

Sustainable lighting makes an impact

3D-printed lighting products contribute to a circular economy, reduce emissions, and help eliminate waste.

PrentaLux

 **COOPER**
Lighting Solutions
a  **signify** business

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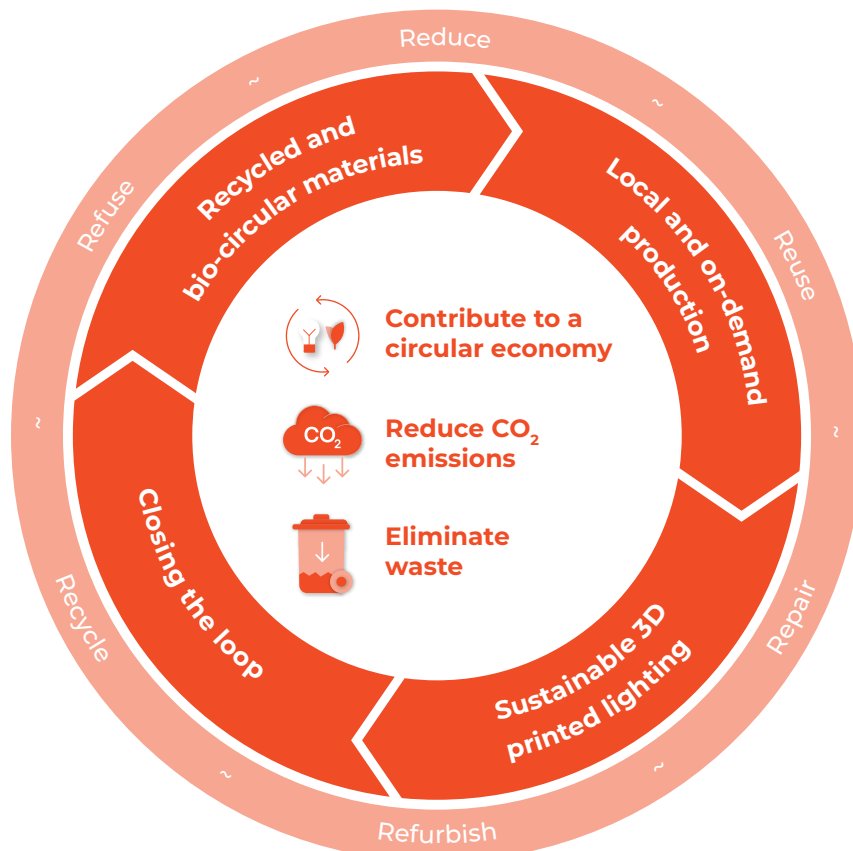
Rethinking our production for a brighter future

Sustainability is one of the most important issues of our time. Creating long-term economic growth shouldn't have a negative impact on other systems, such as social or environmental. To achieve this goal, companies must address strategic and operational challenges.

Sustainability as a matter of course

To remain a competitive, successful industry leader, Cooper Lighting Solutions is consistently working on the holistic transformation to a sustainable company. In addition to our operational commitments such as being carbon neutral in our operations and using 100% renewable electricity, we place great emphasis on the sustainability of our products.

Earth's resources are limited, so we're working on the transformation of materials flows. From linear into circular, from finite into renewable, from virgin into recycled and bio-circular. In a circular economy, material consumption should be a circular process where renewable resources and waste streams are reduced, reused, repaired, refurbished, and recycled.



PrentaLux 3D-printed luminaires are part of a circular economy

3D printing is a highly flexible, more sustainable form of manufacturing. 3D-printed luminaires – such as PrentaLux from Cooper Lighting Solutions – are made with raw material that's already been recycled, tailored to the customer's exact needs, and recycles at their end of life. In PrentaLux products, nearly every component may be reused or recycled thanks to a consistent disassembly process that supports a circular economy. PrentaLux products are 3D-printed only on demand, enabling a significant reduction in inventory, another advantage of sustainability.

