

NET ZERO



The drive to **net zero** manufacturing

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LEADERS' SUMMIT**

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01/ The drive to net zero manufacturing

There are a number of challenges facing Britain's manufacturers today. From the battle for skills and talent to supply chain disruption, digital transformation and the road to net zero, it seems that the industry is currently spinning a lot of plates.

These challenges are inextricably linked, and addressing one will invariably have an impact on another. For instance, the need to reduce energy usage, costs and cut greenhouse gas emissions means the sector is seeking digital technology as a solution and adoption rates are increasing like never before.

The use of a pool of digital tools now available, including data analytics, supply chain management to boost resilience and full automation of business processes including finance, human resources, manufacturing and procurement, have all been working together to boost net zero credentials.

Despite the recent governmental U-turn on net zero targets, powering forward towards net zero still makes huge sense for manufacturing businesses. Manufacturing is the UK's third most emitting sector and is responsible for a sixth of the country's total emissions. This makes the efforts of manufacturers in reducing emissions, even on an individual level, hugely important for halting climate change.

In previous generations, being 'green' may have been seen as a 'nice to have' from a productivity and profitability perspective. Now, however, it is a key business driver which can have a huge impact on a company's bottom line, increase business resilience and help attract potential talent. The need to reduce carbon is now embedded in most companies' business plans with a quarter of Britain's manufacturers believing new digital technologies have already had an impact on decarbonisation and their ability to achieve challenging net zero targets. Just one in ten businesses do not believe that digitalisation will have any impact on their net zero ambitions.

Of those surveyed, 30% of businesses reported they had already invested in supply chain management digital tools which can reduce

emissions and build resilience against delivery disruptions caused by Brexit trading rules and long-term COVID disruption in Asia.

However, significant barriers to digitalisation remain, with six in ten manufacturers still wary of the upfront cost without accurate timings for return on the investment. This could well be a hangover from the uncertainty of the last few years, with manufacturers having to deal with other pressures, leading to sustainability initiatives dropping down the priority list.

For example, research from Schneider Electric has shown that 82% of UK business leaders say the energy crisis will impact their organisation's ability to follow through on emissions reduction plans. Of that figure, around half of organisations say they are delaying planned investment in sustainability and net zero strategies (49%). Just over one-third of the same organisations (34%) say they now have more immediate business challenges to meet. More than a quarter of these organisations claim that taking practical action to meet targets is difficult (27%).

However, there is still a recognition of the importance of net zero, with 39% believing that climate change and net zero ambitions will become more of a priority over the next three years. Forty-five percent of companies said more evidence on investment return would help drive positive decisions towards the adoption of digital tech as part of their journey towards net zero.

Half of manufacturers said that tax incentives to invest in digital decarbonisation technologies and upskill their current workforce would provide a major boost to uptake. Again, SMEs found taking those first digital steps much harder than larger companies with 64% of smaller firms saying they experience skills shortages while trying to invest and adopt digital tech.

Let's find out more....

According to research published by Make UK earlier this year:

- Nearly half (47%) of manufacturers have an active plan underway to invest in digital technology to decarbonise their business
- Almost a quarter (24%) of manufacturers have invested in digital technologies while a further 23% plan to do so



- 62% of those who have adopted digital technologies reported energy cost savings
- Over half who reported savings said they were between £10,000 and £100,000
- Almost half (44%) said digitalisation was their firm's top productivity improvement driver

However, while four in five manufacturers have a net zero strategy in place, fewer than half (46%) are actively implementing their plan

25% of Britain's manufacturers believe new digital technologies have already had an impact on decarbonisation

25%



39% of manufacturers believe that climate change and net zero ambitions will become more of a priority over the next three years

39%



82% of UK business leaders say the energy crisis will impact their organisation's ability to follow through on emissions reduction plans

82%



02/ The key net zero challenges

The demands around the journey to net zero are multi-faceted and there are a number of factors that have to be addressed, and there is certainly no one-size-fits-all solution. These challenges can vary depending on the industry, location, size and specific circumstances of a manufacturing company. The common challenges can include:



Supply chain emissions

The emissions associated with the entire supply chain, including raw material extraction, transportation and distribution, can be significant. Common terminology when speaking about supply chain emissions is Scope 1, 2 and 3 – a method of categorising the different kinds of carbon emissions a company creates in its own operations, and in its wider value chain.

