

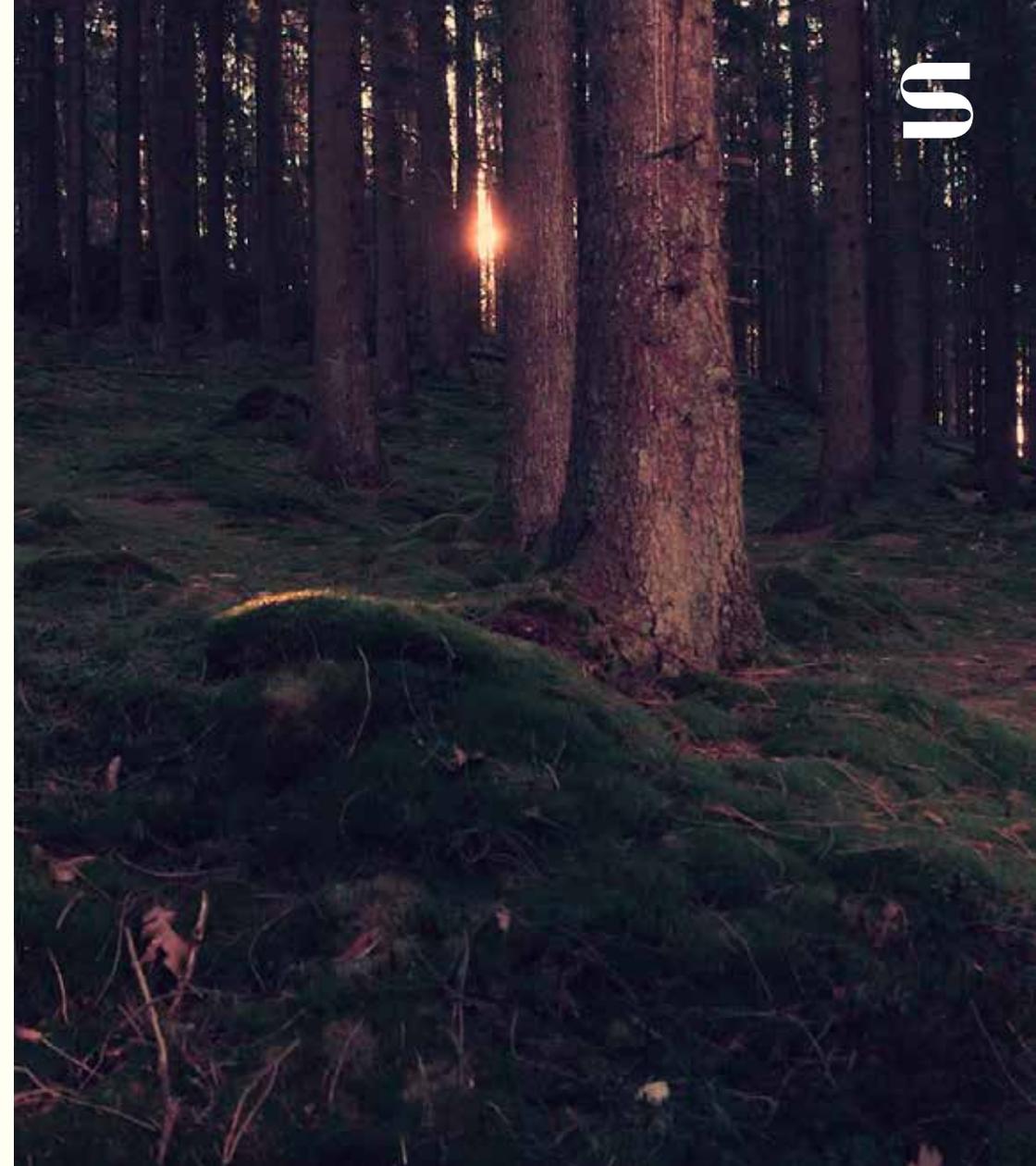


S PaperShell

”PaperShell aims to make components that are more environmentally friendly than press moulded veneer, weather resistant as plastic and strong as fibre composites.”

Summary

- 1)** Front runner in the cellulose fibre component developing field, in line with the green revolution in the global material industry.
- 2)** Underpinned by global megatrends of high and increasing demand of sustainable and circular material solutions for brand owners and large corporations.
- 3)** Unique environmental, technical, design and aesthetic properties with large scale availability.
- 4)** Ongoing co-development projects and high demand from customers in all target markets with famous brands in Sweden and abroad.
- 5)** Strong and diversified purpose driven team supported by founders and well known investors.
- 6)** Attractive financial profile with a high growth agenda going forward.



PaperShell is born



PaperShell AB was founded in 2021 but the idea behind PaperShell was born in 2018. We have the core belief that the solution to the climate crisis and a sustainable management of resources is found in nature. We are building paper back into a more resistant version of wood. We are slowing down the papercycle and paying tribute to the high tech found in forests by creating components that store bio carbon instead of wasting it on single use items or biofuels.

