



# BETTER DESIGN, BETTER BUSINESS

## Reinventing Design and Manufacturing for Sustainability

This is the first article in our series on product design and sustainability.

Sustainability is a strategic imperative for manufacturing organizations in Europe. In particular, the saving of energy and the efficient use of resources are the top two areas of strategic implementation, according to a recent survey with around 200 manufacturers in Germany<sup>[1]</sup>.

Respondents in the survey are also expecting the EU Supply Chain Act to impact their sustainability goals further, despite its potential to add more complexity and bureaucracy. The legislation, approved by the European Parliament in April, places new requirements on companies to respect environmental and human rights standards in their supply chains.

### What does circular economy mean for industrial companies?

While not new, the concept of circularity is gaining momentum in a digital economy that enables quicker and more efficient exchanges of information between suppliers, manufacturers and consumers.

Manufacturers have historically worked within linear value chains, in a so-called take-make-dispose model. In contrast, the circular economy emphasizes efficiency by keeping resources in use for as long as possible and, critically, beyond the life of the product.

Over the last 10 years, the circular material use (CMU) rate<sup>[2]</sup>, which measures the share of material recovered and fed back into the economy in overall material use, has been steadily increasing, reaching 11.5% across the EU27 in 2022. Practices between countries vary, with Netherlands (which has set lofty ambitions and concrete plans to achieve a fully circular economy by 2050) and Belgium achieving CMU rates of above 20%.

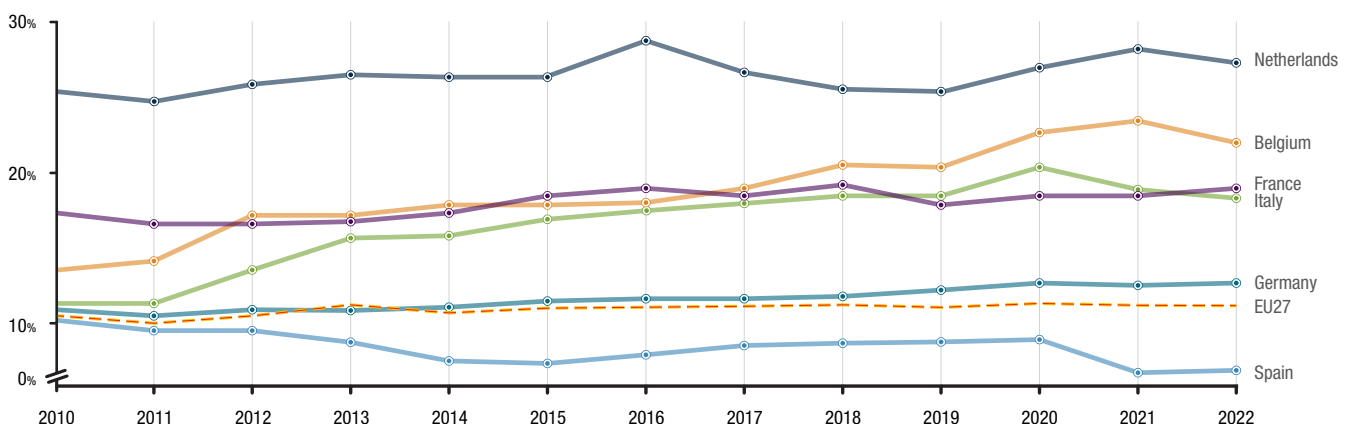


Figure 1: Circular material use rate, selected EU countries. Source: Eurostat sdg\_12\_41

