

Manufacturing in the metaverse

Virtual twins allow for hybrid digital and physical manufacturing. Can they help green one of the world's most polluting industries?

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Manufacturing is a top polluter. In the US, it accounts for *around a quarter* of direct carbon emissions. While powering our factories with renewable energy must be a priority, there are ways we can make what happens within them more efficient.

“It’s clear that digital technologies can be harnessed to provide greater support to sustainability initiatives”, says Severine Trouillet, Public Sector Director at Dassault Systèmes. Luckily, investment in energy-saving climate tech is increasing.

One example of this is ‘virtual twins’. A virtual twin is a digital version of whatever product is being manufactured, plus whatever is involved in the manufacturing process. It allows design and testing to be carried out digitally, saving time and eliminating the vast amount of waste that can come from construction errors. Virtual twins were notably used by Moderna during its production of the COVID-19 vaccine – enabling one of the fastest rollouts in history.

Research suggests that, by 2030, the use of virtual twins could save 7.5 gigatonnes of CO2 emissions. Leading on from this, virtual twins allow for unparalleled speed and flexibility in testing. This will be key in making it as risk-free as possible to develop even more radical green technologies.

Below are a few examples from Trouillet on how virtual twins work in practice.

Virtual twins in action

Grenoble hopes to become a sustainable city. Image courtesy of [Grenoble.fr](https://www.grenoble.fr).

Low-carbon social housing in Grenoble

Amidst sustainable city commitments, construction company Bouygues set out to create a first ever low carbon, autonomous social housing in Grenoble.

The project used virtual twin technology to engineer airflow, energy use, and recycling methods to deliver the first-ever low-carbon, autonomous social housing in the city, and assemble all the parts at the worksite to reduce carbon emissions.

This project decreases water consumption by 70% and recovers heat from recyclable wastewater. Household waste will also fall by 40% using compost and biogas energy.

NIO ES8. Image courtesy of Wikimedia Commons.

Next-generation smart electric vehicles

Born from a growing concern about the high pollution levels in cities in 2014, Chinese automobile brand NIO has aimed to position itself at the head of electric vehicle innovation by launching its ES8 model in three years instead of five, the industry norm for new car models.

It succeeded in doing so by using virtual twins for its testing and prototyping process. It used virtual twins to create vehicle digital mock-ups with complete vehicle data available at any hour, saving huge amounts of time.

Projects like this one can result in 227 Megatons of CO₂ emissions avoidance in autonomous vehicle development via simulation, and 2 Megaton CO₂ emissions reduction in product development from physical prototypes and test vehicles.

Bio-based coffee packaging. Image courtesy of Amcor.

Circular packaging

Swiss packaging manufacturer Amcor has set a goal to be a circular ecosystem by 2025. It plans to develop all of its packaging to be recyclable or reusable and to significantly increase its use of recycled materials.

Prototyping packaging designs within a virtual environment has allowed the company to reduce the weight of its bottles from 35% to 50% while reducing its demand for PET resin by more than 100 million pounds annually, equivalent to over 3,500 trash trucks.

Florence Wildblood is the cofounder of *Ours to Save*

Article by FLORENCE WILDBLOOD