



Plastics in Architecture & Design

The Plastic Pavilion Case Collection



Plastics in Architecture & Design

Preface

In the summer of 2023, The Danish Plastics Federation set up an exhibition in the heart of Copenhagen. Surrounded by classical Danish buildings and world-famous architecture, the goal was to showcase the potential of plastic – a material often viewed through a skeptical lens.

This exhibition became known as the *Plastic Pavilion – Building Sustainable Societies*.

For four weeks the Plastic Pavilion stood as a symbol of dedication, creativity, and commitment to a future with minimal use of resources and energy consumption.

This project started when The Danish Plastics Federation was invited to create a pavilion inspired by the Sustainable Development Goals as part of the official side event program for the World Congress of Architects.

Our ambitions were high from the beginning: The pavilion would be more than just a construction. It would be a place to show the ways in which plastic can help us build a future within a safe use of resources, water, and energy.

The pavilion would house a wide range of products, highlighting the indispensable role plastics play in our society; from construction to design, and infrastructure.

Beyond the physical exhibition and the website plasticpavilion.com, the Plastic Pavilion also became a platform for the exchange of knowledge and ideas. Guests and colleagues joined us for debates and social events, to share their insights and perspectives – and local residents and visitors would explore the pavilion and learn more about our industry.

We know that plastic is often criticized – and we are not ignoring the problems it can cause. But we also see the opportunities within the challenges. We believe that plastic can be part of the solution. And to reach our climate goals, we must consider how plastic can be used, in many different parts of society.

Now we will look to the future – a future where the exhibition will live on, not only in memory but in the form of a beautifully crafted coffee table book.

When you flip through the pages of this book, you will find insights into the products and solutions driving the green transition, along with a nuanced understanding of the pros and cons of plastics.

Our vision for the Plastic Pavilion was to initiate important conversations, raise awareness, and work together for a more responsible and conscious use of plastic.

I hope this book will spread that message and show how plastic can be a valuable material in the transition towards a climate and resource-efficient society.



Thomas Drustrup,

Managing Director, The Danish Plastics Federation
Copenhagen, November 2023.

Plastic Pavilion 2023 – Celebrating plastic's role in modern society at Gammel Strand

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Plastic Pavilion 2023

Celebrating plastic's role in modern society
at Gammel Strand

Plastic Pavilion – Building Sustainable Societies was an exhibit and event space initiated by The Danish Plastics Federation, located at Gammel Strand in Copenhagen between June 19 and July 14 2023.

The pavilion, designed by the architectural firm TERROIR and overseen by building consultant Nordiq Group, was an official 'SDG Pavilion' within the UIA World Congress of Architects 2023. The congress is organized by the International Union of Architects UIA every three years and stands as the world's foremost event on sustainable architecture.

Over its exhibition period, the pavilion recorded approximately 30,000 visitors, including professionals, locals, and international tourists. The pavilion showcased 78 plastic products, each selected for their significant societal value, particularly in areas such as architecture and construction, recycled plastic, plastic in healthcare, climate solutions, and more.

The purpose behind the Plastic Pavilion project was to highlight the essential and sustainable role that plastic materials can play in the development and maintenance of modern societies due to the space and energy-efficient features of the material. The initiative was made possible through the support of 40 sponsors listed on page 155.

This book serves as a record of the Plastic Pavilion's exhibition. It aims to provide an overview of the themes and cases presented at Gammel Strand, ensuring that the information remains accessible to those unable to visit in person and serves as a reference for those who did.

Architect: TERROIR

Building Consultant: Nordiq Group

Construction Sponsor: Plastmontøren

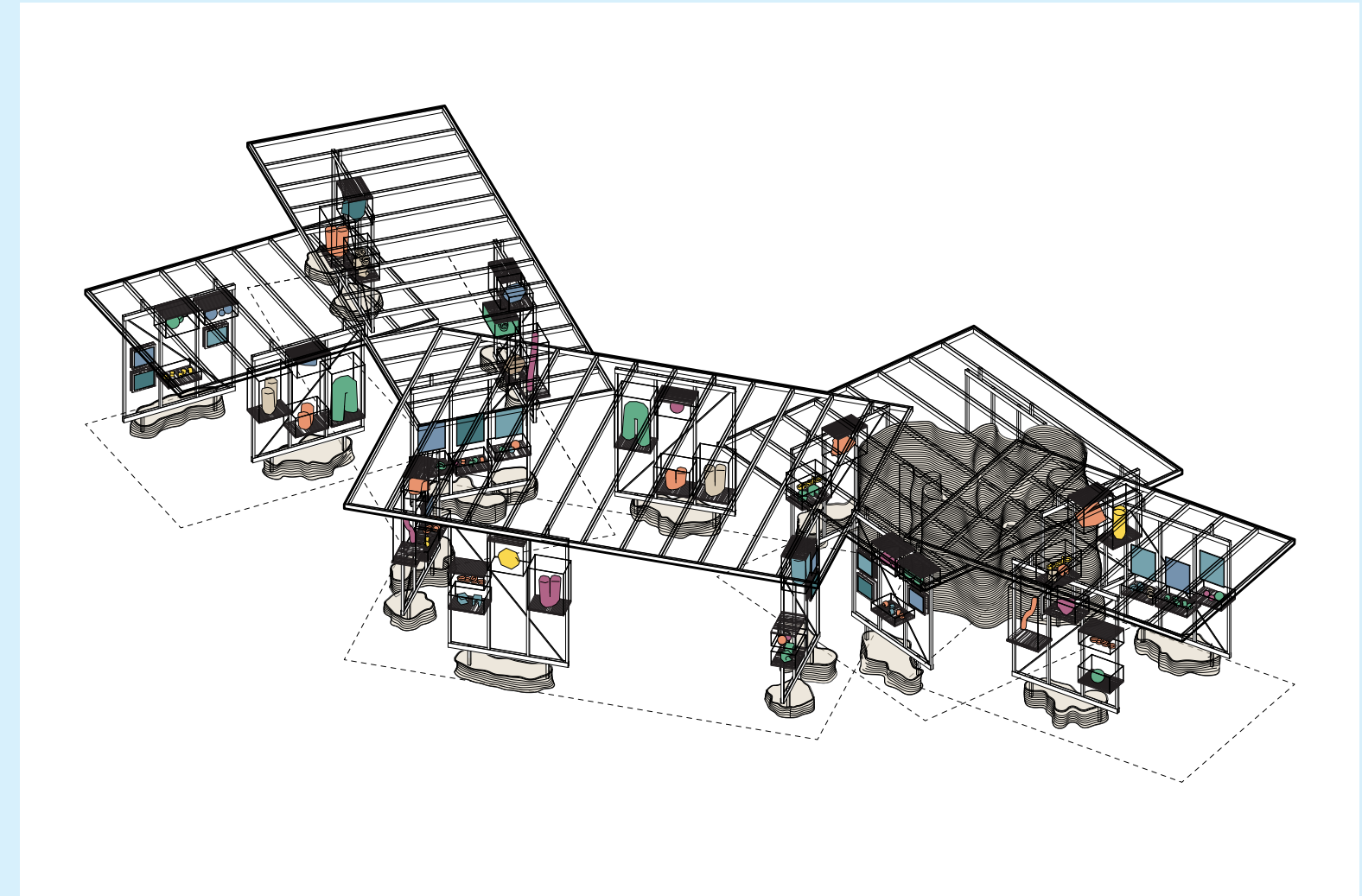
The pavilion also served as an event venue. The Danish Plastics Federation hosted 25 events and public showings during the exhibition period.





Plastic Pavilion, located at Gammel Strand in Copenhagen, as seen from above, June 2023.

Photo: Torben Eskerod



Plastic Pavilion
Illustration: TERROIR



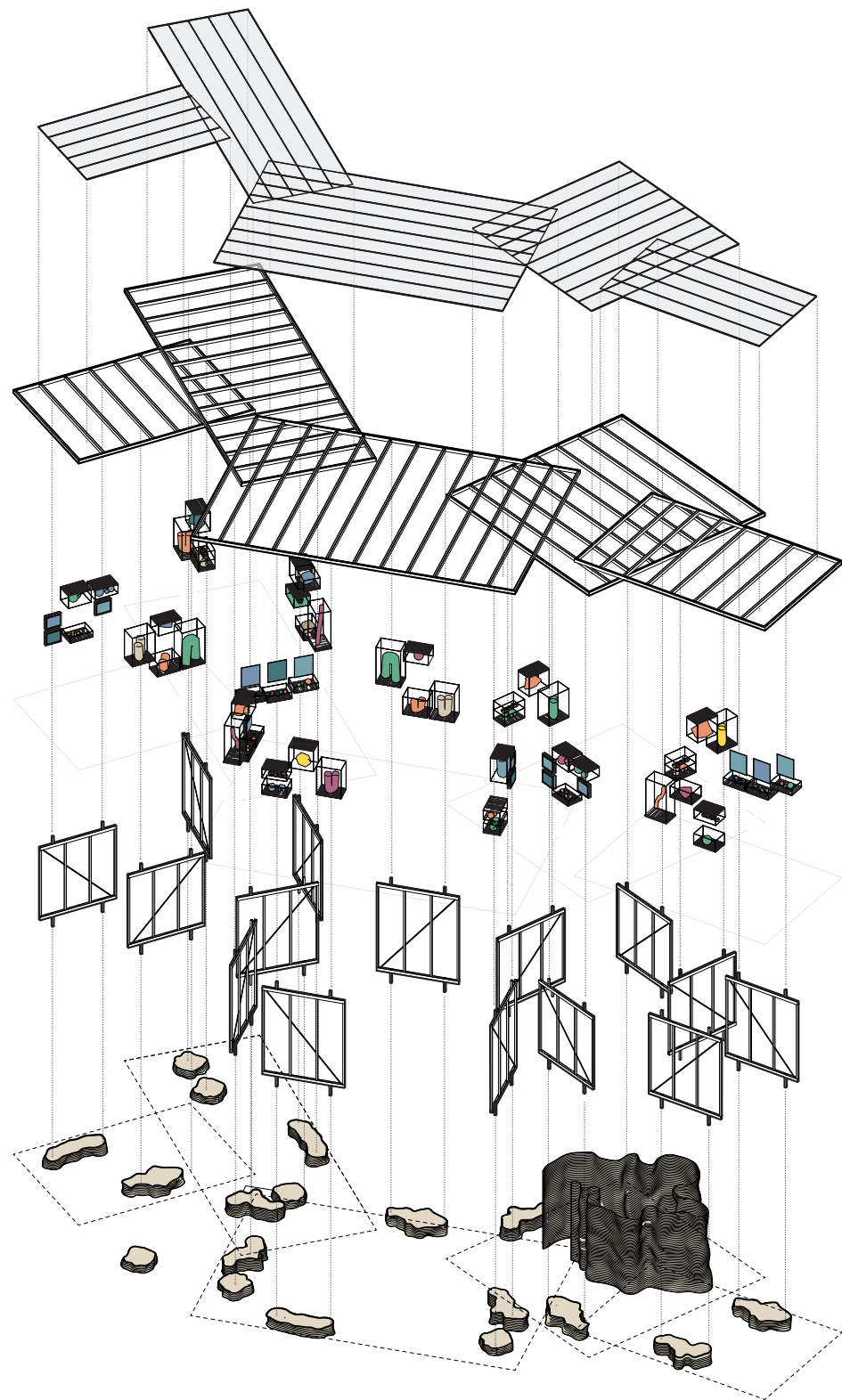
The architecture and materials of the pavilion

Plastic comes in many shapes and forms. This diversity is evident in the construction materials of the Plastic Pavilion. Selected for their innovative, aesthetic, and practical qualities, every component – from the structure to the foundational base and the roof cover – is crafted from plastic-based materials.

At first glance, many visitors assumed the pavilion's walls and roof were aluminium. However, they are crafted from fibreglass, a composite of glass fibres and polyester. Fibreglass stands out as a resource-efficient alternative to materials like steel and aluminium, offering strength, lightness, and superior corrosion resistance.

One of the standout features of the pavilion is its 3D printed base and spatial structure. These components are crafted from wood and plastic waste. This blend provides excellent printing and performance, ensuring a robust and visually appealing pavilion base.

The roof itself and the poster walls are made from polycarbonate sheets, which is durable, lightweight, and has a transparent and clear surface. The base of the exhibition display boxes is constructed using multiple layers of polycarbonate, while the display boxes are made from acrylic.



Plastic Pavilion Elements: TERROIR

Roof cover in multi-layer plastic sheets provided by VINK Plast

Roof structure in fibreglass provided by Fiberline Building Profiles

Display boxes in recycled acrylic provided by GOP Denmark and Silkeborg Plast

Structural walls in fibreglass provided by Fiberline Building Profiles

3D printed base and spatial structure provided by WOHN



Structural walls and roof structure.

3D printed base and spatial structure.



01

Architecture & Construction

Imagine living in a home designed to minimize CO₂ emissions with compact living spaces, optimized use of resources, and a strong focus on energy efficiency. Your home is built with an emphasis on durability and longevity, reducing the need for frequent replacements, and minimizing waste generation. When something breaks, it is repaired, repurposed, or recycled. Discover a few examples of plastic's application in architecture and construction.



Cooling tower construction in Germany.

