Under pressure?

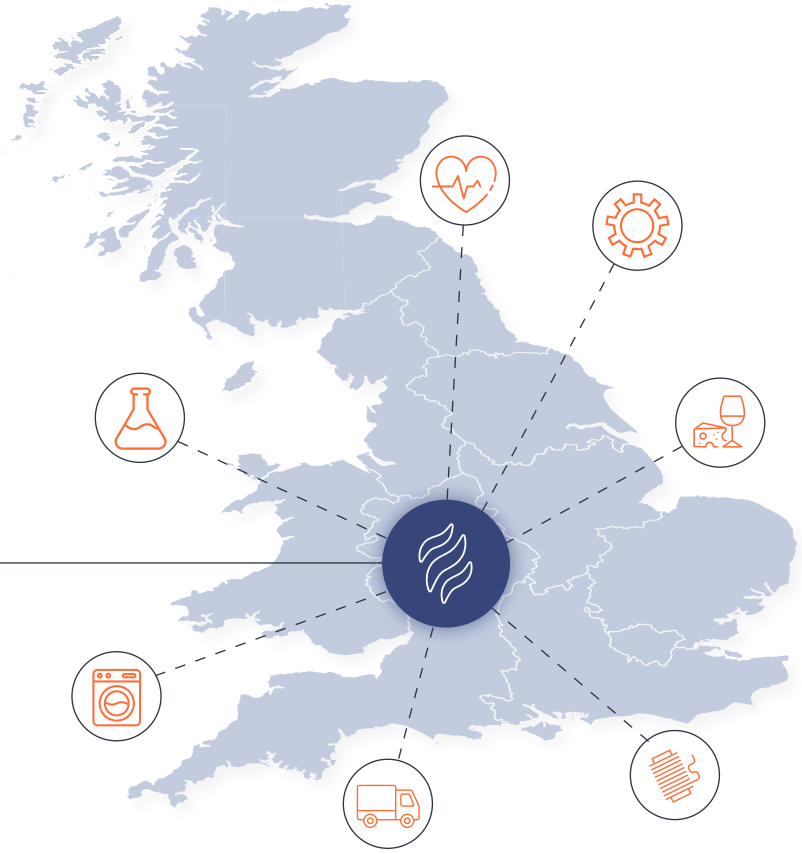
Alleviating steam system strain in industry

aggreko

Introduction

Steam's industrial significance

Steam is an essential industrial utility that continues to advance technologically. Without it, many sectors, such as transport, textiles, chemical processing and healthcare, could not exist as they do today. In the food and beverage industry, for example, steam is used in cooking, distilling alcohol and pasteurising milk. It's also used to treat and shape wood in furniture, iron textiles for garments and dry the pulp that eventually becomes paper and cardboard.



PUT SIMPLY, STEAM IS AN ESSENTIAL ELEMENT OF NUMEROUS INDUSTRIAL PROCESSES.

The UK's economy has been under intense pressure over the past few years.

Global trade frictions have affected activity in most industries, but the manufacturing sector's improved outlook is placing a strain on vital process equipment. With steam boilers heavily relied upon, managing ageing equipment is a crucial consideration for industrial efficiency.

However, enduring continued economic challenges and supply chain volatility has left businesses uncertain about what the right investment levels are for upgrading equipment. Obviously, minimising downtime and ensuring production continuity remains paramount to production and engineering managers, but with a revitalised emphasis on reshoring – as seen within the UK's steel industry – there is evidence that UK manufacturing is making investments again.

Reliance on older steam boilers risks resilience and potentially curbs future sector growth ambitions.

Operating ageing fleet also means manufacturers are increasingly prone to unplanned downtime and reduced energy efficiency, which impacts on sustainability objectives and the threat of falling behind competitors.

Addressing these issues means putting greater emphasis on future planning to ensure businesses have the ability to be agile and adjust to a rapidly changing landscape. Where steam is concerned, more flexible strategies can be considered to procure more up to date equipment and ensure fast comissioning of temporary systems during the repair of fixed assets.