1. B2BEST BAROMETER 2024, ECC Köln in Zusammenarbeit mit Creditreform

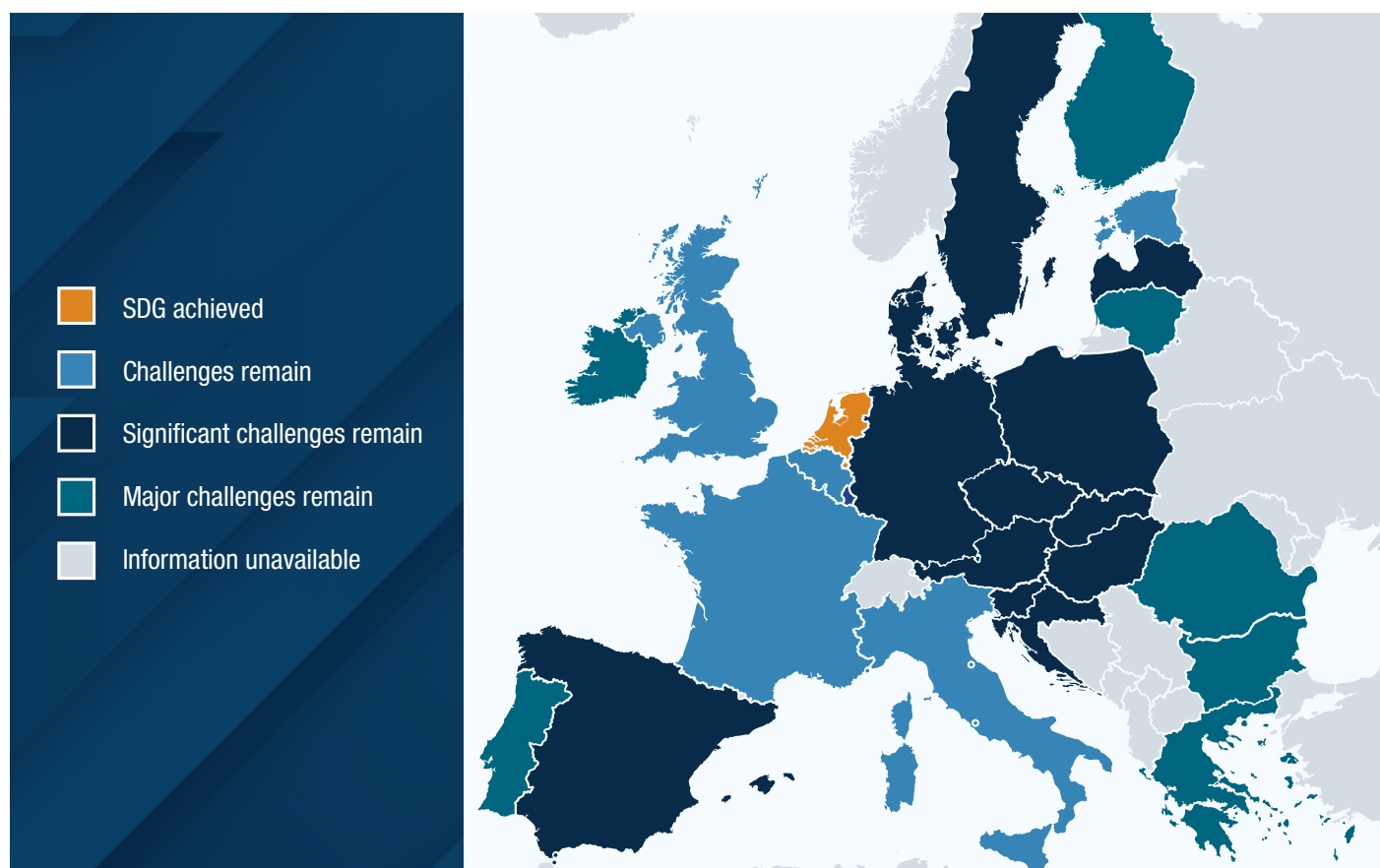
(<https://www.ifhkoeln.de/produkt/b2best-barometer/>) - Institut für Handelsforschung;

2. Eurostat [https://ec.europa.eu/eurostat/databrowser/view/sdg\\_12\\_41/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/sdg_12_41/default/table?lang=en)



Product design plays a pivotal role in enabling circularity. Decisions made during the design stage – from the selection of materials, manufacturing processes and resource utilization – determine whether a product can be returned for continued reuse. In fact, The Ellen MacArthur Foundation<sup>[3]</sup> has estimated that over 80% of all product-related environmental impacts are established during the design phase of a product.

Within manufacturing, circularity brings together several good practices, such as lean manufacturing, design-to-cost and emissions impact assessment. In our experience, this is one of the most fundamental approaches to transforming industry and responsibly enhancing profitability, especially in light of increasing resource scarcity.



