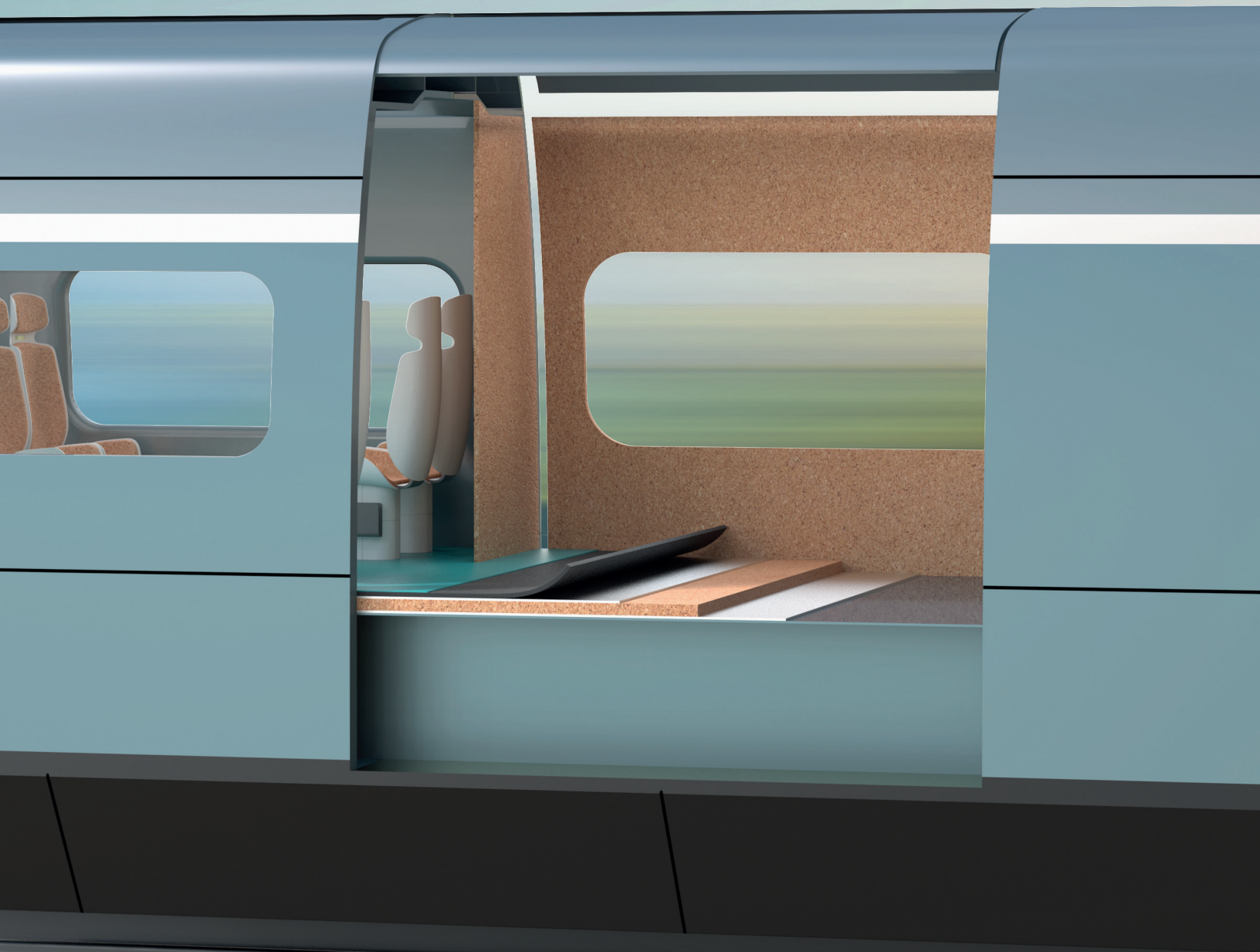
Mobility

Reinventing the mobility sector

Cork solutions for structural parts



AMORIM CORK SOLUTIONS

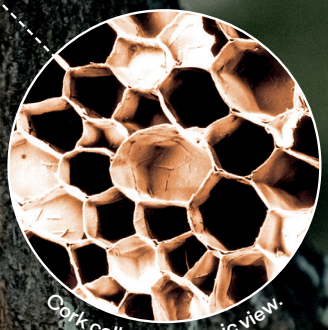
Cork, an exceptional raw material

Cork is the outer bark of the cork oak tree (Quercus suber L.), the 100% natural plant tissue covering the trunk and branches.

It consists of a honeycomb-like structure of microscopic cells filled with an air-like gas and coated mainly with suberin and lignin. One cubic centimeter of cork contains about 40 million cells.

Cork is also known as "nature's foam" due to its alveolar cellular structure. It has a closed-cell structure making it lightweight, airtight and watertight, resistant to acids, fuels and oils, and impervious to rot.