Our goal is to offer sustainable, high tech, long lasting and load bearing B2B components based on ingredients found in wood and plants. We are taking a pioneering role in the transformation towards a local and circular biobased society. PaperShell aims to replace fossil-based materials with bio carbon solutions without compromising on nature's balance or performance.

We are a diverse and purpose driven team cross breeding design, science and industrial technology. Inspired by nature's 3.8 billion years of bio intelligence we are creating high tech, artificially engineered wood components with the potential to replace bulk materials like moulded wood, plastics, fibre composites and even metals.

PaperShell is derived from and designed for a circular economy. To maximize our impact, we want to work with colleagues, suppliers, partners, and clients who share this ambition.

PapersShell is growing fast and organic. We work closely with scientists in Sweden and abroad with ongoing and deep collaboration with The Research Institute of Sweden (RISE). In Tibro, Sweden, we have our pilot plant where we have co-development projects and R&D with max capacity of 60 000 components per year. In 2023, we will launch our first highly automated and flexible factory with max capacity of 700 000 components per year. Our management team, board and investors have strong and, in many cases, well known industrial, entrepreneurial, engineering or design backgrounds. The team is diverse and committed to industrialise, scaling and creating value for our customers helping them reach our mutual sustainability goal.



PaperShell skateboard.



Features and benefits

Materials

Load bearing cellulose fibre composite that can replace wood veneer, plastic, fibre composites and in some cases, metal.

Design freedom

Double curvature potential, to replace expensive 3D veneer alternative and plastic replacement.

Strength and material efficiency

Strong and load bearing composite. Due to its strength PaperShell can replace components with less material making it material efficient.

Moist resistant

Hydrophobic, allowing for wet spaces and outdoor environments. Unique for natural fibre composites.

Look

Unique exclusive eco look and class A surface possibilities reducing need for surface treatment.

Sustainability

Renewable natural resource. Upcycled and Recyclable as well as Biodegradable over time. A material tailored for a bio based circular economy.

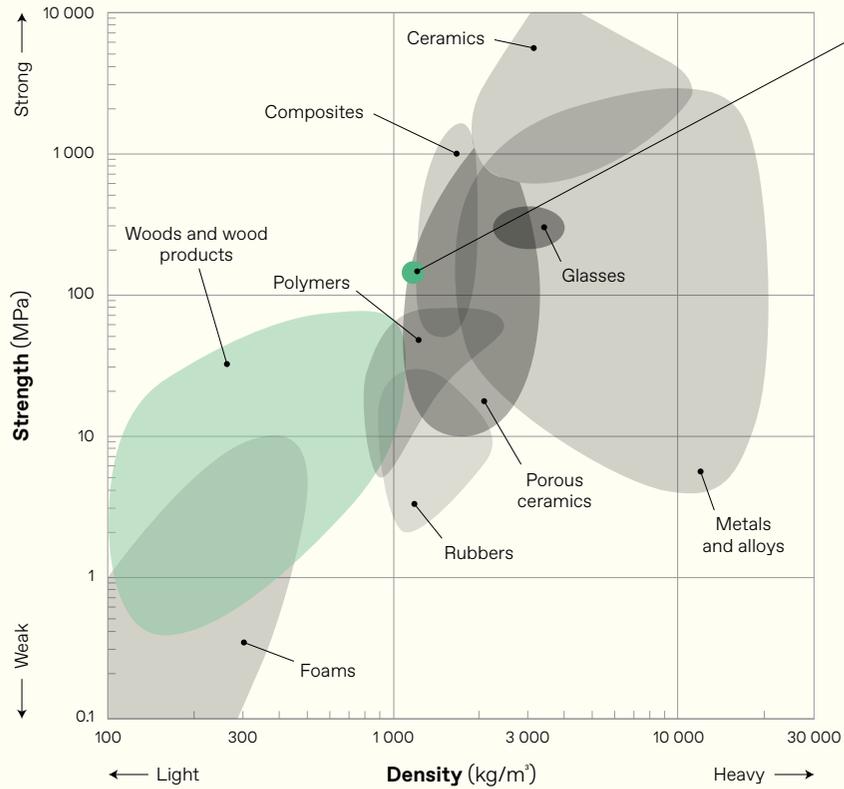
Automatization

Due to innovative material features, automation and flexible production is possible for large scale up.