9 elements where 3D printing makes a sustainable difference

- 1 Using recycled and bio-circular materials which have a story to tell
- 2 Fewer components for more flexibility
- 3 Assembly with disassembly in mind
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Element 1

Using recycled and bio-circular materials which have a story to tell

A basic tenet of ecological sustainability includes moving away from the use of virgin materials for the production of goods. Using fewer fossil resources and more recycled and bio-circular resources is an important step toward stopping global warming and preserving the Earth's foundations of life. Part of the needed change is behavioral, but an equally important part is technological, such as 3D printing technology.

Already working with 71.5% renewable granulate

Bio-circular mass-balanced raw materials are materials from ISCC PLUS (International Sustainability and Carbon Certification) certified waste streams and residues. These can be tall oil from the wood processing industry or used cooking oil. The bio-circular granulate, used as raw material for PrentaLux 3D-printed luminaires, is ISCC PLUS certified and 71.5% renewable. Based on the colors and additives used in production alone, the officially mass-balanced rate will be at least 55%.



GOOD TO KNOW:

ISCC PLUS is a globally applicable sustainability certification system for fully traceable and deforestation-free supply chains.



Fewer components for more flexibility

Apart from the issue of source material, 3D printing manufacturing offers several other advantages. One of these is the integration of multiple functions into a single component, e.g. the integration of the strain relief into the housing of a PrentaLux luminaire. In this way, two screws and a plastic part are typically removed from the assembly. This allows for easy and quick disassembly, as the strain relief doesn't need to be separated into one or more waste streams. It's one less assembly step in the production process, simplifying manufacturing.

The freedom to design colors, shapes and textures

Another advantage of 3D printing technology is its flexibility and design freedom. 3D-printing allows for an almost unlimited number of different component shapes -- an impossibility with traditional manufacturing methods such as injection molding, which is always restricted by the mold release. With 3D-printed PrentaLux lighting there's no such limitation, so your customers get the design they want.



Traditional metal luminaire



PrentaLux 3D printed luminaire

disassembly:	8.5 minutes	3 minutes
components:	32	18
colour paints:	2	0
screws and washers:	14	6 screws, 0 washers
material groups for recycling:	9	5 pure material groups

Enabling human and environmental health

PrentaLux from Cooper Lighting Solutions has received the Declare certification for the 200s, 300s, and 400s product lines. Declare is a label that highlights healthy building products, awarded with the aim of enabling the creation of buildings that support human and environmental health.

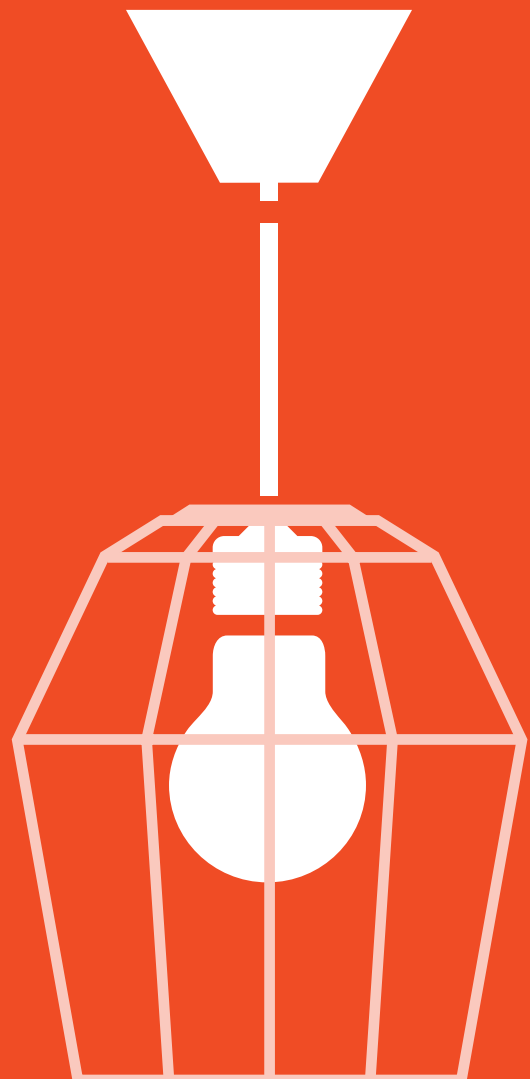
It's issued by the International Living Future Institute, a non-governmental organization committed to a global transformation toward true sustainability.