Scope 1 covers the Green House Gas (GHG) emissions that a company makes directly, for example while running its boilers and vehicles. Scope 2 emissions cover indirect emissions such as the electricity or energy a company purchases for heating and cooling buildings which is being produced on its behalf.

Scope 3 emissions (the tricky part) cover all the emissions associated, not with the company itself, but that the organisation is indirectly responsible for, up and down its value chain. For example, from buying products from its suppliers, and from its products when customers use them.

Scope 3 represent the greatest challenge for most organisations as they are numerically often several times larger than the easier to measure and manage Scope 1 and 2 emissions, due to the significance of the carbon, both in the underlying supply chain but also the future use of the manufactured products. Digital technologies can offer manufacturers accuracy and visibility of emissions up and down their value chain, but it's vital that they work closely with suppliers to make this happen.

Until now, most EU companies have only reported on Scope 1 and 2 – with only a third measuring their Scope 3 emissions. However, with the Corporate Sustainability Reporting Directive, this is about to change. Under the proposed value chain sustainability reporting, companies will also be required to report on Scope 3, and their net zero reduction targets and progress.

This means manufacturers will have to be able to exchange data with partners to track and document the carbon footprint of raw materials brought in, the final product for sale – and everything in between.

70%

For many businesses, Scope 3 emissions account for more than 70% of their carbon footprint

Rising inflation (75%) and interest rates (54%) have been cited by manufacturers as having had a negative impact on their sustainability goals

Financial investment

Transitioning to cleaner technologies and processes often requires substantial upfront investment. Manufacturers, particularly SMEs, may struggle to secure the necessary funds or may be concerned about the return on investment, with many citing this as a key roadblock to becoming more sustainable.

According to Lloyds Bank, almost half of manufacturers believe high costs against a backdrop of insufficient budgets present a significant challenge to net zero, citing rising inflation (75%) and interest rates (54%) as having had a negative impact on their sustainability goals.

It can be difficult to persuade the finance department to divert funds away from business-as-usual activities such as procurement and marketing, and towards sustainable redevelopment. But looking to the future, it's perhaps the most important investment that an organisation can make.

Stakeholders are becoming increasingly eco-conscious; research from Schneider Electric showed that 60% of consumers worldwide now rate sustainability as a key criterion when choosing who to shop with, while investors are likely to scrutinise the long-term ESG efforts of a business as closely as its financial health.

However, financial assistance such as grants or tax incentives are available to help. Utilising funding can help protect cashflow over the payback period for an investment. A quarter (25%) of SME manufacturers working towards net zero are using government grants to support them, while a similar percentage are taking advantage of green finance products from banks and other financial institutions (23%).

Investments in decarbonising operations can help futureproof manufacturers, paying dividends down the line. Many manufacturers are restructuring current or building new manufacturing sites and plants with sustainability at the core. Buildings can be equipped with solar panels, energy efficient lighting, water pumps and lighting with sensors, which all drive down emissions and therefore, cost.

50+

Average age of a manufacturing operative in the UK is now over 50

Skilled workforce

Implementing sustainable practices will require a skilled workforce that understands new technologies and processes, and companies may need to invest in training and education to develop this expertise.

As mentioned earlier, one of the many challenges facing manufacturing businesses today is an ageing workforce and a widening skills gap. The average age for a manufacturing operative is now over 50 and there is simply not enough people coming into the sector to replace them, meaning many manufacturing companies have been left worrying about how to fill roles moving forward.