Availability

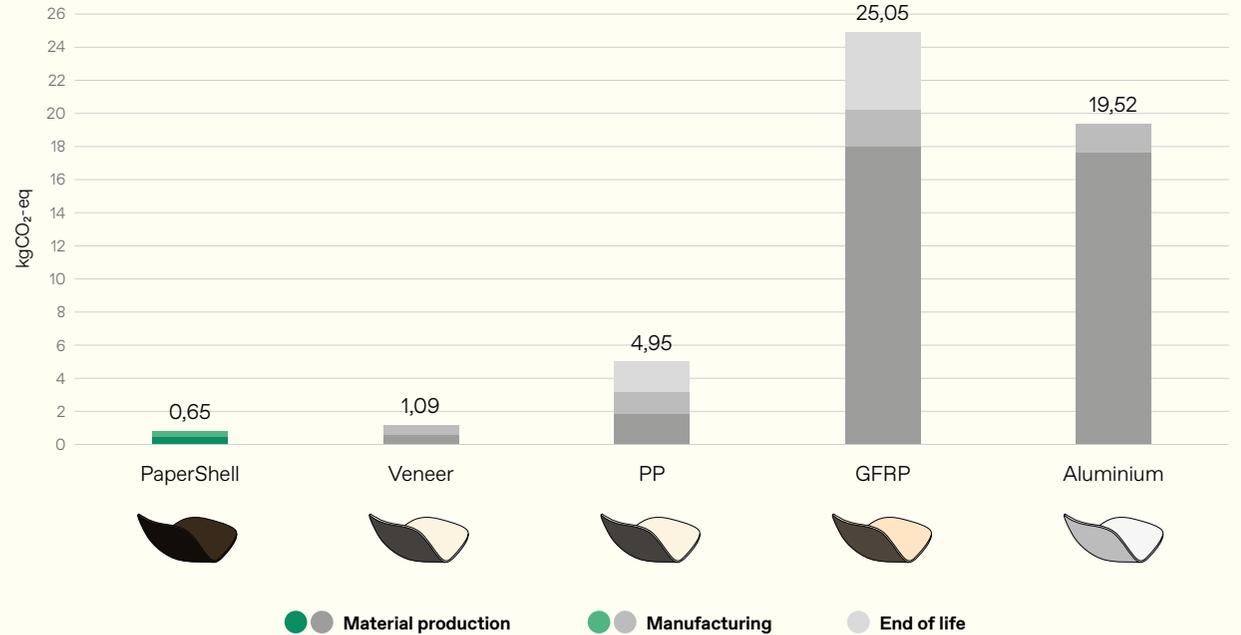
Large scale availability, pilot plant maximum capacity of 60 000 components per year, in Factory One of 700 000 components per year





PaperShell component

Life Cycle Analysis



Ceramics: chart shows compressive strength, tensile strength typically 10% of compressive. Other materials: strength in tension/compression.

A Mutual Challenge

Any business or organization taking sustainability seriously is working towards Agenda 2030 and the Paris Accord (COP 21). A circular economy has the potential to be instrumental to reach these sustainability goals. Most greenhouse gas emissions come from material extraction, resource management, and design choices. This is where 80% of the environmental impact is determined, and this is the starting point for PaperShell. PaperShell is working towards a bio based circular economy. The Ellen MacArthur Foundation defines the circular economy as an industrial economy that is restorative or regenerative by value and design. In their famous butterfly diagram there is a bio cycle on the left and a technical cycle on the right. PaperShell aims to combine the two. (See diagram on the right)

The Green Gold

At present, the forest industry and agro waste streams are the only viable bio-based solutions to achieve scalable and sustainable materials. Both are available in large amounts and managed correctly they have minimum impact on the environment. A perfect alternative to the fossil based linear economy. To achieve a bio based circular economy using these two valuable resources, they must be treated with uppermost care and understanding.

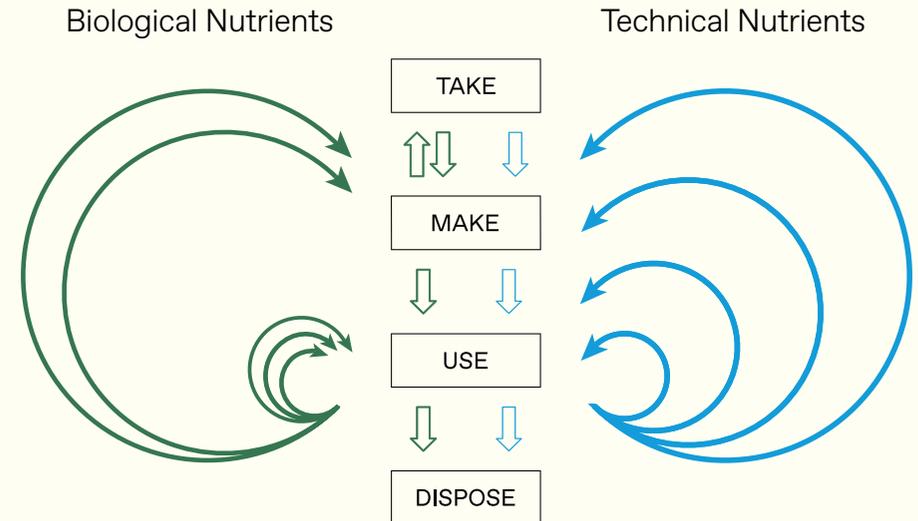
PaperShell Solutions

In PaperShell we want to do everything in our power to help restore our natural forests and hinder biodiversity loss. We continuously strive to work with nature instead of against it. We therefore need to work along value chains and with the right partners and clients to continuously become better. This journey will never end - it has just begun. We want to measure everything and to team up with the best. Initial LCA* shows that we are on the right track. Compared to a functional unit of a bulk plastic such as Polypropylene our impact is 1/7,5th and 2/3 of press moulded veneer. However, we can be even better - we can trim more. A key in the circular economy, is to have material efficiency for as long as possible, why functionality and aesthetics are of upmost importance. PaperShell is much stronger than wood and plastics, resembling more a fibre composite. It doesn't burn even though it has no hazardous flame retardants. It has half the strength of aluminium but half the weight, which implies that you can replace a 1 mm aluminium sheet with 2 mm sheet of PaperShell. Common problems with natural materials is that they absorb water. PaperShell hardly absorbs any water and is similar to the plastic Nylon (PA10) which compared to wood is extremely low. The material withstands UV and temperature cycling very well.