**Figure 2:** Achievement of sustainable development goal 12 (SDG12), circular material use rate, 2022.

Source: Eurostat <sup>[4]</sup>

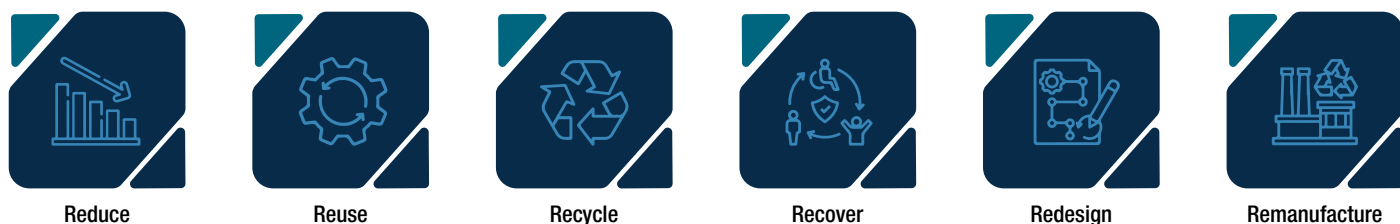
3. The Ellen MacArthur Foundation (2022), An introduction to circular design, <https://www.ellenmacarthurfoundation.org/news/an-introduction-to-circular-design>;

4. Europe Sustainable <https://eu-dashboards.sdindex.org/map/indicators/circular-material-use-rate>



## Principles of sustainable design

Design for sustainability (DfS) is used to either create new products and solutions that are environmentally responsible and resource-efficient throughout their lifecycle, or to redesign existing products with sustainability at their core.



**Figure 3:** Circular design approaches

**Source:** Adapted from Badurdeen, Fayleena & Jawahir <sup>[5]</sup>

The approach goes beyond the principles of 3R (Reduce, Reuse, Recycle) and often requires a reorientation of business models from a product- towards a service-based system<sup>[6]</sup>.

In the traditional linear economy, revenues are generated from the sale of new products, with limited incentives for reparability or the extension of product life.

In a circular model, pay-per-hour and use-not-own models not only prolong the usable life of the product but, when implemented effectively, can result in improved business performance.

One such example is the pioneer “power-by-the-hour” approach introduced over 60 years ago by the aircraft engine maker Rolls-Royce<sup>[7]</sup>, whereby maintenance and uptime are offered on a fixed-cost-per-flying-hour basis. The model aligns the interest of the operator and the manufacturer, who is only paid for engine uptime, while incentivizing reliable design.

## Design for sustainability in practice

Beyond practical considerations around materials and processes, sustainable design primarily questions products’ reason for being – whether they need to exist in its current form and function. The most sustainable products are never produced in the first place – consider how consumers are increasingly avoiding non-essential single-use items and packaging, which lack a practical use.

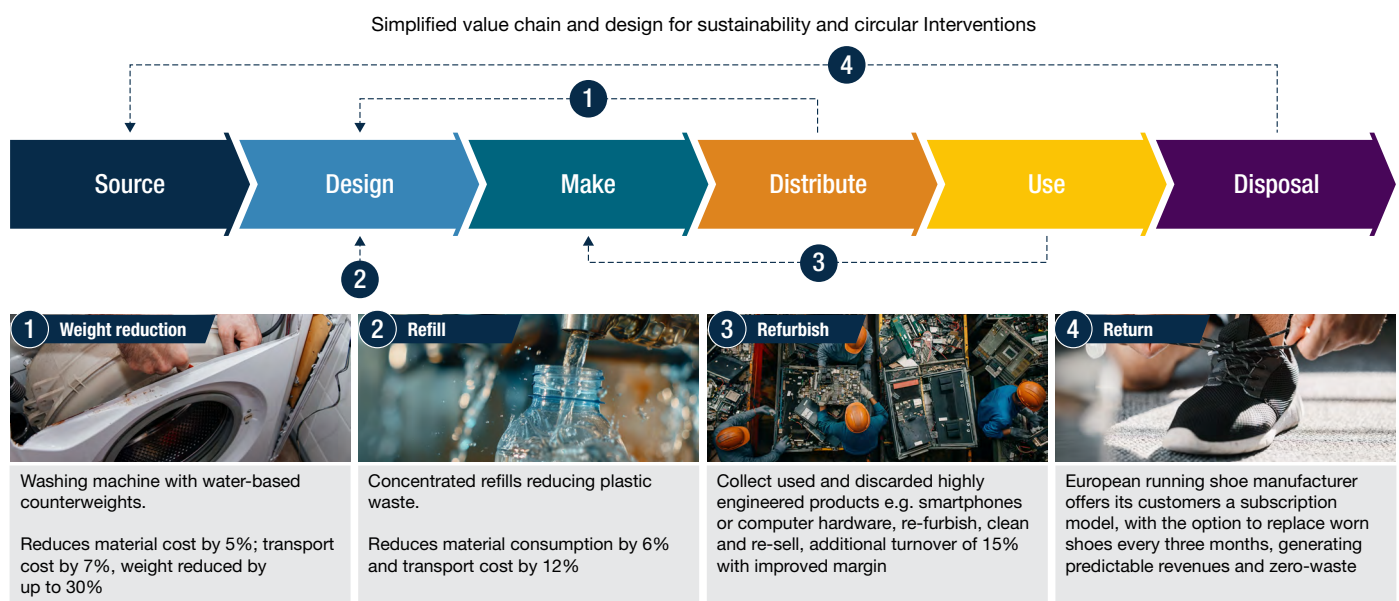
For required products, the core focus lies on designing out waste while removing unnecessary elements and materials. It is also about balancing different design priorities, such as durability and reparability. For example, a machinery producer must consider whether to solder and glue components together (for durability and weight) or to build modular designs using connectors (allowing for easier repair and disassembly), depending on the application of the machine.