Not only is the sector in dire need of traditional manufacturing skills such as welding and CNC machining, Industry 4.0 has seen the sector open up to the possibilities of technology, eschewing in a new era of digitalisation, and with it the requirement for a whole new range of skills the sector has never needed before.

The digitalisation of production processes, with a heavy emphasis on connectivity, automation and data analysis, has transformed the talent needs of industry – talent which is currently in high demand and increasingly short supply.

The key to successfully closing the skills gap is investing in education, training and employing the latest technologies on factory shopfloors to innovate – and build excitement around – job roles, thus boosting employability in the manufacturing sector, making roles more appealing and dynamic.

Therefore, UK manufacturers need to engage with leading technology providers to ensure that their systems and processes are up-to-date, accessible and attractive to the next generation of workers.

85%

85% of manufacturers considered data analysis a top priority within the plan for net zero

Data and measurement

Accurately measuring and reporting emissions throughout the manufacturing process is crucial for tracking progress toward net zero goals. Manufacturers may struggle with data collection and reporting, especially if they have complex supply chains.

An often used phrase in the sector is 'you can't manage what you can't measure', and many manufacturers are grappling not only with how to collect data from their ever-growing inventory of digital assets, but also what to do with that data once it's been gathered in order to create valuable insights.

Research carried out last year by Drax of key decision makers in the manufacturing sector, revealed 85% considered data analysis a top priority within the plan for net zero, but fewer than half (42%) cited a lack of data analysis knowledge within the business as a barrier to implementing change.

Data analysis is essential in the manufacturing sector and companies are becoming increasingly aware of its necessity as part of the net zero puzzle. By tapping into the rich goldmine of data that each company possesses, businesses can identify their strengths and blind spots. This will then help them to map an effective roadmap towards further decarbonisation.

The challenge is that without the necessary know-how to interpret data, there's no way of unlocking its potential. With an apparent lack of data analysis knowledge within businesses, it's natural to be concerned about the upskilling required to integrate data into net zero plans.

Manufacturing leaders must therefore look to centralised, cloud-based optimisation and project management technologies to glean data-driven insights that support more informed decision-making around environmental action. These investments can directly benefit the bottom line through reductions in energy consumption, particularly with the current high energy prices, or improvements in process efficiency.



Transitioning legacy infrastructure

Older manufacturing facilities may have outdated equipment and infrastructure that is less energy efficient. Updating these facilities can be costly and time-consuming.

Almost a third (29%) of manufacturing leaders, according to Schneider's research, say that their organisation's legacy assets and infrastructure present a major challenge. This is unsurprising – after all, many buildings, power supplies and processes predate the latest technology and climate science.

Industrial companies often measure infrastructure replacement rates in decades, and the process is expensive and disruptive. However, while installed systems may not be well suited to sustainability initiatives, ripping and replacing them with new infrastructure will likely cost more, be operationally implausible and leave an even greater carbon footprint in the process.

Here, organisations can 'digitally retrofit' their operations to maximise efficiency while minimising impact. One way of doing this is through implementing intelligent energy management systems (EMS) to monitor and manage energy use.

The software offers insights into real-time energy performance while tracking variables like weather reports and building and site occupancy to automatically regulate the required levels of consumption, ensuring organisations only ever use the energy they truly need.

Given their efficacy, it is no wonder that over half of industrial organisations are predicted to harness energy management and renewable energy systems within the next three years.

29%

29% of manufacturing leaders claim their organisation's legacy assets and infrastructure present a major challenge

228%

Demand for Chief Sustainability Officers has grown 228% in a decade

Culture

Culture change, or a lack thereof, is ranked by 19% of organisations as a major challenge. Organisations can be hesitant to move away from a 'winning formula' and struggle to plan with all departments in mind.

Sustainability initiatives require buy-in across a business, and many manufacturers are making it the responsibility of senior leadership. Indeed, 78% of organisations report that C-level roles are directly responsible for driving their sustainability efforts.

