

Taking the Heat

How much can heat exchanger
servicing really save your business?



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Foreword

It's Time to Rethink Maintenance

High energy users now have to contend with increased energy costs and more aggressive competition from overseas. At the same time, these pressures run alongside ambitious decarbonisation targets that challenge traditional ways of working.

For most industrial businesses, plate heat exchangers are one part in a much larger chain of operations, yet their contribution far outweighs the cost to keep them in optimum working condition.

But it's not just about cost. Proactive maintenance also offers huge efficiency gains, helping businesses to avoid unplanned downtime and make better use of energy that nowadays comes at a premium.

This guide is an update to a version Alfa Laval first published in 2020. We have created a new guide because manufacturing now finds itself in a bind, albeit one that can be worked out with the right approach.

Now is the time for renewed focus on effective maintenance strategies, not only to make the most of installed assets, but also to correct the course as commercial resilience is tested to its limit.

Prevention really is better than cure.

A handwritten signature in black ink, appearing to read 'Rachel Bridges', written over a light grey background.

Rachel Bridges
MANAGING DIRECTOR
Alfa Laval

01

Introduction

Why Is Industry Struggling to Take the Heat?

Ask any production or process manager about their priorities and their answer will likely be the same: there is now a renewed focus on asset performance and availability. This is not just because it makes a business more competitive, but also because it protects from the type of energy price shocks experienced across virtually all European industry in recent years.

These energy price hikes have had a profound impact and the downward pressure they have created is undeniable. At one point in 2022, 60% of UK manufacturers said that 'out of control' energy bills had raised the prospect of shutdowns and redundancies.¹ While the situation has improved somewhat since then, the wholesale price of electricity and natural gas still remains higher than values recorded in late 2020.²

But what does this have to do with asset performance and availability? For one, difficult trading conditions put pressure on the budgets of businesses that already face thinning margins and intense competition from overseas. This naturally has an impact on the type of maintenance strategy a business is able to execute, which in turn affects yield quality, total output and the expected working life of key assets such as plate heat exchangers (PHEs).

In other words, tighter budgets raise the prospect of unplanned downtime in production lines – an issue that is becoming more common. According to research from Siemens in 2023, the world's largest manufacturers lose around \$1.5 trillion each year due to unexpected outages, with each outage taking longer to recover when compared with data from two years earlier.³

1. <https://www.makeuk.org/news-and-events/news/out-of-control-energy-bills-are-now-business-threatening-for-60-of-manufacturers>

2. <https://tradingeconomics.com/united-kingdom/electricity-price> / <https://tradingeconomics.com/commodity/uk-natural-gas>

3. <https://blog.siemens.com/2023/04/the-true-cost-of-downtime/>

This points to two problems. First, a tendency for businesses to run key equipment to failure, particularly assets that require a planned schedule to contribute more to the balance sheet than they take away. Second, basic financial pressures are not just affecting smaller operations but also the most recognisable names across industry. In this climate, it's unsurprising to find production line failures becoming more severe.

Asset performance, however, is not just important for output; it's also directly related to energy efficiency. It can be difficult to see how the condition of production equipment, like PHEs, can make a real difference to emissions given the power requirements of high energy users. But there is good reason to be proactive, especially if carbon reductions are a priority. Studies have shown as much as 11% of total global emissions could be saved through energy efficiency measures, with 'maintenance of heat exchangers' being one of the main recommendations.⁴

PHEs may be one piece of a larger puzzle, but today's unforgiving market makes it essential to keep them working optimally. Doing so will make best use of a site's energy, lower operational costs and ease the pressure to decarbonise.

This guide has been written to give manufacturers a practical plan for PHE maintenance and demonstrate how Alfa Laval can drastically lower the chances of line failure for this key piece of equipment.