In fast-moving environments, businesses require proactive equipment procurement strategies, in which steam boilers can be deployed rapidly to accommodate fluctuating demand.

> Indeed, adopting a more flexible approach is essential for businesses to maintain production continuity and maximise energy efficiency in today's increasingly challenging business landscape. Issues including mismatches between steam provision and actual demand can greatly impact on operations and overall efficiency, and it is vital engineering, production and procurement managers take steps to adapt to this new normal.

Steam:

A universal utility

Steam boilers play a crucial role in optimising energy efficiency, reducing fuel consumption and increasing environmental sustainability within key processes.

PROCESSES

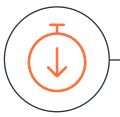
- Conventional heating
- Sterilisation and cleaning
- Atomisation
- Motive force
- Propulsion
- Cooking
- Moisturisation
- Humidification

INDUSTRIES

- Healthcare
- Education
- Manufacturing
- Food and beverage
- Commercial laundry
- Textiles
- Petrochemical
- Government
- Critical infrastructure
- Power generation

Despite the many advantages, steam systems face several challenges that can impact on their efficiency and reliability.

THESE CHALLENGES INCLUDE:



Potential downtime costs
Without clear contingency strategies or adequate resources, organisations risk costly disruptions during downtime.

Insufficient site resilience
Plants conducting maintenance works or responding to breakdowns on a reactive footing, rather than proactively, often see a negative impact on productivity.

Efficiency and operational inflexibility
Conventional metrics ignore real-world boiler behaviour – frequent cycling, load shifts and energy losses during warm-up, idle and cool-down, all of which plant teams must address.

Load mismatching
Boilers are often specified to meet peak demand levels rarely required. As a result, these oversized boilers waste energy and money all year round. In contrast, some plants have systems sized too small that do not provide enough capacity.

Operators of steam systems may now need to consider newer, more efficient technologies to ensure output is aligned with tougher environmental legislation.

Manufacturing, for example, accounts for **60% of industrial emissions** in the UK and as a heavy user of process steam, even marginal improvements could have a profoundly positive impact on the nation's climate commitments.[1]

While markets remain subject to volatility, the resurgence of UK industry is bringing with it an appetite to adopt technologies that drive sustainable efficiency. Aggreko suggests alternative procurement strategies like rental may offer a viable alternative solution to capex.

While capital investment in steam offers long-term improvements, short-term, rental solutions **can play a stronger role during peak periods, improving efficiency and minimising disruption** from maintenance schedules or upgrades.

1 https://eciu.net/analysis/briefings/net-zero/heavy-industry-and-the-net-zero-economy#:~:text=Current%20emissions%20and%20energy%20use&text=About%20half%20of%20industrial%20emissions,%2C%20cement%2C%20chemicals%20and%20aluminium.

The importance of driving efficiency

Evolving needs and challenges

Steam's wide range of uses iterates the need for efficient, well-maintained assets, not only to keep operations ticking over but also to mitigate expensive operating costs for UK firms. This is especially pressing with electricity bills forecast to stay 70% above pre-energy crisis rates.[2]

ENERGY BILLS

70%

above pre-energy crisis rates

ENERGY CONSUMPTION

89%

of businesses increased their consumption

ENERGY PRICE VOLATILITY

92%

of businesses expect the price of their products and services to increase

This is far from a trivial issue. As research from PricewaterhouseCoopers has made clear, 89% of businesses increased their energy consumption in the past year, and 83% anticipate their usage to increase again in 2025.[3]

The same report also found that 92% of surveyed businesses expect energy price volatility to increase the price of their products and services over the next two years, up from 81% last year.[4]

While energy prices are always subject to market changes, it is not unreasonable to suggest costs will remain high.

