- pottertoncommercial.co.uk
- heatraesadia.com
- packagedplant.com

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ALL TOGETHER BETTER

BAXI HEATING HAS A PORTFOLIO OF SOME OF THE BEST KNOWN AND MOST RESPECTED COMMERCIAL BRANDS IN THE HEATING INDUSTRY ACROSS THE UK AND IRELAND.

remeha · ANDREWS WATER HEATERS · POTTERTON COMMERCIAL · HEATRAE SADIA · PACKAGED PLANT SOLUTIONS

COMMERCIAL SOLUTIONS FROM **BAXI HEATING**

- **REMEHA** – ENGINEERING EFFICIENCY SINCE 1935
  Reliably engineering high-performance and high-efficiency heating solutions.
- **ANDREWS WATER HEATERS** – BUILT TO PERFORM
  UK's No. 1 commercial water heaters of choice for quality and reliability.
- **POTTERTON COMMERCIAL** – TOTALLY DEPENDABLE
  Heating solutions that customers can rely on and services they can trust.
- **HEATRAE SADIA** – SMARTER CLEANER WARMER
  Market-leading electric heating and hot water products.
- **PACKAGED PLANT SOLUTIONS** – INGENUITY BOXED
  Leading specialists in prefabricated plant rooms from concept to completion.