It is sustainably harvested by specialized professionals without damaging the trunk, thus enabling the tree to grow another layer of outer bark that, in time, will be re-harvested. Over the course of the cork oak tree's life, that lasts 200 years on average, the cork may be harvested around 17 times. This means that cork is not only a natural raw material, it is also renewable and recyclable.



Cork cell microscopic view.

Thermal insulation

Acoustic insulation

Resistance to fire and high temperatures

CO_2 reduction

Vibration control

Easy process

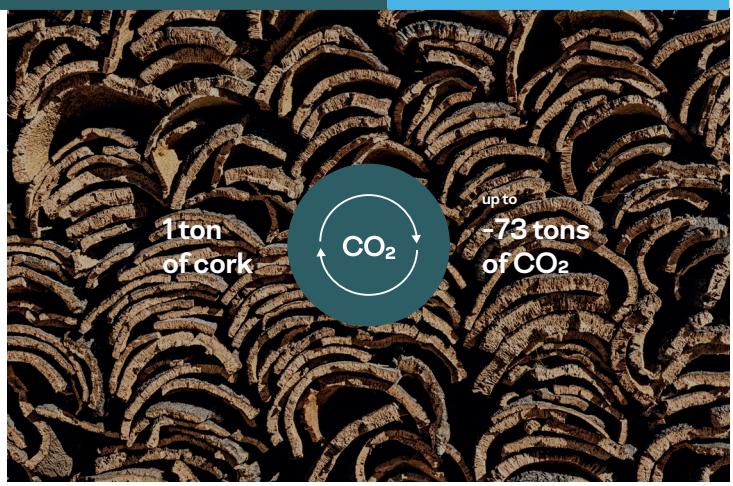
Lightweight

Eco-design

Cork, sustainable by nature

Cork forests are important natural carbon sinks. It is estimated that for each ton of cork produced, the cork oak forest sequesters up to 73 tons of CO_2*.

These forests, which have a recognized protection status, contribute to climate regulation, are the driving force of sustainable development and play a central role in the ecological balance of the planet. In this way, cork is a naturally sustainable raw material, like no other.

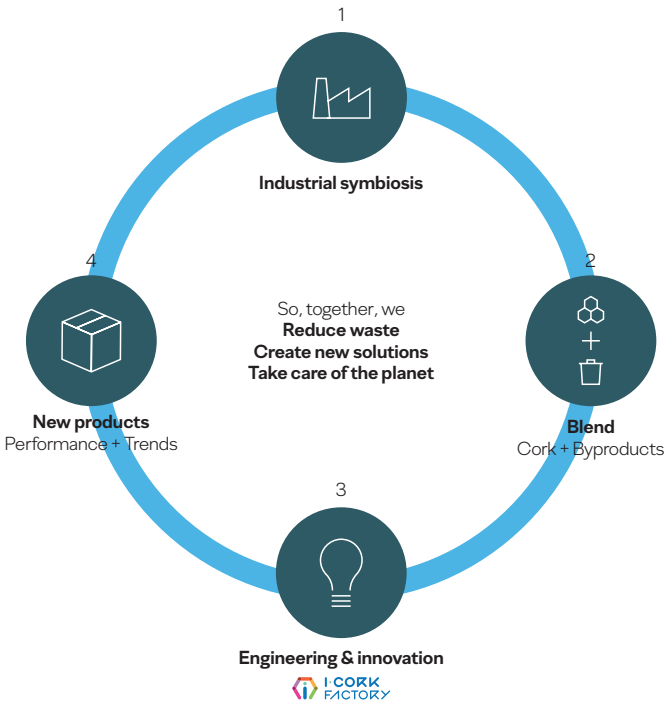


* Source: Instituto Superior de Agronomia (ISA), 2016

The circular economy at the heart of innovation

At i.cork factory, our innovation hub, we achieve the perfect match between performance and sustainability. New, innovative and high performance products from the circular economy are being created.

With cork at the core, blended with other materials, that are by-products from other industries (industrial symbiosis), we give materials a new life by creating new products that leverage cork's attributes while taking care of the planet.



CORK INSIDE®

When cork isn't so visible, the Cork Inside seal guarantees that the product contains cork in its formulation, a 100% natural and recyclable material with unique technical properties. Cork Inside formulations combine cork with other materials and are developed and rigorously tested by Amorim Cork Solutions' innovation and engineering teams. Cork Inside responds to stringent requirements and guarantees the performance required for the application.

Mobility

With an attractive look and warm and soft touch, cork is an innovative option for interior vehicle components, which combines the beauty of a natural material with passenger comfort and well-being.

Cork's unique properties, together with Amorim Cork Solutions' expertise in highly technological and specialized sectors, enable us to develop sustainable and innovative solutions for the mobility sector.