Structural profiles and planks

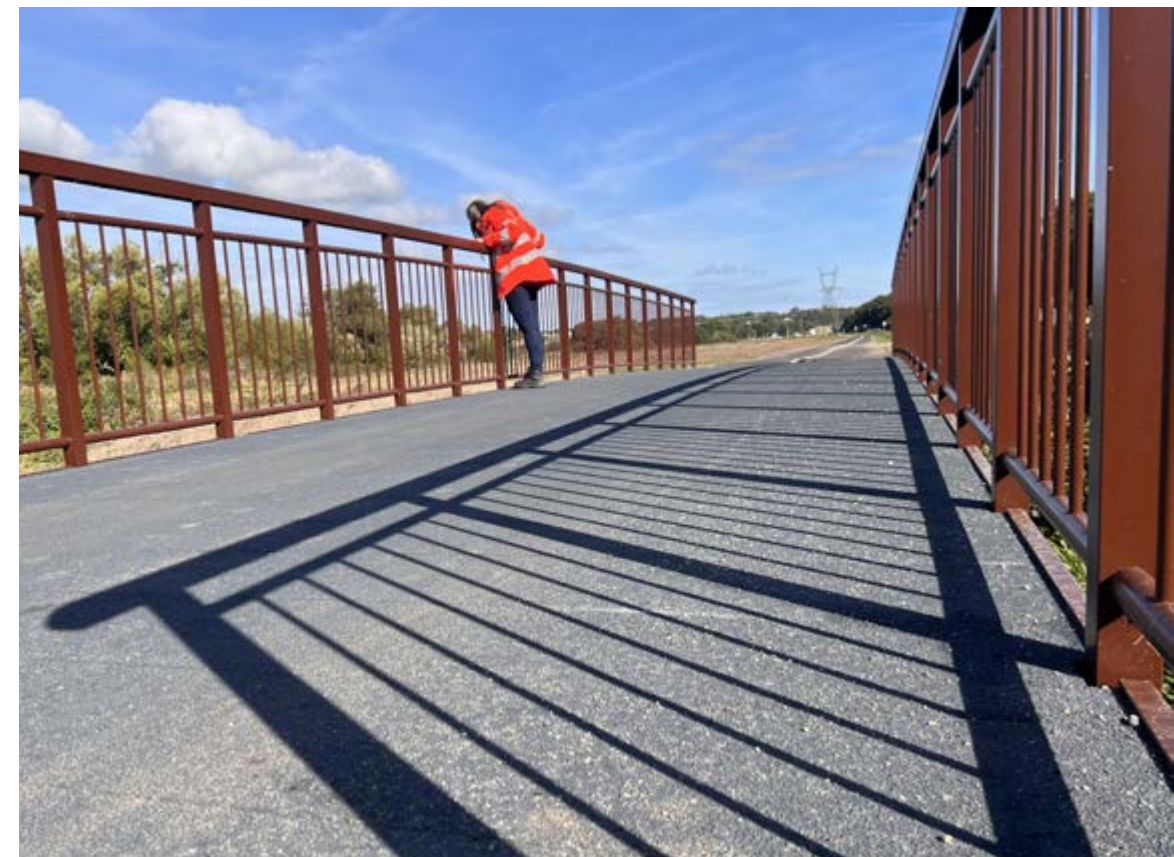
Fibreglass is a polymer-based composite, consisting of fibreglass and polyester. In combination, it provides a very strong and rigid material. It is often used in load-bearing structures where the combination of high strength, low weight, and corrosion resistance plays a crucial role – for example bridges, platforms, stairs, rails, and coastal applications.

Company: Fiberline Building Profiles

Products: Profiles, planks, gratings

Material: Fibreglass

Structural profiles in fibreglass – even though it might look like steel or aluminum.



Bridge made with fibreglass profiles.



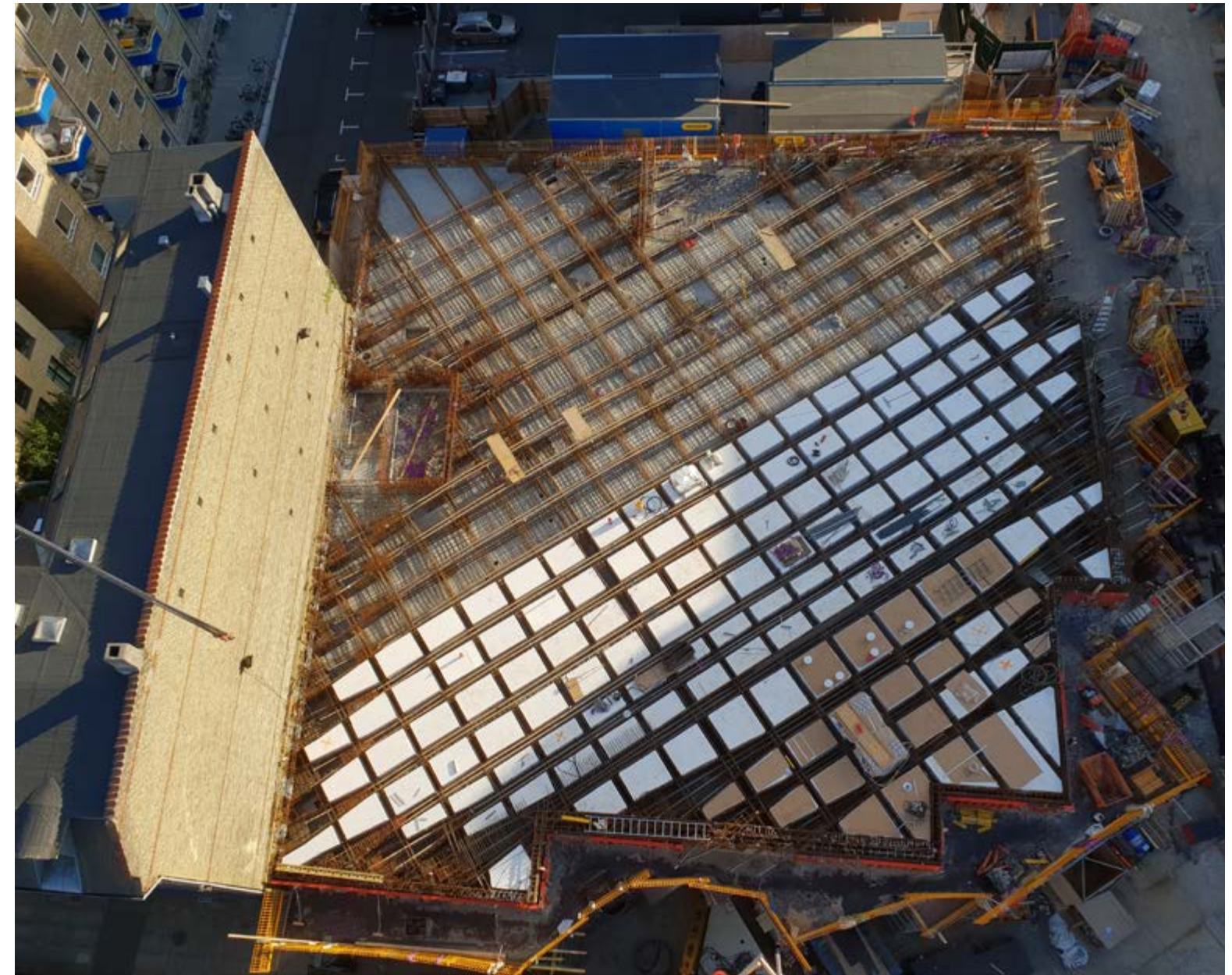
Lightweight fill

Sundolitt Lightweight fill is utilized for its low density and robust compressive strength in concrete casting, supporting building structures, expanding roads, and as compensation fill in road construction. Specifically, in this instance, it was employed in a load-bearing deck over the Frederiksberg Allé Metro Station to accommodate a six-story building construction on top.

Company: Sundolitt

Product: Sundolitt Letfyld

Material: Expanded polythurene (EPS)



The concrete deck was built with reinforcement, forming crosswise, and lengthwise beams, known as a ribbed deck. It is supported by just 11 columns and two walls, spanning over the open space above the Frederiksberg Allé Metro Station.



Fibreglass facade planks

The fibreglass plank is a polymer-based composite, consisting of fibreglass and polyester. In combination, it provides a very strong and rigid material. Together with high insulating properties, the facade planks are suitable for creating low-weight, durable, and energy-efficient facade solutions for architectural buildings, bridge cladding, coastal near constructions, and cladding along the railway.

Company: Fiberline Building Profiles
Product: Facade cladding/plank
Material: Fibreglass

Fibreglass facade planks used for the Cultural Center on Southend Pier, Essex. Architects: White Arkitekter & Sprunt.
 Photo: Luke Hayes



Close-up of fibreglass facade planks.



Fibreglass facade planks used for the Cultural Center on Southend Pier, Essex. Architects: White Arkitekter & Sprunt.
 Photo: Luke Hayes



The Gallina arcoPlus multiwall panels are durable, lightweight, and have a crystal-clear surface.

Multipurpose panels

The multiwall panels are primarily used as facade cladding but can also serve as roofing or screening solutions. They offer rigidity and excellent thermal insulation properties, making them an option for architects and designers wanting to admit natural light while preserving heat inside. The panels come in a variety of structures, colors, surfaces, and finishes.

Company: Vink Plast

Product: Gallina arcoPlus multiwall panels

Material: Polycarbonate (PC)

“The simple structural frame is clad with **polycarbonate sheets**. The building is essentially a large shelter that provides ample **natural lighting but minimal glare.**”

– JAJA Architects



The panels were used in the Harboore Activity Center in Western Jutland by JAJA Architects in 2015.



The corner profiles, which can be green, yellow, or brown, are manufactured from recycled plastic sourced from the dairy industry.

Window frame

Window mounting frames are tailor-made for new construction and renovation projects. The frames are made from recyclable materials and with a disassembly-oriented design. The customized profiles are delivered to measure, ensuring easy installation while enhancing home insulation.

Company: Outercore
Corner profiles produced by: LETBEK





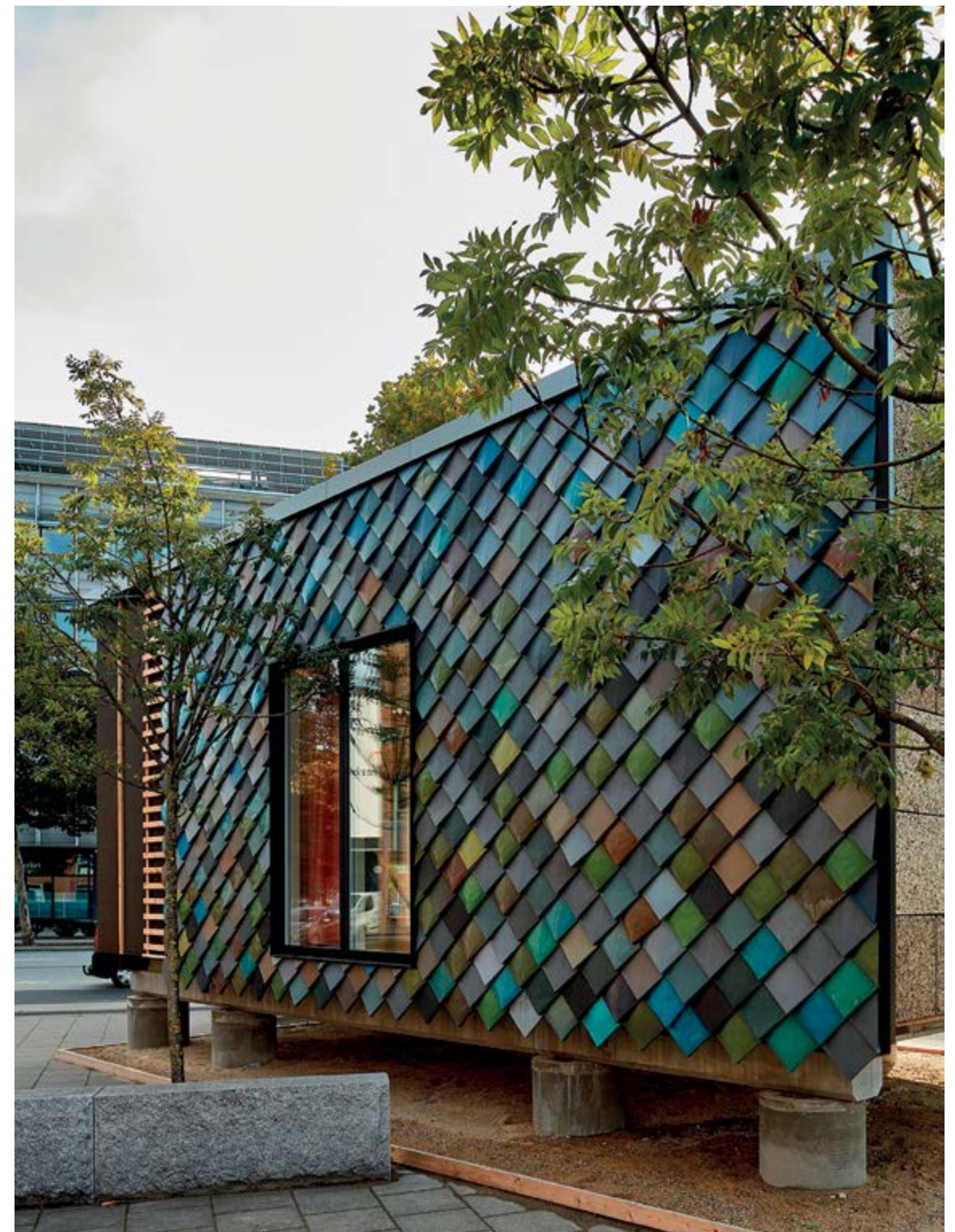
Music Pavilion for Sint Oelbert High School in Oosterhout, the Netherlands, 2020. By architect Grosveld Bekkers van der Velde Architecten.