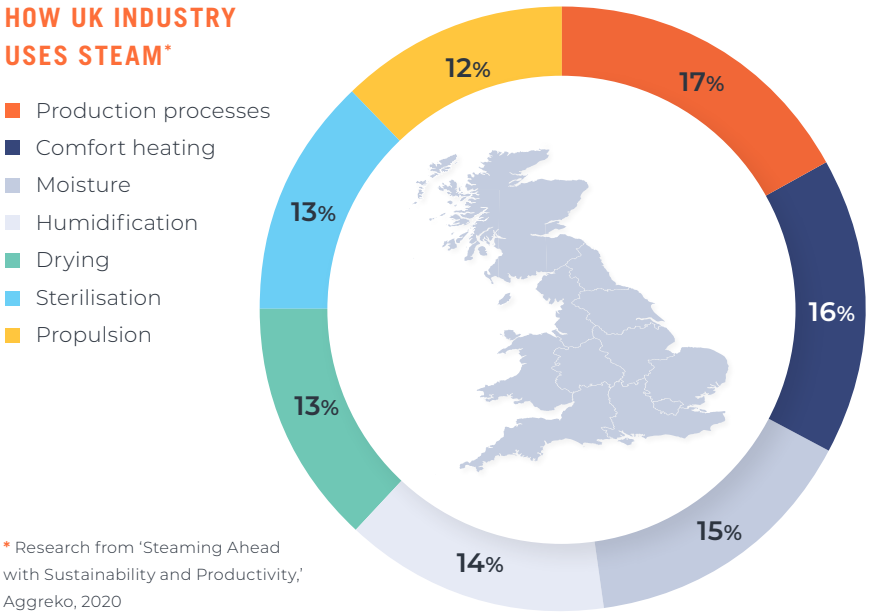
As such, **it is now imperative for companies to adopt more efficient equipment** as a means to offset uncertainty and keep operations affordable.

2 https://www.cornwall-insight.com/press-and-media/press-release/business-energy-bills-forecast-to-stay-70-above-pre-crisis-rates/#:~:text=The%20small%20business%20index%20included,businesses%20renew%20their%20energy%20contracts

3 https://www.pwc.co.uk/press-room/press-releases/research-commentary/2024/rising-energy-demand-tests-uk-business-growth-ambitions.html

4 https://www.sas.com/en_gb/news/press-releases/2024/december/energy-costs-manufacturers-face-biggest-rise-in-bills-this-winter.html

HOW UK INDUSTRY USES STEAM*



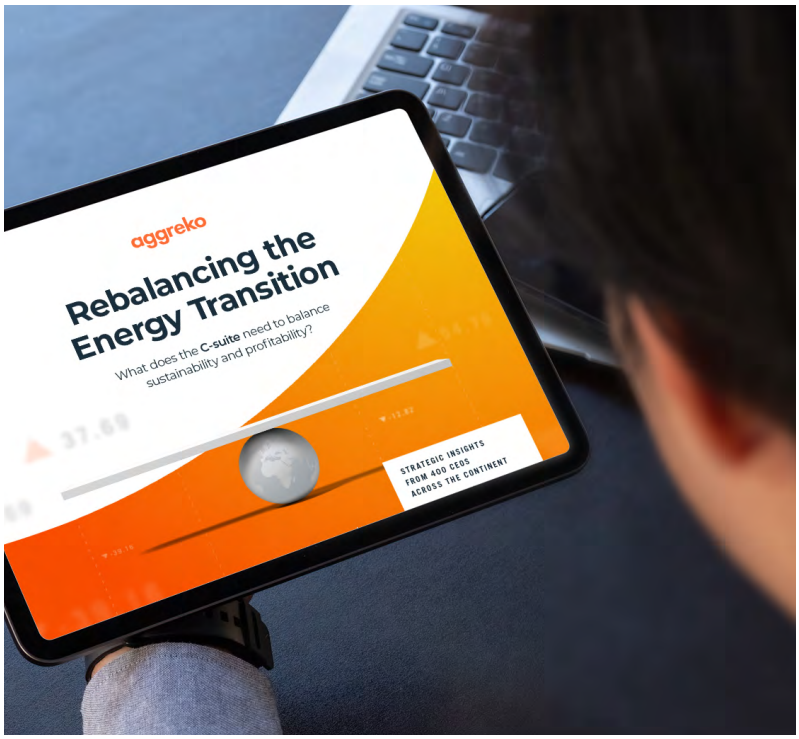
* Research from 'Steaming Ahead with Sustainability and Productivity,' Aggreko, 2020