To navigate this challenge, many companies are creating a specialist chief sustainability officer (CSO) role to focus on their environmental evolution, with US demand for CSOs growing 228% in a decade. Indeed, the scope of the role of the CSO is also evolving rapidly.

Where once the job function might have been subsumed within the HR department and limited to, as one CSO told *The Manufacturer*, "telling people to put their rubbish in the correct bin," it is now a board level role and very much part of a manufacturer's strategic planning.

To be successful, this role must consider day-to-day operational decisions and long-term strategy, not just reporting. Then, the success of initiatives will depend on how well the technologies and solutions can be introduced into daily operations and longer-term plans with employee buy-in.

Here, it's often worth hiring a team of expert sustainability consultants to help the organisation break down silos, comply with net-zero regulations and craft a long-term strategy.

Circular manufacturing

Moving towards a circular economy, where products are designed for reuse and recycling, can be a significant shift for some manufacturers. It requires rethinking product design and disposal practices.

Reduce, reuse, recycle is becoming a common mantra within the sector, but the less well-known 'remanufacture' could be even more important in the years ahead as it has the potential to boost the economy and reduce raw material and energy consumption, CO₂ emissions, amount of material sent to landfill and costs for the consumer.

Remanufacturing can extend the life of that product, preventing excess waste and consumption. The product can then continue to be used by the existing customer or sold to a new one. By using this model, onshoring can be further encouraged as customers will send products directly to a company to be remanufactured.

Research from the Ellen MacArthur Foundation claims 45% of CO₂ emissions can be tackled by changing the way goods are made and used. Not only does this reduce emissions, but it also provides a competitive advantage as customers can save money through remanufacturing rather than purchasing a brand-new product.

The demand for new materials places a significant strain on the environment, with companies producing more emissions to keep up with demand. Circular manufacturing enables companies to reduce this demand by 50-98%. What's more, the energy required to remanufacture products is often up to 90% less than when manufacturing from scratch with raw materials.

As highlighted previously, consumer preferences are changing as awareness increases of the need for more sustainable and greener products, and they are voting with their wallets. Manufacturers may want to consider the opportunity to incorporate new, sustainable, ethical and alternative raw materials in product design and production.

They may also want to look at improving a product's energy efficiency to reduce cost and waste during production and/or highlight how their product forms part of the circular economy by making it easier to repair, reuse, recycle and remanufacture.

45% of CO₂ emissions can be tackled by changing the way goods are made and used

Onshoring

Sourcing and production of goods from the company's origin country makes perfect sense for any manufacturer looking to reduce its environmental impact. In previous decades, many companies looked to offshore their manufacturing to other countries, the Far East in particular, to save money.

However, as labour costs have increased in the developing world and the last few years of global disruption having laid bare the vulnerabilities that exist with manufacturing supply chains, many are now realising the myriad benefits to onshoring, nearshoring or friendshoring their manufacturing.

During the COVID-19 pandemic, the need for a secure supply chain that is both resilient and agile became clear. By manufacturing in your home country, firms face much shorter lead times, cutting delays due to global shipping waits and customs clearance.

The lack of reliance on volatile markets that can face global disruptions puts companies in a great position to adapt to change. Another key benefit to onshore manufacturing is the sustainability of eliminating global supplies. This reduces the environmental impact of manufacturing as the distance between suppliers and their final points of arrival has been decreased. By reducing emissions and manufacturing closer to home, victory in the battle for net zero can be bought closer.

65%

65% of UK food and drink companies have focused on onshoring or nearshoring

03/ Additional and related challenges

01/ Technological gaps

Many manufacturers may lack access to or knowledge about green technologies. They may need to invest in research and development to find innovative ways to reduce emissions.

02/ Consumer and market demand

Manufacturers may face changing consumer preferences and market demands for greener products. Meeting these expectations while remaining competitive can be problematic.