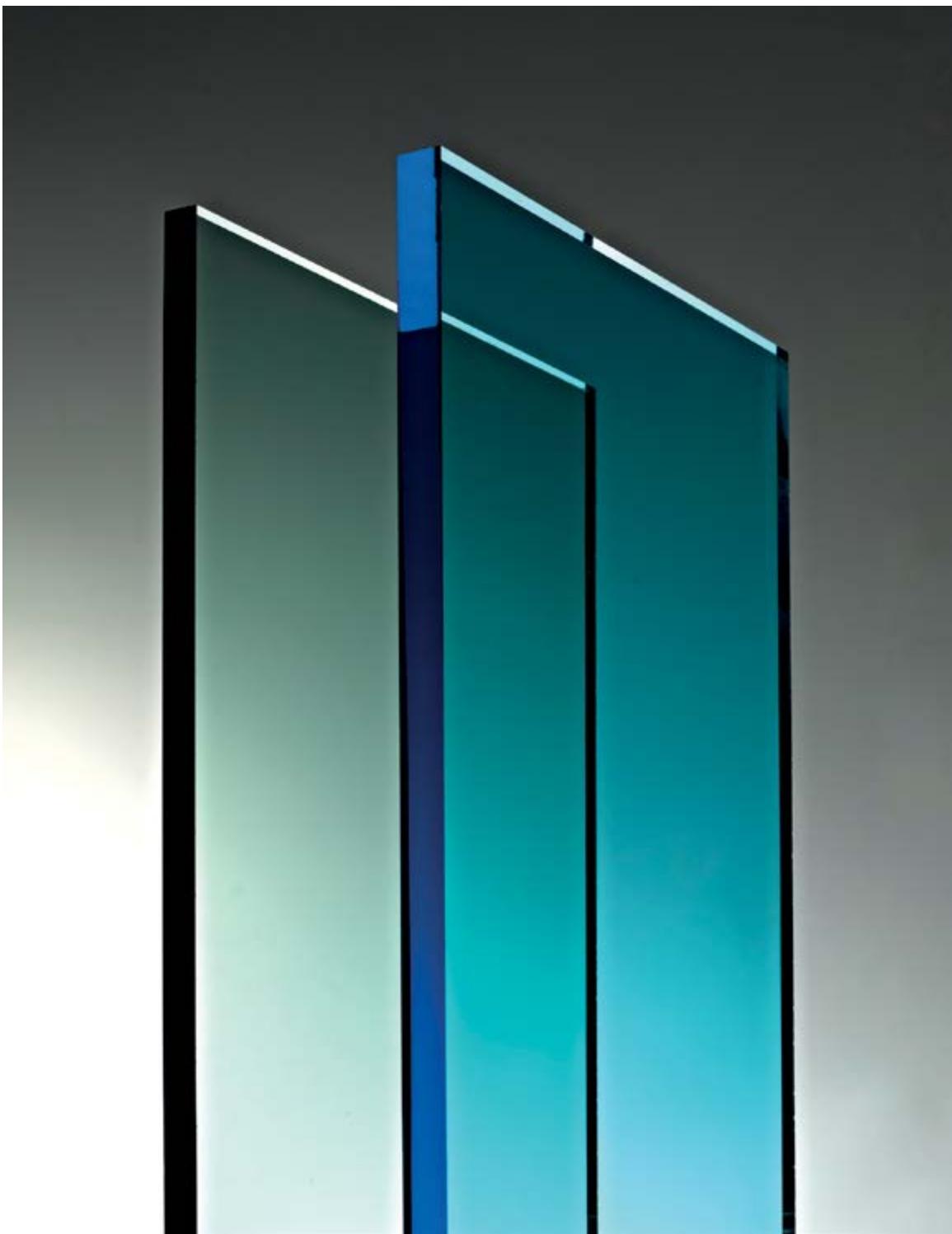
Exterior wall and roof cladding

The Dutch company Pretty Plastic transforms polyvinyl chloride waste into aesthetic and enduring cladding for roofs and facades. The circular tiles are made from discarded post-consumer building material, such as old window frames and rain gutters. They come in shades of grey, green, ochre, and terracotta, and two different shapes called "First One" and "Second One".

Company: Pretty Plastic
Material: Recycled polyvinyl chloride (PVC)
Product: First One & Second High

'Circle house project' in Aarhus, Denmark, 2020. By architect 3XN/GXN. Photo: Tom Jerso





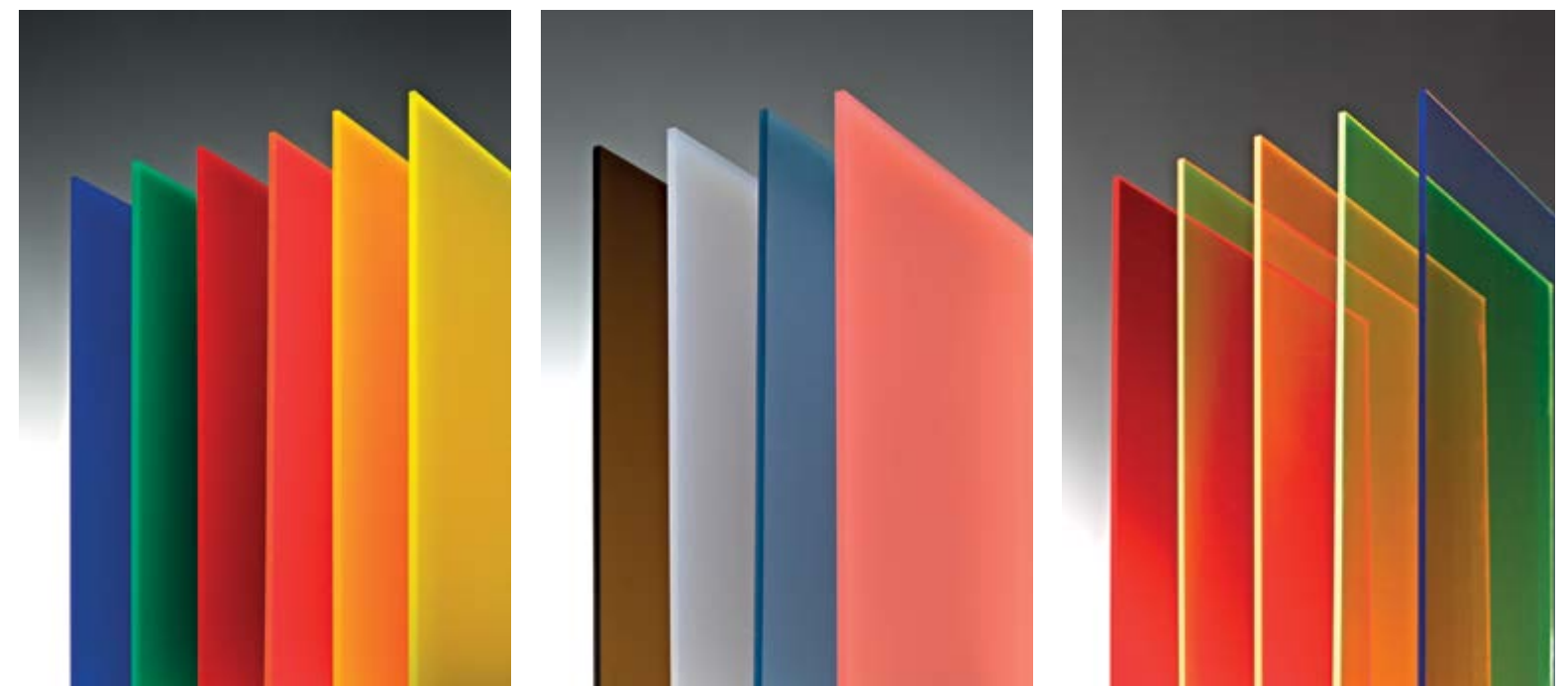
Acrylic sheet colors.

Acrylic sheets

The acrylic sheet material is made from depolymerization of acrylic sheets and liquid production waste using a cracking and distillation process. The colorful or transparent acrylic sheets can be used for a wide range of applications in buildings due to the high optical transparency, durability, and UV stability.

Companies: GOP Denmark, 3A Composites
Product: CRYLUX®

CRYLUX® in various vivid colors used in a shopping mall in Germany.





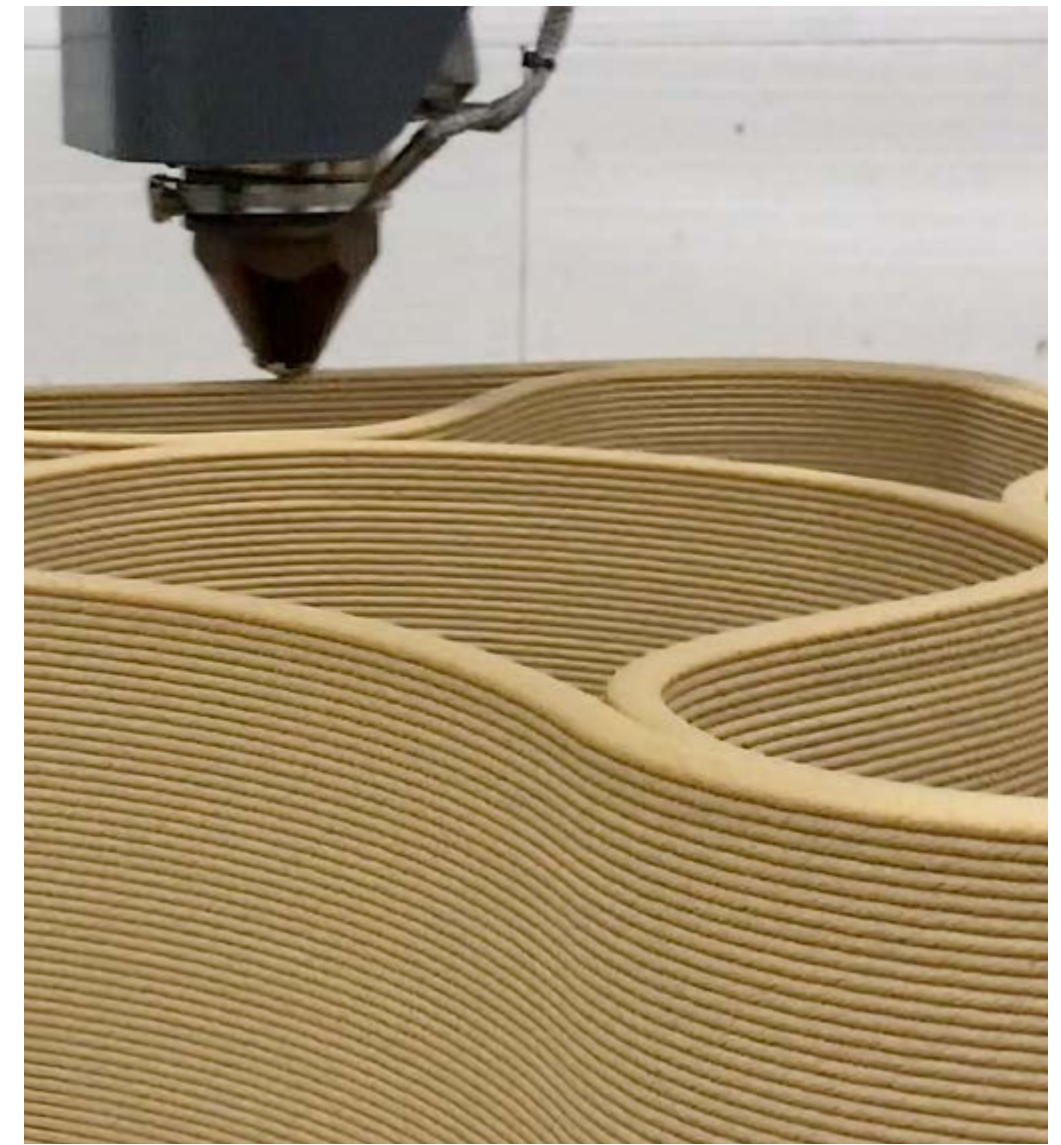
20 m² tiny living modules.

3D printed tiny houses

Tiny Homes are 3D printed homes made from recycled plastic and waste wood. The materials used in their construction makes it possible to keep the homes carbon footprint low. Cities are struggling to meet the demand for sustainable and affordable housing as the population grows. Tiny Homes aim to be scalable, sustainable, and affordable.

Company: WOHN
Product: Tiny Homes

3D printing in factory.



Segmented print concepts – load bearing shells and full frame structures.



The panels are used in the construction of a barn building for farm animals.

Facade panels

Production residues that accumulate during the manufacture of polycarbonate products are valuable, high-quality raw materials. The Savenergy panel is a product where recycled polycarbonate, post-consumer material, can be used again for a lightweight building element. The panels are therefore redeveloped in a recycling concept to avoid polycarbonate waste and used as facade or roofing systems.

Companies: Rodeca GmbH, GOP Denmark

Product: Savenergy Panel

Material: Polycarbonate (PC)





QUBEzero – a tiny house constructed using Smart Panels.

Panels of wind turbine blades

The panel is built on circular principles with compressed polyurethane posts and recycled parts from wind turbine blades. Insulation, durability, and acoustic properties are significantly improved compared to traditional polyurethane panels. The elements are a part of a non-organic construction that can be disassembled, reused, and crushed.

Company: Aqune ApS
Material: Polyurethane (PUR)
Product: Smart Panels



Window

Today, windows, patio doors, and facade doors are often made from plastic, which makes them maintenance-free, robust, long-lasting, and highly energy-efficient compared to traditional windows. This top hung window is fitted with sliding hardware with a simple, stepless mechanism that allows the window to be opened as much as desired by simply turning a handle.

