Core brochure

Stronger, lighter, smarter

Optimize your product with our sandwich composite core materials

Diab

Make your application stronger, lighter and smarter

Why sandwich composites?

With sandwich composites you can:

- Decrease weight and increase strength
- Save fuel cost or increase payload
- Reduce lifecycle cost
- Lower your carbon footprint
- Enjoy more design freedom

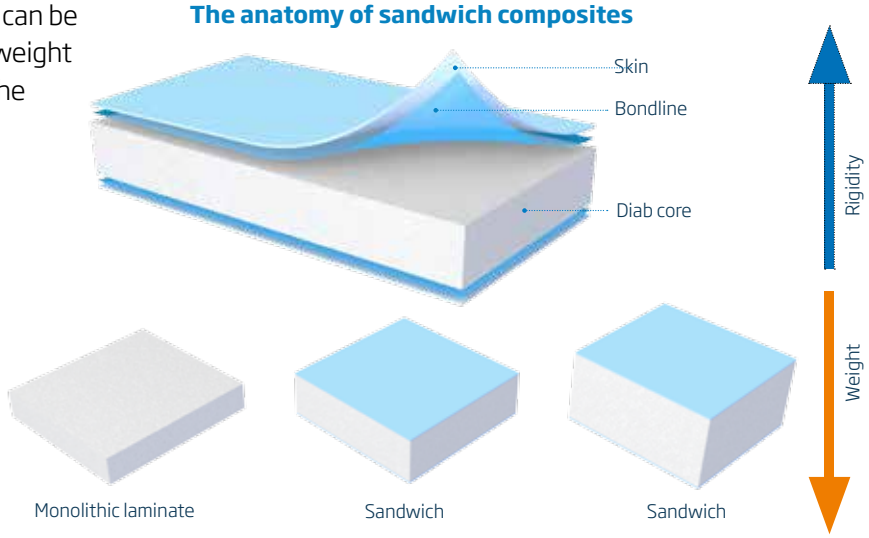
What is sandwich composite?

The concept is cleverly simple. Two thin, strong and stiff materials are separated by a lightweight core. The result is a strong and durable product that provides mechanical properties at much lower weight than traditional monolithic materials, such as single skin FRP, wood, steel or aluminum. Sandwich composite materials also allow designers to engineer with extreme optimization to their loading requirements. A sandwich solution can be tailored to avoid over-engineering, saving weight and increasing performance. By choosing the appropriate fibers, resin and core you can create a product that has, for example, high thermal insulation, tailored mechanical behavior and fire resistance.

Why a solution from Diab?

Diab is a world-leading supplier of sandwich composite solutions. We have long experience and are always at the forefront of this technology. Diab is a solutions-oriented company and we believe in working together with you to find the optimal solution to fit your needs. This brochure, based on our expertise and experience from a variety of segments over the years, will show you how we can help you save energy and enable faster and more effective solutions in many areas.

The anatomy of sandwich composites



What are the key benefits for your application?

Optimize your products by tailoring the materials to your needs.

Stronger

Sandwich composites can be engineered to be stronger and more durable than traditional materials, such as aluminum, steel or wood.

Lighter

The high specific strength of sandwich composites makes them a logical choice for weight sensitive products, such as airplanes, boats and wind blades.

Smarter

Allowing for increased payload, reduced fuel consumption and lower carbon footprint, sandwich composites are the smart choice for a more sustainable world.

