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# AMORIM T&D

Power Industry



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## Reinventing the power industry

Sealing, noise  
& vibration control

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AMORIM CORK COMPOSITES



# 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.

Elasticity



Flexibility, installation and process friendly



Vibration control



Impermeable to liquids



Chemical resistance



Thermal resistance



Shock absorption



Performance

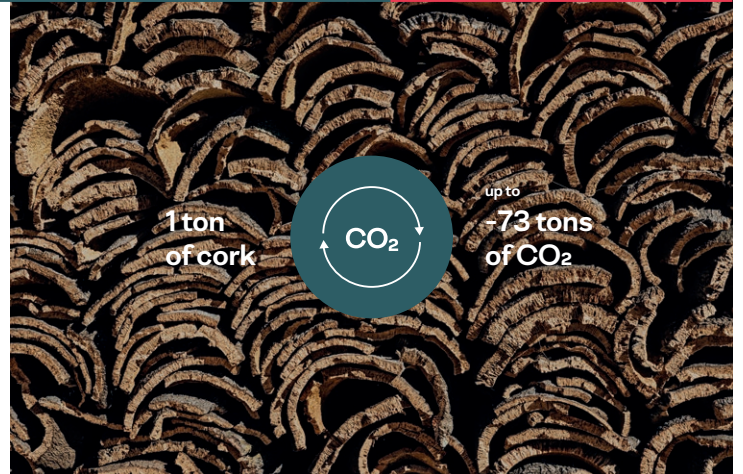




# Cork, sustainable by nature

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<sub>2</sub>\*.

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.

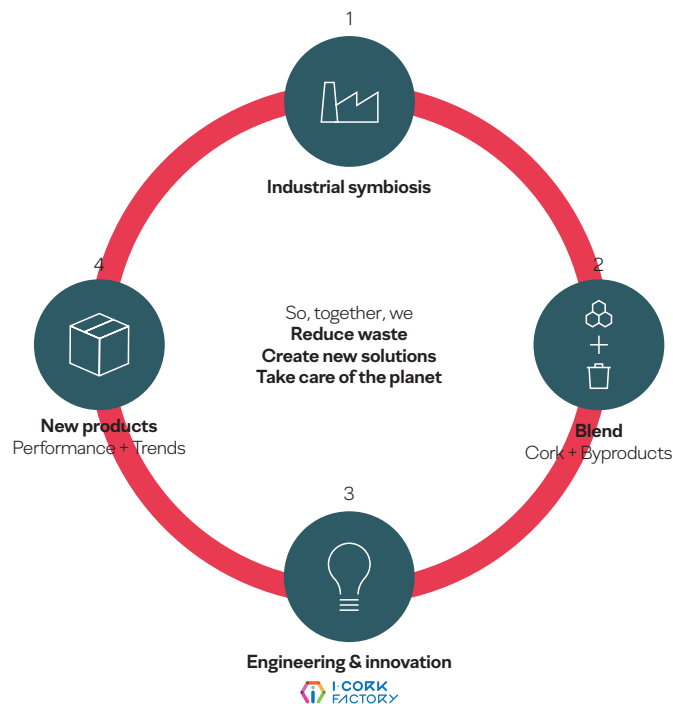


\* Source: Instituto Superior de Agronomia (ISA), 2016

# 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.



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 Composites' innovation and engineering teams. Cork Inside responds to stringent requirements and guarantees the performance required for the application.