Most importantly PaperShell does not contain any fossil carbon. At the "End of Life" it releases carbon back into the atmosphere, but only the carbon that the tree or plant once sucked from the atmosphere. Thus, replacing any fossil based material with PaperShell will help reduce fossil CO2 emissions entering the atmosphere. So, let's keep this valuable bio-based carbon stored in beautiful and functional products for as long as we can.



We at PaperShell are mainly focusing on these SDGs*.

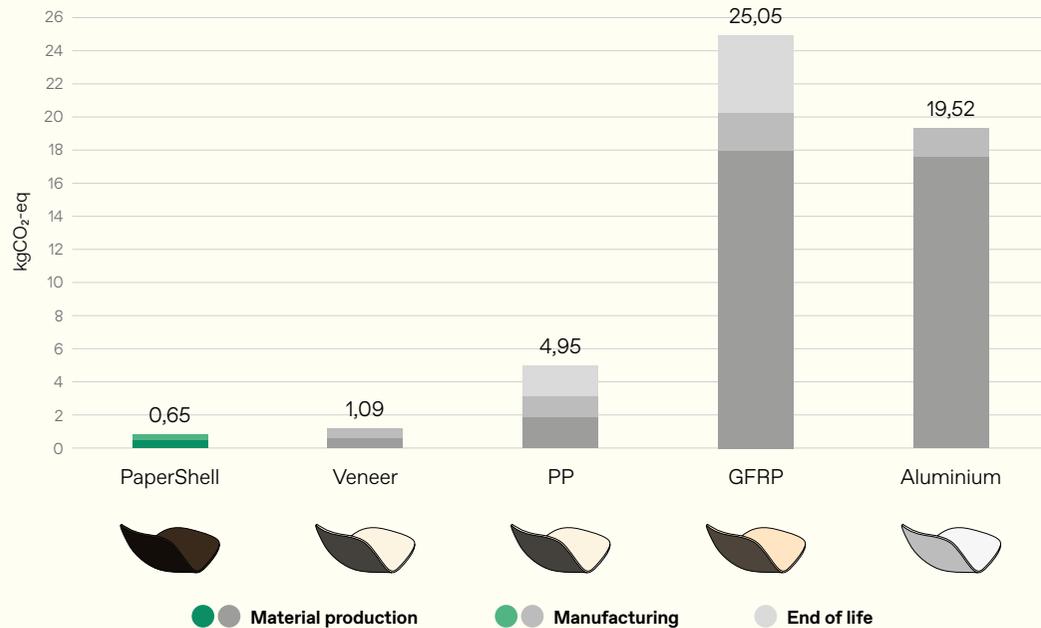


* Life cycle assessment or LCA (also known as life cycle analysis) is a methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service.