In the UK, industry consumes roughly 29% of the final energy consumption of the entire economy[5] and generates 14% of the country's greenhouse gas emissions.[6]

Moreover, 73% of the UK's industrial energy demand is for heat, while steam systems are responsible for approximately 35%.[7]

These figures clearly demonstrate the importance of raising the efficiency of existing equipment and adopting newer technologies where possible to meet government targets and adhere to company sustainability objectives.

The cost of energy and its impact on the bottom line have been discussed in an earlier report published by Aggreko in 2024, *Rebalancing the Energy Transition*, which revealed that 90% of businesses had changed their timescales for net zero in light of recent energy supply and pricing issues.



5 https://www.enerdata.net/estore/energy-market/united-kingdom/#:~:text=United%20Kingdom%20Power%20Consumption&text=In%202023%2C%20electricity%20consumption%20was,its%20peak%20level%20in%202005.&text=Households%20are%20the%20main%20electricity,%25)%20and%20industry%20(29%25)

6 https://assets.publishing.service.gov.uk/media/65c0d15863a23d0013c821e9/2022-final-greenhouse-gas-emissions-statistical-release.pdf

7 https://www.sciencedirect.com/science/article/pii/S1364032118304775#bib10

Despite this, 80% said they expected to increase investment into the energy transition over the next 12 months in some capacity. The same report also showed how cost and commerciality remained a higher priority than decarbonisation overall, though emissions reduction programmes remain intact.

These findings reveal that while sustainability remains a key priority, today's turbulent business climate is pushing companies to focus more sharply on immediate concerns, including productivity and the financial bottom line.

Yet, importantly for manufacturers, efficiency and sustainability are not mutually exclusive. By increasing the efficiency of their steam boilers and other low-cost improvements, businesses can reduce energy and emissions while also enhancing efficiency.

> *"In the context of rising costs and an uncertain economic climate, manufacturers are nevertheless preparing strategies to survive and grow. There will be a concerted effort on offsetting costs through productivity gains ... energy efficiency improvements and investment."*[8]
>
> **PRICEWATERHOUSECOOPERS**

UK manufacturing has historically struggled with rising costs and other pressures, with the Standard & Poor's Global UK Manufacturing PMI in March citing the current operating environment as a key reason behind its lowest reading in 17 months.[9] **Consequently, the need to upgrade older, inefficient assets is clear**, especially in the face of increasingly rigorous decarbonisation timelines and global business uncertainty.

8 https://www.pwc.co.uk/industries/documents/make-uk-executive-survey-2025.pdf

9 https://tradingeconomics.com/united-kingdom/manufacturing-pmi

Key priorities

Adverse conditions

There is a clear desire for greater resilience in industrial plant operations, particularly given the increasingly volatile trading conditions we have seen in recent times.

While a significant number of respondents in Aggreko's *Rebalancing the Energy Transition* research cited a willingness to invest, many still chose capital purchases for equipment despite ongoing market difficulties.[10]

This is notable given the demands capital expenditure places on the balance sheet, especially in a time when so many are focused on cost and commerciality. These issues are likely better served with more flexible and lower-risk approaches, such as leasing.

In a 2020 Aggreko survey of 200 organisations regularly reliant on steam for daily operations, **85% said they'd consider hiring a steam boiler**.

This highlights a strong market appetite for hire solutions and confirms that flexible, modular equipment procurement is no longer novel – it's a proven strategy, and one that has become more established over time as business volatility has increased.

10 https://www.aggreko.com/en-gb/resources/rebalancing-the-energy-transition

Key priorities

Increasing efficiency and flexibility across operations

Traditional equipment performance metrics focus on 'steady-state' conditions, defined as the ratio of useful steam energy output to fuel input under full load and optimal conditions. However, using this rating has one key drawback when it comes to calculating steam boiler performance: it assumes the boiler is operating while fully warmed up and running under a consistent load.