The assembly with disassembly in mind

When the life of a luminaire comes to an end and it's time to recycle it, it's important that disassembly is as simple as possible. A 3D-printed luminaire consists not only of printed materials, but also of non-printable components such as LEDs, drivers (which in turn consist of electronic

components), and metals (such as heat sinks and screws). In end-of-Life recycling, the various components need to be disassembled and sent to separate waste streams, where they can be appropriately recycled.

Another way to simplify disassembly is to minimize mechanical connections that use glue or screws, and replace them with click components. To effectively support end-of-life recycling, each product is provided with disassembly instructions to enable the recycler to easily separate the different parts and transfer them to the correct waste streams.



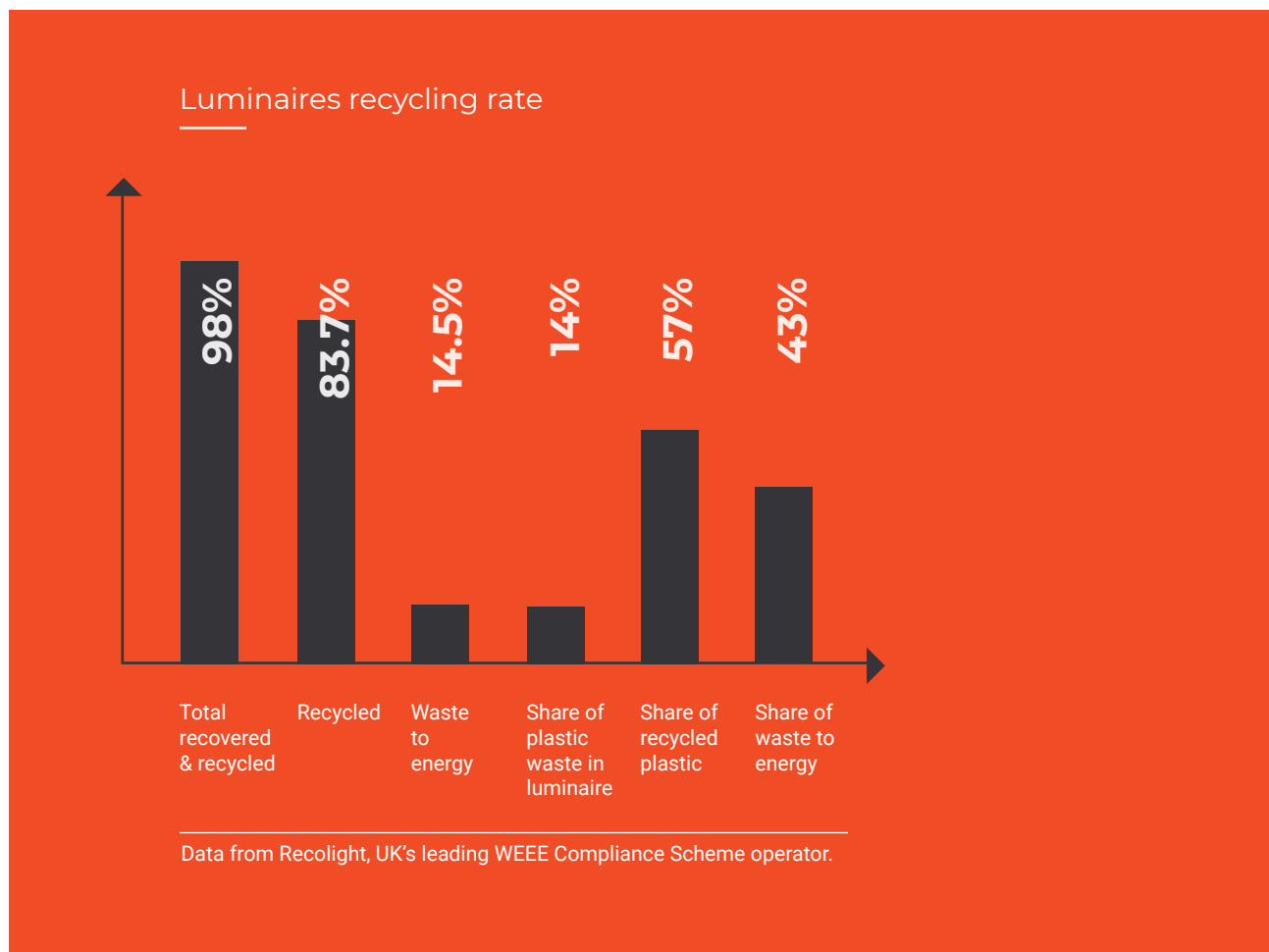
Closing the loop of recycling

The collection and recycling of end-of-life electrical equipment protects the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste from electrical and electronic equipment. It also reduces the overall impacts of resource use and improves efficiency and contributes to sustainable development.

Pilot projects to close the loop

Components such as glass and metals can be recycled easily, and the recycling rate is already quite high. With plastics, things are a bit more complex. There are many types of plastics, all with different properties, such as melting temperature. It's difficult to separate the different types of plastic when they're mixed.

Polycarbonate is a high-quality plastic that can be recycled when kept separate. Therefore, Cooper Lighting Solutions, along with our parent company Signify, has organized dedicated pilot projects to prove that luminaires such as PrentaLux can be recycled at the end of their life cycle.



Lowering carbon emissions in materials and transport

Research shows that reducing emissions from fossil fuel combustion and other sources results in better air quality -- and it slows climate change by improving human health and preventing economic losses. A 2020 study compared the Life Cycle Assessment of a traditionally manufactured downlight with a die-cast aluminum housing and a 3D-printed downlight, both delivering the same amount of light.