5. Badurdeen, Fayleena & Jawahir, I.s. (2017). Strategies for Value Creation Through Sustainable Manufacturing.

6. Adapted from Tukker (2004) - Eight types of Product– service system - [https://venturewell.org/wp-content/uploads/Tukker-2004-Business\\_Strategy\\_and\\_the\\_Environment.pdf](https://venturewell.org/wp-content/uploads/Tukker-2004-Business_Strategy_and_the_Environment.pdf)

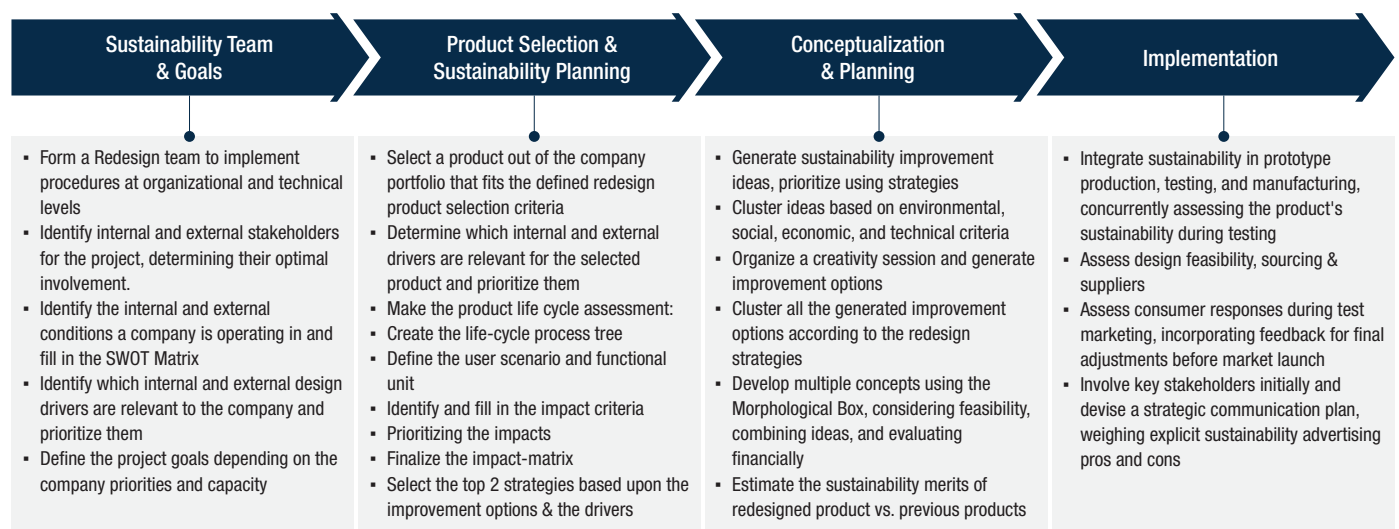
7. <https://www.rolls-royce.com/media/press-releases-archive/yr-2012/121030-the-hour.aspx>





**Figure 4:** Circular design examples  
Source: A&M public-domain research

Based on our experience with clients in the industry, we have developed a structured approach to embed design for sustainability into manufacturing processes. This is often embedded into large, strategic transformation programs.