Why PHE Servicing Matters

- Several studies have shown PHE fouling contributes up to **2.5% of global carbon emissions**⁵
- Around **15% of all factory maintenance costs** are credited to heat exchangers, with half of that figure due to fouling⁶
- Machine downtime is costing manufacturers in excess of **£180 billion each year**⁷

4. <https://www.energyefficiencymovement.com/insights/industrial-efficiency/>

5. <https://heatexchanger-fouling.com/refereed-proceedings/heat-exchanger-fouling-and-cleaning-xiii-2019>

6. <https://www.impomag.com/maintenance/article/13216742/fouling-in-heat-exchangers-a-costly-problem>

7. <https://www.theengineer.co.uk/content/advanced-manufacturing/machine-downtime-costs-uk-manufacturers-180bn-a-year>

02

Energy Hunter

Our Search for Industrial Efficiency

Our Energy Hunter initiative is about minimising the impact of lost heat in production environments. We do this by providing the technology, expertise and servicing necessary to maximise heat transfer efficiency.

It's ultimately about making the best use of resources. But what does that look like in practice?



Energy savings



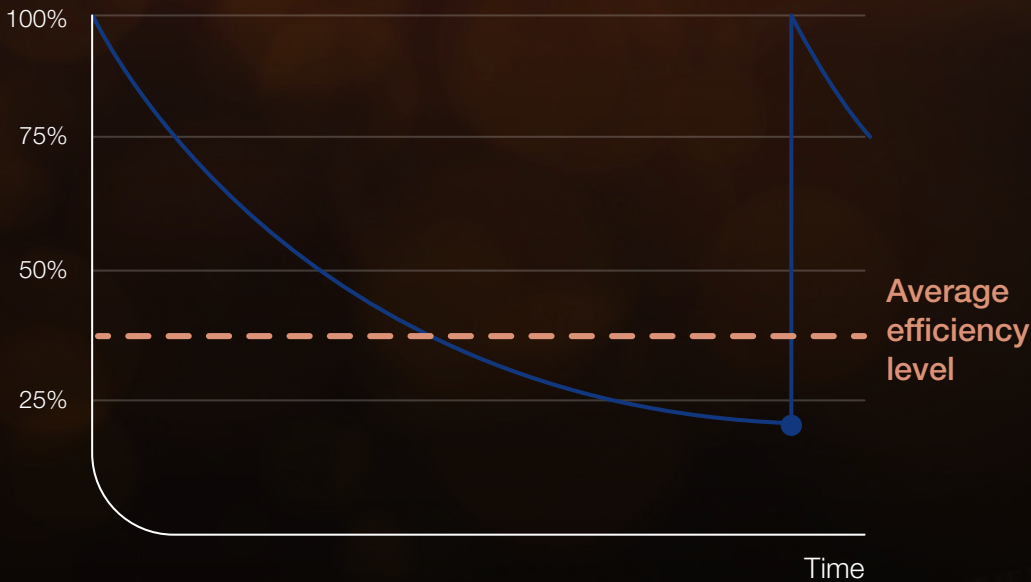
Cost savings



Emission reductions

Traditional performance of plate heat exchangers

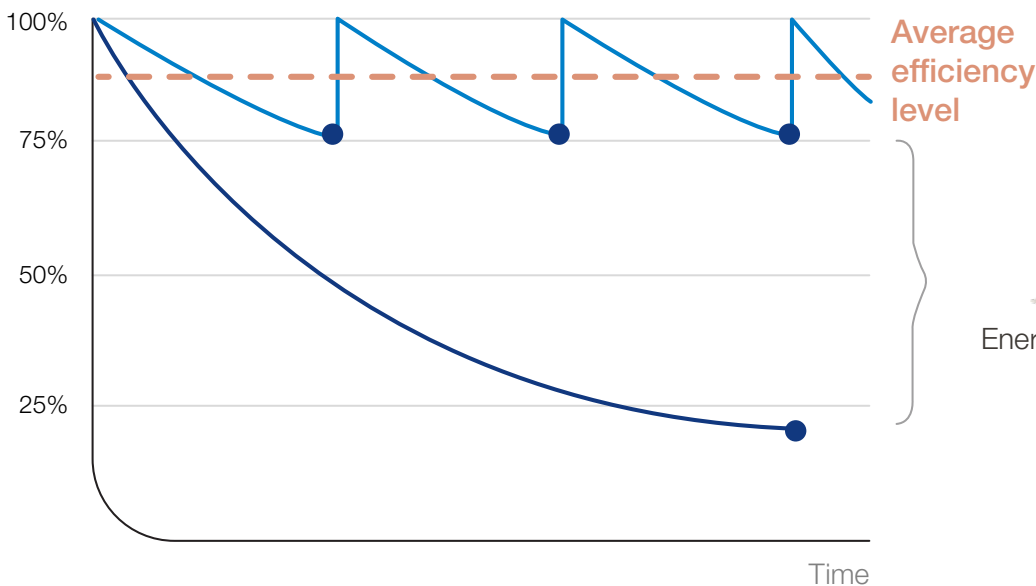
Heat transfer efficiency



This shows a typical plate heat exchanger maintenance strategy, which sees heat transfer capacity reduce significantly over time. This reactive approach leads to increased energy consumption, emissions and operational expenses

Optimal performance of plate heat exchangers

Heat transfer efficiency



This is the ideal scenario with regular scheduled maintenance intervals. This proactive approach lowers energy consumption and emissions, optimising asset lifecycle costs.



Energy savings

03

Why Run to Failure Is a False Economy

Reactive maintenance is a common strategy for driving down costs. While useful in some cases, its limitations ultimately make it a false economy for businesses looking to gain a long-term competitive advantage.

Inefficiency

Corrective maintenance does not protect equipment and therefore limits the lifetime of plant assets. Less-than-ideal operating conditions will also raise an organisation's energy consumption across the whole process, energy spend and carbon footprint.

Lack of Control

It is difficult to know how much to set aside for maintenance without foresight. An organisation might end up paying a premium for repairs as engineers will be called out without warning. Some months may require no fixes but others might sink an entire budget.





? Unpredictability