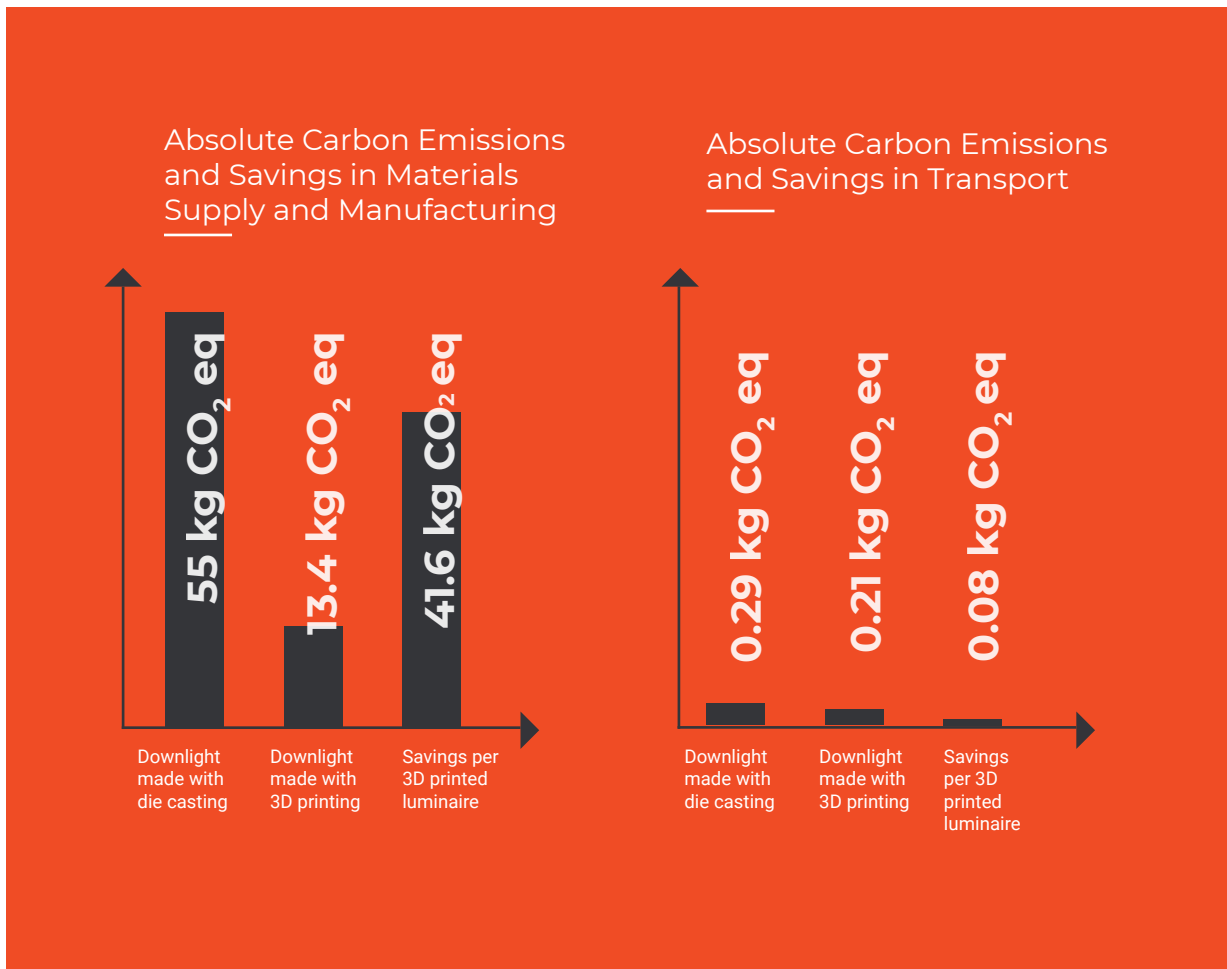
The following points were considered in the study:

- all components (excluding packaging)
- type of components
- material of components
- weight of components
- manufacturing method of components
- component supplier location
- mode of transport



The study showed that 3D printing resulted in a significant savings of up to 76% in material supply and manufacturing, and up to 28% in transportation.

Eliminating die casting for housings is critical to reducing carbon emissions because so much heat is required to create the metal housings. Avoiding metal housings also helps to decrease emissions for transport by reducing the luminaire's weight by more than 20%.



Carbon neutral production

“We are very proud to be carbon neutral already in 2020, ahead of our target... It is a truly significant achievement for us and we call on many others to join us in pushing for carbon neutral operations.”

Signify's Head of Sustainability, Environment, Health & Safety

The only carbon-neutral lighting company

With climate change and increasing amounts of waste threatening our planet and its inhabitants, our parent company Signify has put sustainability at the center of everything we do. To achieve our goals, we've developed a strategy called “Brighter Lives, Better World” –

and already met all our initial goals ahead of schedule. By 2020, we were already the only lighting company to operate on a completely climate-neutral basis, including the use of 100% renewable electricity.

Beyond carbon neutrality: Our 2025 vision

Encouraged by our early achievement, our sustainability goals for the years 2020 to 2025 were formulated even more ambitiously:

- Double the pace of the Paris Agreement
- Double circular revenues to 32%
- Double our revenues for brighter lives which benefit society to 32%
- Double our percentage of women in leadership to 34%
- Increase climate action revenues to 72%
- Zero waste to landfill for all manufacturing sites
- Supplier sustainability performance of 95%

Being a carbon neutral company

On the way to becoming climate neutral, a wide variety of projects have been successfully launched.