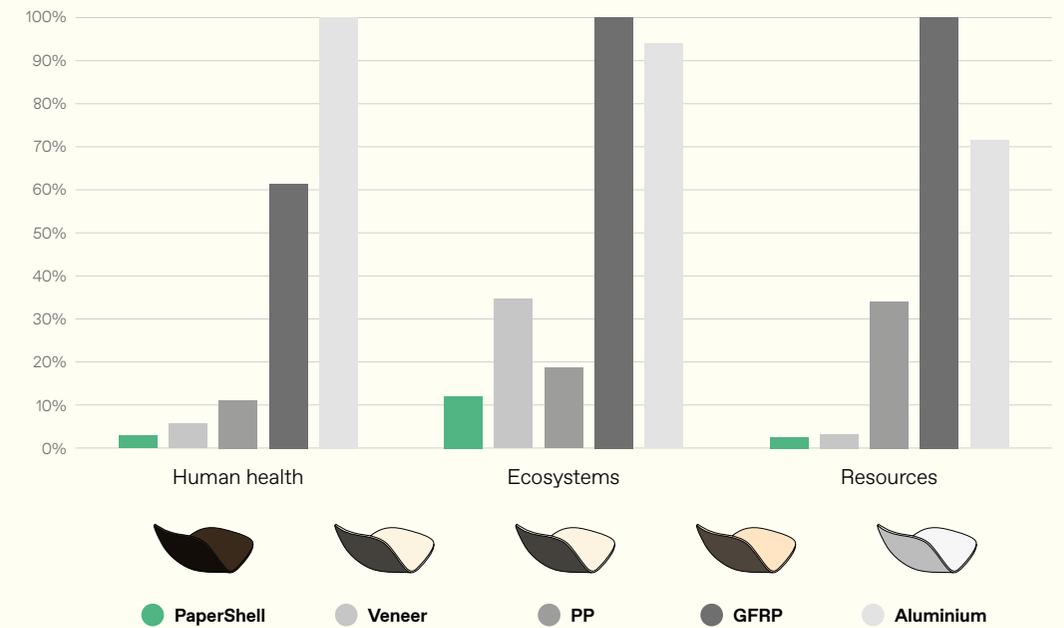
Climate impacts per functional unit



Life Cycle Analysis



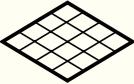
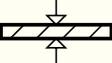
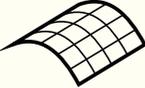
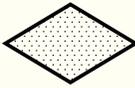
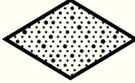
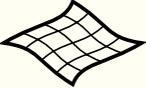
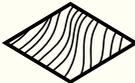
Endpoint impacts per functional unit (ReCiPe 2016)



Sources: LCA calculations made by third party environmental consultants using SimaPro. Full LCA report accessible for download on www.papershell.se.

©2022 PaperShell AB – All rights reserved. PaperShell AB and its subsidiaries ("PaperShell") believe that the technical data and other information provided herein was materially accurate as of the date this document was issued. PaperShell reserves the right to update, revise or modify such technical data and information at any time. Any performance values provided are considered representative but do not and should not constitute a substitute for your own testing of the suitability of our products for your particular purpose. PaperShell makes no warranty or representation, express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, and disclaims any liability arising out of or related to, the use of or reliance upon any of the technical data or information contained in this document. The buyer is solely responsible for the application, utilization and processing of the product, and must observe the laws and government regulations and the consequential rights of third parties.

How it works and what components we can do

Shapes	In mould surfaces	Material
 Flat	 Gloss - satin finish	 Various thicknesses Same thickness over entire detail
 Single curved	 Matte finish	Pressing tool
 Double curved / sphere	 Rough surface	
 Complex	 Pattern	
 With holes	 Pictures / Text	



Technical Data Sheet



PaperShell properties



Fire resistant
STD 104-0001 / ISO 3795



UV Resistant
STD 423-0061



Scratch Resistant
STD 423-0030



Heat Aging
2000h Volvo STD 423-0055,
15% decrease



Climate Cycling
0,22% moisture absorpt. 400h - 6h
85°C, 21h 38°C 95% RH, 5h-30°C



Moisture Aging
6% moisture absorption
1008h - 38°C 95% RH



No VOX
Volvo - STD 429 - 0003



Impact Resistant
EN 13087, Rum Temp,
11 Joule, -22°C, 11 Joule

Physical properties

Density	1,34	g/cm ³	ISO 1183
Tg	145	°C	ISO 11358
Charpy	8,6	kJ/m ²	ISO 179

Mechanical Properties

Tensile Modulus - 0°	18	GPa	ASTM D3039M
Tensile Stress at Break - 0°	150	MPa	ASTM D3039M
Tensile Strain at Break - 0°	1	%	ASTM D3039M
Tensile Modulus - 90°	10	GPa	ASTM D3039M
Tensile Stress at Break - 90°	90	MPa	ASTM D3039M
Tensile Strain at Break - 90°	1	%	ASTM D3039M
Flexural Stiffness - 0°	16,8	GPa	ASTM D7264
Flexural Failure Stress - 0°	156	MPa	ASTM D7264
Flexural Failure Strain - 0°	1	%	ASTM D7264
Compression Stiffness - 0°	17,9	GPa	ASTM D6641
Compression Failure Stress - 0°	154	MPa	ASTM D6641
Compression Failure Strain - 0°	>4	%	ASTM D6641
Compression Stiffness - 90°	10,3	GPa	ASTM D6641
Compression Failure Stress - 90°	146	MPa	ASTM D6641
Compression Failure Strain - 90°	>4	%	ASTM D6641

©2022 PaperShell AB – All rights reserved. PaperShell AB and its subsidiaries (“PaperShell”) believe that the technical data and other information provided herein was materially accurate as of the date this document was issued. PaperShell reserves the right to update, revise or modify such technical data and information at any time. Any performance values provided are considered representative but do not and should not constitute a substitute for your own testing of the suitability of our products for your particular purpose. PaperShell makes no warranty or representation, express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, and disclaims any liability arising out of or related to, the use of or reliance upon any of the technical data or information contained in this document. The buyer is solely responsible for the application, utilization and processing of the product, and must observe the laws and government regulations and the consequential rights of third parties.