Relying on corrective maintenance can be problematic if an asset is not monitored after purchase. Not only will this lead to more failures, it will also be difficult to determine what is causing equipment to fail without taking it offline.

⚙️ Downtime

Equipment failure will lead to periods of low output, potential product or batch contamination and might even halt production entirely. This can have a wider knock-on effect across a facility. Food and drink production, for example, is difficult to sustain without an operational heat exchanger. Leaving an essential piece of equipment to chance will eventually result in losses.

↑£ Higher Costs

Organisations will opt for reactive maintenance when stop-and-repair costs are less than the investment required for planned maintenance. But this does not always work out. When serious failures occur, and they inevitably will when running a reactive maintenance strategy, the cost to get back online can be far greater than initial savings.

04

Alfa Laval's Expert PHE Servicing

It makes sense to run some assets to failure, but that's not the case for PHEs. It's only possible to achieve higher yields and better product quality when these assets are kept in good condition all year round.

PHEs are durable but they still encounter difficulties. Heat transfer is an intensive process that will eventually affect the performance, output and expected lifetime of an asset and other downstream components if left unchecked.

Alfa Laval established its dedicated PHE service centre in Camberley to simplify the maintenance process. Once on site, our engineers will put your PHE through a series of cleaning and testing procedures designed to maximise performance and availability.

Identifying Common PHE Problems

01 Fouling

! PROBLEM

Deposits that form on a heat exchanger's transfer surface caused by the settlement of particulates, biological matter, decomposition and crystallisation

⊗ OUTCOME

Unwanted deposits create an insulating layer that lowers the efficiency of heat transfer between two fluids. Fouling will also impede flow due to greater resistance, meaning greater force is required to drive medium through a unit



02 Corrosion

! PROBLEM

PHEs require extensive sealing along the edges of each plate, which can cause crevice corrosion under gaskets or next to seal welds

⊗ OUTCOME

Corrosion creates internal and external leakages, which can cause mediums to cross-contaminate. It may also invalidate insurance in some sectors, such as food manufacturing



03 Gasket Failure

! PROBLEM

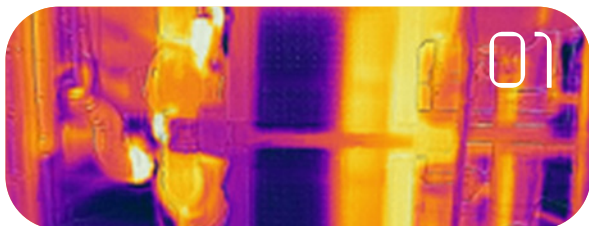
If the operating fluid temperature is close to or above the maximum for an extended period, gaskets can begin to melt or over-cure