03/ Resource scarcity

Many manufacturers have experienced material shortages in recent years due to COVID, Brexit, the war in Ukraine and trade disputes between the US and China. Therefore, for some it is difficult to secure sustainable and low carbon raw materials. This is particularly relevant for industries that rely on rare minerals or materials with a high carbon footprint. The extraction and processing of raw materials often have environmental consequences, including greenhouse gas emissions, pollution and habitat destruction. Resource scarcity can amplify these impacts as companies are forced to seek to access more remote or unconventional sources.

04/ Risk management

Climate change poses risks to manufacturing operations, including extreme weather events, supply chain disruptions and regulatory changes. Manufacturers must develop strategies to mitigate these risks.

05/ Production

Manufacturing production lines can be fraught with hidden causes of waste and inefficiency that can contribute significantly to a company's overall production footprint. Unplanned downtime per site per year, service delays, shift losses and errors missed through manual code inspection and lack of data aggregation, all constitute forms of production line waste.

By identifying such causes of waste and addressing these through automation and intelligent cloud-based monitoring solutions, not only can significant cost savings be achieved, the positive sustainability impact will benefit brand reputation among stakeholders.

06/ Global scope

Manufacturers often operate on a global scale, which can complicate efforts to achieve net-zero emissions. Different regions may have varying regulations and access to clean energy sources, while at the same time, it can prove difficult for manufacturers to align sustainability initiatives across multiple sites, particularly if they are siloed from one another.

07/ Regulatory compliance

As we've seen recently with the government's change of tack when it comes to net zero, manufacturers must navigate a complex landscape of environmental regulations. Meeting current and future emissions targets while complying with these regulations can be a significant challenge.

04/ Stay ahead



Even when the benefits of investing in sustainability are clear, it's easy to get caught out by these numerous challenges that are standing between a business and net zero. Here Dave Atkinson, Head of Manufacturing at Lloyds Bank, offers some top tips to help manufacturers stay on track.

01/ Share learnings

The journey to net zero isn't one that businesses are on alone. Manufacturers need to work together as sector, sharing knowledge, best practice and learnings. By listening to other businesses about the strategies that worked for them, as well as things that haven't gone so well, we can all get there faster. This doesn't need to be restricted to partners just within the manufacturing sector. All businesses across the UK economy are on this journey, including suppliers and customers, and many learnings can be applied by all different types and size of business.

02/ Measure and monitor

Measuring can feel like a big job at first, but it quickly pays off as it allows companies to demonstrate return on investment for sustainable changes, as well as show customers that the dial is shifting. There's no need to tackle a full assessment of Scope 1, 2 and 3 emissions at first. Start small, maybe by looking at how much fuel is used by the business' fleet, and what this means in terms of emissions. There are lots of tools available to help firms start measuring, such as the Lloyds Bank Green Buildings Tool, which helps assess the impact of buildings on the environment.

03/ Create sustainable skills

No one manufacturer will have all the answers, so it's important that companies surround themselves with those who do. Look to bring in talent with specialist skills in sustainability, or work to upskill existing employees so they can help support that work towards net zero. One route is via the Advanced Manufacturing Training Centre (AMTC), which offers a 'step on, step off' pathway, training and upskilling staff at different points during their career. This helps colleagues keep up to date with the latest innovations which can help drive sustainability and efficiencies in manufacturing.

05/ Make use of available expertise

As the ninth largest manufacturing nation in the world, the UK has a wealth of institutions which can support manufacturers with expert knowledge and insight. One good example is the Manufacturing Technology Centre (MTC), which offers manufacturers nationwide a complimentary sustainability line walk to explore how their business could make sustainability improvements to its factory and processes, as well as identifying energy and cost saving opportunities.

04/ Utilise financial support

As mentioned previously, cost can often be a major barrier for manufacturers that want to invest in sustainability. However, there's a variety of support available from government, industry bodies and banks, often as a grant or at preferential rates. Conduct the research and find out what's out there.

