

Sustainable Manufacturing: Leading change

The journey towards sustainable manufacturing demands ambitious leadership to achieve. This insight draws on cases of leaders in sustainability to capture key features of how they operate. Its purpose is to demonstrate we can and must follow the ambition that others have set.



What is the agenda?

The word sustainability means different things to different people. For some it is maintaining the financial viability of the company to continue trading in the next year. For others it has an environmental and social imperative to ensure that future generations have the same opportunities and benefits that the current generation has enjoyed. Fundamentally it is about ensuring that what we do in the short term does not undermine the possibilities in the long term.

There are significant financial, environmental and social pressures on industry. Sustainable manufacturing offers opportunities to reduce costs and open up new markets. It presents a means by which we can conserve vital resources and prevent environmental damage. It challenges us to better care for our employees and support wider society. Sustainability for some can have negative connotations of “green wash” and restricting business through legislation. Capturing the achievements of the leaders in sustainable manufacturing presents a picture of vibrancy and achievement in not just environmental and social performance but business performance too.

Those that are held up as leaders on sustainability have significantly reduced costs by reducing energy, water and other resource consumption. They have uncovered ways to better utilise their production capacity and build resilience into their business model. They have established channels to minimise the cost of waste disposal or even profit from wastes (as others see them as ‘nutrients’ for other production processes). The leaders have shown strong environmental stewardship by reducing their impact on the environment locally and globally and shown they care for all of the communities they impact on. Perhaps it is a coincidence but the same companies have also seen financial growth.

“You might be reading this because you want to know more about how leading companies are integrating sustainability into their manufacturing transformations. And because you are busy and cannot go to the library or read long reports... If so you have come to the right place. Three brief stories from real factories illustrate some essential points for those manufacturers who have started on the journey of sustainable manufacturing and who want to think about what comes next. Read on...”

Professor Steve Evans, Director of Research in Industrial Sustainability,
University of Cambridge

What is achievable?

Significant improvements have been achieved across industry in the use of energy and water as well as achieving wider environment performance improvements. Companies are increasingly understanding the 'value add' of energy, water and other resources and considering how they minimise them and make them flow in time with production. Across our industrial system we need to accelerate this change.

Global brands through to niche companies publish their achievements on their websites and document them in their annual reports. Improvements of 50% in energy or water efficiency or 50% reductions in CO2 emissions over a ten year period are common. Others show significant reductions in other emissions such as VOCs (Volatile Organic Compounds). Zero waste to landfill has been achieved by many in the last ten years and those same companies are now focused on reducing waste to incineration. Many have quietly or otherwise influenced their customers and suppliers to improve the overall supply chain performance. Finally companies are increasingly considering reverse logistics and adopting the long established principles of circularity to recover and reuse valuable materials.

Aspirational leaders are challenging dominant business practice. At one level, some are boldly influencing consumer behaviour as they recognise that is it the consumer who has most influence on the environmental impact rather than the producer. Others are considering the influence their business has on the environment not to reduce impact but to be positive, for example where water entering their business could leave as a 'waste' but has been cleaned to a level that can be bottled for drinking. Some are challenging their customers' perceived needs and in doing so may sell fewer products. Others are changing the relationship with their customer and delivering value rather than product in sectors ranging from clothing to automotive.