Company: Ventisol
Collaboration: VEKA
Material: Polyvinyl Chloride (PVC)

Modern Insulation

In modern architecture, plastic insulation plays a crucial role by reducing CO₂ emissions and creating more usable space in buildings. Plastic insulation is valued for its durability, cost-effectiveness, versatility, and high insulation value, making it a vital component in contemporary construction. Take a look at some examples highlighting the significance of plastic in insulation today.



Building foundation

The building foundation provides effective thermal insulation, ensuring a consistent temperature in the foundation and reducing energy costs. The insulation elements are lightweight and easy to install, resulting in a shorter construction period, smaller amounts of concrete, and no heavy lifting for the contractors.

Company: Sundolitt
Product: Building Foundation Systems (F-, U-, and L-elements)
Material: Expanded polythurene (EPS)

Expanded polythurene foundation system being used in single-family homes at Tidselbjerget, Slagelse.



Road fill

Road fill is used to prevent settlement damage when building on soft ground or over structures with low bearing capacity. The lightweight blocks of road fill achieve a significant reduction in the permanent load on the ground. The blocks weigh very little and are easy to handle for contractors.

Company: Sundolitt
Product: Sundolitt Letfyld
Material: Expanded polythurene (EPS)

The image shows road fill as load-compensating fill for a new road at Campus Aabenraa.



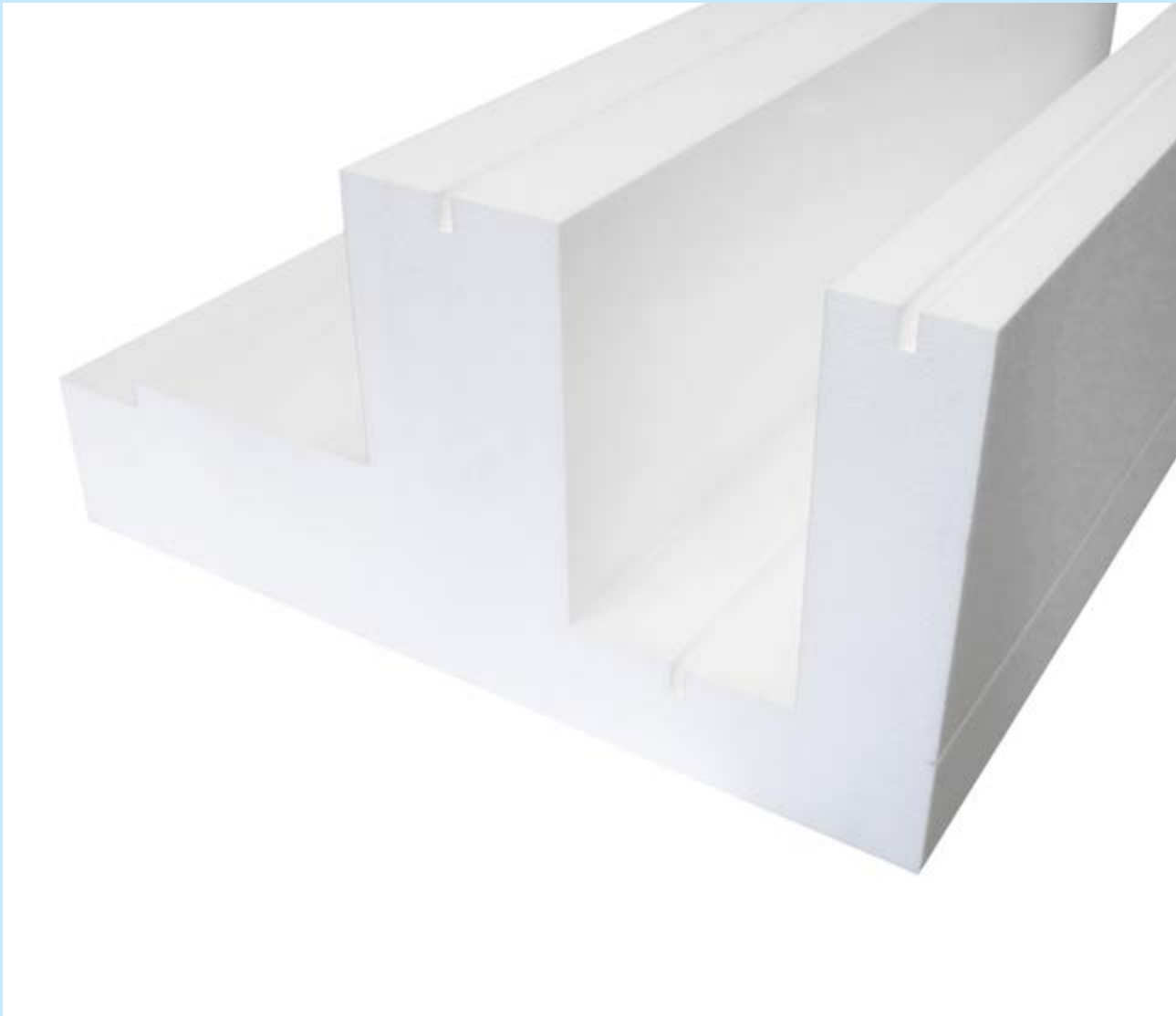
Insulation for pitched roofs

The insulation is designed for pitched roofs, placed on or between rafters. It offers protection on rafter bays with an integrated diffusion-open underlay. Polyisocyanurate has a high insulation value, which makes it possible to insulate with almost half the thickness of traditional insulation. Insulation from the outside makes it possible to optimize the livable area inside without compromising the visual appearance of the roof.

Company: IKO Insulations
Product: ALU NF PRO
Material: Polyisocyanurate (PIR)



The architectural firm Møller Nielsens Tegnesteue, based in Struer, designed the new roof for Struer Fri- og Fag-skole, which was installed by Rosenberg Madsen. The architect opted for a polyisocyanurate insulation to maximize space and maintain the roof's aesthetic appeal.



Close-up of the foundation blocks.

Foundation system

The foundation system streamlines construction by using prefabricated trenches for concrete filling, conserving time, and resources. Once set, external insulation is added to prevent frost beneath the foundation. Suitable for both light and heavy construction, this system is efficient and rapid to install. It ensures a consistent surface and great thermal bridging and insulation properties.

Company: BEWI

Product: Building Jackson Foundation System

Material: Expanded polythurene (EPS)



The contractor HP Byg used the foundation system in the building of 43 townhouses in Aalborg, Denmark.



Contractor Møllerens Hus A/S used the plates in the construction of 29 houses in Ugelbølle, Mols, Denmark, to protect the buildings against radon in the soil.

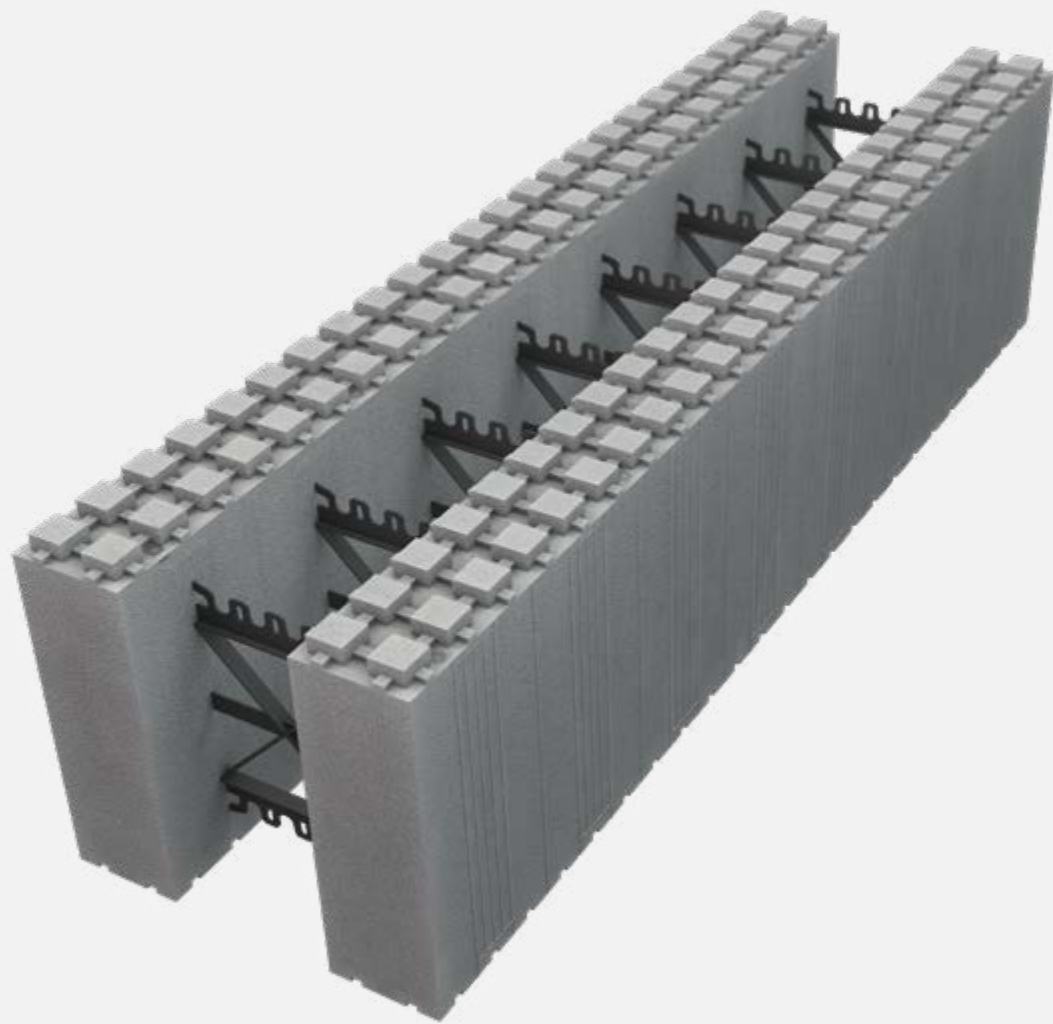
Radon protection

Radon enters buildings through cracks and crevices due to the pressure difference between inside the building and under the building. Too much radon can have health consequences for the occupants of the building. The Radon Board is molded with narrow air channels and placed under the bottom layer of expanded polythurene insulation in the ground deck to establish a suction layer. This method counteracts the building's radon vacuum cleaner effect and effectively and safely draws radon out of the building.

Company: BEWI

Product: Building Jackson Radon Board

Material: Expanded polythurene (EPS)



The grey blocks contain graphite, increasing the insulation capacity by approximately 20% compared to a similar block in white expanded polythurene.

Complete building blocks

The all-in-one building blocks are stacked and filled with reinforcement and concrete in the core. After casting, the wall is finished with 2-sided insulation without thermal bridges. The simple installation and low weight makes it easy to work with the building blocks. The building system provides great insulation and conditions for energy-efficient construction.

Companies: Jackon, BEWI
Product: Thermomur 350 Super



A villa, located on a narrow hillside in Snekkersten, Denmark, with large clear spans and panoramic windows that would not have been properly supported with traditional construction. Designed by Lars Gitz Architects.



Facade insulation

The facade cladding is a highly insulating system with effective external insulation that can replace internal insulation. The system consists of a rigid foam board mounted on a brick shell. The boards are cast in blocks, creating a hardened, closed-cell material that gives the material its high insulation properties. Insulating the house from the outside avoids thermal bridging, which can be a problem when using internal insulation.

Companies: Tinby, Briiso ApS

Product: Briiso

Materials: Polyurethan (PUR), polyisocyanurat (PIR)



Roof insulation

The contractor Envodek A/S applied the insulation solution to the roof of the ALDI grocery store in Hobro, Denmark.

The roof insulation product consists of the material expanded polythurene or extruded polystyrene combined with mineral wool from the same company. The insulation is easy to handle and install as the boards are large and lightweight. The roof insulation is cost-effective and ideal for steel structures or renovation projects.

Company: Sundolitt

Product: Building Sundolitt Kombitag

Materials: Expanded polythurene (EPS), extruded polystyrene (XPS), miniral wool



The element in use in the building process.

Insulated concrete walls

Sundolitt KUB is a single element consisting of formwork and insulation and has a concrete core that ensures effective load-bearing capacity. The slim construction also provides more m² of living space and is an ideal solution for low-energy buildings. It can be used in architecture with large openings in the facade and around building corners and large free spans in the interior.

Company: Sundolitt
Builder: Kenneth Daarbak
Product: Sundolitt KUB



Window edge foam

Window edge foam is an insulating foam used as insulation around windows and doors. The foam boards are an effective insulation material that is lightweight, easy to handle, and install. The low thermal conductivity of the materials means that a thin layer of insulation can reach high levels of energy efficiency, thus saving space.

Company: Tinby
Product: Foam sheets
Materials: Polyurethane (PUR), polyisocyanurate (PIR)

Green Urban Living

Imagine having access to green city spaces and urban community gardens where you can harvest and eat your own fruit and vegetables or buy them in your local supermarket. Modern apartment buildings have green rooftops and vertical gardens, using rainwater for irrigation. Discover examples of how plastic can take part in an eco-conscious urban lifestyle.



Beehive

Beehives made from expanded polythurene provide bees with a good indoor climate, regardless of whether it is cold or hot. The beehives are easy to handle as the material is extremely light and maintenance-free, they are stackable and have a lifespan of more than 30 years. Expanded polythurene does not absorb moisture and adheres tightly, avoiding attacks from wasps and other bee families.

Company: BEWI

Product: Behive

Material: Expanded polythurene (EPS)



Bees play a crucial role in urban environments by pollinating plants, ensuring the growth of fruits, vegetables, and flowers that beautify and sustain city ecosystems. Their presence also promotes biodiversity, enhancing the health, and resilience of urban green spaces.