Dark Tech Coffee



Gold Stained Fade



Light Ghost Leather



Satin Coarse Polish



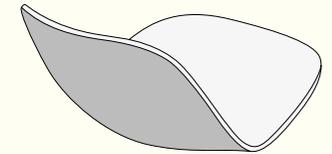
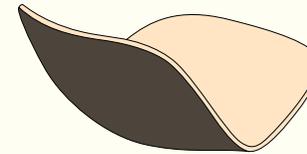
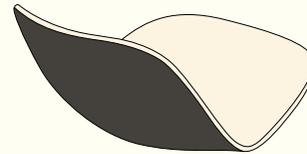
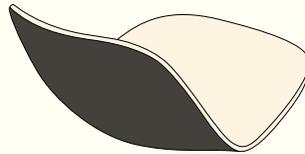
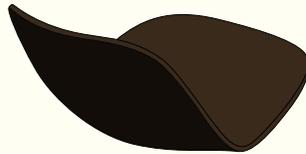
Waste Dream Camo



Wood Tiger Art

Material comparison

Reference case; Chair seat component



PaperShell

Veneer

Polypropylene

Glass fibre reinforced polymer

Aluminium

	PaperShell	Veneer	Polypropylene	Glass fibre reinforced polymer	Aluminium
Thickness	4 mm	9 mm	5 mm	4 mm	2,5 mm
Weight	1,8 kg	2,7 kg	1,5 kg	2,6 kg	2,2 kg
Component price	Medium	Medium	Low	Medium	Medium
Outdoors	Yes	No	Yes	Yes	Yes
Eco footprint	Very low	Low	Medium	Very high	High
Tooling cost	Medium / High	Medium	Very High	Low	Very high
Surface treatment	Possible / Not needed	Needed	Possible / Not needed	Possible / Not needed	Needed
3D possibilities	High	Low	Very High	High	Very high
Surface structure from tool	Very high	Low	High	Medium	High

There is a need for a sustainable materials revolution – PaperShell is part of the solution



THE GLOBAL GOALS

Sustainability and circular economy is high on the strategic agenda for corporations in particular and society in general. Global warming is driving legislation and investments towards green tech.



The need for stronger and lighter materials is growing fast to support the transition towards an electric society. PaperShell behaves like fibre composites and is stronger than plastics and press moulded wood.



The forrest and agriculture waste streams are renewable resources so every 1 kg of fossil based plastics replaced by PaperShell will decrease CO₂ by 7,5+ kgs released into the atmosphere.



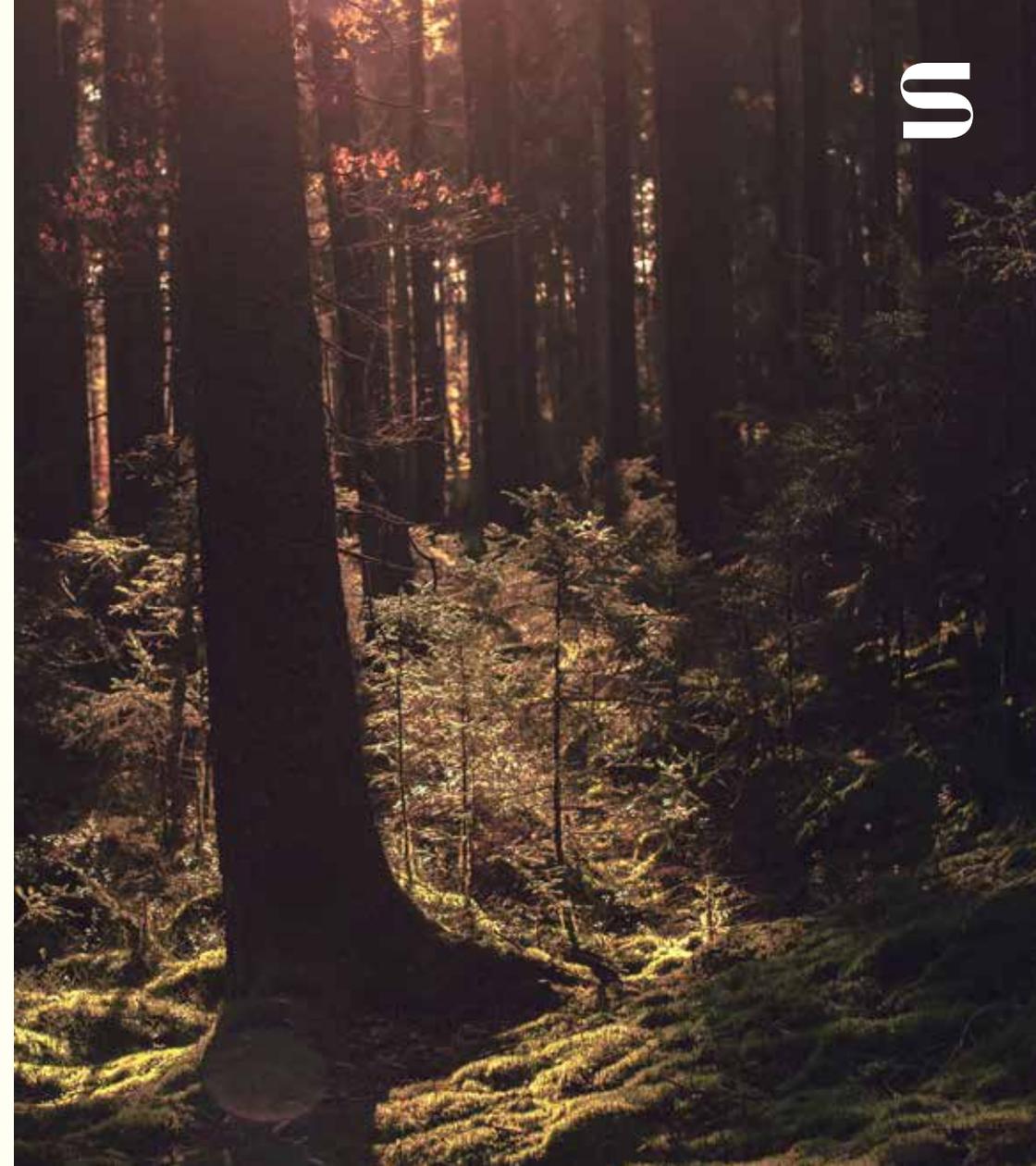
There is a high demand for materials to replace fossil based materials such as plastics. PaperShell can replace plastics and glass fibre reinforced plastics in a number of applications.



