



Decarbonisation through Digitalisation

Manufacturing made smarter and
greener with technology

**MADE
SMARTER**

Contents

Foreword	3
Executive Summary	
Demystifying decarbonisation	
Why net zero is necessary	
The benefits of decarbonisation	
Making the change	
How to get started	7
Commit to the cause	
Pledge to Net Zero	
Calculate your carbon footprint	
Make the most of digital technologies	8
Industrial internet of things (IIoT)	
Data and systems	
Additive manufacturing (AM) or 3D printing	
Automation and robotics	
Augmented reality (AR), virtual reality (VR), and mixed reality (MR)	
Other ways to drive decarbonisation	11
Efficient lighting systems	
Electric vehicles	
Building improvements	
Waste management	
What Made Smarter makers have achieved	13
Crystal Doors - navigating the way to net zero	
Fylde Fresh and Fabulous - a potato-powered factory	
The Cumbria Clock Company - visibility for sustainability	
Overcoming the barriers to decarbonisation	15
The Made Smarter pathways to decarbonisation	16
Tailored advice	
Digital transformation workshops	
Funding	
Skills and leadership	
Turn to Made Smarter for help	

Foreword

Executive summary

The decarbonisation of manufacturing is the industry's biggest challenge - but it is also a significant opportunity.

To the UK economy manufacturing is worth £170 billion¹, sustains 2.6m jobs, produces half of UK exports, and has almost two-thirds of all business R&D, which drives vital innovation. In our daily lives, it produces almost everything we depend on.

But it also has a colossal impact on our environment. Manufacturing is responsible for 17%² of the UK's greenhouse gas emissions.

The pressure and scrutiny on the sector to be more sustainable is ramping up and coming from all directions including employees, customers, the government, investors, regulators, and the communities in which manufacturers operate.

To meet the UK's net zero target by 2050, industrial emissions have to be reduced by at least 90%³, the equivalent of removing every car from our roads immediately.

To make things greener, we need to make things smarter. This is where digital technologies will be key to the net-zero transition.

In recent years we've seen technology play an incredibly important part in tackling disruptive and emerging challenges. It has helped businesses navigate the Covid-19

pandemic and recover, negotiate supply chain disruption and labour shortages, as well as focus on solutions to mitigate the energy crisis.

For the climate emergency, digitalisation offers manufacturers a huge opportunity to deliver operational efficiencies, decarbonise heat and power, optimise design and materials, and improve logistics and transport, benefitting their business, their bottom line and the environment. Then there is the reputational gain which helps secure customer loyalty, as well as attract new talent and investment.

But despite the proven impacts, adoption is far from widespread and there is a palpable lack of urgency to accelerate decarbonisation and reduce emissions.

It is clear that talk needs to stop and make way for action and a concerted commitment to change. Decarbonisation is not a distraction. It is an imperative. UK manufacturing must get behind the mantra that the future is decarbonised and digital.

Made Smarter is committed to help small and medium sized makers get there with vision, technology, leadership and collaboration.

In the following pages of this guide we explore how you can start your decarbonisation journey. We start by demystifying some of the key terminology and demonstrate how sustainable practices, small or big, can help your business.

We explore how digital technologies such as the Industrial internet of things (IIoT), data, systems and data analytics, automation and robotics, 3D printing and Extended Reality can be used to increase efficiency, use less energy, and produce less waste.

We then demonstrate how Made Smarter-supported manufacturers are already pursuing decarbonisation and finding the sustainability sweet spot between economic, social, and environmental goals.

Made Smarter can help your business take your first steps accessing our tailored, expert advice and funding for the technology and skills you will need to achieve your green credentials and power your growth.

We look forward to supporting your decarbonisation journey through digitalisation.



Donna Edwards,
Director of Made
Smarter's North West
Adoption Programme

Demystifying decarbonisation

Decarbonisation is about taking steps to drastically reduce your company's greenhouse gas emissions, including CO₂, to alleviate global warming and climate change.

The goal is to achieve net zero – in other words, get as close as possible to zero emissions and balance any remaining emissions by reabsorbing them from the atmosphere.

For manufacturers, this can be achieved by reducing energy use, switching to renewable and sustainable power sources, and striving to eliminate emissions from every aspect of the business, including your factory and vehicles, the materials and suppliers you use, and how the product is disposed of at the end of its life.

Why is net zero necessary?