Grass reinforcement panels

Grass reinforcement panels are used in driveways, walking paths, and busy grass areas to create a stable surface and counteract wear and tear, subsidence, potholes, and unevenness. The panels return rainwater to nature quickly and efficiently.

Company: Plastmo

Product: Grass reinforcement panels

Material: High density polyethylen (HDPE)





Photo: Alexander Aagaard

Ebb and flow irrigation system

The Ebb and flow irrigation system, also known as Flood and Drain, is the world's most recognized professional irrigation system and is now widely used in vertical farming. Water is pumped into the irrigation trays and supplied to the crops in the required amount. The plants are illuminated with the exact wavelength that provides the best growing conditions and taste.

Company: Staal & Plast A/S

Product: The Ebb and Flow irrigation tray type 330.3



Gutters for greenhouses

Greenhouse gutters are greenhouse systems for growing lettuce and herbs directly in the gutter. They are designed as channels that ensure stable irrigation and direct water through the gutter from start to finish. These gutters are essential to maintain proper drainage and prevent water damage to the greenhouse structure. The drainage system is a closed loop system where water is collected, cleaned, and reused.

Company: Primo



Surfboard

The Columbus surfboard is made from recycled expanded polythurene foam and bio-based epoxy resin. Epoxy boards are harder to break, thus last longer meaning you do not have to buy a new board as often helping to decrease landfill. The board has a higher tensile strength and better impact strength compared with standard polyurethane.

Company: Columbus

Product: EColumbus Board

Materials: Recycled expanded polythurene (EPS) foam, eco-friendly epoxy resin





Urban gardens

The project Garden to Connect repurposes plastic pipe waste to create urban gardens. The project aims to transform urban landscapes, conserve resources, and foster inclusivity. Traditional urban gardens often rely on materials like steel, cement, or terracotta. The reuse-approach saves resources, and the affordability and accessibility of the material makes it possible to establish the urban gardens anywhere – be it rooftops, courtyards, parks, or public spaces.

Project: Garden to Connect
Supported by: VinylPlus®
Material: Reused polyvinyl chloride (PVC) pipes



Garden to Connect was initiated in Aarhus, Denmark in 2015 and has since been expanded nationally and internationally. An example is the ongoing Garden to Connect project in Rwanda's capital, Kigali.



TreeTank root cell system.

Root cell system

The oxygen that trees produce contributes to better air quality and a more vibrant urban environment. With high temperatures in the summer, trees act as a form of natural air conditioning, helping to future-proof cities. The tree tank is a root cell system that optimizes root growth conditions under the city's paved surfaces.

Company: Wavin
Product: TreeTank®

TreeTank project
 in Hasselt.



Plastic Design

Can aesthetic and sustainable design go hand in hand with using plastic materials? Picture living in a home with beautiful and environmentally conscious decor and furniture. At the same time, they are made from plastic. They are durable, can last a lifetime and can be recycled at end-of-life. Explore examples of beautiful plastic design.



3D printed lighting

3D printed lighting has the potential of low environmental impacts as it allows the creation of shapes not possible with traditional production and with fewer components, no glue or other non-reversible methods. 3D printed parts in polycarbonate are light, and with at least 55% recycled or mass balanced bio-circular plastics in all printed parts.

Company: Signify
Material: Polycarbonate (PC)
Product: Philips MyCreation



Philips My Creation
Original Hanglamp and
Voila One Table lamp.



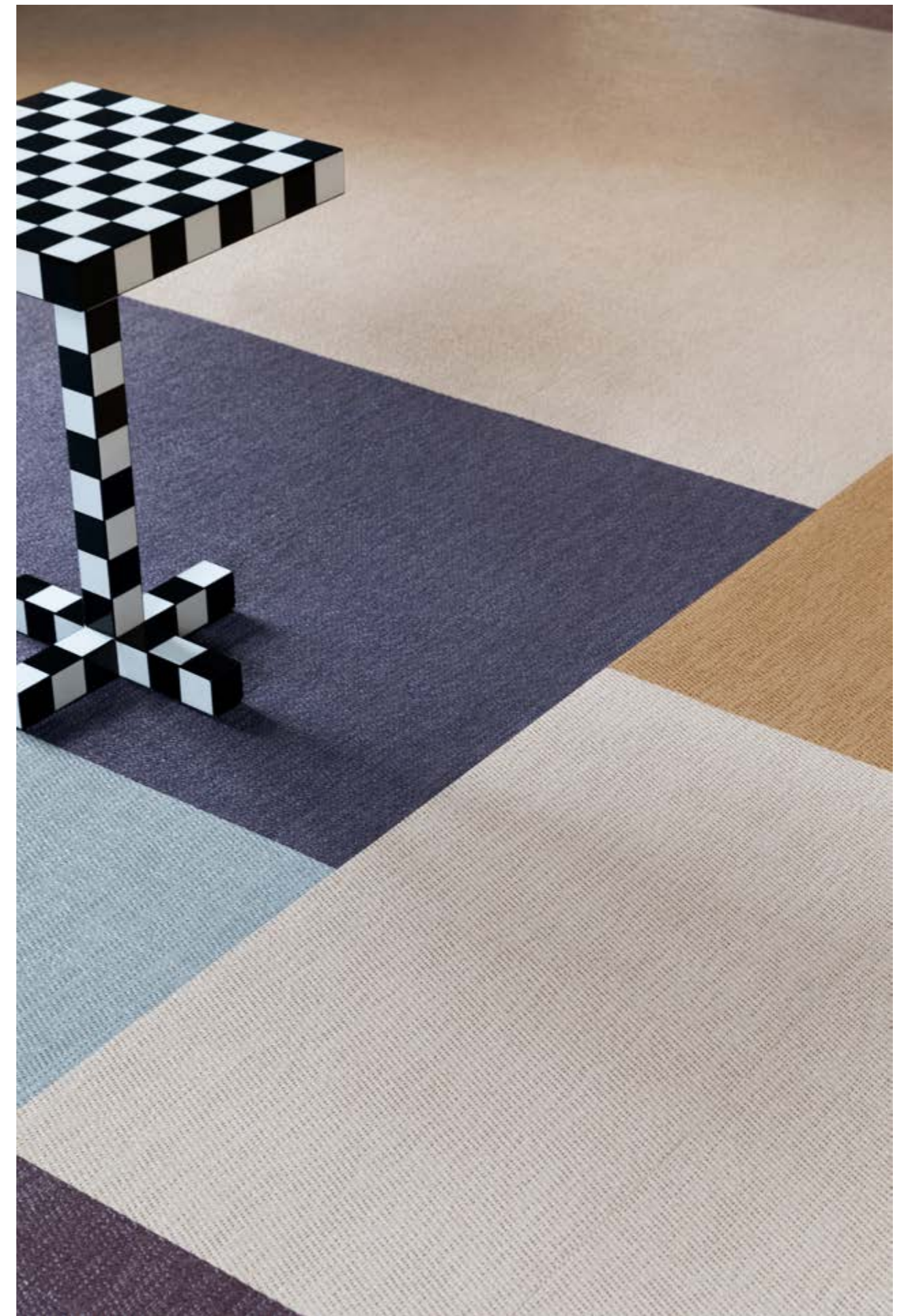
Hard flooring

Bolon is a Swedish design company specialized in innovative and sustainable flooring and rugs solutions for public spaces. With a strong commitment to sustainability, Bolon designs and manufactures all products in its facility using only renewable energy.

Company: Bolon

Products: Bolon Artisan, Bolon Botanic

Material: Polyvinyl chloride (PVC)





Reusable tiles

The tiles can be installed and changed without the help of a craftsman. The mounting plate is either glued or applied with double-sided tape on the desired surface, particularly suitable for an already existing tiled wall. Used tiles can be returned and used for the production of new tiles or recycled in another tile collection.

Company: Click'n Tile
Material: Acrylonitrile butadiene styrene (ABS)
Product: Click'n Tile



Click'n Tiles can be installed and changed easily.



Lapee at Copenhagen Half Marathon, Denmark, 2019.

Photo: Liv Wardlaw

Female urinal

Lapee is designed to secure women and people peeing squatting a safe stay and better experience at large outdoor gatherings such as festivals and sporting events. The female urinal is designed and produced in Denmark, where it had its premiere at music festivals and sporting events in the summer 2019. Today, it is present in many countries in Europe and all the way to Australia.

Company: Lapee

Product: The Female Urinal

Idea: Gina Périer (FR) and Alexander Egebjerg (DK), two architects who graduated from the Royal Danish Academy in Copenhagen in Spring, 2017

“**Lapee** has given us the ability to provide our female guests with a **greater safety, dignity, and convenience.**”

- Henrik Bondo Nielsen, Head of Division – Roskilde Festival.



Lapee at Roskilde Festival 2019, Denmark.

Photo: Olivia Rohde



The group from SDU competed with the drone in the competition IMECHE UAS Challenge in 2019 and won the Danish Composite Award in 2020.

Drone

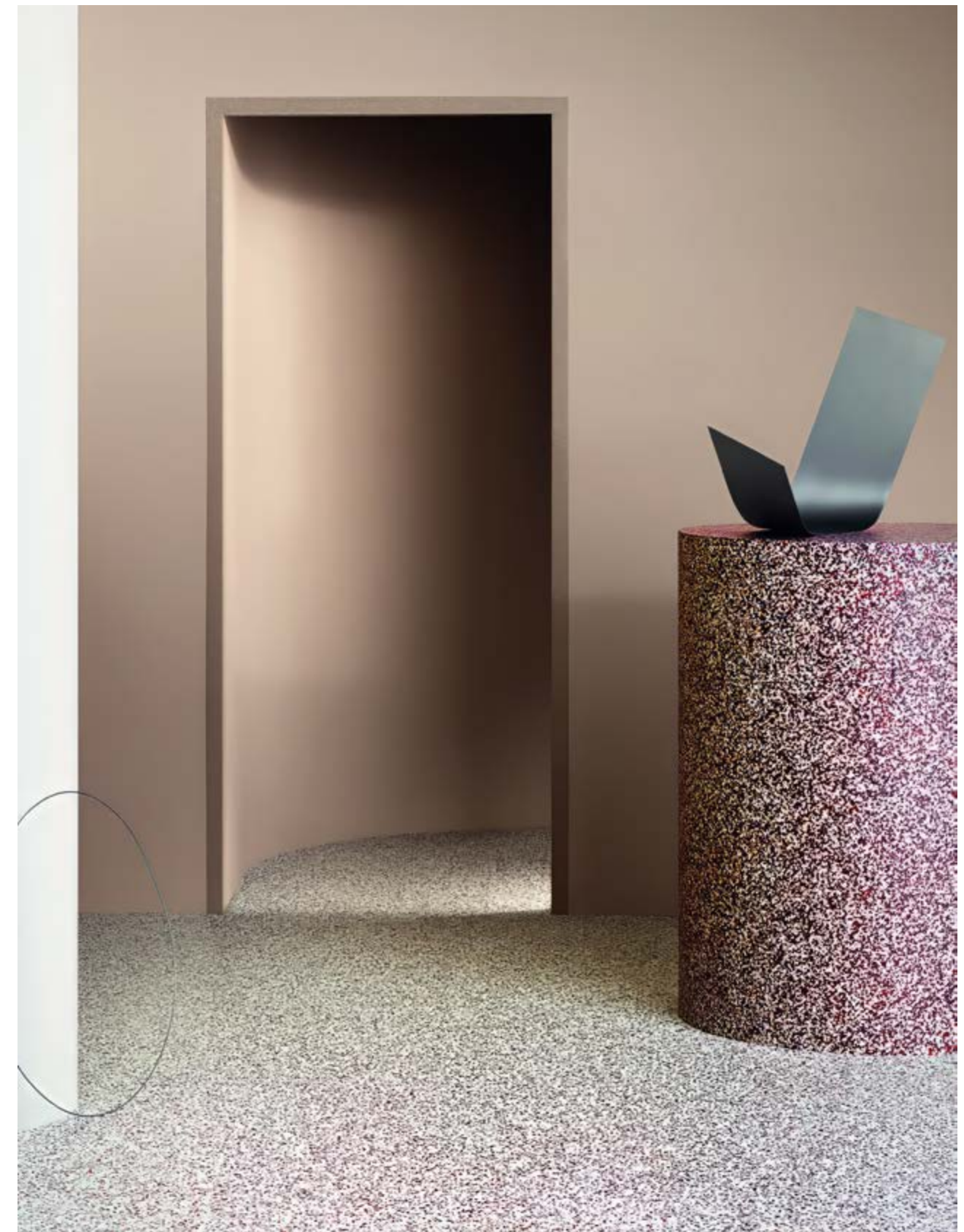
Innovative students from SDU have created a drone featuring a cutting-edge blended-box wing design, aimed at enhancing aircraft energy efficiency. Crafted from composite materials and powered by electricity, the drone is designed for transportation. Its ultimate vision is to transform the delivery of goods and potentially bring vital aid to remote areas in humanitarian missions.

University: University of Southern Denmark, SDU

Product: Blended box-wing drone

Material: Composites

The floors can be re-used in new vinyl floors using a new technique.



Flooring in vinyl

Ultra-resistant, homogeneous vinyl flooring containing more than 25% recycled material. Old floors are cleaned of glue and concrete slab, granulated, and used as raw materials in new vinyl floors. The floor can be used on different surfaces like walls, furniture, and is certified for use in bathrooms.

Company: Tarkett

Materials: Polyethylene (PE), polypropylene (PP)

Product : iQ Surface



Parts in carbon fibre on the bike include bike frame, front fork, wheelset, handlebar, and seat post.