Real-world operations often involve frequent start-stop cycles and fluctuating loads. Large fire-tube boilers can also take a long time to warm up, and the energy losses from fluctuating states – including idle periods – must be accounted for by plant teams.

Adopting a flexible approach focused on 'dynamic efficiency', which accounts for lifecycle performance and load variability, can unlock significant efficiency gains. In industries like manufacturing, food and beverage and pharmaceuticals where demand fluctuates, optimising for dynamic efficiency enables faster steam readiness, improved partial-load performance and reduced energy waste during idle periods.

Some modern containerised steam systems typically feature low-water content designs, enabling rapid start-up and allowing for flexible start/stop usage. This can reduce energy wastage, particularly during off-peak periods.

Key priorities

Rightsizing boilers

Companies often install oversized boilers to handle rare peak demand, but this leads to wasted energy and higher costs year-round.

While a large boiler may be suitable for heating buildings on the coldest days of the year, inefficiencies for the remaining days of the year result in larger costs that these businesses need to address.

In industries where demand is highly variable, having the ability to scale steam capacity and equipment up or down on a modular basis may be invaluable. Without a long-term commitment or need to overinvest in oversized, permanent assets, allowing for greater energy and cost savings through more flexible steam provision.

Key priorities

Maintaining continuity

Organisations may struggle to allocate adequate resources to maintain operations during periods of planned or unplanned downtime, resulting in significant costs and lack of production continuity for key processes.

The procurement of temporary utility provision equipment, including steam boilers, can enhance continuity and safeguard productivity during scheduled shutdowns or equipment overhauls. Engaging external expertise to provide short-term hires, emergency equipment provision and tailored contingency plans based on site-specific assessments of power and steam needs mitigates risks and ensures a faster, safer recovery.

Aggreko's 2020 research found **94% of companies surveyed that regularly relied upon steam for essential processes had contingency plans in place for planned or unplanned downtime.**

Given the rapidly changing circumstances and volatility affecting businesses five years on, ensuring these plans are regularly updated is of paramount importance.