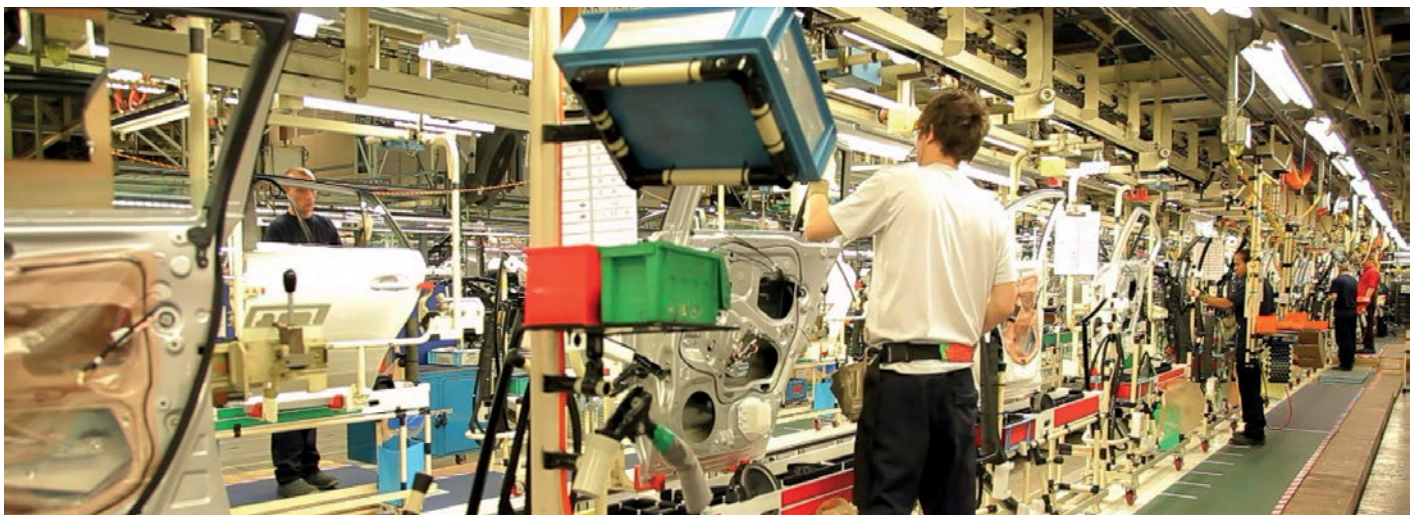
The opportunity for inspiration by numerous leaders is available and their achievements are widely published. Many have published specific practices that have resulted in improved performance. Others have published their methods and tools. It is important to draw parallels with lean manufacturing here. With lean, limited success comes from copying what others have done mechanically. Real success results from understanding how they have applied their tools and developing the fundamental principles and philosophies across the organisation.

“We have opportunities to learn simple but effective practice from others. Learning by sharing experience is a great way to develop new ideas and solutions.”

Martin Baxter, Chief Policy Advisor, Institute of Environmental Management & Assessment (iema)

“To address the scale of the challenge, business leaders need to stretch beyond the current corporate responsibility agenda to embrace broader systemic change.”

Polly Courtice, LVO, Director, University of Cambridge Institute for Sustainability Leadership (CISL)



Sustainable Plant Steve Hope, Toyota Motor Europe

Toyota's vision derives from the deeply held belief that it has to minimise impact. The company's automotive origins are from a time and place of limited resources and its conservative thinking has held throughout its history. Valuing resources because staff know that they are limited embodies the Toyota culture.

In October 2015 the company launched its Global Environmental Challenge 2050 with six major challenges that it will be tackling with the wider support of society (<http://www.toyota-global.com/sustainability/environment/challenge2050/>). Using this vision, each region and operating company are now preparing their sixth five-year environmental action plan (FY2016-2020).

In 2007, Toyota had established five sustainable plants globally, two of which in Europe, which lead on initiatives and cascade their advances to the rest of the company. Toyota aims for zero emissions by addressing the impact of its products and its production system. Like with its classic obsession with waste in production, Toyota is seeking to “zeronise” its emissions.

Key to the specific sustainable plant action plan is an ambitious long-term vision built around three pillars of environmental performance, renewable energy and living in harmony with nature. How to make the journey towards that distant vision is not known in detail at the outset, however by breaking the journey down into smaller steps, solutions are developed that collectively bring the company to its destination. The vision serves to motivate people and then is followed up with hard work.

Toyota has distinct vertical structures that support technical strength functionally, for example in production or research and development. Taking an analogy from weaving (the origins of Toyota), strong horizontal strands need to be created to bind the vertical structure in place from top to bottom. It would be ineffective to have strong ties at the top and not support alignment down through the levels. So commitment is established globally and then a consistent message is cascaded down through the regions. Like with the success of the Toyota Production System (TPS), the approach is built on core principles and philosophies, not rules. So the principles are consistently applied but the actual implementations are sensitive to local needs and infrastructure. With a strong, principle-based message from the top, each division then understands the message it needs to broadcast and what contribution it needs to make. The principles and consistency of TPS are core to their environmental actions too.