Cork can take on many different shapes, from the simplest to the most complex, to meet manufacturers' design requirements and create sophisticated and elegant interiors, using, for example, molding, lamination, extrusion, and injection processes.

General applications

Automotive
Hoods, flooring, pillars and bumpers

Trains
Flooring, side walls, wall partitions, ceilings and doors

Buses
Flooring, side walls, wall partitions and ceilings

Ships
Side wall, doors and flooring

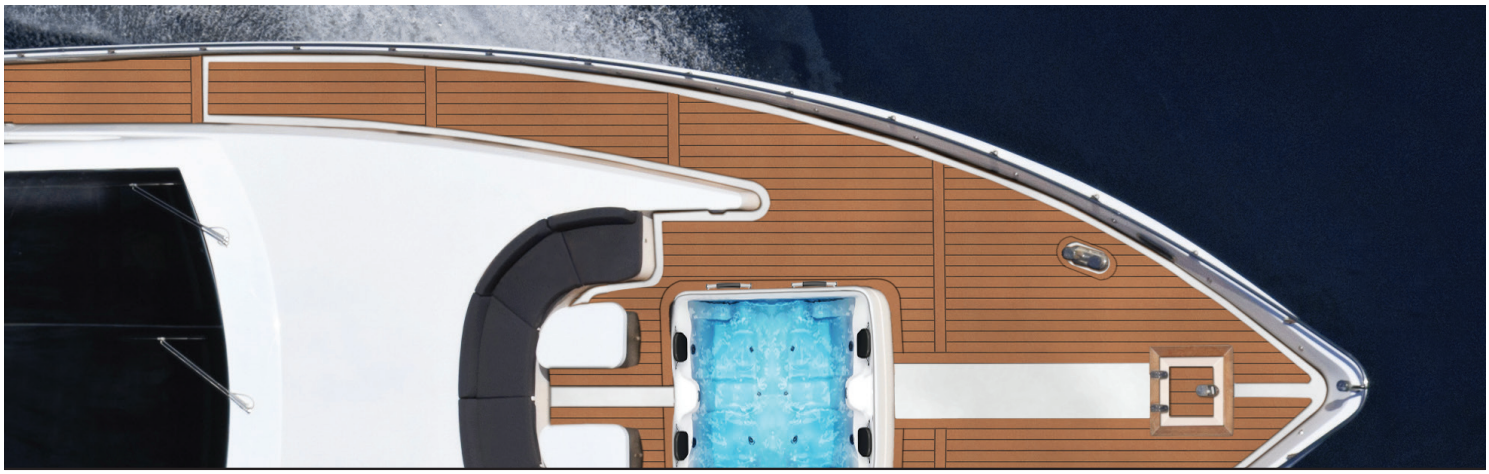
Main advantages

Thermal insulation
Cork is the world's most ecological insulation solution

Fire performance
Cork based materials are very resistant to extreme temperatures

Lightweight
Lightweight materials enable vehicles to reduce weight without reduction in size, increase load-carrying capacity and achieve higher speeds

Acoustic performance
Corkbased materials increase comfort by dampening noise and vibration of a wide bandwith of frequencies



Mobility Acoustic Core

The acoustic core materials can be used to create innovative and more efficient interior systems in different means of transport.

Floor, side and ceiling panels are examples of applications in which cork's lightness and insulating capacity play an important role in the system's performance.

Mobility Acoustic Core solutions combine cork with a selected elastomeric compound matrix that yields specific performances, - from thermal insulation, noise reduction to fire resistance - while maintaining a reduced surface weight.

Product range

	MAC015	MAC016	MAC017	MAC018	MAC040	MAC089	MAC087
Density (Kg/m^3) [1]	580–680	620–740	900–1000	900–1030	200–250	1150–1250	750–850
Lightweight	●●●○○	●●●○○	●●○○○	●●○○○	●●●●●	●○○○○	●●○○○
Thermal Conductivity (W/m°K) [2]	0,089*	0,134*	0,177*	0,181*	0,046	0,235*	0,103*
Accoustic performance	●●○○○	●●○○○	●●●○○	●●●●○	●○○○○	●●●●●	●●●○○
Loss Factor (20ºC @ 1Hz) [3]	0,12*	0,11*	0,10*	0,10*	0,11*	0,24*	0,13*
Thermal insulation	●●●○○	●●●○○	●●○○○	●●○○○	●●●●●	●○○○○	●●○○○

(1) ASTM F1315 (2) ISO 8302 (3) ASTM D5023 *Typical Values

Green Heavy Mass Layer

Green Heavy Mass Layer was developed as an effective direct replacement to bitumen damping materials.