Key priorities

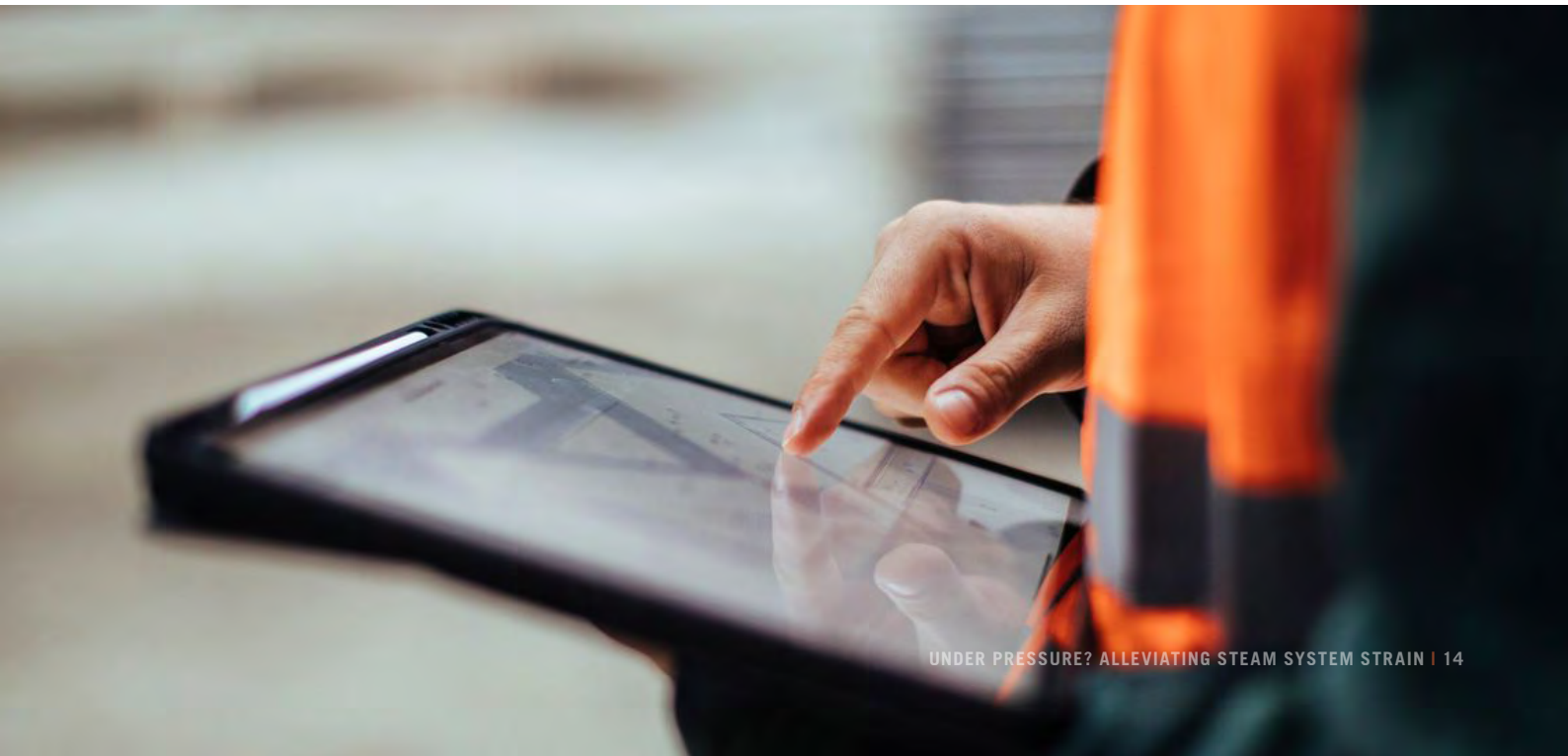
Adhering to environmental legislation

UK industry continues to decarbonise in line with the net zero emissions target that became law in 2019, necessitating a wholesale shift away from fossil fuels to meet the 2050 deadline.

This pathway has since accelerated with additional legislation and clarifications aimed at reducing all greenhouse gas emissions by at least 81% by 2035, compared with 1990 levels.[11]

For sites looking to adopt next-generation burners, low-NOx systems or biofuel-ready infrastructure, short to long-term temporary solutions can provide an interim step – allowing time to plan and trial before committing to major investments to further protect production continuity while integrating greener options and new technologies.

11 https://www.gov.uk/government/publications/uks-2035-nationally-determined-contribution-ndc-emissions-reduction-target-under-the-paris-agreement/united-kingdom-of-great-britain-and-northern-irelands-2035-nationally-determined-contribution



Key priorities

Ensuring safety

Determining the pressure range needed for steam-using production processes is vital to operational efficiency and safety.

Functioning at the wrong pressure can cause safety hazards, reduced efficiency and potential damage to the boiler and downstream equipment, leading to costly repairs, downtime and possible danger for plant teams.

The operating pressure affects the design and safety features of the boiler and may necessitate additional ancillaries such as low-pressure valves. Engaging third-party expertise and modern equipment is crucial to identifying these potential hazards.

Aggreko's steam boilers have a low-water volume design, which is around 10 times less than fire tube boilers, and a multitude of safety mechanisms.

Another essential component of operational safety is digitisation of plant performance metrics.

Remotely monitoring key metrics of in-use steam boilers can provide quick responses to faults and performance issues.

Key priorities

Bridging the skills gap

Recent data from the British Chambers of Commerce demonstrates the issues facing manufacturing around skills shortages.

According to its research, 82% of firms in the sector are facing recruitment problems.[12] This will clearly have a knock-on effect in areas where specialist labour is required, and it likely to become even more difficult to hire staff with the necessary skills to operate and maintain steam assets.

While temporary solutions cannot solve the engineering skills gap, they can ease the burden of labour shortages by providing businesses with equipment and dedicated support.

