The Institution of Engineering and Technology

Sustainable Manufacturing

Progressing the next steps for a productive, resilient and resource-efficient future

Professor Peter Ball
IET Design and Production Sector Executive Committee

Reducing the impact of manufacturing industry through proactive resource efficiency measures is enabling many businesses in the sector to save money, improve flow and create new opportunities. Getting more while using less makes sound environmental sense too. So how can we help manufacturing become more sustainable and successful?

Manufacturers are waking up to the opportunities for success which can be gained by exploring and acting on their resource productivity.

Beyond traditional 'output per worker per hour' measurements of productivity, resource productivity is not new, but I am constantly surprised to discover not all firms are aware of what it's all about, how urgent it is to change or how to go about it.

Firms will increasingly feel the pressure from their customers, from their shareholders, from their employees, from potential employees and, critically, from legislation.

Those that change now are more likely to prosper in the future. Because this is about prosperity and not about burden.

Inspired by our report[1] 'Sustainable Manufacturing – the next steps', this thought piece from the IET Design and Production Sector has been written with the assistance of leading practitioners from industry.

It provides a glimpse as to what to do and what can be achieved together with some user case studies.

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Advancing resource productivity is challenging, how does a company start?

It is best not to get too complicated. Look for high level step change where data uncertainty is not as important as implementing something that is obviously more effective whichever methodology you use.

Use the triple bottom line structure[2] whereby benefits can be assessed as social, environmental and financial (or people, planet, profit).

To help you, keep networking to learn about new ways of working and see new technologies in development or application. In time you can make change normal and continuous.

Dr Nigel Davies
Technical and Sustainability Director, Muntons plc

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Save money, improve flow

How are industry practitioners driving the sustainability agenda forward and delivering productivity gains at the same time?

Here are four more leaders in the field giving their answers to key questions.

Having started on improving resource productivity, how can companies keep advancing?

Key to maintaining momentum is always going back to basics to question how you are working. So, whilst working on challenging strategic projects, fostering the habit of day-to-day improvement is essential.

Standardisation is core to this. It allows replication across the business and significantly it embeds environmental improvement into business process.

For example, the project management process at Airbus has environmental lifecycle analysis and our capex process has mandatory energy and carbon impact assessment. So, whilst environmental improvement is not part of everyone's job role, it is business as usual for everyone.

Peter Lunt
Industrial Environment Programme Manager, Airbus

How can you assess the potential savings?

Be sure that you take a broad system view to understand what is being saved and where. Ensure that value creation or protection is aligned with the right points in the system.

Simplistic metrics can lead to perverse incentives, adverse consequences and the risk of 'gaming', intentional or accidental.

Multiple inter-dependent measures can help to reduce box-ticking and target-chasing but if they become too complex, they may not be correctly adhered to.

Benefits can be non-financial, so ensure that any attempt to reflect social or environmental value takes into account the perspectives of multiple stakeholders.

Dr Gavin Milligan
Director, Green Knight Sustainability Consulting Ltd

Can one resource productivity lead in a business really make a difference?

Having only a single lead within a business to focus on resource productivity is not to be considered a token gesture.

One is often the correct number for what that lead does to engage multiple stakeholders (colleagues, customers, suppliers) results in a large collectively minded team, who are trained and understand the necessity, the purpose, and the business case to provide a team of people focusing on improving efficiency and efficacy of resource use.

In very large businesses a greater number of leads can provide greater resource productivity, but the real efficiency lies in the ability of one to engage others.

Ben Orchard
Energy and Environment Manager, Superdry

How do you justify the investment in resource productivity to the board?

Advances are made in Nestlé by establishing a clear strategic plan with clear target setting.

The strategic plan ensures that the portfolio of projects is coherent across the business yet site specific. The target setting comes about from identifying improvements which are phased according to strategic fit and return. Not all will require capex to bring benefits.

Our approach has evolved, and emphasis is now on all company projects considering environmental benefits rather than having dedicated environmental projects. This change of emphasis is core to our ongoing environmental performance improvement.

Andy Griffiths
Head of Value Chain Sustainability, Nestlé UKI

= Make more while using less

To help meet the challenges facing us in industry, there are numerous inspiring stories of sustainable manufacturing projects which have reduced costs, improved productivity and resilience, and, in some cases, created new products and services. Here are some examples.