05/ Case examples

Talking around the net zero challenges for manufacturers and their potential solutions is one thing, but what are companies on the ground doing in practice, today. Here, we look at a number of businesses around the country, from a variety of manufacturing sectors, that are forging ahead on their net zero journey.



01/ ANT Industries

ANT Industries, an aerospace parts manufacturer based in Warwickshire, has invested in measures to reduce its energy costs as well as carbon emissions. It has installed 13,000 sq ft of solar panels on the roof of its factory, where it manufactures and assembles complex components for the aerospace and power generation industries.

The new system has significantly cut ANT Industries' energy bills by providing almost a third of its energy requirement, while also reducing its CO₂ emissions by 23.2 tonnes per year. Across the industry, more than a third (35%) of businesses are already sourcing renewable energy in some form to reduce their costs and cut emissions.

These solar panels were funded via Lloyds Bank's Clean Growth Financing Initiative, which provides customers with access to discounted lending for green purposes, and a grant from the government's Coventry and Warwickshire Green Business Programme.

02/ Rebellion Brewery

Rebellion Brewery in Marlow is taking an alternative approach to reducing its Scope 3 emissions with a local-based sales model. Manufacturers usually struggle to control the emissions produced by distributing their products once they leave their own premises.

Rebellion Beer is changing this, with 98% of its sales being made within a 30-mile radius. This used to be 70 miles, but as the business grew locally it shrank the area it delivered to, rather than increasing capacity.

Previously, the business also outsourced its bottling to a company in Kent, meaning its beer was making a 160-mile round trip. Rebellion Brewery has invested in an on-site bottling line, saving 16,000 road miles a year. With its proactive approach, the brewery is taking control of its value chain emissions to reduce its environmental impact.



04/ Encirc

An ongoing issue for glass manufacturer Encirc, is the carbon emissions associated with manufacturing and transporting glass compared to other packaging materials. Developing sustainable furnaces is one way of addressing this.

In 2021, in partnership with industry body, Glass Futures, Encirc fuelled a furnace in its Northern Ireland plant on biofuels and used 100% recycled glass to make bottles. The results saw bottles with a reduced carbon footprint of up to 90% and the company has more recently announced plans to utilise hydrogen in its Cheshire plant to power furnaces in the future.

The company is also making huge strides in the digitalisation of glass, working to create the smart bottle of the future. Encirc's high-speed Industry 4.0 line is capable of indenting a laser printed QR code onto every bottle it produces.

This contains the source information of those bottles, creating endless future possibilities around machine learning plus additional benefits for the consumer, brand and retailer. The company has also launched a new ZE30 mission for the business (zero emissions by 2030) which is getting huge buy-in from staff.



03/ Coca-Cola Europacific Partners

A new £31m investment at Coca-Cola Europacific Partners' (CCEP) manufacturing site in Wakefield will help develop a new state-of-the-art canning line which will include advanced technologies to help minimise energy, water and CO₂ consumption.

Energy and water savings come from innovations such as air rinsing capabilities, dry lubrication on conveyors and an auto-sleep function on motors. Funding will also go towards infrastructure upgrades to optimise the factory for production and future innovations.

This will include the construction and fit of a new raw materials storage warehouse, plus additional utilities storage and the expansion of other facilities on-site. It also supports the recent implementation of attached cap production capabilities on two of the site's lines, making it easier to recycle the entire plastic bottle with no cap left behind.



05/ Respirex

Respirex, a world leader in personal protective solutions, is the first company to use the brand-new solar panel funding of up to £1bn from Electron Green. The installation, which started in September, will cut Respirex's electricity grid usage and is projected to save the firm more than £500,000 over 25 years.

Electron Green is installing 238 rooftop solar panels on Respirex's buildings in Redhill, Surrey. These facilities are used to manufacture and maintain gas tight suits, chemical splash suits and other equipment for essential public and private sector industries.

The agreement is that Respirex pays nothing for installation or maintenance of the panels. This will result in the generation of 89,000kWh for the business, enough power to supply more than 30 households; reduce usage of electricity from the grid by almost 25%; achieve carbon savings of 564 tonnes and cost savings on energy bills of £10,500.