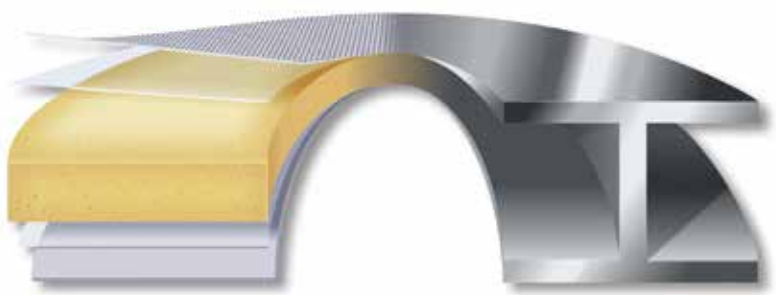
Design freedom

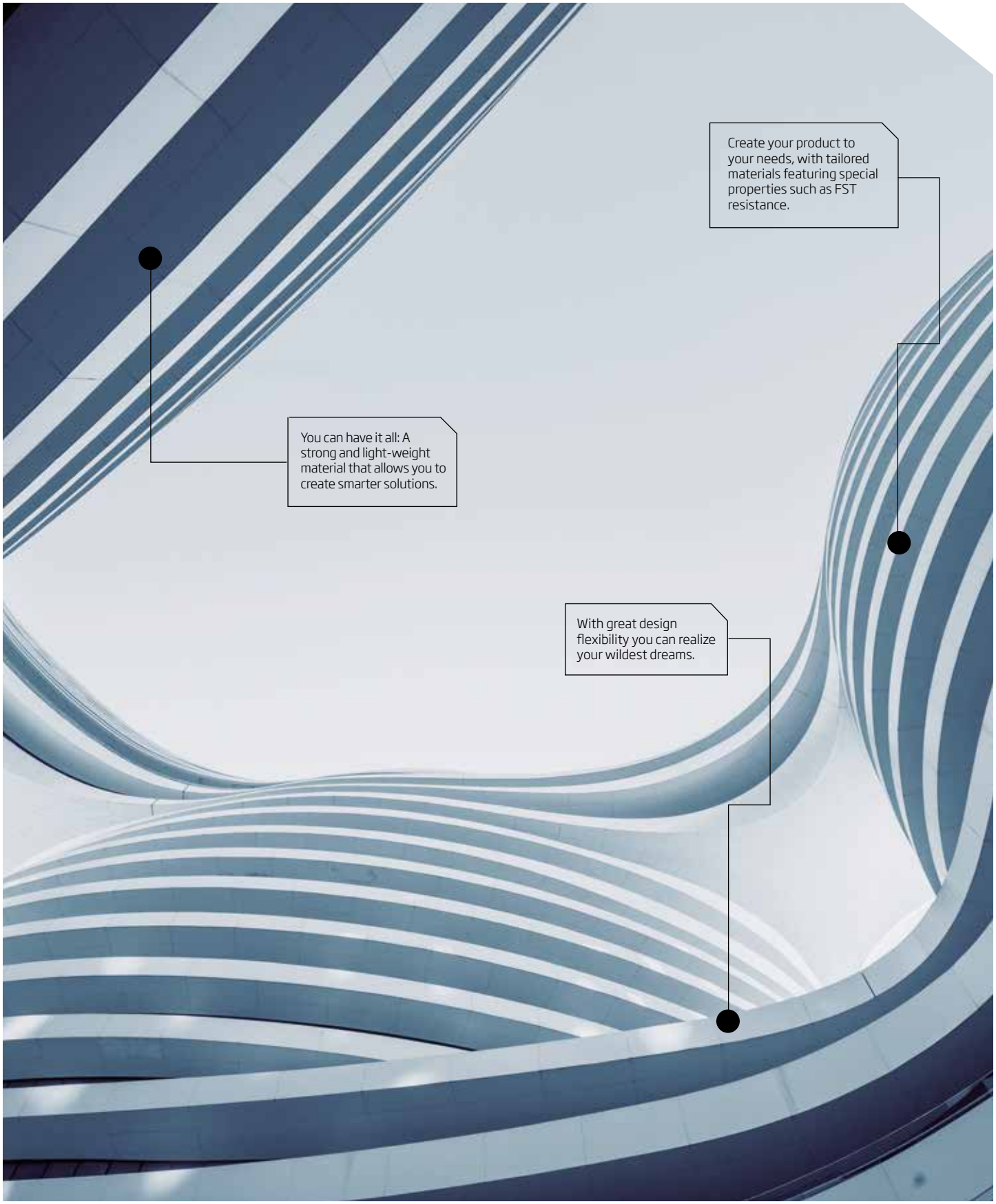
Sandwich composites allow for more freedom of design compared to conventional construction materials. Easily shapeable, they are excellent for double curvature geometries and aero-dynamic designs.