Carbon bike

Composite materials, like carbon fibre, are favored for bike frames due to their combination of lightness and strength. Carbon bike frames can be tailored for optimal performance, balancing rigidity, and flexibility. Composites absorb road vibrations, and allows for different innovative, aerodynamic designs.

Company: Pronghorn
Product: Pronghorn Road-X
 Gravel Full Carbon Edition
Bike weight: 8.1 kg
Material: Carbon fibre



The toys are made of bio-based plastics by using left-over material from sugarcane production.

Toys

The garage with cars is made of bio-based plastics manufactured from the residuals of sugarcane production. The tiny amount of sugar still left in the core of the sugarcane is extracted and turned into ethanol and ultimately plastic granules, that can be used in the production of new toys for kids.

Company: Dantoy
Material: Bio-based polyethylene (PE)
Product: BIO garage



Plastic rug

The woven rug made of bio-sourced polyvinyl chloride crafted from wood-based tall oil. The crude oil is a byproduct of the pulp-making process used in paper production and is sourced from wood. Compared to conventionally produced polyvinyl chloride bio-sourced delivers a high reduction in carbon footprint.

Company: Pappelina
Material: BIOVYN™ – a bio-sourced polyvinyl chloride (PVC)
Product: Poppy



Rug woven in bio-sourced polyvinyl chloride.

Recycled Plastic

Picture a world where every piece of plastic is sorted for recycling and made into new products. Many innovative designs and solutions with recycled plastic are already available. By sticking to the principles of a circular economy — resource efficiency, durability, and recycling, we pave the way for a future with minimal waste. Discover some examples leading this resource-efficient transition.



Recycled composites turned into interior design.

Table-plates

When a wind turbine has provided energy for its entire lifecycle, one significant challenge remains. It is the complex task to take care of the waste from the manufacturing process of composites as well as the end of life of the wind blade. The company MM Composite has found a way to reuse composite materials used in wind turbine blades to create furniture. The project started with in-house experimenting with fibreglass and left-over material from wind industry production.

Company: MM Composite – a part of SP Group

Material: Fibreglass



Construction board

The board is made from recycled plastic, which is produced using molding technology, where the process of plasticizing the raw material into a properly prepared shape takes place. The product is an ideal replacement for plywood and other building materials. EKOpoly's boards are used in the furniture industry, construction, agriculture, and other production branches thanks to their adaptability.

Companies: Plastinvest Sp, GOP Danmark

Product: EKOpoly

Surfaces: Standard, non-slip



Rosendahl's products are made of recycled household waste plastics.

Bird feeder and flower pot

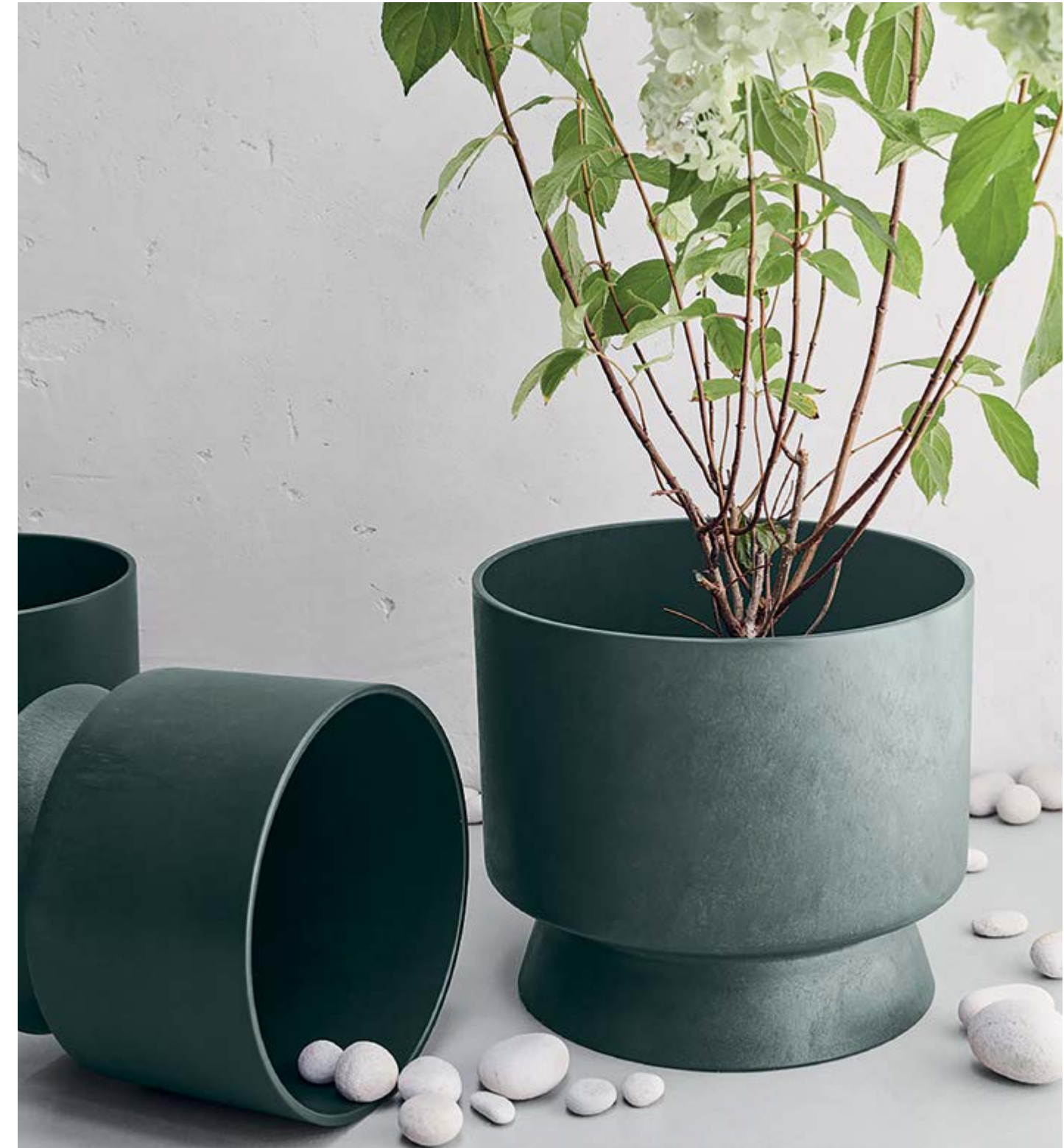
These bird feeders and flower pots are designed by Danish designer Signe Wenneberg, as part of an effort to develop more responsibly produced products and reduce carbon footprint. The products are from recycled plastics collected from households in the Danish town Randers and processed by Dansk Affaldsminimering.

Company: Rosendahl Design Group

Collaboration: SP Moulding

Products: Recycled Birds Feeding station hanging, Recycled Birds Feeding ball, Recycled Flowerpot

Designer: Signe Wenneberg





Chair

R.U.M. is short for ReUsed Materials. The chair is made of plastic from either electronic waste or fishing nets or a mix of fishing nets and plastic beer kegs. All materials can be recycled 100% for new furniture.

Companies: Wehlers, C. F. Møller, LETBEK

Materials: Polyethylene (PE), Polypropylene (PP)

Product: R.U.M.



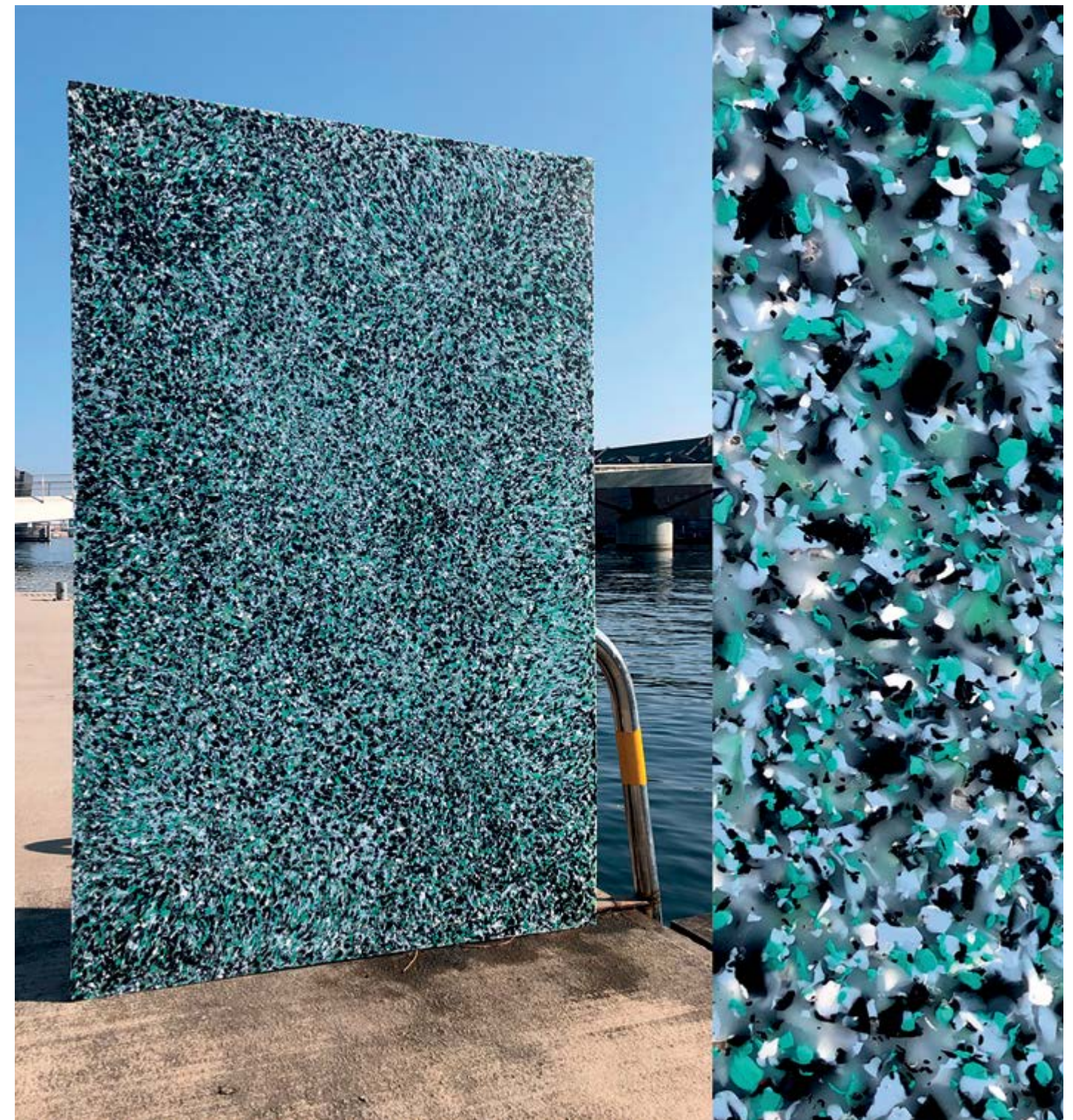
The R.U.M. chair is made up of fishing nets taken from Scandinavian seas and harbours.



Furniture

The furniture is made from recycled plastic waste, which can be repurposed several times. All products are locally produced, ensuring the entire value chain stays within Denmark. Each piece is uniquely crafted solely from plastic waste. Additionally, SMALL Revolution is well-informed about the origin, type, chemical composition, and capacity of the plastic waste utilized in the furniture.

Company: SMALL Revolution
Products: Stools, podiums, tables.
Designed and produced in Denmark
Material: Recycled Plastic



Panels

The panels are developed through a technology that ensures a product with good quality, pattern control, and 100% sorted and locally sourced recycled plastic. Plastic panels are a versatile product with endless possibilities when it comes to construction, design, and product development.

Company: Plastic Projects
Product: Recycled Plastic Panels



Shopping bag

Hinza is a Swedish classic from 1957. The production of the bag was discontinued in the mid 60s and restarted in 2006. This version of the bag is made of recycled plastics and the handles from bio-based plastics. The Danish company Carmo supplies Hinza with high quality surplus plastic material from its productions of components for the medical device industry.

Companies: Hinza AB, Carmo

Materials: Polyethylene (PE), polypropylene (PP)

Product: Hinza Bag



Swedish design from the 1950s
– now in recycled materials.



Jewelry in beads

After a storm, the coastline in Thy, on the Westcoast of Denmark, is filled with plastic waste. The amber washes up together with the plastic, and like a time capsule it contracts with the waste. Aeriel is a unique jewelry in beads assembled and handmade in Thy, Denmark.

Company: STRANDET

Designer: Sóley Ragnarsdóttir

Materials: Recycled plastic, amber

Product: Aeriel



Bead necklace made from plastic waste in Thy.



Noise barrier

The noise barrier is made from recycled plastic from households, which takes on a new function. It now serves as an exterior structure designed to protect inhabitants from noise pollution. Noise barriers are the most effective method of mitigating roadway, railway, and industrial noise sources.

Company: Gibo Plast

Collaboration: SP Group

Material: Recycled household waste



Flowerpot

A flowerpot and a pouf made from 50% worn-out fishing nets. The Scoop Ocean has received the PRIZE DESIGNS Award first given in 1949 by the Museum of Modern Art (MoMA) "to encourage the best of contemporary design by exhibiting the most notable examples in the furniture industry".
Quote: Global Design News.

Company: Manga Street ApS

Designer: Julie Storm

Product: Scoop Ocean

Hidden Infrastructure

The seamless delivery of heat, water, and electricity to our homes is orchestrated by an intricate, perhaps overlooked system. These essential resources travel from building to building, connecting entire neighborhoods, facilitating our everyday needs. Find examples of how plastic plays an essential role in creating a reliable infrastructure for water, heat, and electricity.