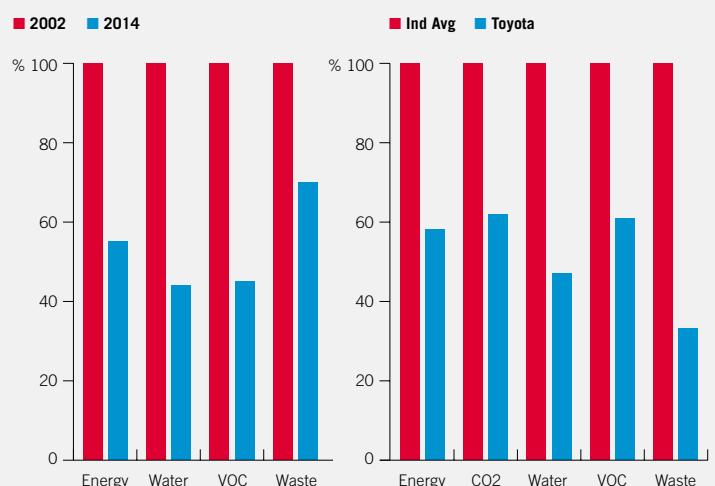
Taking Europe as an example, there are a maximum of three to four dedicated, environmental members who work in each of the sustainable plants. For outsiders this could either appear as very low or provoke a reaction of “If only I had that many in my team!” But if the question on “how many people are involved in environmental improvement” is looked at in a different way the answer may come back as ... “thousands”. Using the cascade approach small teams are formed who engage others.

By bringing more and more people on the journey then seemingly very small improvements quickly add up. Importantly habits form which maintain the improvements and progress them further.

Core to Toyota's achievements is a process of identifying where to use as a test bed, conducting trials to understand benefits, refining the improvements so they can be scaled and then spreading the benefits across the organisation. The classic Toyota approach of “go and see” (genchi genbutsu) the actual workplace (gemba) supports deep process understanding, picks up things that can easily be missed and builds engagement. It enables members to understand why they are working the way they are before assessing where they could be. Not every potential technical solution is found to be as good as first thought but by trying different routes on the journey towards the vision then good ways forward can be found. Some of the work is centrally funded to take risk away from operations. It can be the case across industry that even if benefits from environmental improvement can be predicted, investing time and resources is a hurdle. By engaging local teams at low cost and showing benefit then initial success can be achieved. The early success will enable plants to quickly take action themselves to cascade the improvements to other areas without the help of the central team.

The results of consistently applying this management approach and creating a positive environment to make improvements are very clear (see figure) and significant milestones such as zero waste to landfill have been realised.

Consolidated Toyota Performance



Toyota learning points to share with others:

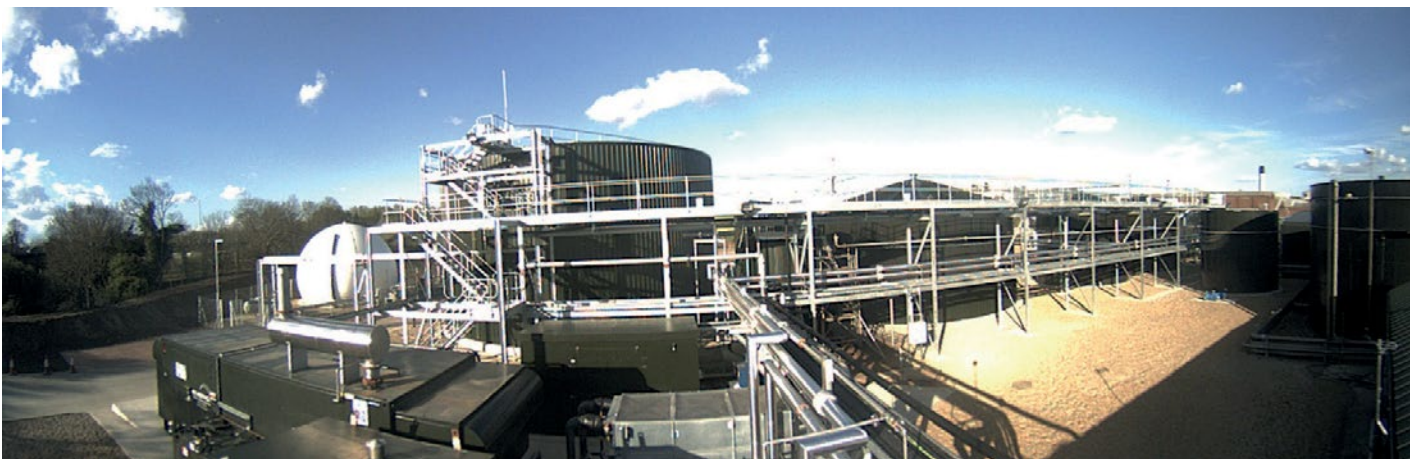
- Establish a long term vision that all believe they can contribute to.
- Ensure direction and support from the Top Management cascades through the whole company.
- Get people involved, everyone in the company can contribute and, by doing so, a little adds up to a lot.
- Structure the improvement process to trial, remove risk, take small steps and demonstrate and celebrate achievement.

Profiling the leaders

There are many leaders to seek inspiration from. Companies and those driving change within them are present in every sector. They possess a 'recipe book' of invaluable practice of how to initiate and sustain change to achieve significant environmental performance improvements. This section draws on a few cases from across industry to illustrate recurring themes across those leaders. The cases (see main case inserts as well as company profiles at the end) draw on key features of each company's leadership of change, rather than presenting their comprehensive approach.

Important steps

- 1 The **vision creation** is a common feature of the successful companies striving to make significant changes to their company's operation. The vision is typically ambitious and necessarily at such a high level that all within the company can relate to, for example, preventing harmful emissions. The vision is easy to communicate so it can be cascaded down through the levels of the organisation, but challenges all to find a way to contribute to achieve it.
- 2 Leaders we read about have made impressive progress but all started off with small projects and achieved **early success through pilots**. They will have gained consensus across the company to initiate projects in which an individual or small group would achieve modest improvements through determination and belief that change was essential. The early small achievements are essential to build confidence that further change is achievable. Technology-led improvements need capital expenditure to be agreed so early projects often seek to change habits or processes.
- 3 Change can often be resisted and the **passion to lead** a different approach to the current norms is a significant factor in success. Supported by the collectively owned vision and early success, the leaders in sustainability thinking constantly communicate simple messages and engage others in the change process.
- 4 **Building momentum** is essential to make significant performance improvements. Moving from small early successes others need to be engaged to replicate in new areas of the company. For some companies the biggest impacts lie outside of their operation and working with, say, suppliers can bring significant benefit. The early gains made from using the company's capital better lead to more work on how to make better use of the capital. Technology purchasing by leading companies does not feature highly in the success factors lists; technology does help with many advances but is rarely the starting point.
- 5 **Keep it simple!** All leaders communicate the simplicity of how they approach the changes to achieve their improvements. None would claim the change was easy but all have a straightforward approach to setting out the principles and following a process for improvement. Early justification of why to focus on a particular area may result from very high level data collection and analysis. Accuracy is often not important initially as the areas of opportunity are so striking. More detailed analysis may follow to gain confidence in the decision detail once the focus has been established. Visual communication is used throughout with simple metrics such as the site's gas and electricity meter readings.



Practical sustainability Nigel Davies, Muntons

The Muntons mantra of ‘Practical sustainability’ neatly sums up their approach to strengthening their business and minimising environmental impact through simple and effective engagement.

The momentum behind the progress at Muntons came as a result of the significant early energy savings from their energy action plan. At the time, understanding their wider carbon footprint was challenging because of the lack of information available and not finding others to draw learning from. With signs of interest from the customer base, the company fast tracked its carbon footprint assessment using PAS2050 to identify the “hotspots”: raw materials, electricity and gas. Seemingly obvious areas to address such as transport were not as significant. In a simple and practical way the company had the focus for what to address next.