**Figure 5:** A&M method for design for sustainability



## What is holding back industrial manufacturers?

With around €263 billion<sup>[8]</sup> in annual revenues, industrial machinery represents a tenth of Germany's industrial production. However, only about a fifth<sup>[9]</sup> of that is generated from new products, illustrating the long path ahead before industrial businesses fully embrace circularity in their design decisions.

At the same time, investment in Germany's material recovery and circular economy infrastructure has increased and is considered a significant economic contributor with €33 billion in gross value added in 2022, according to a recent report by a group of industry associations<sup>[10]</sup>. As manufacturers and recyclers become more connected, access to reclaimed materials is likely to become easier and cheaper.

Nonetheless, for industrial manufacturers, we see several challenges towards adoption:

1

### A risk-averse culture:

The addition of new business functions, e.g. for energy recovery, is not prioritized due to fears it may increase system complexity.



2

### Total cost of ownership:

Efficient new components are often more expensive, with many manufacturers opting to use cheaper components in a price-sensitive market. Often, expensive components pay back over time, leading to overall financial savings over the equipment's useful life.

3

### System engineering:

Existing processes and established standards are often relied on, even though new proven technologies could be exploited.

4

### Operating model:

Transitioning from machine manufacturing towards re-manufacture, upgrade and recycling requires a redesign of operations, logistics and change management across the organisation.

Cross-functional transformation in conjunction with strong leadership, as well as the regulatory framework and incentives, are needed to drive meaningful change.

8. <https://www.vdma.org/maschinenbau-zahl-bild>

9. [https://www.zvei.org/fileadmin/user\\_upload/Presse\\_und\\_Medien/Publikationen/Regelmaessige\\_Publikationen/Daten\\_Zahlen\\_und\\_Fakten/Die\\_deutsche\\_Elektroindustrie\\_Daten\\_Zahlen\\_Fakten/Faktenblatt-Mai-2024.pdf](https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/Regelmaessige_Publikationen/Daten_Zahlen_und_Fakten/Die_deutsche_Elektroindustrie_Daten_Zahlen_Fakten/Faktenblatt-Mai-2024.pdf)

10. Statusbericht der deutschen Kreislaufwirtschaft (2024), <https://statusbericht-kreislaufwirtschaft.de/>





## Critical success factors and key takeaways

Embarking on a journey towards sustainable, circular design is not easy, but it can be ultimately rewarding for the company, its employees, customers and users, as well as the planet. A fundamental different way of thinking about design in manufacturing is required, one that moves durability, repairability, re-use and recyclability to the top of the agenda.

For business leaders looking to reap the several benefits of the approach, we recommend focusing on the following areas:



### **Focus on viable projects:**

Understand what is achievable and set a challenging business case that states the intended impact in terms of value. Select viable projects, focusing on quality rather than quantity.



### **Secure funding:**

Secure the necessary financial resources to invest in sustainable practices. This may require a reallocation of existing budgets or finding new funding sources.



### **Materiality assessment:**

Identify the sustainability topics that are most relevant to your organization and stakeholders.



### **Set goals and track progress:**

Align with international standards like the United Nations' SDGs and set specific, measurable objectives. Establish Key Performance Indicators (KPIs) to track progress and adjust as needed.



### **Engage stakeholders:**

Involve employees, customers, suppliers, and investors in your sustainability initiatives to ensure broad support and collaboration in achieving the shared goals.



### **Communicate clearly and effectively:**

Launch products/services and transparently report on sustainability efforts and outcomes to build trust and demonstrate commitment to stakeholders.

As the cost differential between recovered and virgin resources narrows and regulations get stricter, the business case for sustainable design in a circular economy will become increasingly compelling for stakeholders. The approach is instrumental in ensuring businesses look after the resources responsibly for future generations, opening opportunities for value creation in both economic and environmental fronts.



## How A&M can help

By leading several transformation programmes together with our clients, we have learned how to effectively work with and change product design processes and deliver sustained improvement. A&M teams consist of experienced senior business leaders, consultants with strong change management credentials and seasoned industry subject-matter experts. This blend allows for fast-paced analysis of underlying causes and rapid implementation.

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With over 10,000 people providing services across six continents, we deliver tangible results for corporates, boards, private equity firms, law firms and government agencies facing complex challenges. Our senior leaders, and their teams, leverage A&M's restructuring heritage to help companies act decisively, catapult growth and accelerate results. We are experienced operators, world-class consultants, former regulators and industry authorities with a shared commitment to telling clients what's really needed for turning change into a strategic business asset, managing risk and unlocking value at every stage of growth.

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