Your business should recognise the pressing issue of climate change and the role that your operation plays in it. In addition to avoiding the worst effects of global warming, a robust decarbonisation strategy also serves your commercial interests. In fact, 80% of UK residents have expressed that they are concerned about climate change⁴ – many of these people may be your customers. What's more, around a third of consumers are actively looking for businesses that possess strong sustainable and ethical accreditations⁵, and are willing to pay more for products that are eco-friendly. While the vast majority of consumers are unaware of how to practically reduce everyday carbon emissions, those who do know about it, find it too confusing and expensive - therefore the onus is on businesses to take action.⁶

Decarbonising your business is also cost-effective. By switching to more energy-efficient materials and equipment, you'll save significant funds to channel elsewhere in your business. It's been found that this strategy could result in cutting energy bills by as much as 25%⁷. Rising energy prices, too,

are an increasing issue for many businesses – and an unstable supply means natural gas costs are predicted to go up even further throughout the next decade.



The benefits of decarbonisation

Manufacturing businesses acting against global warming have reported a reduction in energy costs and improved employee engagement.

Plus, green credentials might elevate your profile both locally and nationally.

From a numbers perspective:

- 34% of businesses stated that they slashed costs with improved productivity⁸
- 16% increased sales with access to new markets where customers expect a level of care for the environment⁹
- 14% said that reducing emissions has enabled them to secure finance for new projects¹⁰
- 15% have successfully attracted new talent by making their sustainability values known¹¹

Moreover, 96% of manufacturers prioritise sustainability in their business model¹² – with decarbonisation measures already in place or plan to apply a more eco-friendly approach to their supply chain. Nonetheless, more than a third of business owners say they need help to calculate the carbon footprint of their businesses and, in turn, form a solid decarbonisation plan.¹³

Making the change

The best plans require you to be proactive and thoughtful in your approach. At Made Smarter, we're simplifying the process to help you take action – specifically by using digital technologies and outside support available to your business.

Our mission is to inspire the new industrial revolution, turning the UK into a world leader in digital tools. This guide aims to show how these tools can not only support your decarbonisation efforts, but also strengthen your competitive edge and make an everyday difference to your business.



How to get started

Decarbonisation is about much more than just saying you'll cut emissions – you need to demonstrate it too.

Pledge to Net Zero is a global initiative encouraging business leaders to take strong action against climate change. Signatories of the pledge commit to delivering greenhouse gas reductions in line with the science-based target of a 1.5°C climate change scenario.

The initiative works with Race to Zero, a campaign led by the United Nations Framework Convention on Climate Change that rallies leadership from businesses, investors, and local governments to encourage more ambitious net-zero targets. Organisations who wish to join the UN Race to Zero programme via Pledge to Net Zero must establish targets that encompass a standardised framework devised by the Greenhouse Gas Protocol (GHGP).

Greenhouse Gas Protocol framework

Scope 1

all emissions released directly from your company – for instance, from your factory or fleet.

Scope 2

indirect emissions produced by your company when the energy you purchase and use is produced – for instance, your electricity.

Scope 3

includes all other emissions generated throughout your value chain – like raw materials, logistics, business travel by the team, and employee commuting.

You should also provide evidence that your lobbying and advocacy activities are, and will continue to be, in line with net-zero targets. You will need to proactively support the UK's climate policies at both the subnational and national level consistent with the Race to Zero criteria. And, within 12 months of joining Pledge to Net Zero, you must provide a plan detailing exactly how your company will achieve 2030 emissions targets.

Learn more about [Pledge to Net Zero](#) and make your own pledge.

Commit to the cause

Publicly communicating your decarbonisation efforts will convey your climate-conscious goals to consumers – and, hopefully, encourage other businesses to follow suit.

SME Climate Hub is a non-profit organisation empowering small to medium-sized businesses to tackle global emissions. They equip organisations with a database of tools and resources to help develop a sound climate action strategy.

Recognised by the Race to Zero campaign, [SME Climate Hub](#) asks SMEs to commit to halving emissions

Calculate your carbon footprint

Whether you have five employees or 250, the first fundamental step to any net zero strategy is understanding your footprint. This means measuring your Scope 1, 2 and 3 emissions to identify where you're producing the most emissions. This way you can set the benchmark for all future actions and begin to implement an effective decarbonisation plan.

One of SME Climate Hub's tools is the handy [Business Carbon Calculator](#) which helps to look at your emissions output through the lens of the GHGP framework.

While it can be challenging, even in simple supply chains, thankfully, there are a variety of software solutions to help you address each aspect, as well as expert consultants who can support this key activity.

And this is just one of the many ways technology can accelerate your net-zero journey..