Today, existing and potential customers want to know more about Muntons’ performance and methods. However, earlier in the journey it was challenging to engage others as the activity of assessing raw material impact on overall carbon footprint was perceived as a threat rather than a mutual benefit. The company’s approach was to offer up the tools and data for others to see and use. Over a period of two years the fear of what a competitor to some (and a customer to others) was doing changed to an atmosphere of collaboration.

The company wanted to help others learn. Collaboration with the Centre for Low Carbon Futures enabled them to develop a simple tool that quickly gained widespread adoption amongst farmers. The farming community did not have the time and skills to obtain data in the format that more sophisticated carbon footprinting tools demanded. By creating a tool that used minimal data that farmers could easily obtain or estimate, Muntons was able to help farmers who in turn enabled Muntons help their customers. It was readily accepted that the accuracy of the tool was not perfect. This was not an issue as greater accuracy was not going to change the obvious results of the analysis. Farmers could see that the “hotspot” in their carbon footprint was fertiliser, so therefore



sourcing of lower carbon fertiliser would have a major impact on the overall supply chain footprint.

Facing the opposite way, Muntons has been working to influence its customers. With simple approaches the company can show its customers the benefits of making changes. For example, the use of roasted malt-based blend to substitute some cocoa in its customer’s chocolate muffins has convincing multiple benefits: customers like the taste better, the product has a lower carbon footprint, it is cheaper to produce and it can be sold at a premium price.

The inspiration for Muntons’ approach is built around discussion and understanding. This is both within the company and with the wider supply chain both upstream and downstream. By demystifying the challenge and working with suppliers and customers it has focused on the basics and avoided periphery initiatives such as offsets. An independent survey of its staff shows 99% are completely aligned to the company stance on sustainability meaning the progress comes from all rather than a lone leader.

The next challenges are to address renewable energy through a programme of investment. Starting with an anaerobic digester for in-process liquid waste, the company will generate 25% of its electricity demand on site and quickly look to incorporate solid waste too in order to maximise the value obtained from internal waste (or nutrient) streams. Finally, plans are afoot to introduce onsite solar to further reduce power drawn from the grid.

Muntons has two key learning points to share:

- Keep it simple! Use the data you have to focus on the important areas.
- Do not be dissuaded by those who want to wait for perfect data – top level carbon sources remain the same whatever level of detail is available.





Industrial Energy Efficiency Network Peter Lunt, Airbus

This particular journey started back in 2006 with the corporate Vision2020 setting ambitious targets for energy and CO2 reduction, which resulted 32% and 36% reductions respectively against a 2006 baseline adjusted by revenue. Small successful initial projects generated confidence for more projects and more ambition. A collaborative R&D project funded by TSB (now InnovateUK) enabled Airbus to learn from leaders in academia and industry.

Core to the energy efficiency work was the use of the waste hierarchy to guide core thinking. The principles were applied to energy by drawing on what was available from collaborators but importantly adapting to local needs. By avoiding a straight 'copy and paste' methods were adapted to fit with the existing lean manufacturing improvement structure.

The industrial energy efficiency network that enabled success to be replicated across multiple sites was developed under the umbrella of existing manufacturing operations, facilities management and manufacturing engineering functions. Senior managers with environmental responsibility at each site helped draw in volunteers as well as encouraging others to participate. The work was deliberately focused to fit within the corporate ways of working and the performance measurement system. With support from senior managers, those working on the energy efficiency projects had the confidence that their work was being valued.

So how is success at one location spread to many others? A standardised energy efficiency improvement methodology called 'STRE3TCH' (which draws on the waste hierarchy) was developed by adopting and adapting an approach used by leaders in lean. Imparting knowledge through training and coaching the methodology that covered both the "exciting" capital purchases as well as the more "mundane" operational improvement projects was deployed. The methodology and supporting training was important to ensure that what may seem like attractive technology replacement projects were challenged and more down to earth changes considered. For example, to reduce the energy used in air compressors it was important to question why compressed air was being used before questioning whether a more efficient

compressor was needed. The operational efficiency projects were relatively quick to implement and built a culture of questioning the fundamentals.