In the short to medium term, this approach could help to alleviate some of the pressures facing companies as the UK looks to accelerate growth in a challenging market. Furthermore, temporary systems supported by external service teams can reduce the operational burden on in-house staff.

12 https://www.britishchambers.org.uk/news/2025/01/workforce-growth-struggles-as-budget-costs-loom/

How can Aggreko help?

Shifting strategies

While permanent systems remain the backbone of daily operations, businesses are increasingly exploring flexible strategies that enhance operational agility, reduce capital expenditure and safeguard continuity during planned maintenance, unexpected outages or shifts in demand.

Indeed, in today's fast-changing industrial landscape, the ability to adapt quickly is no longer a luxury – it is a necessity. One solution gaining traction across sectors is the deployment of modular, containerised steam systems. These mobile units offer a scalable, on-demand alternative to traditional infrastructure, allowing organisations to respond swiftly to operational changes without long-term commitments or costly downtime.

THESE SYSTEMS PROVIDE A RELIABLE, EFFICIENT WAY TO MAINTAIN STEAM SUPPLY IN A VARIETY OF APPLICATIONS, INCLUDING:

- Supporting planned maintenance or asset replacement
- Managing seasonal or surges in demand
- Enhancing efficiency
- Bridging towards long-term technology upgrades
- Navigating labour and resource shortages

How can Aggreko help?

High-quality, efficient steam

Aggreko's steam boilers can support all types of operations, including petrochemical, manufacturing, pharmaceuticals, food and beverage and healthcare. Whether needed as part of your daily operations, to resolve capacity challenges, for equipment testing, maintenance and turnarounds, replacing inefficient equipment or scaling up production, Aggreko's mobile products can be installed on site quickly and efficiently to cater for your needs.

Aggreko's fleet includes 2 ton/hr and 5.5 ton/hr containerised low-emission steam generators with high boilerhouse and combustion efficiency that guarantees high-quality dry saturated steam across a diverse range of applications.

They are also compatible with greener 'drop-in' fuels including hydrotreated vegetable oil. They are highly energy efficient, minimising fuel usage and offering compliance with the toughest emissions standards for NOx.

SPACE, SPEED AND SAFETY

Aggreko has added the next generation of steam boilers to its fleet, designed to maximise space, speed and safety.

Space – Aggreko's steam boilers offer a compact and lightweight design, fitting efficiently into standard 10ft or 20ft containers for simplified transport and fast deployment. Each self-contained unit integrates the steam generator, chemical treatment, water softener, hotwell and blowdown.

Speed – engineered for quick deployment and safe operation, Aggreko's design eliminates the need for large water storage, increasing efficiency and delivering high-quality 99.5% dry saturated steam on demand in just three minutes. Quick start-up ensures the boiler can be stood down to conserve energy when not required.

Safety – prioritising safety, Aggreko's boilers feature a low-volume design, holding up to 10 times less water than conventional boilers to minimise risk.

A REVOLUTIONARY DESIGN

Three feature components of Aggreko containerised steam systems:

1 Coil

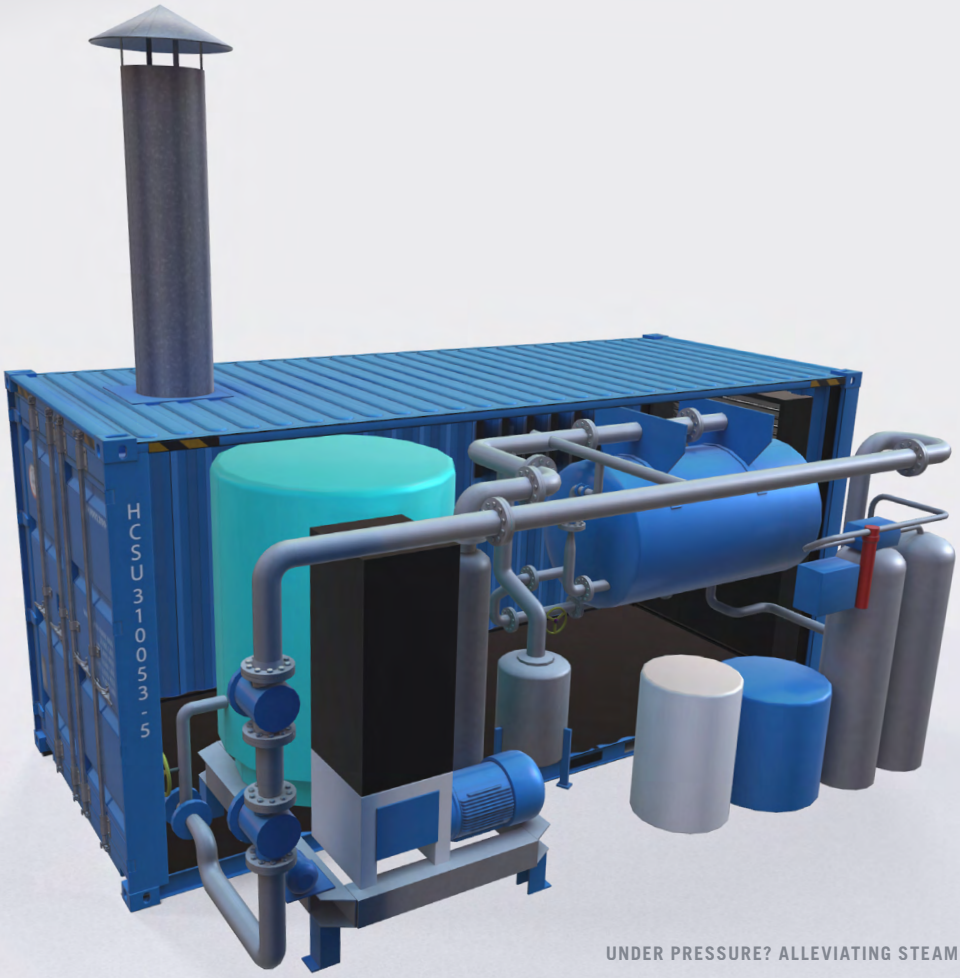
Developed for optimal heat transfer at all steam output levels, the coil design used in Aggreko steam boilers is a single water tube stacked in spirally wound layers to form a 'water wall' around the combustion chamber. This arrangement, alongside the spacing between layers and gaps within various temperature zones, maximises efficiency and prevents hot spots.

2 Pump

The feedwater pump is designed for forced circulation through the coil, ensuring stable flow across varying pressure conditions. Our steam boiler pumps operate without mechanical seals, packing rings or glands, with a robust construction that is unaffected by high water temperatures and minimises maintenance requirements.

3 Separator

A highly efficient centrifugal design with no moving parts, the separator used in Aggreko steam boilers produces at least 99.5% dry saturated steam, even under variable load conditions.



Conclusion

As UK manufacturing continues to rejuvenate and technologies evolve, the importance of steam will only grow.

Operational inefficiencies stemming from ageing or oversized equipment or lack of specialist skills will hamper productivity, sustainable efficiency and long-term business growth.

While many businesses have some form of contingency in place, lasting, sector-wide challenges highlight the untapped potential of procuring steam equipment on a flexible basis. Temporary solutions not only bridge gaps during periods of high demand but also enable companies to boost productivity and meet stricter emissions targets.

Crucially, this approach allows businesses to bypass capital expenditure restrictions while gaining access to third-party expertise, meaning these companies can take on extra equipment without worrying about the risks associated with staff shortages, maintenance and unexpected breakdowns.

Forward-thinking businesses that prioritise sustainable efficiency are increasingly turning to specialist steam boiler providers to ensure their systems operate at peak performance and they have the flexibility they need to remain agile.

By prioritising flexible procurement strategies and leveraging engineering expertise, companies can unlock significant benefits in energy efficiency, operational reliability and overall cost savings, while ensuring they are competitive in a rapidly evolving industrial landscape.

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