Industrial Operations	Non-Industrial Operations	Logistics	Business Travel
Energy efficiency projects Energy savings walkthroughs Reduction of energy consumption in energy intensive operations Reduction of critical substances use	Flex-working across the organization Intelligent systems regulating lighting and heating Efficient use of spaces	Continuous check of supply chain Reduction of logistical operations Use of environmentally friendly carriers Transparency on the environmental impact of our ocean transportation	Reduction targets for each business department Efficient models enabling remote work and eliminating the need for travel

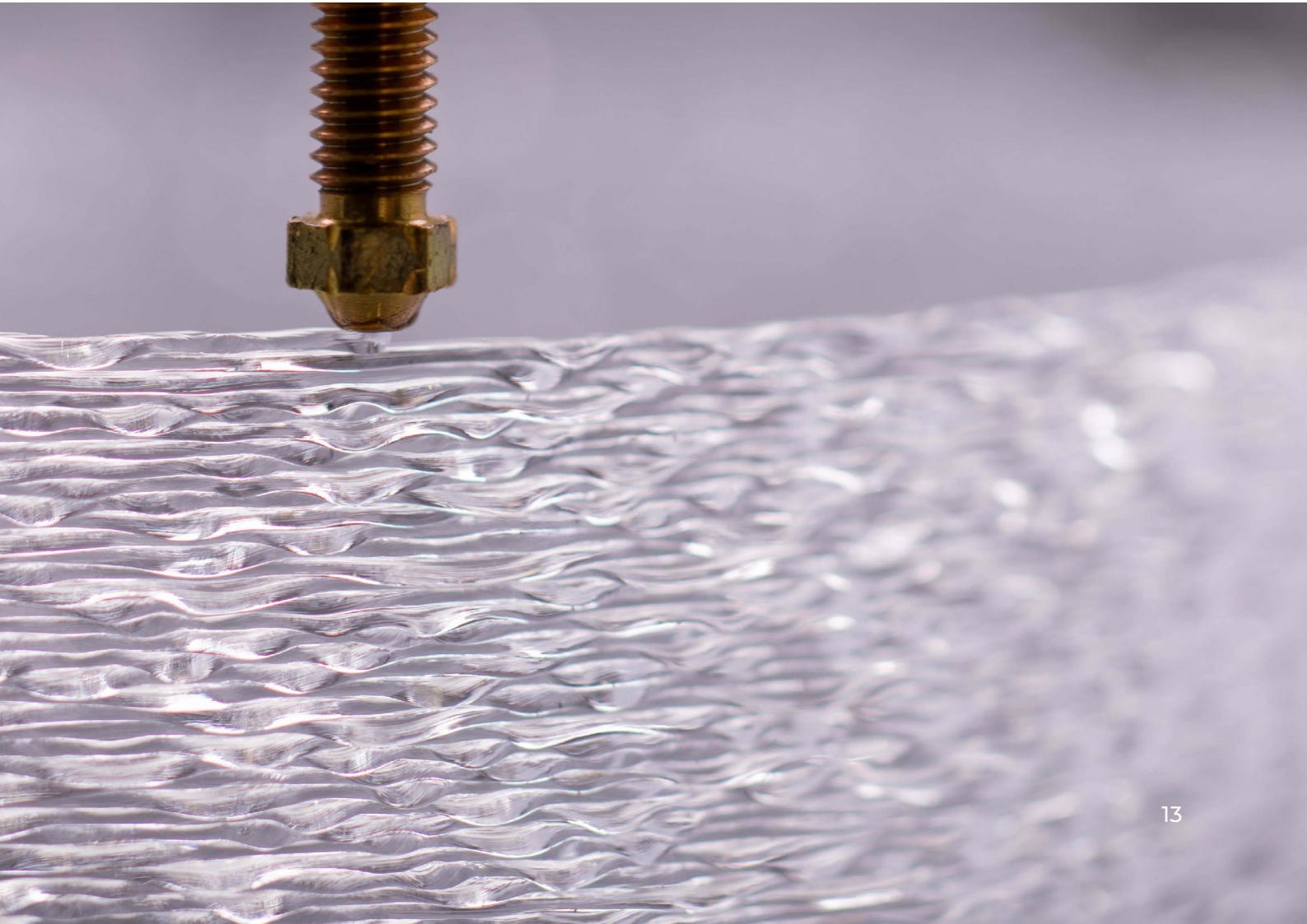
Producing on demand instead of on stock

Environmental aspects play an important role in reducing global warming – lowering CO₂ emission rates is one of the goals in designing a