Relentlessly reducing consumption:

How SAITEX became the world's cleanest denim factory.

Reducing consumption of energy, water and other resources in a factory is challenging and often starts with the basics of switching off lights and replacing the luminaires with LEDs.

SAITEX[3] hangs its jeans and directs naturally hot air towards them, to reduce by 85% the amount of energy needed for drying.

This is how most of the people around the world still dry their clothes, although it is quite rare in the garment industry. Improvements can seem to get harder, but it is all about capturing the value of wastes as part of the wider business of creating high value clothing.

If traditional laundries use 80 litres of water per item what could the best factory achieve? SAITEX was relentless in improving and then questioning and improving again, and again.

Sludge is captured from the factory and used for making bricks. Fabric waste is turned into tiles and furniture.

Social and environmental sustainability belong together, and the mindset that has brought SAITEX to become one of the greenest large-scale denim manufacturers in the world, has also helped it achieve Fairtrade and B-Corp certifications.

Circular economy made easy:

How Eurocell captures value in the supply chain.

The circular economy describes how we make the most of the value of materials and avoid waste. Eurocell[4] use this principle in the manufacture of their Logik and Modus Window Systems.

By working with their supply chain, they capture the value of old windows before they reach disposal points. This post-consumer waste of whole uPVC frames is collected from installers and regional collection points.

Next, the recycling operations separate the materials which go on to be formed into new windows which meet the highest accreditation standards.

This is better than recycling, it is upcycling; the new products are frequently to a higher specification than those being recycled.

Overall, this removes cost from the installers and provides valuable materials for Eurocell. More will develop on from this with a company-wide sustainability group looking at all aspects, from people to packaging.

References:

1 *Sustainable Manufacturing – the next steps*, The IET, October 2017.
2 *The triple bottom line: A sustainable model for success.* Sunpower®, October 2017.
3 *Making jeans is bad for the planet. This factory could change that.* Bloomberg, January 2019.
4 *PVC-U Sustainability* ebook. Eurocell, 2019.
5 *Whole system design.* Riversimple, 2019.
6 *Global warming of 1.5°C*, IPCC Report, October 2018.
7 *Net Zero – The UK's contribution to stopping global warming.* The Committee for Climate Change, May 2019.
8 *Sustainable Development Goal 9.* UN, 2019.
9 *Engineering is key in tackling climate change.* Steve Evans on Raconteur.net, December 2018.
10 *Engineering priorities for delivering net-zero.* The IET, September 2019.

Mobility at zero cost to the plant:

How Riversimple uses whole system design to achieve their goal.

Being less unsustainable is still not sustainable. By rethinking how personal transport can be achieved, Riversimple[5] seeks to eliminate environmental impact and create competitive advantage by doing so.

Instead of traditional massive plants, a distributed manufacturing model of human-scale is applied enabling profitable operations near the markets they serve.

Taking a systems view, they are not selling product. Instead they retain ownership of their cars and sell mobility as a service, not fuel but mileage, aligning the traditionally opposed interests of manufacturing and society.

Their hydrogen fuel cells, along with the rest of the car, will be digitally enabled to feedback performance to the company so they can offer better products to the customer and minimise their costs. And of course, remove environmental impact.

Action on resource efficiency through better data, a skills-based approach and sharing good practice can deliver massive gains for manufacturers.

We at the Institution of Engineering and Technology (The IET) fervently believe in the power of collaboration. Engineers, environmental and sustainability managers are working together with colleagues across the factory floor and in the boardroom to share ideas for resource productivity, and to identify and drive reductions in energy, water, materials and other consumables.

That's good for profits. It can also be good for the planet too. Completed on a mass scale, improved resource productivity will help to deliver on much-needed national and international commitments to reduce greenhouse gas emissions.

Why is change urgent?

A UN Intergovernmental Panel on Climate Change (IPCC)[6] forecasts an increased risk of drought, floods, extreme heat and poverty for hundreds of millions of people unless urgent and unprecedented changes are made to keep global warming within a maximum of 1.5C by 2030.

What does good looks like?

The Committee on Climate Change recommends a new emissions target for the UK of net-zero greenhouse gases by 2050.[7] Clear, stable and well-designed policies to reduce emissions further are required across the economy without delay.

Which goals are needed?