Bioplastics and recycled plastics are either high in price or contaminated by additives such as flame retardents. PaperShell is made of grown and natural waste streams with no flame retardents.



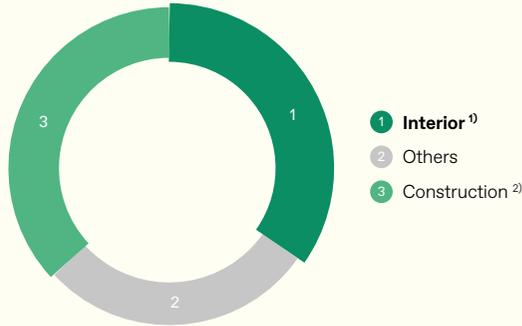
Few sustainable materials can support the huge volumes needed. PaperShell is based on ingredients with stable and large scale availability.



Market references and potentials

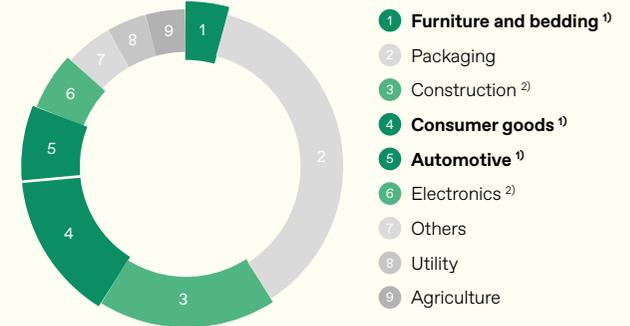
Press moulded veneer

Contract furnishing market in Europe is poised to grow by USD 2.64 billion during 2020-2024, progressing at a CAGR of almost 3% during the forecast period. 3D veneers are now well established in Europe and have extended real wood veneers into applications previously dominated by plastics.



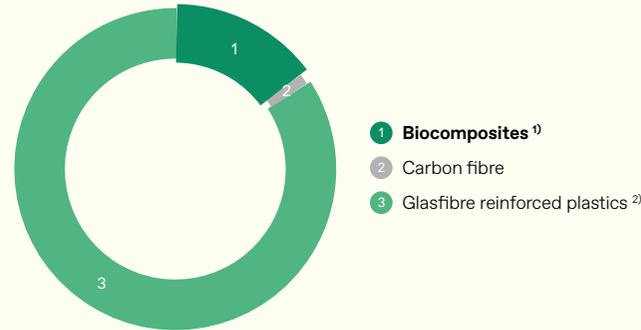
Plastics

More than \$30 trillion is currently held in sustainable investments around the world. The biodegradable plastics industry alone is expected to reach nearly \$7 billion by 2025.



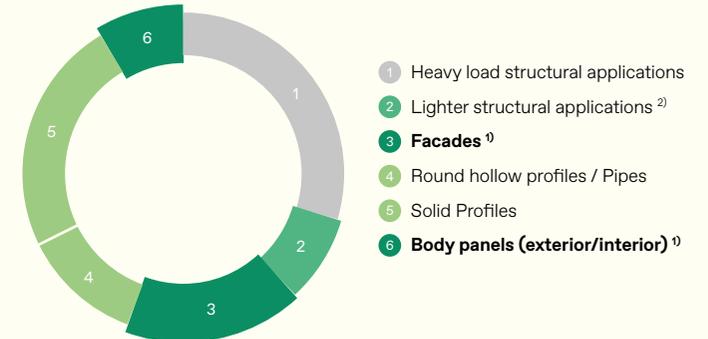
Fibre composites

The global composites market size was estimated at USD 89.04 billion in 2019 and is expected to expand at a compounded annual growth rate of 7.6% from 2020 to 2027. The market is driven by increasing demand for lightweight materials. Increasing demand for composites in the automotive industry is anticipated.



Aluminium

World production was 42.4 million tonnes in 2011. It trended steadily upward over the next decade to reach 65.3 million tonnes in 2020. Consumption of refined aluminium reached 58 million tonnes in 2020. PaperShell has half the strength of aluminium but also half the weight and can replace sheet aluminium.