Electron Green launched the funding to support UK businesses at a time when energy bills are escalating – and UK electricity usage is projected to increase by 56% between 2020 and 2036.



07/ Alstom

High-speed train manufacturer Alstom has partnered with Swedish design and technology company, STILFOLD, to explore how the latter's origami-inspired manufacturing technology could be used to make building trains more environmentally sustainable. STILFOLD's technology involves the use of robotic arms to fold flat sheet metal over curves to form strong and sustainable new structures, using minimal component parts. The technology removes the need for cutting, welding and joining, reducing material waste, energy consumption and production time while increasing structural strength.

STILFOLD and Alstom will jointly review existing manufacturing solutions at Alstom to analyse and identify areas where the greatest impact can be achieved by implementing the STILFOLD technology. STILFOLD will enable Alstom to use fewer raw materials, reduce the weight of different components and improve the strength and durability of its trains' structures.



08/ DS Smith

DS Smith, a leading provider of sustainable fibre-based packaging solutions worldwide, has partnered with sushi specialist Eat Happy to develop a fully recyclable sustainable solution for the firm's disposable plastic sushi trays.

The tray and the lid of the new packaging are made from natural and renewable raw materials using corrugated cardboard. The innovative packaging solutions are designed to be water and grease repellent and designed to protect and preserve the sushi product within. They are developed in a diverse range of shapes and sizes from single to party platters using DS Smith's innovative Circular Design Metrics approach and the replacement trays are anticipated to save more than 1,250 tonnes of plastic per year.

Using Circular Design Metrics, DS Smith packaging experts evaluate and tailor a product unique solution against a formula of eight set criteria inclusive of recyclability, renewable materials and supply chain optimisation. The design metrics are intended to measure a packaging's suitability for the circular economy and enable designers to identify areas for completion in each unique product.

09/ Burton's Foods

Burton's Foods, now operating as Fox's Burton's Companies (FBC) UK under a Ferrero-related company, has worked with 42 Technology (42T) to investigate the feasibility of electrification of its gas-fired industrial baking ovens used for biscuits and other products, to help cut its carbon emissions.

Industrial baking in the UK relies on using natural gas-fired ovens to produce biscuits and other products with the flavour, texture and appearance that appeal to consumers. The Food and Drink Federation (FDF) has estimated that direct-fired ovens used within the UK's food and drink sector contribute around 700,000 tonnes of CO₂ per year, with electrification seen as the best route to decarbonising the industrial baking process.

42 Technology's work included characterising the thermal and humidity profile of a current gas-fired industrial baking line; mapping the energy losses within the current process to identify potential savings; and investigating commercially available electric ovens to replicate the existing baking process.

The team also developed a process to assess and reconfigure other production lines relying on electrical heating technologies. FBC UK estimates it could potentially reduce annual greenhouse gas emissions by up to 17,000 tonnes of CO₂ by decarbonising production lines.



06/ Wren Kitchens

Wren Kitchen's environmental team has partnered with specialist academics from Hull University to accelerate its journey to net zero. The partnership will take advantage of a unique supply chain carbon mapping tool, designed and developed by the university, to support Wren in its quest to become more sustainable. This will enable its customer base the choice on the carbon footprint for each element of the kitchen as early as the design stage.

Wren Kitchens and the University of Hull have secured a Knowledge Transfer Partnership (KTP) from Innovate UK, to fund the two-year project. The KTP will facilitate accelerated access to this specialist expertise and knowledge within Hull University Business School.

It will also enable Wren to fully embed environmental sustainability knowledge, know-how and innovation from the university, right across its business and create the foundations for an in-house sustainability team with access to new, emergent, eco-conscious markets globally.

The project will go beyond understanding operational carbon impact to total transparency of whole-life carbon of a kitchen, which is the combination of embodied and operational emissions. In order to ensure sustainability remains a key driver at Wren, two senior members of staff will also study PhDs on the theme of sustainability.





