SUSTAINABILITY KIT

LOSE THE CARBON

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Lead the pursuit of climate-neutral products powered by the right digital platform





I. DESIGN CLIMATE-NEUTRAL PRODUCTS

In the pursuit of climate-neutral products, design is key in weaving sustainability elements into a product's design concepts and promoting sustainable behavior throughout the value chain.

Embedding eco-design principles early in the **design phase** is a crucial first step toward establishing how a product is made and used. Here companies can:

- Determine <u>80%</u> of a product's environmental impact
- Make sustainable choices on materials and resources used
- Develop and incorporate light-weighting and additive manufacturing methods
- Eliminate the need to produce more products, **adopt recycling** and **prolong the use** phase of a product
- Incorporate the use of reformulated materials as sustainable alternatives

This kit offers insights into Dassault Systèmes design, collaboration and development tools that strengthen product **design** by establishing the right carbon footprint reduction approach at each stage of the **product lifecycle**.





II. DO MORE WITH LESS

Today, improving just designs and energy-efficient practices alone are not enough to reduce a product's carbon footprint.

Material efficiency is increasingly vital as the production of materials contributed to almost a <u>quarter of global GHG emissions</u> in 2020. By doing more with less materials, companies can mitigate this climate crisis.

The following questions will guide companies to use the **least material** in making a product, **achieve critical environmental goals** and **reduce the impact** associated with its use:

- Can the materials work together in a product?
- What material formulae work and can they be expanded for multiple resources and use?
- How will the material be assessed throughout the product's lifecycle?

On a robust digital platform such as Dassault Systèmes' **3DEXPERIENCE**[®] platform, companies gain accurate insights into material use to identify potential carbon savings, better answer material challenges and improve material performance from two major perspectives:

SOEXPERIENCE / SIMULIA Physics Results Explore

in Lattice Open Fill A.1

90

*Simulation capabilities not included in the Lattice Designer role

270+1

8.340+1

230+

Resource efficiency •

Accurate resource measurement based on a weight measurement can guard against overconsumption. Generative design on the cloud and on premise, and light-weight materials further improve material usage.

Lifecycle assessment approach

Complete visibility and traceability into a product's lifecycle can minimize waste, enable companies to **explore resources locally** and significantly reduce logistical carbon footprint.

Advanced **virtualization and simulation capabilities** on the **3DEXPERIENCE** platform enable companies to explore, evaluate and test material efficiency to:



Improve yield by increasing the chances for product upgrade, modularity and remanufacturing



Increase recycling opportunities on product components through design for disassembly strategy



Decrease consumption of materials



Lengthen product lifespan



A. HARNESS THE POWER OF GENERATIVE DESIGN

Generative design on the **3DEXPERIENCE** platform breaks free from siloed work operations to combine design, simulation, optimization and manufacturability in one collaborative digital space.

Companies can **simplify design concepts** by leveraging artificial intelligence, save time and solve complex engineering challenges related to designing low-impact products.

By factoring in **specified parameters**, including optimal weight, shape, cost and other identified goals or constraints, companies can quickly and accurately **generate multiple design options**. These alternative designs are then **evaluated** for quality and environmental compliance.

On the cloud, collaboration speeds up design cycles, fulfills and adapts with agility to more demanding and specific shape requirements.

With **topology optimization** – a key enabler in generative design – the material distribution of a design is optimized within a defined space and constraint. Designers can strip away unnecessary parts or spaces of a product to reduce wastage, weight and cost while preserving the product's structural strength.

Apart from developing the most efficient design based on functional requirements and complying with strict methodologies for low-impact products, companies can level up their product designs through CATIA's Cognitive Augmented Design approach, Structural Generative Design and Flow Driven Generative Designer tools.



B. ADOPT THE LIGHT-IS-RIGHT STRATEGY

By adopting a light-weighting strategy, companies can truly unleash the power of generative design. Light-weighting reduces materials used without compromising overall quality and performance, saving material use, cost and time.

A study predicts that additive manufacturing can lead to a <u>5%</u> to <u>27%</u> reduction in global energy use by <u>2050</u>. Products use less energy per unit in transit – reducing transport emissions and improving energy resource efficiency.

Through 3D printing, companies only need to print what is needed, reducing waste in the process. Additive manufacturing integrates radical designs such as lattices, which can lighten a solid body with lighter internal structures. How generative design and light-weighting keep its climate-neutrality promise:

Decarbonization strategies

Promote alternative sustainable material choice and boost the use of reformulated alternative materials.



The Ardagh Group Story showcased material breakthroughs from new coatings formulation that significantly reduced the weight of glass bottles while maintaining materials quality and strength. Consolidate multipart assemblies to single-part products to reduce supply chain carbon footprint with additive manufacturing (lattice design).



The Tamu 3D printed chair story illustrated how latticing can combine form and function, consolidate multipart assemblies, use minimal material and in some cases, design products to be stackable or foldable for efficient transportation. Enable faster prototyping of products to improve time-to-market through a collaborative platform.