Hidden infrastructure

100

Radiator thermostat

Danfoss invented the radiator thermostat more than 80 years ago and today, more than 40 million homes are heated with this technology. The radiator thermostat optimizes the heating and saves energy without compromising on comfort. With the thermostat a preferred temperature can be set, even down to individual rooms.

Company: Danfoss



Radiator thermostat

101

More than 40 million homes are heated with radiator thermostats.



Ground sewer pipe

The ground sewer pipes are made from bio-attributed polyvinyl chloride made from forest-industry waste. The pipes are recyclable and will be used for soil and waste, wastewater, and rainwater drainage. They are durable with a lifespan of more than 100 years.

Company: Pipelife Sverige AB

Product: Ground sewer pipe

Material: Polyvinyl chloride (PVC)





Recycled polyurethane foam can minimize heat loss in hot water installations.

Hot water insulation

Underfloor heating offers an efficient and convenient way to heat indoor spaces. However, uninsulated components can lead to significant energy losses. Recycled polyurethane foam products provide thermal insulation performance, minimizing heat loss, and maximizing energy efficiency.

Company: Dan-iso A/S
Material: Polyurethane (PUR)



Expanded polypropylene (EPP) can be used for transportation and insulation.

Products for Heating Ventilation and Air Conditioning systems

Expanded polypropylene is well used by the HVAC industry. The material can serve as protective packaging during transport and afterwards serve as an insulating cover in which you can mount wires, cabinets, and even install circuit boards. It has high insulation value, high durability, and impact strength, corrosion resistance, light weight, and can be produced in 30% recycled material. The material does not degenerate and is optimal for reuse and afterwards recycling.

Company: BEWI
Material: Expanded polypropylene (EPP)

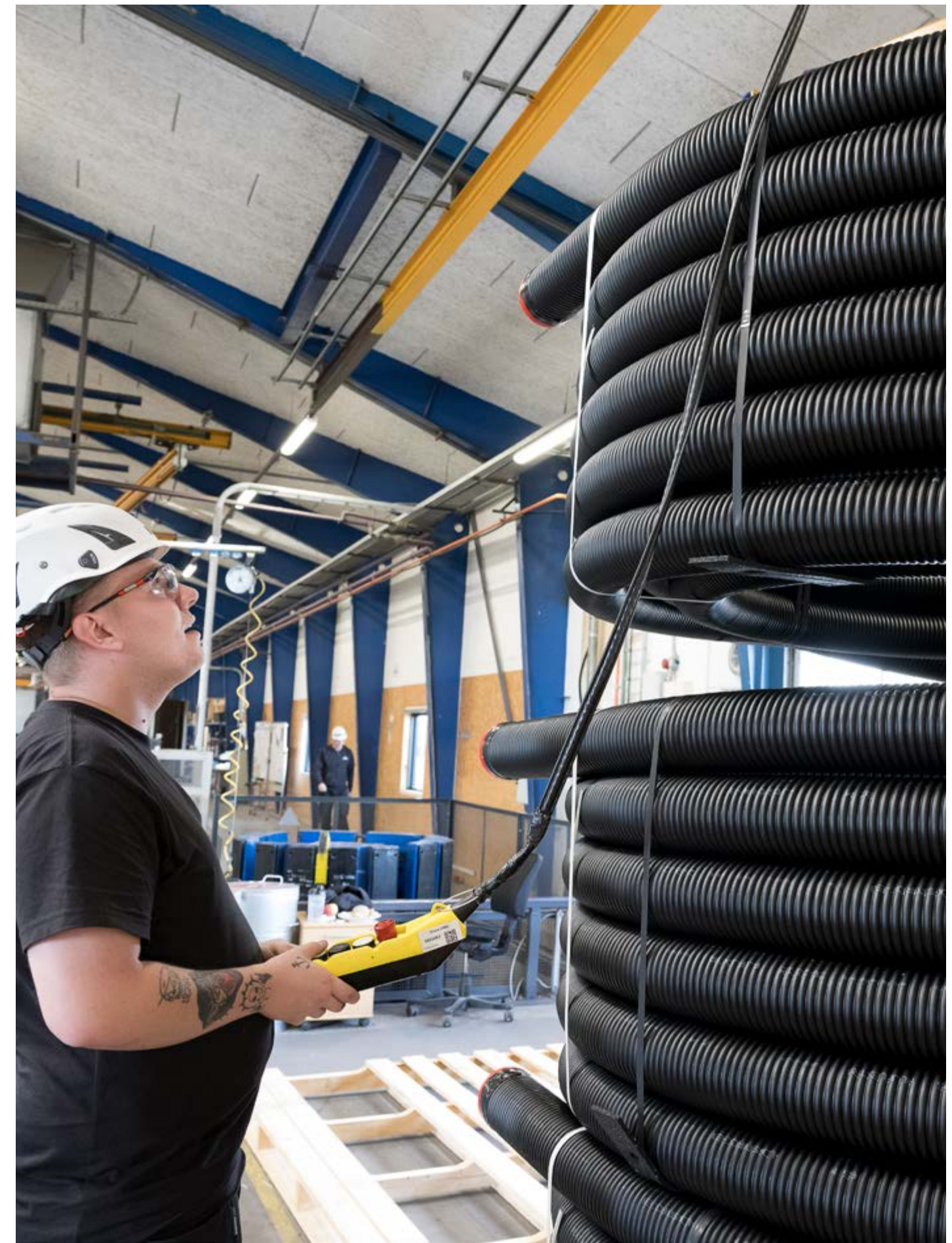


District heating pipes

The pipes are energy-efficient, pre-insulated, and flexible, making them easy to work with. In Denmark, they are primarily used by district heating utilities as a service pipe between the district heating network and homes. The pipes are produced with minimal greenhouse gas emissions and retain their high insulation performance for their expected lifetime of more than 50 years.

Company: Kingspan LOGSTOR

Products: LOGSTOR FlextraPipe, LOGSTOR Alu-Flextra





As part of the electrification, Elektro Isola has developed the composite material G-Etronax EP 311 HC for safety in electrical applications.

Electrotechnical material

The material is used as an insulator for electrical components. Along with its electrical insulating and electrotechnical properties, the composite material is extremely strong, allowing it to withstand significant mechanical loads. It complies with stringent mechanical requirements, making it a solution for the further development of components in green energy applications.

Company: Elektro Isola
Product: G-Etronax EP 311 HC
Material: Composite



Insulation caps

The insulation caps for valves and fittings are made of polyurethane with a high insulating capacity. The caps reduce heat loss and significantly improve heat economy while improving internal working conditions in the rooms where they are used. Insulation caps are an effective and flexible solution because they fit almost all types of valves and fittings.

Company: Tinby
Product: Topo Insulation Caps
Material: Polyurethane (PUR)



Wastewater pipes

New wastewater pipes are usually made entirely from virgin polyvinyl chloride plastic. However, it is now possible to produce pipes with 70% recycled polyvinyl chloride without compromising on Nordic quality requirements. The high proportion of recycled plastic results in greater CO₂ savings compared to conventional pipes.

Collaboration: Klimatorium –
The International Climate Centre of
Denmark, Lemvig Vand, Wavin, WUPPI

Product: PVC pipes
Material: Recycled polyvinyl chloride (PVC)



Power switch LK FUGA made of 85% recycled material.

Switches and sockets

Switches and socket outlets produced in recycled plastic. LK FUGA is a Danish design classic, designed in 1981 by Jørgen Juhl. Today, sockets for LK FUGA are made of 85% recycled material.

Companies: Lauritz Knudsen, Schneider Electric

Materials: Polypropylene (PP), acrylonitrile butadiene styrene (ABS), polycarbonate (PC), styrene ethylene propylene styrenes (SEPS)

Product: LK FUGA

Designer: Jørgen Juhl



Valves

Polyoxymethylene is often used in the manufacturing of valves, especially in applications such as in plumbing, water supply systems, and various industrial settings.

Polyoxymethylene valves are a central part of the network of pipes and valves that provide us all with clean drinking water. Polyoxymethylene is a type of engineering plastic known for its low friction, high stiffness, and resistance to wear and chemicals. AVK Plast's polyoxymethylene connection valves are manufactured in Denmark. The valves have a fully welded design and a drinking water-approved rubber gasket, ensuring a long lifespan, and a leak-tight valve.

Company: AVK Plast

Product: Series 16 AVK POM valve

Material: Polyoxymethylene (POM)



Protection for offshore power cables

Shaped fillers for power cables provide protection of electrical conductors and fibre optic cables. The use of shaped fillers is one of the critical elements to improve the stability and rigidity of the cable structure. It helps maintain the cable's shape and prevents deformation or collapse under external pressure, ensuring consistent performance over the cable's lifespan.

Company: Primo

Product: DEH & Power cables AC System

Material: Composite



Climate Solutions

Facing intensified weather and rising water levels, climate adaptation is vital. The shift to clean energy, as seen in Denmark, charts a sustainable path. Plastics are central, from climate-resilient infrastructures to advancing green energy. This theme explores the intersection of climate adaptation and renewable energy, highlighting plastic's pivotal role.



Coastal protection with minimal material consumption and space for flora and fauna.
Sources: Heijmans & BASF

Coastal protection

Coastal protection for stabilizing riverbanks with an open-pored and energy-absorbing top layer that prevents wave impact energy from attacking and destroying the surface, creating a higher standard of safety. The fuse also acts as a submerged breakwater, which has proven to be ideal for marine plant restoration.

Company: Enviatic A/S
Product: EnviaCoast™
Material: Polyethylene (PE)

Space for flora and fauna and a good habitat for shellfish at the start of the food chain.
Source: Heijmans





HexaLine with microgrip grating environment.

Drainage systems

To avoid damage caused by sudden changes in weather, it is important to build wisely around the house. Drainage channels keep driveways, paths, terraces, and facade areas free from rain and dirty water, and protect the structure of the building.

Company: Plastmo
Product: HexaLine

HexaLine with top drain.



HexaLine with microgrip grating.



Gutters

Gutters protect the building structure from rain and help it last longer. The gutter is popular because the plastic material is easy to work with, easy to handle, and can withstand low temperatures, salty air, and air pollution. Plastic does not corrode or rust and does not react with other materials. Therefore, the gutters can be used for all roof structures.

Company: Plastmo
Product: Plastmo Plastic Gutters.
Designed and produced in Denmark
Material: Polyvinyl chloride (PVC)





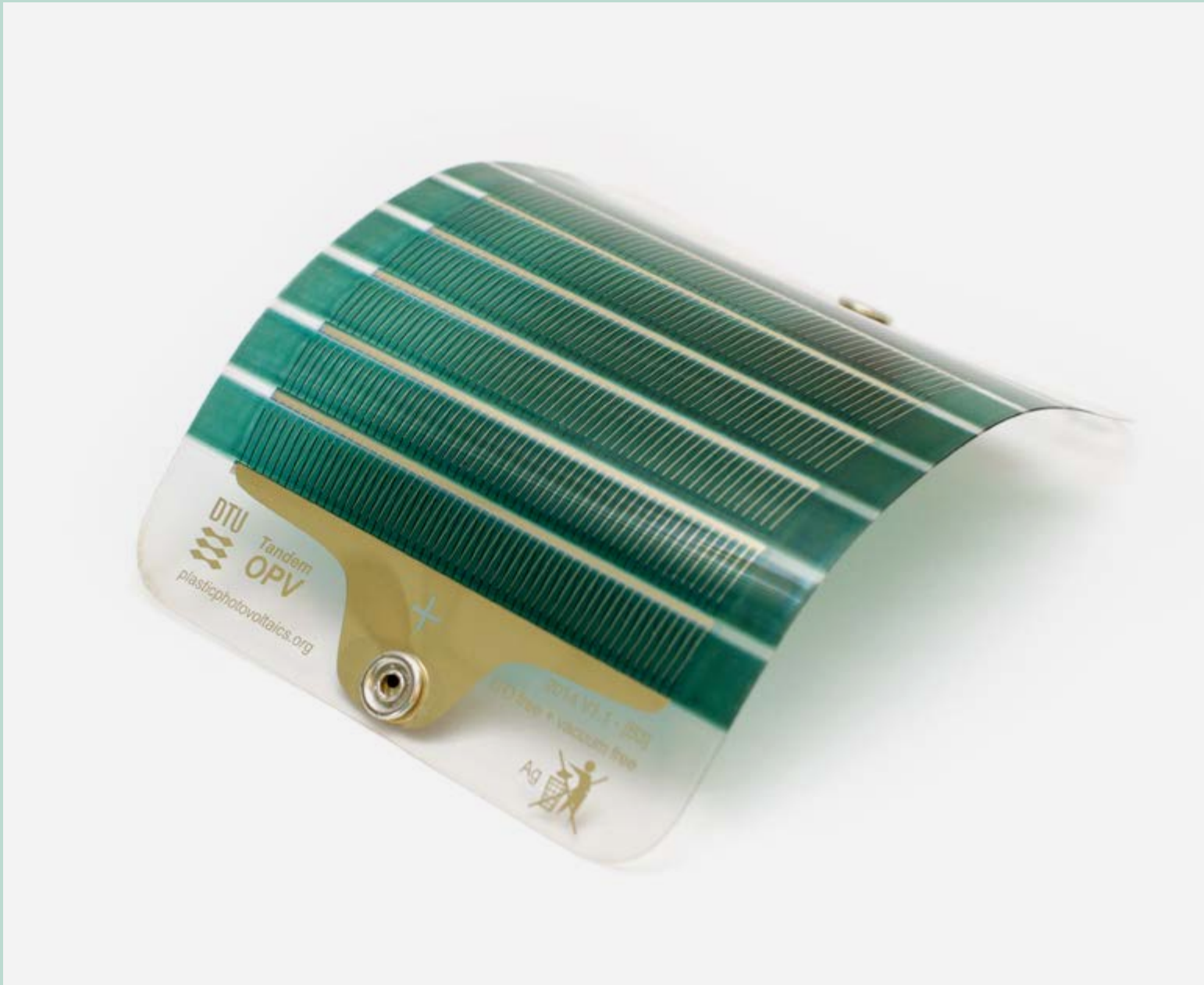
Plinth gutter

The plinth gutter is produced in high-impact, black recycled plastic with full traceability, which is a robust solution that is easy to customize. The product can withstand heavy downpours with a volume of up to 10 liters of water per metre.