⊗ OUTCOME

Flattening seals, leading to mixed fluids, poor thermal performance and unexpected downtime



How We Transform PHEs



Pre-Inspection

Using thermal imaging, our team is able to determine if a PHE requires servicing before it even leaves a customer site

Inspection

Before cleaning, our engineers will examine all components and understand the extent of work required

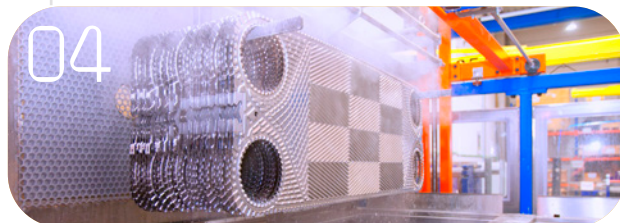


Gasket Removal

Plates are usually immersed in liquid nitrogen, allowing the gaskets to separate easily. Other jobs might see chemicals used to remove gaskets

Chemical Bath

Each plate is immersed into a separate chemical bath where deposits are gently removed

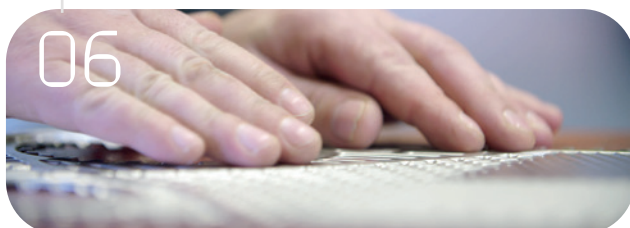


High pressure cleaning

Pressure washing removes stubborn deposits that were not removed in the chemical bath

Examination

Plates are inspected thoroughly for cracks, corrosion and any deformation





Crack Detection

Ultraviolet light and fluorescent dye penetrants are used to detect microscopic cracks and pinholes that could develop into larger holes

New Gasket Fitting

Plates are reassembled using new Alfa Laval gaskets and specially formulated glue



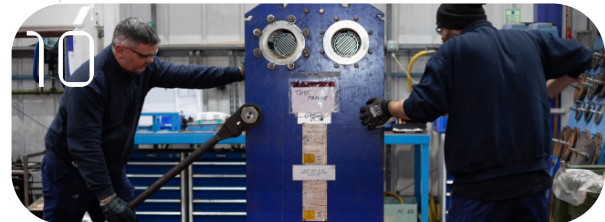
Oven Curing

The glue used for adhering gaskets is a two-component epoxy, which is carefully oven cured. This allows for secure bonding and full strength when fluids are processed



Pressure Testing and Certification

Once assembled, the PHE is pressure tested to ensure the fluid is processed correctly. Alfa Laval will also issue a report with ongoing recommendations



Alfa Laval: Partner Not Supplier

We recognise that not every PHE can be taken offline for extended periods. Through our partnership programme, Alfa Laval provides regular in-field analysis to detect problems at the earliest stage. This minimises costs and also assures production is kept to schedule while maintenance takes place. Our engineers will be able to diagnose most PHE problems, irrespective of brand, and restore a PHE to prime working condition.

Research and development form the foundation of Alfa Laval's approach. This has allowed us to develop the best adhesive and curing process for the strongest gasket-plate bond. We also benefit from a material and chemicals research centre in Lund, Sweden, that is used to establish the root cause of unusual failures, all supported by an international network of leading engineers.