sustainable supply chain. A big step toward supply chain sustainability is the minimization of inventory, as warehousing has the potential for product waste and harmful greenhouse gas emissions. Since PrentaLux and other 3D-printed luminaires are produced only on demand, there is no need to stock finished goods.

From make-to-stock to make-to-order

Make-to-stock (MTS) is a manufacturing method based on forecasted product demand. Once manufactured, products are kept in stock until they are sold. The alternative is called Make-to-order (MTO) and starts production only after receipt of a confirmed customer order. This allows

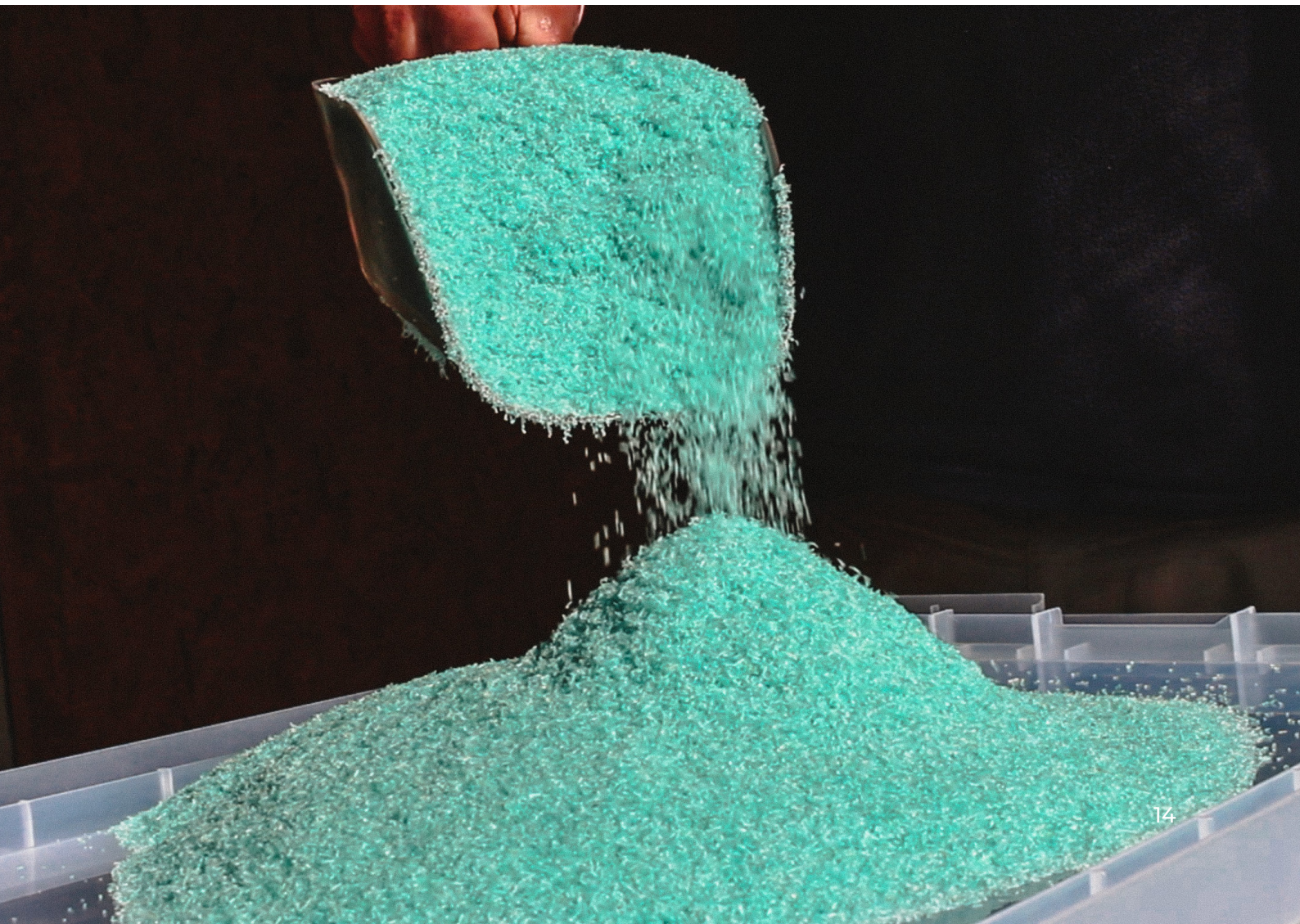
consumers to purchase products that are customized to their specifications. No inventory of finished goods is required, as only non 3D-printed parts such as drivers or LEDs need to be stored.