Extreme Analyses Engineering story demonstrated how faster prototyping and additive manufacturing reduced 30% mass of a train's supporting structures resulting in energy and cost savings for the entire ride.

III. GO GLOCAL

In 2020, manufacturing and production sectors contributed one-fifth of the world's carbon emissions and consumed <u>54% of the world's energy sources</u> – pushing companies to streamline manufacturing processes for carbon savings urgently.

To add to this green challenge, disrupted supply chains struggling to support lean and just-in-time production demands further exacerbate **production** shortcomings. Most industry leaders believe that **glocalization** can alleviate the situation and reduce the supply chain impact.

Roland Robertson, a sociologist, defines <u>glocalization</u> as the adaptation of global and international products into the local contexts they're used and sold in.

In manufacturing and production, glocalization delivers massive sustainable gains. It **decentralizes** the sourcing of materials in production. Also known as **distributed manufacturing**, it shifts the manufacturing model from a centralized one to one based on the end user in their local market, effectively designing more locally sourced products to:

- Cut resource waste by eliminating the need to keep massive inventories
- Leverage local technology such as additive manufacturing (e.g. 3D printing parts using a variety of local raw materials) to cut down materials and production costs
- Source materials locally, with options of reshoring/nearshoring and relocalization to minimize supply chain carbon footprint
- Speed up go-to-market and improve customer service levels as products are built closer to their intended customers
- Reduce logistical carbon emissions due to shortened distribution time and process of finished goods to their intended markets
- Respond in real time with strategies specifically addressing local market changes, especially on environmental regulations
- Stay agile and ahead of disruptive supply chain and local market trends for business continuity

Featured:

<u>Ariens</u>

To better customize its products according to hyper-local needs, Ariens diversified its business processes to answer local demands. Leveraging SIMULIA tools, Ariens successfully initiated light-weighting to redesign its process and reduce its frame and chassis by 50% fewer parts and cost less to manufacture than before.

IV. REEVALUATE PRODUCT LIFECYCLE

Recent market events have pushed companies to reevaluate their product development - mainly to shorten lifecycles, lower production costs and meet sustainability demands.

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Alternatives Comparison

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CO2 emissions

Jeens Classic - ABS Plastic A: \$6.59 kg CO2

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Searcy Classic - Recycled Plastic & 50.87 kg CO2

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Leveraging product lifecycle assessment on a powerful platform, such as the **3DEXPERIENCE** platform, companies gain the visibility, traceability and agility to assess, monitor and significantly reduce their environmental footprint at every point of the product's lifecycle.

From setting up sustainability requirements early in the ideation stage to pushing them into the design, product development and manufacturing engineering phases, companies get to evaluate designs, variations and configurations – maximizing product reuse and efficiency while averting waste product runs and recalls.

Lifecycle assessment on the **3DEXPERIENCE** platform further enables companies to:

- Capture, store, retrieve and share important product information in each lifecycle stage, material (e.g. hazardous substances and waste) and resources used (e.g. energy and renewable sources)
- Measure and minimize the environmental impact of products, materials and processes to drive the circular economy through the <u>sustainable innovation process</u>
- Reuse knowledge of proven environmental impacts of specific processes
- Model and simulate materials through the virtual twin to reduce the need for physical testing and prototyping, thus reducing materials and energy use
- Incorporate alternative materials into products to minimize carbon footprint (e.g. Kenaf [Hibiscus cannabinus], a fast-growing plant such as jute is used in architecture and furnishings has a positive carbon footprint)

With this iterative process in place, lifecycle assessment specialists, industrial designers and product and manufacturing engineers can create circular lifecycles.

Featured:

Jaksche Technology

Thermoset plastic components manufacturer, Jaksche, reconsidered all aspects of its product development lifecycle for full traceability of parts and transparency of its products. Jaksche achieved complex designs right the first time and simplified resources and materials management in real time with platform tools.

DECARBONIZE BY DESIGN

The pursuit of climate-neutral products echoes Dassault Systèmes' commitment to harmonizing product, nature and life for the next generation.

66 Building a sustainable economy together requires a change in the sustainable innovation process, from the extraction of raw materials use, reuse and recycling,"

Florence Verzelen EVP Industry, Marketing and Sustainability, Dassault Systemes

Dassault Systèmes offers extensive experience and proven platform tools to help companies imagine, develop and deliver sustainable innovations that will shape the future of climate-neutral products.

Learn more <u>here</u>.

Related Reading Resources:

- 1. Article: Design for Disassemblu
- 2. Article: Reformulate Alternative Materials for Safer, Cleaner Future
- 3. Ebook: Performance-Driven Generative Design on the Cloud
- 4. Ebook: Distributed Manufacturing: Global Development, Local Needs
- 5. Video: Performance-Driven Generative Design

Our **3D**EXPERIENCE[®] platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit **www.3ds.com**





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