05

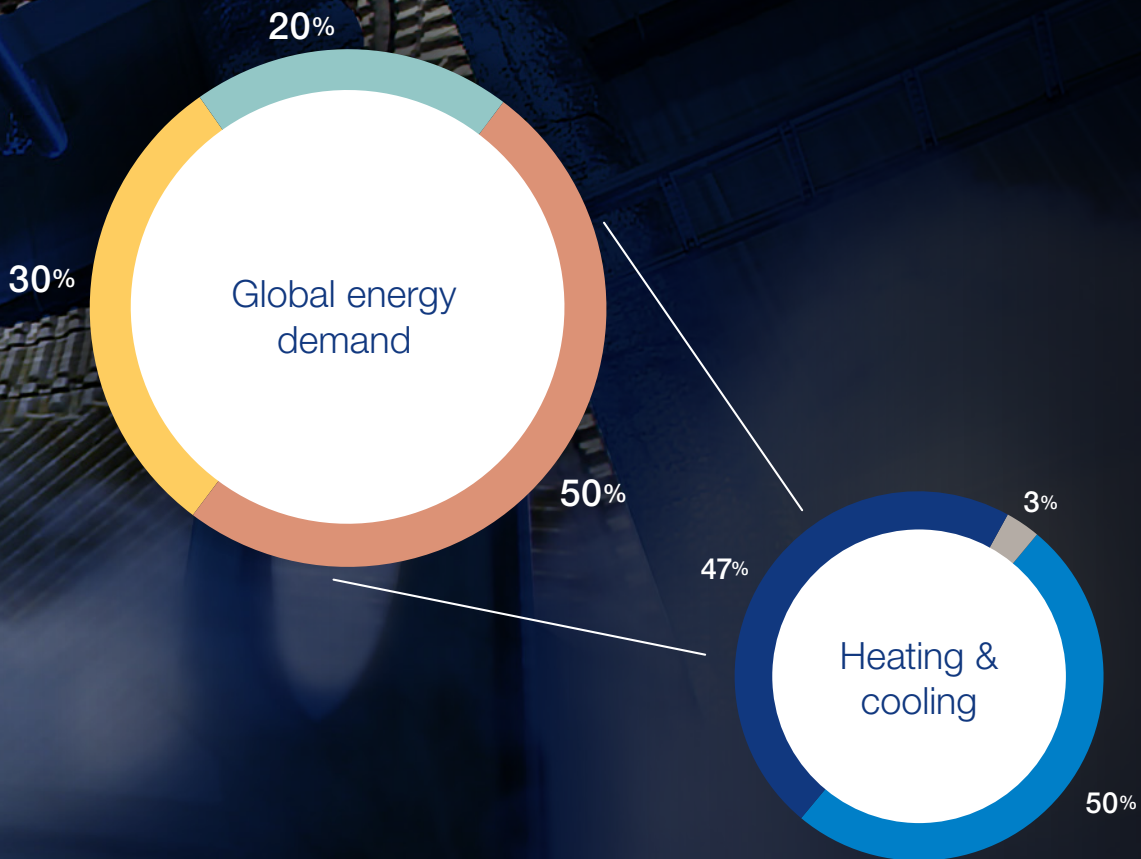
Building a Business Case

Effective Servicing in Action

Some might wonder how regular servicing of a single asset could make such a difference. After all, production environments are complex and interconnected, making it difficult to measure the impact of inefficiencies and improvements with any certainty.

It's easier to break the idea down using analysis from the International Energy Agency. According to the agency's research, heat accounts for 50% of the world's total energy demand, with industrial processes accounting for half of that figure. This greater than the demand from buildings.⁸

8. <https://www.iea.org/reports/renewables-2020/renewable-heat>



Heat Transport Electricity Industrial processes Buildings Agriculture

From here, it's easier to see how the condition of assets responsible for handling heat can influence the wider picture. Servicing makes better use of heat needed for production, in turn lowering the total demand created by industry. But this is not an abstract argument because it also has a clear impact on productivity and the success of individual businesses. Lean manufacturing starts with effective use of resources.

Alfa Laval has several notable examples where servicing and energy-hunting initiatives have made a significant impact. The following two case studies demonstrate how a proactive approach can deliver tangible returns, often far greater than the savings made when failing to make best use of heat or opting to run assets to failure.