Element 8

Zero-waste production

There's only one thing better than recycling waste: producing no waste at all. That's why we're actively investing in our "Towards Zero Production Waste" program. We're working to improve yields at all our production sites. In filament production, there are some rejects that we chop and use to make new filament.



Resulting in sustainable products

Our PrentaLux 3D-printed lighting products are designed for circularity and thus follow the “reduce-reuse-recycle” approach. Being energy-efficient and having a long product lifetime, our offerings are not only environmentally friendly but also cost-effective.

Energy efficiency and lifetime

Our products are highly energy-efficient as we make our own advanced LED drivers, LED modules, and LED light sources.

The energy efficiency of our products can vary depending on the product series, ranging from 100 to 180 lm/W. Our LED lamp based products can reach 210 lm/W when using Ultra-Efficient A-class bulbs. We prioritize energy efficiency in our designs because energy consumption during the use phase is the largest part of Life Cycle Assessments (LCA) for luminaires. In addition to energy efficiency, our products have a long and reliable lifetime of 50,000 to 100,000 hours.

We strive to provide products that are not only energy efficient but also durable and reliable, hence our 3D-printed PrentaLux luminaires are part of the GreenSwitch program and are aligned with the Lighting for Circularity approach.



Upgradable

Our lighting products are now being designed to enable certain upgrades such as sensor additions and easy exchange of certain identified electronic and/or mechanical parts. The available options for upgradability differ per product series. The design principle to allow for future upgrades is now being rolled out as part of our new design rules.

Reusable & recyclable

The material for our printed parts is plastic. All printed parts are reusable and recyclable. We use no paint, no potting, no glue, and fewer screws for easy disassembly and to simplify recyclability. We cooperate with Collection & Recycling Operations (CRO) for end-of-life management. For more details on reuse and recycling see the closing the loop section.

Less weight

In comparison to traditional die-casting processes that involve metal housings, our products are significantly lighter in weight. We achieve up to 76% less in carbon emissions in material sourcing and manufacturing, and we save up to 28% in carbon emissions in transport compared to the traditional process. The lightweight nature of our products also simplifies the installation process.



Lighting Brands

Ametrix
AtLite
Corelite
Ephesus
Fail-Safe
HALO
HALO Commercial
Invue
iO
Iris
Lumark
LumarkAP
Lumière
McGraw-Edison
Metalux
MWS
NeoRay
Portfolio
PrentaLux - 3D Printed Lighting
RSA
Shaper
Streetworks
Sure-Lites

Controls Brands

Greengate
Fifth Light
Intelligent Lighting Controls

Connected Lighting Systems and Smart Spaces Platform

WaveLinx
Trellix Infrastructure

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Printed in USA
Publication No. WP53123424
August 2025

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