Make the most of digital technologies

Manufacturers value energy efficiency and installing new or upgrading equipment as the main pathways to effectively reduce emissions.

For many businesses, the difficulty is knowing where to start and which are the right technologies to choose.

Research shows that 13% of manufacturers said that they now use industrial digital technologies (IDTs) to focus their decarbonisation strategy.¹⁴

Below are some key technologies to consider...





Industrial internet of things (IIoT)

The industrial internet of things is a subsection of the internet of things (IoT) – a network of smart devices in the industrial sector that monitor, collect, analyse, and exchange data.

Adding sensors to existing machines within your setup will improve your understanding of energy use – determining which machines are more energy-efficient and when.

Vibration sensors could also alert you to machine maintenance requirements – enabling a regular repair cycle and extending their useful life. Not only does this improve the efficiency of your operation, but it will also reduce the number of machines or components that are unnecessarily disposed of.

Plus, using occupancy sensors can highlight which rooms are occupied, and when, and adjust your heating and lighting settings to match. For instance, if a room is rarely used, it doesn't need continuous heating or lighting. Switching to a more intelligent heating and lighting system will ultimately conserve energy and save money.

Other sensors that add value to your operation include:

- Air flow sensors to check for air leaks and establish when repairs are required
- Water detection sensors to get ahead of leaking pipes or machinery
- Door sensors to alert when doors are left open (a drain on your heating system)
- Sensors that detect machine use and turn off idle machinery

Data and systems

You can use data and systems technologies to analyse data, improve planning, and ultimately reduce waste. For example, you could plot delivery routes more efficiently to lower emissions from vehicles.

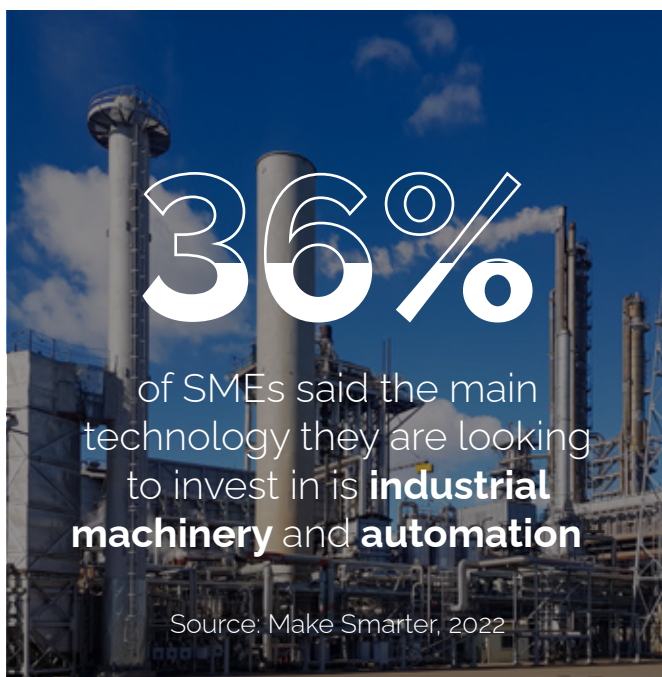
This technology can also help optimise production by analysing the quality, value, and carbon footprint of materials. And you may find an alternative product with a lower carbon footprint or a local supplier that reduces your delivery miles.

Finally, take the steps to digitise production information and reduce paper consumption. Not only is this a greener option, but it also makes sense from a security perspective – giving you peace of mind that all of your documents are in one place and backed up in case of loss.



Automation and robotics

Automation and robotics mean using technology to complete human tasks. In some cases it can improve quality, resulting in less waste throughout production.



For instance, an automated loading system can improve quality by ensuring a machine is loaded accurately every time, while also increasing operational efficiency and reducing standby times.

Using automation to load and unload machines could also allow operations to continue overnight unaided by a team of employees. This provides a capacity increase without the significant emissions from heating, lighting, and staff travel that would usually come with it.

Additive manufacturing (AM) or 3D printing

Additive manufacturing (AM) – more commonly known as 3D printing – is the process of creating a physical object by building it layer by layer. Three-dimensional parts are made by adding material – as opposed to subtractive manufacturing methods, such as machining, where material is removed to create the desired shape. Though it's highly dependent on the technology used, 3D printing only puts material where it's needed – successfully reducing what you use.

AM can also optimise designs, making them lighter without compromising their strength and therefore improving efficiency. For example, building a vehicle with lighter components means less fuel consumption. What's more, by using AM to test designs before committing to full production, businesses can eliminate wasted production runs or incorrect tooling.

