

REINVENTING THE MANUFACTURING INDUSTRY WITH GREEN PRODUCTS





We are currently facing the greatest collective challenge in human history. Right across the globe, the effects of climate change on our communities, our economies, and our societies are becoming increasingly intense and disruptive, proving that we can no longer afford to maintain business as usual. To avoid irreversible ecological collapse, catastrophic natural disasters, and climate-driven social and political unrest, we must redirect our resources to create a more sustainable, regenerative, and resilient world.

Faced with this situation, governments, consumers, and investors are pushing industrial companies to make their business models, products, and ways of working more sustainable.

However, the implementation of sustainability initiatives is fragmented. While some companies have started on such a journey, the entire manufacturing industry must make substantial progress to step up its sustainability efforts.

This transformation will have far-reaching implications for the industry. Companies need to accelerate their sustainability efforts to stay competitive. The companies that take the lead toward green products will have a significant advantage and opportunity for growth.

The steps to green products

Based on our experience, the following framework could describe the steps that manufacturing companies must excel in to succeed in their sustainability transformation from commitment to sustainable achievements.



1. Establish a sustainability baseline and commitment

Before starting the actual transformation, companies need to establish a baseline and commit to the journey ahead.

For green products, the baseline is established by conducting a life cycle assessment (LCA) to assess environmental impacts associated with all the stages of a product's life, from raw material extraction through materials processing, manufacturing, distribution, and use. The LCA identifies sustainability issues, checks regulatory compliance, and identifies potential improvements to reduce the environmental impact of a product.

The LCA forms a baseline and helps commit to a green product strategy.

2. Shift to a circular business model

The most common example of shifting to a circular business model involves moving from traditional manufacturing and selling of products to a business model where the customer either rents the use of a product or shares the use of a purchased product with other customers.

A circular business model can facilitate increased sustainability of the ecosystem by increasing the utilization of fewer products. Car sharing or tool rental are great examples.

The business model shift not only provides opportunities for increased sustainability but also economic benefits for the company. As a circular model become more service-oriented, it typically facilitates increased insight into consumer behaviors through data generated through smart products. This increased insight can be used to improve customer satisfaction and to identify opportunities for increased efficiency. Furthermore, with the shift from product-oriented to service-oriented, business and consumer needs become better aligned and both parties and the planet benefit from durable, efficient, easily repaired products.

For example, Signify, formerly Philips lighting started offering lighting as a service to its commercial and public sector consumers Under a LaaS contract, Signify installs, operates, and maintains the lighting systems while the customers pay a monthly service fee for light. Additionally, the luminaires and other lighting fixes that Signify uses under the LaaS contract, are specifically designed for easy repair and replacement while in operation; and can be easily reused or recycled once each use phase is over.

3. Implement sustainable modularization

Companies that have applied modularization successfully can offer products that are tailored to specific needs with a few parts that can be mixed and matched thanks to standardized interfaces. Over time, specific parts can be easily upgraded to meet new requirements, without domino effects on other parts. Metrics indicate a potential reduction of unique parts by 30–75 percent.

Commonality and carry-over reduce change-over-time and shorten the learning curve. Uniform product design means unified toolsets, and companies can sometimes even reduce the number of factories. Resource-efficient production means that less energy is used to power tools and facilities, reducing the environmental impact. Product performance can be optimized to specific use cases. For example, Scania configures each of its vehicles to reduce fuel consumption. The wind turbine manufacturer Vestas optimizes each installation to the site's specific wind conditions, which increases customers' energy production.

Going forward, modularization needs to emphasize circular business models. One example is simple and standardized interfaces that enable easy replacement of broken parts and simple disassembly for recycling. Sustainable modularization can help us move away from the throwaway culture, as consumers can continue using a product for years rather than discarding it and buying a new one.

4. Apply sustainable engineering

Sustainable engineering involves designing products to reduce environmental impact and optimizing the use of natural resources by ensuring serviceability and recyclability.

Not all materials are fit for a circular economy. Some contain chemicals that are hazardous to humans or the environment. Additives are often used unintentionally or for performance reasons – such as improving flexibility or durability – but there are ways to design them out. By choosing materials that are safe and circular, you can build a better offering for your users, while ensuring that the products and services you create fit within a circular economy.