Company: Milford
Collaboration: LETBEK A/S
Product: Canyon 3.0™



The Plinth gutter can contain a volume of up to 10 liters of water per metre.



Solar cell

Plastic solar cells have the potential for lowering the manufacturing cost by several orders of magnitude compared to the conventional silicon solar cells. This is because the processing can be done entirely from solution, without requiring high-vacuum or high-temperature steps.

University: Technical University of Denmark, DTU Energy



Solar cells at Roskilde Festival.



Rainwater cassettes

The development of an integrated infrastructure for managing and collecting rainwater ensures resilience to the challenges posed by climate change in terms of heavy and intense rainfall. A circular approach to water in urban areas takes into account both the benefits of improving people's quality of life and the potential risks that large amounts of water can pose to the city.

Company: Wavin
Product: Q-Bic Plus



Vindeby blade profile.

Cross section of a wind turbine blade

Wind turbines harness wind energy to provide green power to millions of homes, with blades primarily made of fibreglass, resin, and plastic. When Vindeby Offshore Wind Farm retired its turbines, the Technical University of Denmark, DTU Wind, adopted the end-of-life blades for ongoing projects exploring fiber-reinforced composite structures.

1991 vs. today

Vindeby's 11 offshore turbines, with a 35-metre rotor diameter and 0.45-megawatt capacity each, powered 2,200 households. In contrast, 11 modern Ørsted turbines, each with rotors exceeding 200 meters and capacities of 11 megawatts, can serve around 150,000 households.

Company: Ørsted

University: Technical University of Denmark, DTU Wind

Material: Composites



In 1991, Ørsted pioneered the world's first offshore wind turbine installation in Vindeby, Denmark. This wind farm, consisting of 11 turbines, operated until 2017. Insights gained from Vindeby have since advanced the design and efficiency of offshore wind farms globally.

Clean Water

Lack of clean water access is a stark reality for many people worldwide. Water is a scarce resource requiring efforts in conservation and protection. This chapter highlights plastic's instrumental role in our clean water systems and showcases solutions that aid in water purification and distribution, ensuring clean water for communities globally.



Solar-powered water purification bag

The product is an effective solution for providing safe drinking water that reduces the risk of waterborne diseases. The plastic composition combines strength, high UV penetration, and longevity. The dark blue color increases the temperature to 45+ degrees faster than a light background, reducing the time it takes to decontaminate the water in the bag. The solution requires only four hours of sun exposure to provide safe drinking water and purifies up to four liters of water per use.

Company: 4Life Solutions

Collaboration: UNHCR, UNICEF, CRS, Caritas, Red Cross, World Vision

Product: SaWa Bag

Use: 500 applications



Offering the product to women and girls in rural communities can reduce the time they spend collecting water, thus promoting greater gender equality.



Personal water filter

The personal water filter, created in 2005, transforms dirty water into safe drinking water by removing bacteria and parasites. The original LifeStraw was designed as a portable water filter "straw". It filters a maximum of 4,000 litres of water, enough for one person for three years. The filter has been tested all over the globe to face the harshest conditions.

Company: LifeStraw by VESTERGAARD

Product: LifeStraw

Removes: 99.9% bacteria



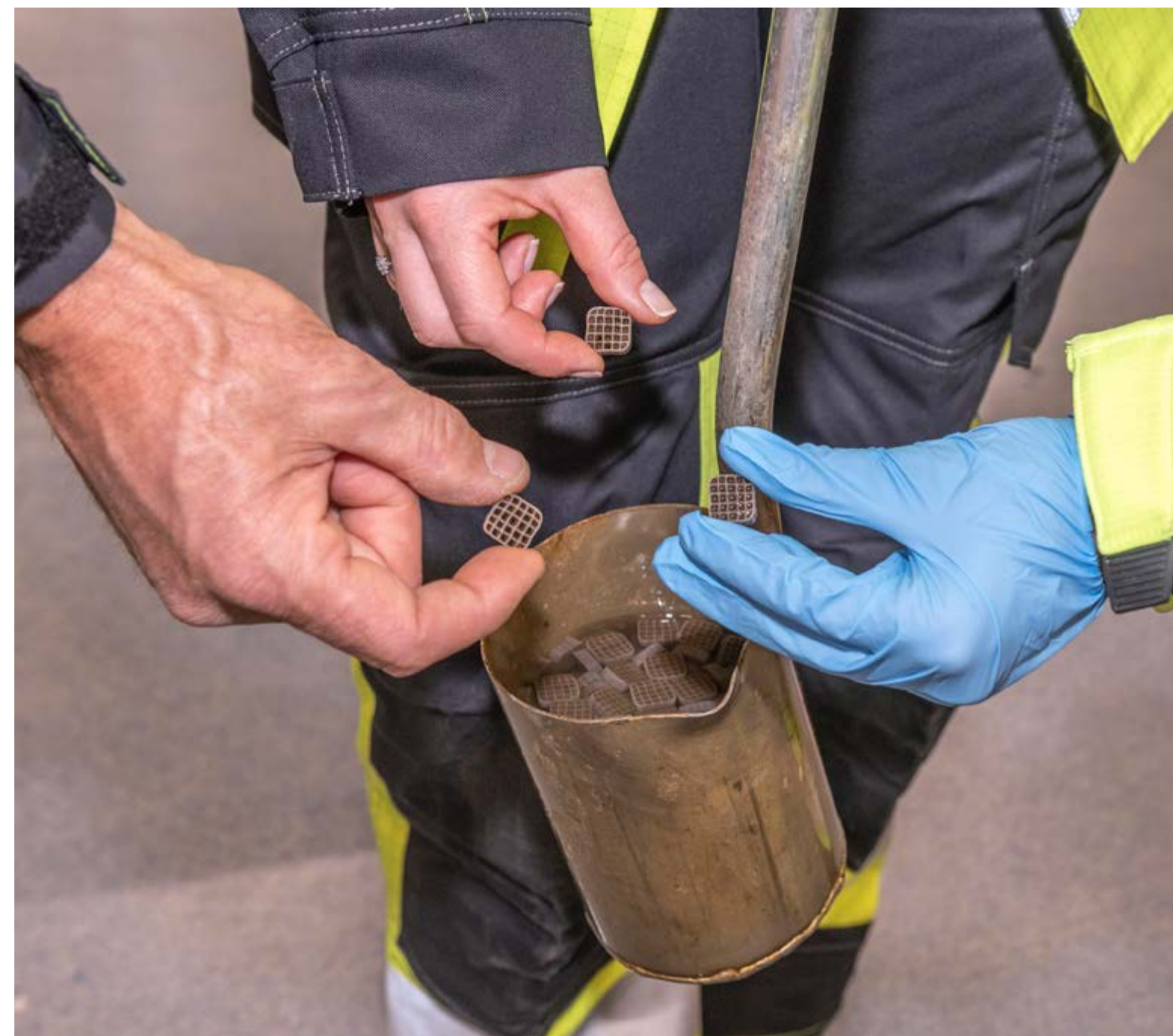
The water filter can be used to drink directly from a lake, a stream, or a puddle of water.



Biomedica

Biomedica are plastic chips designed to act as a substrate for the growth of microbiology. Microbiology is an important part of many wastewater treatment techniques. Biomedica is an integral part of certain wastewater treatment processes which, when designed by experts, can have a lifespan of more than 25 years, perhaps longer.

Company: Biowater Technology A/S
Products: BWTX, BWT15





Membranes for wastewater

Membrane bioreactor technology is a solution for treatment of municipal and industrial wastewater. The membranes provide an absolute barrier to bacteria, microplastics, and several other pollutants, and the treated water meets the requirements for water reuse or environmentally responsible discharge.

Company: Alfa Laval

Product: Alfa Laval LowResist MBR membrane

Material: Polyvinylidene fluoride (PVDF)



The chips are designed to remove organic pollutants from wastewater.

EcoChips for wastewater

The EcoChip™ is made from polyethylene post-industrial material and designed to remove organic pollutants from wastewater in the sectors of municipal sewage, industrial wastewaters, and aquaculture systems. It operates using a fixed-film bioreactor technology, similar to other biological wastewater treatment systems.

Company: MUTAG - a part of LYNDDAHL Group

Product: Mutag BioChip™, Mutag EcoChip™

Material: Polyethylene (PE)

Plastics in Healthcare

Plastics have reshaped modern healthcare. From drug delivery systems to protective gear and medical tools, the material has amplified safety and efficiency. While healthcare quality varies globally, everyone deserves optimal medical care. This chapter showcases examples of how plastic plays a crucial role and has an impact on healthcare quality worldwide.



Biopsy container

BiopSafe is a small container with formalin encapsulated in the lid. With a gentle press of the thumb, the formalin is released into a closed system that covers the biopsy. As a result, no healthcare workers are exposed to the contents in either liquid or vapor form. In the past, a major challenge in hospitals and clinics around the world has been how to fix the biopsy in formalin without exposing it to spills or vapors.

Companies: BiopSafe, SP Medical
Product: BiopSafe



Medical guide wire

The guide wire is a disposable product that is used inside the body during balloon dilation, catheter placement, or other diagnostic examinations. The product can be used for most procedures and most often in conjunction with another instrument. The materials are all medical grade and consist of stainless steel, a friction-reducing coating and a plastic dispenser, which also acts as protection for the product and serves an important function during examinations or surgeries.

Company: SP Medical
Products: Accoat, Poseidon



Plastic vials

Transparent, lightweight, and impact-resistant, plastic vials are a breakthrough in primary packaging solutions for the pharmaceutical and biotech industries. The vials are sterile and can be used directly in the filling line without the need for pre-washing, drying, and sterilization.

Company: MedicoPack A/S –
a part of SP Group

Product: ClearVial™

Material: Cyclic olefin copolymer (COC)





Prosthetic user wearing a shark prosthetic by the sea.

3D printed prosthesis

Scalable plastic prosthesis produced in 3D printing to streamline production time. Traditionally, a prosthesis is made by measuring, plaster casting, and then manufacturing carbon or molded prosthetic sleeves. The collaboration between Sahva and Damvig Prototal has made it possible to scan patients, model prostheses in a CAD program, and send the customized prostheses for 3D printing.

Company: Sahva
Collaboration: Prototal Damvig





Pharmaceutical packaging

Plastic packaging for the pharmaceutical and cosmetic industry. Products include containers with screw caps, snap-on lids and liner lids, as well as lids with and without desiccant, child-resistant lids and senior-friendly lids. They are used for tablets, capsules, and powder.

Company: Gerresheimer

Products: Duma®, Dudek™, Europe Seal, Triveni

Materials: High density polyethylen (HDPE),
low density polyethylen (LDPE),
polypropylene (PP)



The application of the Bug Bite Thing.

Insect bite relief

Bug Bite Thing® is a suction tool that removes insect saliva or venom from under the skin to help alleviate the itching, stinging, and swelling that occurs with bug bites and stings. When you remove the irritant, your body stops producing the reaction that is causing the uncomfortable symptoms. Unlike topical creams and ointments, the problem is eliminated, not masked.

Companies: Bug Bite Thing, SP Medical

Material: Polyethylene (PE)

Product: Bug Bite Thing



Hospital wall covering

Disposable non-infectious medical devices from hospitals are used as wall coverings for healthcare facilities. Vinyl wall covering is hygienic, dimensionally stable, and resistant to chemicals. Due to its durability and shock-absorbing properties, vinyl is ideal for walls that need to be protected from collisions with beds and other hospital equipment.

Project partners: VinylPlus®, Raff Plastics, Renewi, Vescom
Project: VinylPlus®Med
Material: Polyvinyl chloride (PVC)



Hearing aids

Hearing aids are designed to provide a natural listening experience for individuals with hearing loss, enabling them to engage fully in conversations and immerse in their surroundings. With features such as advanced noise reduction, wireless connectivity, and personalized sound settings, hearing aids aim to improve speech clarity and overall sound quality.

Company: Oticon
Products: Oticon Real™, Oticon Play™, Oticon Opn™ STM etc.

Oticon is a well-established Danish company in the hearing aid industry, renowned for its innovative approach to audiology technology and user-friendly designs.

Plastics in Architecture & Design

The Plastic Pavilion Case Collection

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Photo: Torben Eskerod

A journey through the world of plastic

In the summer of 2023 The Danish Plastics Federation set up an exhibition pavilion in the center of Copenhagen as part of the UIA World Congress of Architects 2023.

The Plastic Pavilion would showcase the wide range of products from the Danish plastic industry, each designed to play a crucial role in modern society, from architecture and design to healthcare and infrastructure.

This book is a celebration and a testament to the enduring impact of the Plastic Pavilion and plastics in architecture and design.

In a time with a pressing need to address environmental concerns, the timing of this book is ideal.

The reader can anticipate a comprehensive journey through the world of plastics. You will discover the innovative materials that shaped the pavilion, such as fibreglass and polycarbonate, as well as many other products from the pavilion exhibition.

The aim of the book is to inspire readers to a more responsible and conscious use of plastics and showcase how plastic can be a valuable material in our transition towards a climate and resource-efficient society.