Another aspect of the success was to draw on good practices both within and outside the company. So sites could share practices within the company, as well as draw learning from practices from other companies. One example of this was sharing knowledge on compressed air leak detection which not only saved energy centrally but also was sensed (heard) locally, spurring staff on to challenge what they had become used to.

The changes to practices have resulted in impressive savings to date in terms of cost reduction and CO2 reduction. The successes give confidence that challenging targets can be set for future projects. The network was not just about sharing practices but also about comparing performance. Collaboration with others helps provide inspiration for what to do next. Some improvement projects are triggered by uncovering differences in performance across the Airbus sites, some come from other companies. External benchmarking means Airbus can learn from others and others can learn from them. This also extends to suppliers where new technologies being developed by the supply chain are influencing changes in practice whilst planning for new investment.

There are challenges ahead for the network as it enters another year of projects. There has been no shortage of quick-wins being uncovered so maintaining momentum and being self-sustaining is an important focus. Balanced with the quick-wins is ensuring that new capital investment builds on the learning gained to date; recognising that some of the new investment will be radically different, step-change advances.

Airbus learning points to share with others:

- Provide tools to help others do their own analysis without dictating the detail.
- Create a structure to celebrate the enthusiasm of staff.
- Find time to have fun! Sharing and learning will be far more effective.

- 6** The programme of **educating and training** is essential for deeper and lasting change. For some, these are formal programmes of awareness and development that precede a programme of projects. For others, the work is expert driven; where individuals learn in a project team and then go on to lead their own teams. Like with lean manufacturing programmes the education and training strongly features core principles as well as simple methods with proven success.
- 7** Eventually the leaders **go public**. So many companies have yet to show their hand! The first stage of public communication is wider across the company and then external to the company, often with suppliers and customers and their industrial community rather than directly on public websites. As the momentum of success builds the breadth of the communication extends from team briefings to company-wide structures with targets and achievement against them increasingly formal. The celebration of achievements in the company builds the confidence to continue on the journey towards sustainable manufacturing.

Where next?

There is a wealth of material available in the sustainable manufacturing space that ranges from company websites to seminar presentations to organisations whose sole purpose is to support significant change in the way we continue to bring valuable products and services to customers. Key organisations whose mission it is to make significant changes to our industrial system may be government supported, run as charitable foundations or operate as a membership model. They engage with any company from those just starting out on reducing environmental impact, to those advanced leaders who want to make their environmental impact positive.

“Strength in leadership now is essential for a legacy that the new leaders can build on in the decades ahead.”

Dan Biggs, JCB Transmissions

EEF Future Manufacturing Award National Winner of “Outstanding Achievement by a Final Year Apprentice” and “The Manufacturing Student of the Year”





Airbus makes the freedom of flight possible by designing, manufacturing and supporting the world's best aircraft. Its people around the globe are united by a passion for aviation, as well as their desire to create better, more efficient ways for airlines and passengers to fly. Environmental impact is a major consideration at Airbus, factoring into decisions made at the highest levels – including long-term planning by the company's management team – down to day-to-day operations at its production, customer support and other facilities located around the world.



Muntions plc are a leading global player in the supply of malts, malt extracts, flours and flakes and many other malted ingredients relevant to the food and drinks industry exporting around half of its production. Over the past 5 years Muntions has built an enviable reputation for being the greenest maltster. Muntions has been very successful in gaining accolades for sustainability but the aim has been to use that recognition to develop opportunities to engage with supply chain partners at different levels. Being passionate about environmental protection, however, means that we take the lead in promoting our ethos to both our suppliers and customers.



Toyota operates 75 manufacturing companies across 28 countries globally, and markets vehicles in more than 170 countries, thanks to the support of a 320,000-strong workforce. Toyota's global long-term vision is to deliver better, safer cars and mobility solutions, respecting the environment and enriching the communities in which we work and live. We believe in 'leading by example'. In the workplace, we are continuously seeking new ways to put our knowledge "into practice", proving that every activity, big and small, can have a positive impact.

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Images courtesy of Airbus and Istock

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