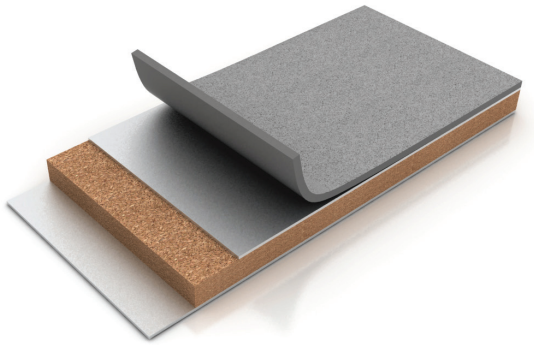
Designed as a hybrid product with respect to acoustic and damping performance, given the cork's presence, can be used in a wide range of applications such as automotive, machine housings and other applications where good damping performance is required. The product is a thermoplastic and so is fully recyclable.

Technical Features

Surface weight (Kg/m^2)	3,64	DIN EN 1602
Density (Kg/m^3)	1619	—
Peak stress (Mpa)	4	ISO 37:2011 (E)
Strain at break (%)	20	ISO 37:2011 (E)
Durometer Hardness (shore A)	90	—
Static Operating Temperature (°C)	-10–80	Short exposure at peaks
Colour	Light brown	—
Nominal thinkness (mm)	2,2	—

Mobility Natural Lightweight

Mobility Natural Lightweight materials ensure a natural perforation for resin impregnation and are compatible with most of the resins used in the industry. Manufacturers can thereby obtain an immediate high-quality surface finish.



Product range

	MNL010	MNL020	MNL020r	MNL051	MNL025
Density (Kg/m^3) (1)	120–180	170–235	170–205	≥ 224	220–260
Thermal Conductivity (W/m°K) (2)	0,042*	0,044*	0,046*	0,054*	0,046*
Loss Factor (20ºC @ 1Hz) (3)	0,102*	0,100*	0,089*	0,099*	0,086*

(1) ASTM F1315 (2) ISO 8302 (3) ASTM D5023 *Typical Values

Key guidelines for processing

	MNL010	MNL020	MNL020r	MNL025
Hand lay-up	•••••	•••••	•••••	•••••
Vacuum bagging	•••••	•••••	•••••	•••••
Resin infusion	•••••	•••••	•••••	•••••
RTM/LITE RTM resin transfer molding	•••••	•••••	•••••	•••••
Prepregs pre-impregnated	•••••	•••••	•••••	•••••
RFI resin film infusion	•••••	•••••	•••••	•••••

Mobility Semi-finished Panels

Mobility Semi-finished Panels always have cork as a core material and another layer material that depends on the project's specifications. It can be used materials ranging from flax fibers to an aluminum construction, that may, or may not be, fire-certified, in function of the customers' requirements.

By using cork as the core material we create a more sustainable solution that reduces the weight of the material and improves noise and vibration damping properties.

More information under request.

Natural based prepeg
Flax prepeg or basalt prepeg

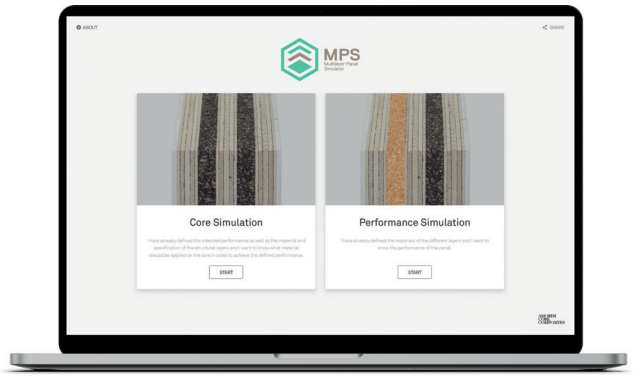
Cork core

Natural based prepeg
Flax prepeg or basalt prepeg

MPS: Multilayer Panel Simulator

The Multilayer Panel Simulator is a tool developed by Amorim Cork Solutions to simulate the acoustic isolation of a multilayer panel, focusing on two main solutions core simulation and performance simulation.

For more information, visit our website:
www.amorimcorksolutions.com



Case studies

Alfa Pendular CP

Lightweight material from Amorim Cork Solutions equip the new generation of high-speed trains of the Portuguese train company CP – Comboios de Portugal.

The project includes the overall refurbishment of the ten trains included in the fleet of the Alfa Pendular service, in order to optimize passenger comfort and safety, and increase the trains energy efficiency.

Siemens Inspiro Platform

Siemens' Inspiro was designed to be the most modern, efficient and sustainable in its class. The project used lightweight material from Amorim Cork Solutions, which contributes to the weight of the carriages being 30% less than that of traditional models.

Did you know that we also develop solutions for visual components?

Visit our website and discover how cork is changing the future of mobility.

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CTP-199/002|NOV 2024|EN