# Transmission & distribution industry

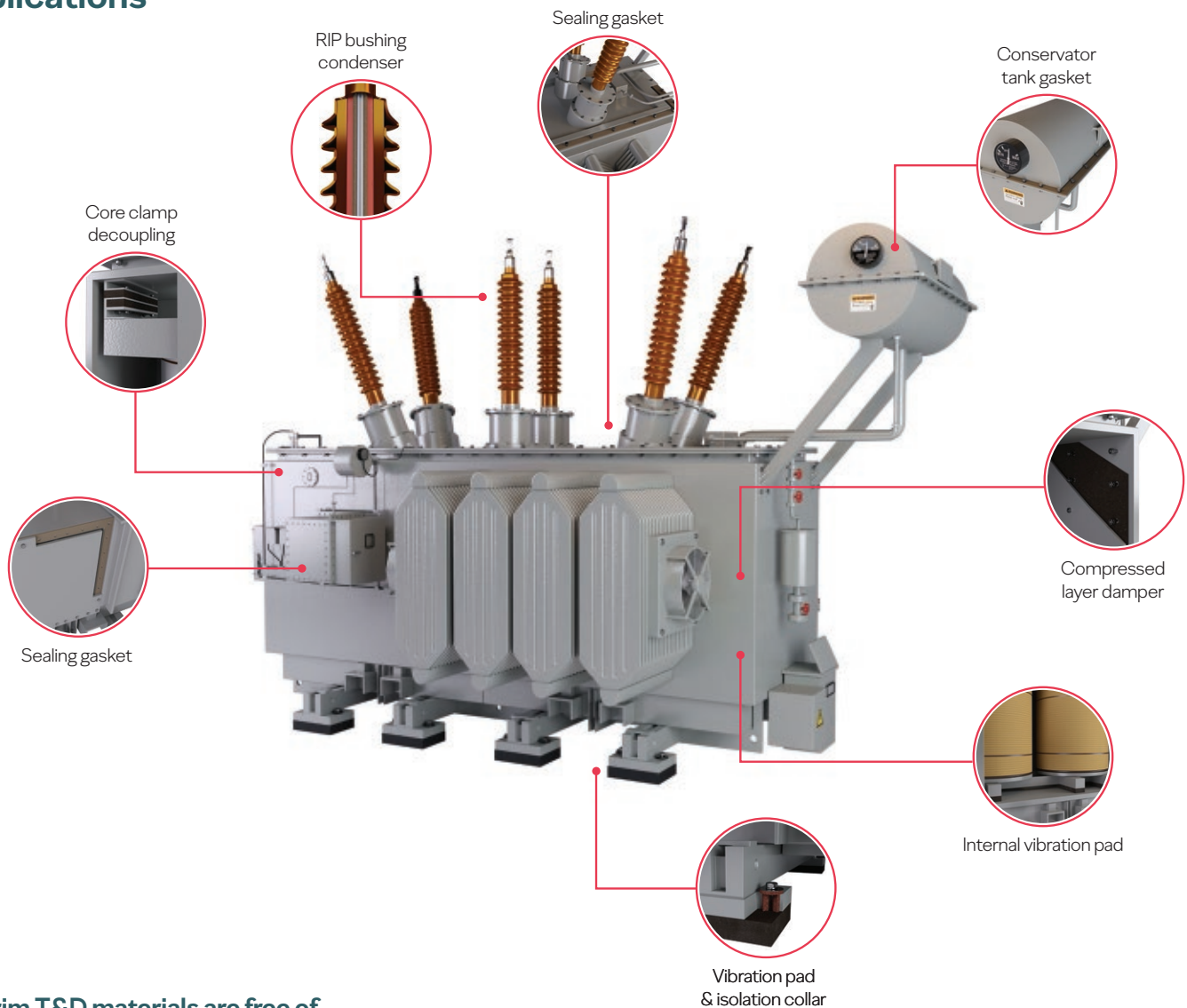
Power structures often endure harsh conditions and are therefore built to withstand the test of time. Cork composites extend equipment lifetime in electrical power plants and distribution networks.

Amorim Cork Composites has been manufacturing materials and gaskets for the transformer industry over the last four decades.

Amorim T&D is the brand for products specifically designed and tested for the power transmission and distribution market, since it provides engineered sealing, noise & vibration control solutions to this industry.

Amorim T&D products are performance-driven and recognized worldwide, with a long history in transformers, reactors, bushings and other T&D components.

## Applications



### Amorim T&D materials are free of

- Asbestos
- Heavy metals (Pb, Cd, Hg, Cr(vi))
- Polycyclic aromatic hydrocarbons (PAHs)

# Sealing

**Amorim sealing materials are designed to withstand the application needs, while providing our clients with attractive manufacturing options.**

Our sealing materials are made with unique blends of cork and select rubbers produce materials indicated for flat sealing applications.

Chemical resistance



Thermal resistance



Elasticity



## Main advantages

### Extended lifetime

With experience in designing gaskets for multiple industries and applications, our materials have proven long-term performance in the field. Cork composite materials extend equipment lifetime in electrical power plants and distribution networks.