1) Primary segment
2) Secondary segment

Sources: Technavio latest market research report titled Contract Furniture and Furnishing Market in Europe 2020-2024. www.businessinsider.com, www.grandviewresearch.com, www.nrcan.gc.ca, svensktaluminium.se, www.statista.com

Members of the board



Ragnhild Wiborg - Chairman

Board member, Intrum AB, Kistefos ASA, Rana Gruber and EWS Foundation. Chair of the Board of EAMSolar ASA and Cerebrum Invest. Chair and CEO of Wiborg Kapitalförvaltning AB. Previous Boardmember of Gränges AB, Borregaard ASA, Sbanken ASA, Cary Group AB and RECSilicon ASA. Other previous positions: partner/Chief Investment director and Fund Manager in Odin Fonder and Wiborg Kapitalförvaltning. Several positions in a number of investmentbanks, including Pareto, ABG Sundal Collier, First Chicago (now JP Morgan) and SEB.



Christopher Carrick

CEO of Lignin industries. Lignin industries started 2017 with the idea of converting lignin from pulp mills to biomaterials to replace fossil plastics. Lignin industries is a Swedish innovation company. Christopher have a family history of five generations of pioneers within the Pulp and Paper industry. Including founding SCA to establishing and managing several of Sweden's most famous Pulp and Paper production plants.



Mats Tarring

Board member and Head of New Ventures Stena Metall AB. Investor Advisory Board NorthVolt. Stena Metall Group has seven business areas and operations at around 200 locations in nine countries. Each year, six million tons of waste and end-of-life products are recycled and refined, and customers are supplied with many essential raw materials, steel products and marine fuels.



Mille Milehem

Vice President / COO Input Interior
Input interior is the Nordic region's leading independent interior design group with unique expertise within needs adapted solutions for offices and businesses, hotels and restaurants, schools and education, and health and social care. The group turnover is approximately €300 million and among Input interiors costumers you can find many of the most successful businesses and companies in Europe.



Anders Bergström

Former Chief Designer / Senior Design Manager advanced materials at a global OEM Car company. Has worked with Colour Material Finish (CMF) on more than 20 production cars, concept cars and facelifts. 17 years of work experience from Car companies in Europe, China and US. Expert designer of automotive innovative materials interior and exterior design, material and supplier decisions. Large global network within both design and automotive supplier.

Anders Breitholtz - CEO
Material designer, Circular Economy Strategist,
Brand Intel and Sustainability.



Anders core is how to utilise materials and resource management for business intelligence, innovation management and sustainable strategies to leverage corporate branding and competitiveness.

He has devoted his professional life to mapping, scouting, sourcing, implementing and designing sustainable, innovative and advanced materials and production techniques. The focus is resource management, material and production technologies near market, market available and industrial ramp up (TRL 6-9).

Anders has 18 years experience of material and management consulting, managing material libraries, creating events and fairs as well as co-founder a number of start ups (materials, design, architecture) - often through technology transfer and crossbre-

eding between supply Industry (Tiers across the whole value chain), (Fortune 1000) Brand owners (automotive, furniture, architecture, food, electronics, fashion and more i.e. cross market) and front end research institutes. He has taken part in countless product development projects, led over 100+ workshops, and been keynote speakers or moderated numerous international events. He has a history of working with SVP, VP, director and management level. He is skilled in Design Thinking and Management, Concept Development, Strategic Branding as well as a deep understanding of production (lean, industry 4.0) potentials, constraints and formal language. Most of his assignments has had a strong emphasis on sustainability (Circular Economy, Agenda 2030 (SDGs 8,9,11,12,13,17), LCAs, EPDs, Phase 3, DFDA, PaaS, C2C) and act as an expert for the swedish government's delegation for circular economy.

Mathieu Gustafsson - COO
Interior Architect and Furniture designer



Mathieu Gustafsson has his roots both in Paris, France and in the Swedish province of Småland – the heart of the Swedish furniture industry.

It is by observing the differences and similarities between these two cultures from an early age that initiated Mathieu's interest in product design. Professionally, Mathieu has a background in graphic design, cabinet making and furniture design. Specialized in furniture for the contract market Mathieu started and managed the design studio at Tengbom during 5 years - one of the leading architect firms in Sweden.

He has run his own studio in Stockholm with projects ranging from design objects to contract furniture to new sustainable materials for the production industry.

Mathieu is well known within the Scandinavian design communities with several products on the market. Mathieu came up with the idea of using paper as an alternative to veneer for chair seats and worked 7 years on a similar solution with the famous furniture producer OFEECT. He has a strong international network within the interior and design world.

Papershell AB develops sustainable solutions based on cellulose fibers and takes a pioneering part in the transformation towards the circular society.

In view of IP, Papershell AB, and the founders of Papershell AB, have developed IP for several years and continue to do so. Papershell AB is therefore in possession of a growing IP platform with significant and relevant knowhow and IPRs. The IP platform covers several aspects of sustainable solutions based on cellulose fibers. It covers a full range of products, raw materials, a wide range of production processes, as well as in depth understanding of the complexities

of the application of developed sustainable solutions on markets to ensure societal impact in view of sustainability.

Papershell AB files for IPRs when considered relevant for business purposes. The business logic of the IPR portfolio has multifold objects. A first object is adequate control over critical knowhow and projected revenue streams for actors in the business eco system surrounding Papershell AB. A second object is putting the IPRs into use as a means to make the business grow.