In 2015 United Nations member states adopted the 2030 Agenda for Sustainable Development. At its heart are the 17 Sustainable Development Goals (SDGs). Several of these Goals such as SDG 9 'Industry, Innovation and Infrastructure' are relevant to engineering and technology.[8]

The next steps

The IET is passionate about sustainable manufacturing. Our report *Sustainable manufacturing – the next steps* sets out an ambitious action plan for government, industry and academia.

Leadership

- Business and industry encouraged to target 8% year-on-year reduction in resources.
- Government to set expectations through the Industrial Strategy.
- Companies required to appoint a board-level sustainability champion.

Collaboration

- Facilitate a network of peer-to-peer groups to advance practice, deliver results and share learnings.
- All educational institutions required to embed sustainability at every level.

Tools

- Academia, professional institutions and membership organisations to deliver national platform, open source toolkit and good practice guides, funded by Government and industry.

Measurement

- National benchmarking scheme to help drive high standards.
- Annual national competition to challenge young and old, national awards to celebrate success.

Support

- Minister for Sustainability to be appointed to work across Government departments.
- Financial incentives to help drive public and private sector investment and behaviour.

Download the full document at
theiet.org/sustainable-manufacturing

Engineering is key in tackling climate change

We simply can't carry on burying our heads in the sand when it comes to climate change, hoping this will all just blow away or that someone else will come along and avert catastrophe.

With climate change impacts now being felt across the world, many engineers are already working on technological solutions, from more efficient fridges to new architectures for a distributed energy grid, from cars that can do over 200mpg (equivalent) to the massive scale of geo-engineering.

These technologies are a key part of the jigsaw of activities that will form a solution. Other parts include government policy and changes to consumer behaviour.

We also firmly believe that engineers have a more direct and more urgent duty to ensure that the systems they work on are as resource efficient as they can be.

Global industry generates more than 30 per cent of climate change impacts.

Resource productivity means making more while using less. We need to massively accelerate the take-up of this common-sense engineering approach if we're to stand any chance of managing the climate, providing clean air and reducing pollution.

Resource productivity engages the brain and challenges our norms, but it needs to be convened.

The Nissans and Toyotas of this world have written the book on resource efficiency. They regularly achieve 8 per cent year-on-year resource productivity gains. That's world class.

Achieve even 3 to 4 per cent across all industries and we begin to start taking significant strides towards keeping our planet liveable, advancing the prospect of higher productivity and profits too. So, it makes sound financial as well as environmental sense.

These are urgent and substantial challenges that engineering can either ignore or choose to be at the heart of.[9]

Steve Evans *Chairman,*
IET Manufacturing Policy Panel

We say...

Proactive resource productivity and efficiency measures will save businesses money and help to reduce the impact of industry on the environment. Towards these goals, here are five actions[10] for manufacturing owners, managers and engineers, policy makers too!

1 Declare a national state of emergency to help bring non-labour resource productivity (energy, water and raw materials) to the attention of business and industry.

Securing these efficiencies makes sound financial as well as environmental sense, resulting in higher productivity and greater economic prosperity.

2 Target the delivery of lean, efficient and effective systems as an urgent priority for all industries.

If 100% of large companies, 50% of SMEs and 10% of micro companies could achieve an 8% reduction in resource consumption each year, it would reduce the UK total resource consumption by around 5% a year.

3 Encourage greater cross-industry collaboration through peer-to-peer learning.

Creating sustainability champions in each business, who are willing and able to share good practice with their neighbours, their supply chain and customers will save businesses money and help to reduce the impact of industry on the environment.

4 Invest in skills, as well as capital equipment to encourage behavioural change and inspire greater sustainability across industry.

This is likely to be more cost-effective and achieve better results at scale than investment in technology alone. Both are equally important.

5 Use the power of resource productivity to increase the impact of future investment in digital technologies within your manufacturing operations.

This is particularly important for manufacturing SMEs. Although such technologies can offer significant step changes, do make sure all your processes are as resource efficient and productive as they can be BEFORE you invest time and money in technology.

We are the Institution of Engineering and Technology (The IET), a charitable engineering institution. Passionate about manufacturing? We bring together expert practitioners from manufacturing industry, academia, the public and third sectors.

Your specialist design, production and manufacturing knowledge can inspire others and make a difference. If you would like to get in touch, please contact us at **sep@theiet.org**

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