### Chemical resistance

Compatible with the main insulating oils used in the T&D industry, such as Mineral Oil, Ester Oil (synthetic and natural) and Silicone Oil.

### Thermal resistance

Products with wide load range and recommended for extreme operating temperatures.

### Customized solutions

Sealing materials supplied in rolls or sheets with thickness ranging from 1 mm (0,040 in) up to 12 mm (0,472 in) ; Roll widths, from 1000 mm (40 in) upwards.

### Conformability

Tolerance to extreme surface finish conditions and high out-of-flatness ranges. Large contact areas and sufficient compression ensures an excellent conformability even if there are surface imperfections in the flange (distortion, paint defects, etc).



# Noise & vibration control

The purpose of vibration isolation is to control unwanted vibration so that its adverse effects are kept within acceptable limits.

Vibration Isolation & Damping Noise Reduction can be achieved by reduction of the magnetostrictive and magnetic exciting forces and avoiding resonance frequencies, by using damping and isolation solutions. Amorim Cork Composites' vibration control materials have exceptional damping properties helping to reduce structural vibration and slamming effect.

Chemical resistance



Thermal resistance



Vibration control



## Main advantages

### Extended lifetime

Proven noise and vibration solutions working in major OEM's worldwide with oil filled transformers/reactors and dry transformers, long term performance in the field and multi-applications/industry design experience.

### Specialized offer

Amorim Noise & Vibration Control range include a variety of solutions such as:

- Internal Vibration Pads
- External Vibration Pads
- Core fixing clamp decoupling
- Compressed layer damper (CLD) solutions
- Fastener isolation accessories (collars)

### Technical support

Our dedicated engineer teams, experts in T&D transformers, reactors, bushings and other components, help and advise in technical aspects and application, ensuring the best solution.

### Chemical resistance

Compatible with the main insulating oils used in T&D industry, such as Mineral Oil, Ester Oil (synthetic and natural) and Silicone Oil.

### Noise & vibration control

Guarantee noise reduction, longer machine or tooling life, longer maintenance periods and no Transmission to Surroundings.

### Customized solutions

Vibration control materials supplied in sheets or pads according to the required thickness.

## Cumulative gains in noise reduction

Through experience in T&D applications, a priority 4 step system approach developed to treat "noisy" equipment. How much can I gain in noise reduction according to the solutions I use?

Solution	Noise reduction typical values*			
Internal Vibration Pads	1dB–2dB	3dB–5dB	6dB–8dB	9dB–10dB
Core Clamping Mechanism				
CLD - Compressed Layer Damping				
External Vibration Pads				

\*Typical Values



# Product range

Amorim T&D products are designed to withstand the application needs, while providing our clients with attractive manufacturing options.



## Cork Rubber Sealing\*

Key benefits	TD1049	TD1120	TD1310	TD7000
Low temperature resistance (°C)	-30	-40	-50	-60
High temperature resistance (°C)	125	125	110	175
Mineral Oil	✓	✓	✓	◆
Silicone Oil	✓	✓	✓	
Ester Oil	✓	✓	✓	◆
SF6 Gas	◆	◆	◆	

\*Typical Values ◆Suitable ✓Recommended



## Noise & Vibration Control\*

Key benefits	VC1047	VC2100	VC6400
Maximum Load (MPa)	1.5	2.0	2.0
Maximum Load (Psi)	218	290	290
Work Load Range (MPa)	0.25 – 1.0	0.5 – 1.5	0.5 – 1.5
Work Load Range (Psi)	36 – 145	72 – 217	72 – 217
Temperature Range (°C)	-25 to 120	-40 to 125	-50 to 110
Application	External	Internal (Oil contact)	External

\*Typical Values



## RIP Bushing Inlay\*

Key benefits	RI1001	RI1002
Compressibility [%] @ 2.8 MPa	10 – 18	30 – 50
Recovery [%] @ 2.8 MPa	>80	>80
Tensile Strength	>4 MPa	>1.3 MPa

\*Typical Values

RIP Condenser Inlay serves as an excellent stress/ dimensional absorber during the resin impregnation process, absorbing contradicting dimensional changes. The main advantages of RIP are the prevention of cracking in

resin-impregnated bushings, reducing quality issues and increases the lifecycle of the RIP condenser/Bushing due to absorbing the dissimilar thermal materials expansion caused by high voltage current.

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