Nonetheless, it's worth noting that producing some materials for additive manufacturing is very energy-intensive – so you should thoroughly investigate before using AM as a net-zero technology.

Augmented reality (AR), virtual reality (VR), and mixed reality (MR)

Augmented reality uses digital elements to create an enhanced version of reality. Virtual reality uses technology to simulate a real-life environment. And mixed reality combines elements of the physical world with a virtual environment.

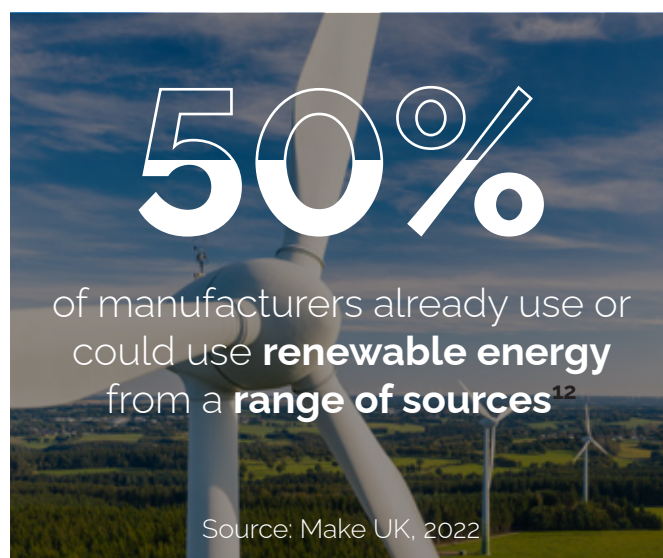
One application of these technologies is remote collaboration, which can reduce travel by allowing experts to discuss designs, challenges, or other data visually, in real time, and in 3D – all from their usual place of work.

Simulating new factory layouts, the performance of new designs, and the effectiveness of new production processes using these tools increases the likelihood of getting them right the first time too – effectively reducing waste and increasing operational efficiency.

You can also allow customers to experience products on their phone or through a VR headset – giving them a chance to test before purchasing and decreasing the likelihood of returns. This also reduces emissions as it means they won't have to travel to your store or warehouse.

Other ways to drive decarbonisation

There are numerous other technologies at your disposal to help you achieve net-zero emissions. 50% of manufacturers have confirmed that they already use or could use renewable energy from a wide variety of sources – like solar, wind, or geothermal power – and the following tools and ideas follow a similar vein.¹⁵



Efficient lighting systems

Upgrading to LED lighting could deliver cost savings of up to 80% for your business.¹⁶ You can also install timers and occupancy sensors that automatically switch off or dim the lights when rooms are empty.

Electric vehicles

33% of businesses have introduced an electric vehicle (EV) company fleet or EV purchase scheme to optimise employee commuting.¹⁷ Cycle-to-work schemes are also a great way to lower your carbon footprint – plus, you benefit from reduced National Insurance contributions on the cost of cycle hire.¹⁸

Building improvements

Improved insulation is energy-efficient and cost-effective. Insulation keeps buildings cool in the summer months and warmer in winter. It's little wonder that 52% of business owners

plan to increase their spending towards building improvements like insulation or heating and cooling systems in the future.¹⁹

Waste management

Repurposing materials for other projects reduces landfill and decreases energy use when transporting and disposing of waste. And if you can't repurpose it, there may be someone in your local community that can – building relationships with others in your area can unlock new partnerships for the benefit of the planet and all parties involved.

Of course, the other way to manage waste is finding ways to avoid it in the first place: minimising overstocking and overproduction, establishing a preventative maintenance schedule, and using technology to optimise the factory floor. It's a great idea to set a specific waste management goal, as well as carry out regular audits to help you review waste streams and identify other ways to prevent and manage waste.



Decarbonisation in action – what Made Smarter makers have achieved

We have helped hundreds of manufacturers to invest in new technology to support their decarbonisation.

There is bike component maker [Ratio Technology](#), textile manufacturer [Derek Rose](#) and interior design experts [Visual Architects](#), all using robotics and automation to achieve green growth and reduce waste and energy.

Then there are those using data and system integration technologies to reduce emissions and environmental impact such as precision component manufacturer [Beverston Engineering](#), eco-friendly cleaning product maker [Organica UK](#), and heritage valve manufacturer [Heap and Partners](#).

Here are a few others we have supported..

[Discover more case studies here](#)

[Crystal Doors](#) - navigating the way to net zero

Vinyl-wrapped door specialists Crystal Doors partnered with Made Smarter to develop an Industry 4.0 manufacturing platform.