Making the Case for Servicing Agreements

LOCATION: 🇨🇱 Chile

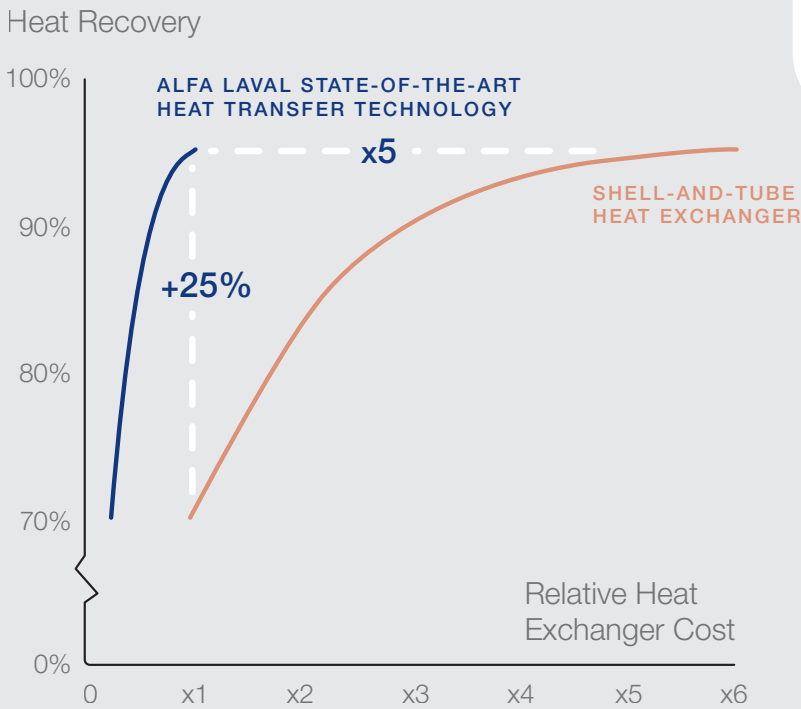
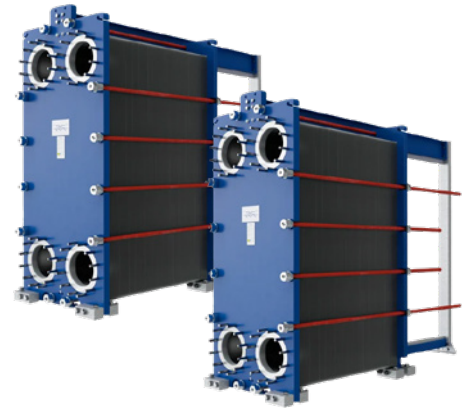
SECTOR: ➔ Mining



The falling cost of wind and solar energy in Chile is driving a green infrastructure boom across industry. Keen to take advantage of these falling costs, one of the country's largest copper mining businesses set out to build a large solar thermal power plant to support its electrowinning process, which typically carries a high energy penalty.



Two of Alfa Laval's gasketed heat exchangers were purchased by the business to make full use of the site's excess heat.



However, providing solar thermal energy on such a large scale also requires effective and reliable heat transfer throughout the year. This was the grounds for a two-year servicing agreement between the two companies, which created a performance baseline and preventative maintenance schedule for the assets.

This work allowed the company to lower its diesel fuel consumption and increase profitability with higher heat transfer efficiency. The agreement also allowed the business to focus on core activities without the threat of unexpected downtime.