10/ Bentley

Bentley has installed a 1,200-litre biofuel tank at its Crewe production facility following the company's success powering its vehicles with such fuel at the Goodwood Festival of Speed.

A 1,200-litre fuel bowser within the Crewe production site may appear unremarkable, but its contents have enabled vehicles from the Bentley Heritage Collection and press fleet to reduce their CO₂ impact by an estimated 85%, compared with ordinary gasoline.

The second-generation biofuel now installed at Crewe conforms to the global EN228 standard for gasoline, meaning that it's a straightforward replacement for normal pump fuel. No engine modifications are necessary, even for

the oldest surviving Bentley, the 1920 EXP2. Any Bentley ever built will run as powerfully and smoothly on the second-generation biofuel as it does on normal pump gasoline, while dramatically reducing its carbon footprint.

Unlike first-generation biofuels, which are made from food crops grown on arable land, second-generation biofuels use waste products, including agriculture and forestry waste and food industry by-products. During the production process, waste biomass is broken down using fermentation, leading to the creation of ethanol. Dehydration of the ethanol converts it to ethylene, which can then be transformed into gasoline through the process of oligomerisation.



11/ HEINEKEN UK

HEINEKEN UK has had a low carbon heat network supplied to its Manchester brewery by long-term partner GEA. This is in support of HEINEKEN's global ambition to reach net zero across its production sites (Scopes 1 and 2) by 2030. The Manchester brewery produces around 400 million litres of Heineken, Birra Moretti and Foster's beer per year.

The Manchester brewery's decarbonisation journey started with the installation of heat pumps and a heat pump network capturing and reusing heat to brew and package beer. GEA will design, supply and install the low carbon heat network to the existing plant and will also modify the legacy process equipment. Currently, steam is produced in large steam boilers powered by natural gas.

With the new system, HEINEKEN UK will use a low temperature (90°C) hot water network – driven by GEA heat pumps – thus replacing the steam boilers with environmentally friendly heat pumps powered by electricity. GEA's heat pump solution operates on an environmentally friendly ammonia refrigerant with zero ozone depletion potential (ODP) and zero global warming potential (GWP). Distribution and recovery pipe work make up the foundation of the network, which will absorb the heat from multiple processes.

Once completed, HEINEKEN UK estimates that the installation will result in a 45% decrease in gas use, leading to a reduction of carbon emissions.



12/ Chivas Brothers

Chivas Brothers, the Scotch whisky business of Pernod Ricard and maker of global Scotch whisky brands including Chivas Regal and The Glenlivet, has made the expertise and learnings from its successful integration of enhanced heat recovery technologies 'open source'.

The move was made after the application of the technology at its Glentauchers site showed significant benefit in carbon emissions reduction, providing insights that will benefit the industry at large. The sharing of its design process and implementation insights is intended to put collaboration ahead of competition on the road to net zero, rooted in the belief that distillers must work together to create a sustainable future.

The heat recovery technologies, including mechanical vapour recompression (MVR) and thermo vapour recompression (TVR), are designed to capture and recycle heat generated in the distillation process that would otherwise go to waste.

To date, these have reduced total energy consumption almost by half (48%) at Chivas Brothers' Glentauchers distillery, near Keith in Speyside, Scotland, reducing the site's total carbon emissions by 53% as a result. This represents an energy saving equivalent to powering 4,979 average UK homes – more than all the houses in Keith – for an entire year.

The business' ambitious plans to roll out these integrations across all viable sites is part of a drive to achieve carbon neutral distillation by the end of 2026.

MANUFACTURING LEADERS' SUMMIT



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Net zero will be a key theme during the event and there will be keynote talks looking at how industrial digitalisation can help drive us to net zero manufacturing? An how to build the most sustainable factory possible.

Book your place at the summit by visiting:
manufacturing-leaders.uk/register/