Extending the life of a system is one of the most effective ways to reduce its overall impact. Allowing for repair, remanufacturing, or reuse of your system can play a huge role in reducing its overall environmental impact. For example, Volvo Construction Equipment remanufactures machine components that have reached the end of their life by using high-quality genuine Volvo parts. This results in a good-as-new component able to reassure customers that it is guaranteed by Volvo, along with all the machine uptime, long service life, and lower owning and operating costs that go with it.



By designing for serviceability, the life of the system can be extended with maintenance procedures, repairs, and component replacements. Even the end-of-life strategy is likely to involve some disassembly of the system. Reducing the effort, energy, and time required to perform disassembly will facilitate many endof-life strategies.

There are more radical ways to deliver utility using the minimum amount of material possible. This could mean finding ways to virtualize your offering and creating a digital product rather than a physical one. Services such as Spotify and Netflix are prime examples of this approach. This could also mean designing a product or service in such a way that requires only a minimal amount of physical material.

5. Sustainable supply-chain

An environmentally sustainable supply chain is one where the company has minimized the environmental impact of the product journey, from raw materials sourcing to production, storage, delivery, and every transportation in between. The aim is to minimize the environmental impact of factors like energy usage, water consumption, and waste production in addition to the traditional focus on revenue and profit.

Manufacturing companies can lower their carbon emissions by such means as:

- Prioritize sourcing of renewable energy for buildings and focused metal and materials procurement on "green steel", ensuring that mining, extraction, and production have minimal environmental effects.
- Reducing waste, increasing recycling and material reuse, and removing environmentally conscious operations throughout the supply chain.
- Minimizing unnecessary transportation by making sure that components and products are sent from the closest distribution center, as opposed to one on the other side of the country.
- Providing upgrades to existing products to improve efficiencies and reduce emissions.
- Offering customers options to refurbish old products to extended life and finally offering the return of products for responsible disposal or refurbishment.

6. Monitor and report

Regular monitoring and reporting of the environmental performance of the products are key in developing green products. It allows the company to make better decisions based on the real impact of its products, effectively evaluate the results of its green product strategy, and monitor its overall viability and efficiency. Whether it is a concept or a detailed design, LCA is useful for assessing the environmental impacts of the design and allows the quantifiable impact to be evaluated against the sustainable objectives and requirements.

In the sustainable design process, LCAs are used to set a benchmark to compare concepts and design iterations, identify 'hot-spots' in a system's design or life cycle that contribute the majority of the environmental impact, and quantify the environmental impact of a product over its lifetime.

As product design is an iterative process, companies may rely on different LCA tools and resources throughout the product development process. For a well-defined system late in the development process, one of two industry standards – *SimaPro or GaBi* – can be used. For less defined systems early in the design process, we lean towards lightweight tools like Sustainable Minds or impact databases like *Ecolizer* that allow for higher-level evaluation of alternative concepts.

In recent years, even major PLM vendors like Dassault Systèmes (*Sustainable Innovation Intelligence*), PTC (*Windchill LCA*), and Siemens PLM (*EcoDesigner*) have taken a great deal of initiative and created a suite of tools to support the lifecycle assessment of the products that are being designed using their PLM solutions.

Capgemini has developed a tool to evaluate the carbon emissions of a product at a very high level, introducing the impact of carbon pricing on the overall product cost. This can be helpful in preliminary discussions about hot spots or to demonstrate the value of LCA techniques in a very low-overhead way.

Recommendation for the sustainable CxO

Will you still be in business after 2030? With the next decade set to be characterized by disruption and reinvention in business to tackle the climate emergency, this is a valid question. While no single person or entity can tackle climate change alone, you as a leader have a platform to support your own organization's sustainability efforts, engage your employees in meaningful action, and collaborate and innovate on sustainability products and services across industries and disciplines. Addressing this need requires radical reinvention of your value chain including business models, product design, manufacturing, and supply chain by incorporating open collaboration, and sustainability-driven technology choices. This is why you, as a business leader, must act now. Pivot your organization to a new, greener ecosystem model before it is too late, for our planet and for your business.v



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