Making the Case for Energy-Hunting Initiatives

LOCATION: 🇨🇳 China

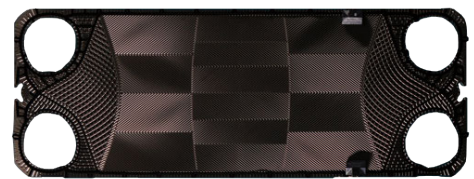
SECTOR: 💧 Chemical



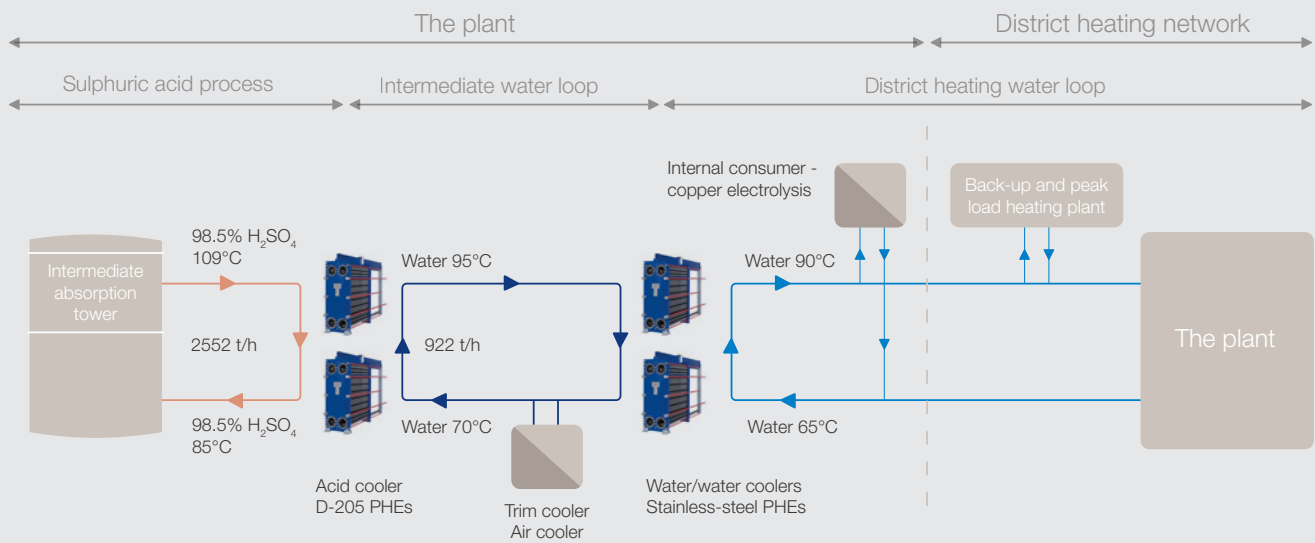
In traditional acid production, a large amount of low-grade heat is generated in an absorption tower. But because of the minimal temperature difference between the cold and hot sides, traditional shell-and-tube heat exchangers cannot recover this useful resource. This excess heat often ends up discarded by cooling water instead of being put to effective use. It was this problem that led to a Chinese manufacturer requesting Alfa Laval's energy-hunting services.



In response, Alfa Laval specified an efficient semi-welded plate heat exchanger assembly with unique **Hastelloy D-205™ plate technology**. The new system was designed to recover heat from the intermediate absorption tower cooler, which could then be used to generate hot water for copper electrolyte heating in the electrolysis workshop. The set-up also allowed hot water to be used for pure water pre-heating and site temperature control.



Waste heat recovery set-up



This work has been transformative. In winter, all recovered low-grade heat is redirected back into the system, with 30% used in production and the remaining 70% for space heating. During the summer, 14% of the energy that is no longer needed for indoor heating is used to pre-heat boiler feedwater. As a result, the site has driven down its use of fossil fuels without having to redesign the factory floor.