This gave them full visualisation of how their machines perform and identify potential efficiencies to reduce energy use and waste.

These gradual gains accelerated the business towards achieving its goal of carbon neutrality for which they received the Queen's Award for Sustainability in 2022 and B Corp status in 2023.





Fylde Fresh and Fabulous - a potato-powered factory

We supported potato grower and manufacturer Fylde Fresh and Fabulous, to digitalise their quality control processes. This has reduced waste, increased the energy efficiency of their production line, improved product yield and allowed them to consistently meet its customer's specifications.

The business, who processes over 1,000 tonnes of potatoes per week, is literally powered by potatoes. Peeling and rejected potatoes are fed into an onsite bio-gas plant and generate enough electricity to power its factory and export back to the grid.

The Cumbria Clock Company - visibility for sustainability

Clock repair and restoration specialists Cumbria Clock Company introduced a bespoke digital management system with our help.

This gave them oversight of all their operations, increasing productivity and efficiency, cutting costs and reducing its carbon footprint.

They can plan the most efficient routes for their engineers, and combine service visits with call backs and inspections to reduce their annual mileage by 30,000. This will not only save a significant sum of money, but reduce its emissions by 11%, the equivalent to 12 tonnes of carbon.

The investment is transforming them from offering reactive and regular service and repair to a proactive data-driven service provider.



Overcoming the barriers to decarbonisation

One of the biggest perceived obstacles to net zero is the cost of decarbonisation. 42% of manufacturers told us lack of capital and funding was their primary concern,²⁰ while 31% said that they were worried about remaining cost-competitive,²¹ and the same amount cited rising fuel costs as the main barrier to change.²²

A quarter of businesses feel held back by the decarbonisation of transport and logistics too.²³ 23% of businesses experience difficulty developing a greener supply chain when not in complete control,²⁴ while other companies lack the internal resources and appropriate skills to make changes.²⁵



It's important to note that there is support available – both financial and advisory. You can often access free expert guidance to build a digital strategy and identify the right tools for your particular organisation – many of which aren't prohibitively expensive.

What's more, you can introduce technologies and new ways of working in increments. We often suggest conducting pilot studies or software trials to make sure any new change or transformation will be a good fit for your business and deliver the benefit you're hoping for. If it isn't quite right, you can explore other avenues before committing.

The Made Smarter pathways to decarbonisation

While decarbonisation might feel overwhelming, and it is by no means a simple task, it is vital you recognise you are not alone. Combatting climate change demands collaboration, and that is exactly what Made Smarter is here for.

We have partnered with thousands of manufacturers of every size and shape and from every sector to shine a light on how technology can drive digitalisation, decarbonisation and growth. Here is how we can help you...

Tailored advice

Speak to our team of experts for tailored advice on the impacts, benefits, costs, and practicalities of implementation.

Digital transformation workshops

For practical steps towards digitisation, we host two-hour workshops tailored to your unique requirements. You'll leave the session with a clear digital roadmap to follow.

Funding

To overcome funding obstacles, there are several tools you can use on a smaller budget. Made Smarter also offers funding support for SMEs in certain regions of the UK.

Skills and leadership

A net zero future is going to need new green skills. This will mean upskilling and educating your workforce, as well as attracting new talent. It also needs digitally-informed, empowered leaders.

Our specialist advisers can help you develop your skills and those of your workforce.

Turn to Made Smarter for help

Ready to secure your green credentials and power your growth? [Get in touch](#) to begin your journey today.

Further Reading

- [The ultimate guide to making your manufacturing business more sustainable](#)
- [Textile manufacturing: How digital transformation is securing a sustainable future](#)
- [How manufacturers are using technology to save pounds and the planet](#)

Sources

[1 & 3 - HM Government Industrial Decarbonisation Strategy, 2021](#)

[2 - Office for National Statistics, 2023](#)

[4 - BEIS Net Zero and Climate Change Public Attitudes Tracker, 2022](#)

[5 - Deloitte Sustainable Consumer research, 2021](#)

[6 - One Tribe, Consumer Expectations Towards Decarbonisation And Net Zero, 2022](#)

[7 - Department of Energy & Climate Change, 2015](#)

[8-15, 17 & 19 - Make UK Siemens Decarbonising Manufacturing, 2022](#)

[16 & 18 - The Carbon Trust, The journey to Net Zero for SMEs, 2021](#)

[20-25 - Made Smarter Market Research, 2022](#)

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