Energy recovered

153,296 MWh per year



Emission savings

46,922 tonnes of CO₂ per year



Consumption savings

262,062 tonnes of steam per year

06

Conclusion

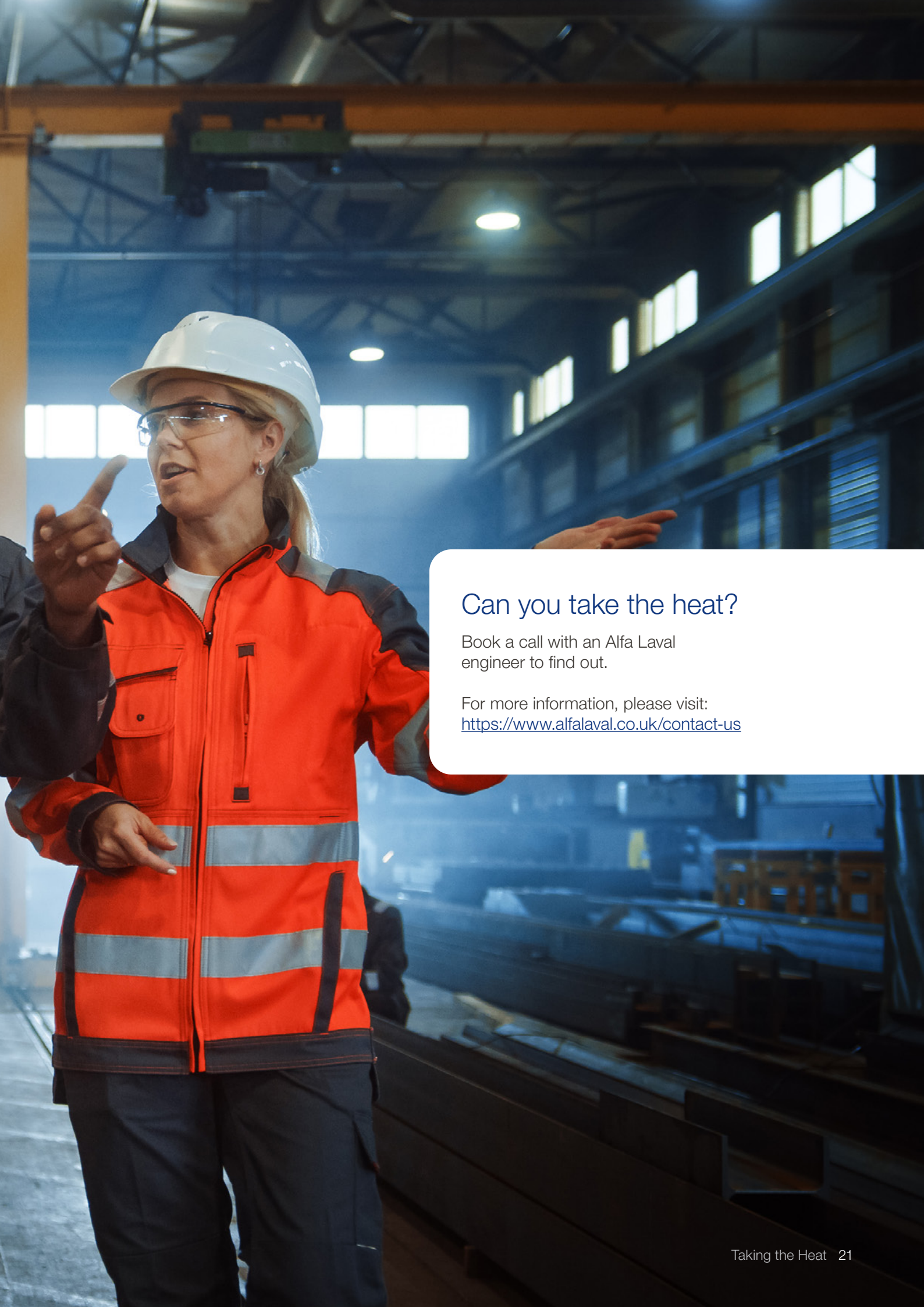
Can You Take the Heat?

Manufacturers face complex operational challenges that are, in some ways, largely out of the hands of those overseeing operations on the ground. This situation makes it critical to properly manage the issues that still remain within control.

Energy costs remain high and the pressure to make better use of resources will only increase as industry moves forward, not least because heat is itself responsible for a large percentage of industrial energy demand. As such, it makes good business sense to maintain the equipment that captures and distributes it throughout a production line.

The impact of a clean PHE can be felt throughout the entire production process. Far less energy is used, yields are higher and better quality, and unexpected downtime is minimised. In a time when there is a legitimate threat to the future of manufacturing, it makes sense to opt for a servicing agreement that creates a competitive advantage. Complacency will only lead to further problems.





Can you take the heat?

Book a call with an Alfa Laval engineer to find out.

For more information, please visit:
<https://www.alfalaval.co.uk/contact-us>



This is Alfa Laval

Alfa Laval is active in the areas of energy, marine and food and water, offering its expertise, products, and service to a wide range of industries in some 100 countries. The company is committed to optimising processes, creating responsible growth, and driving progress – always going the extra mile to support customers in achieving their business goals and sustainability targets.

Alfa Laval's innovative technologies are dedicated to purifying, refining, and reusing materials, promoting more responsible use of natural resources. They contribute to improved energy efficiency and heat recovery, better water treatment, and reduced emissions. Thereby, Alfa Laval is not only accelerating success for its customers, but also for people and the planet. Making the world better, every day. It's all about Advancing better™.

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