Adding that little extra

The core of a sandwich composite can bring additional features to your product, including:

- Fire, Smoke and Toxicity (FST) resistance, ideal for public transport and airplanes
- Thermal insulation, perfect for the building industry and subsea applications
- Excellent material replacement in areas or applications sensitive to rot or corrosion
- Very low water absorption for marine applications or for environments with a lot of moisture and condensation, such as aircraft interiors
- Toughness and impact resistance for applications within marine, transportation and wind
- Low maintenance and ease of repair
- Dielectric properties, ideal for radomes and x-ray equipment




Create your product to your needs, with tailored materials featuring special properties such as FST resistance.
You can have it all: A strong and light-weight material that allows you to create smarter solutions.
With great design flexibility you can realize your wildest dreams.

The basics of sandwich composites

A typical sandwich consists of two skins or laminates with a thicker structural core in between. They are joined by resin or an adhesive.

The sandwich principle

A sandwich structure essentially works like an I-beam in 2D. When a sandwich panel is loaded in bending, the skins (flanges in an I-beam) carry in-plane compression and tension loads and the core (web in an I-beam) carries out-of-plane shear loads. The further the skins are separated, the stronger and stiffer the sandwich will be. The skins and the core are bonded with the same resin of the skins or an adhesive layer.

Skins

The skins are much thinner than the core. Beside the in-plane tensile, shear and compressive loads, the skins also distribute local loads, such as impacts to the rest of the structure. The skins can be made of numerous materials depending on the performance required for the sandwich composite.

Core

The core carries the out-of-plane shear stresses in the sandwich, from where a transverse load or pressure is introduced to where it is reacted. It also supports the thin skins so they don't buckle under compression. The core can also provide thermal and acoustic insulation as well as toughness through energy absorption. It can be made of a variety of materials, such as wood, and a multitude of expanded polymers.

Adhesive

To keep the skins and the core connected, the adhesive must be able to carry shear and tensile stresses. A rule of thumb is to make sure that the adhesive can withstand the same shear and tensile stresses as the core. For a sandwich structure to work as designed, it is important that the skins are always bonded to the core.


The formability of sandwich composites allows for greater design freedom and precise aerodynamic shapes.
The strength of an I-beam with the weight of a feather.
Applications where weight is crucial, such as airplanes, benefit greatly from the high strength-to weight ratio.

Working together

Sandwich composites offer a vast freedom of design and material combination. Together, we can find the optimal solution to your specific needs.

Shape

For curved shapes, the core can be either thermo-formed or supplied with cut patterns to allow it to easily form to the mold. To optimize weight and resin consumption or simplify the manufacturing process, Diab offers different cut patterns (finishing) dedicated to specific needs. For more information on finishing, download the Diab Finishing brochure at diabgroup.com.

Manufacturing process

There are many ways to produce sandwich composite panels. Typically FRP sandwich structures are manufactured using wet lamination, vacuum consolidation, resin infusion, wet-preg or pre-preg. As not all cores are suitable for all processes, the appropriate core has to be selected in combination with the chosen production technology. Diab offers core finishes dedicated to specific processes. For example, grooving on the surface coupled with perforation to distribute the resin is typically used for resin infusion. To make manufacturing as efficient and cost-effective as possible you can use kits of pre-cut and machined sheets. For more information, download the Diab Kits brochure at diabgroup.com.

Choosing the right material for your needs

Diab provides a wide range of core materials and core finishes for sandwich composite applications. Our worldwide network of technical experts is available to support you choosing the appropriate core and finishing for your product.

Our range

DIVINYCELL H
Our most famous core. Excellent strength-to-weight. An all-purpose core used in various industries.

DIVINYCELL HP
High-temperature resistant core suitable for prepreg applications.

DIVINYCELL HM
High-performance core for tough environments, for example in fast marine hulls.

DIVINYCELL MATRIX
Lightweight core with superior strength-to-weight ratio. Used in multiple industries, including wind and marine.

DIVINYCELL H60MC
Our latest innovation in lightweight cores. Incredibly fine cell structure for extremely low resin absorption and improved mechanical properties.

DIVINYCELL P
A recyclable PET core with excellent FST properties used in transport and construction industries.

DIVINYCELL PN
A recyclable PET core with excellent strength and durability.

DIVINYCELL PX
A recyclable cost-effective PET core material used in a variety of architectural applications such as domes and claddings.

DIVINYCELL PN200, PN250, PX300
High-density recyclable PET cores developed for local inserts in the way of fittings, either tapped or bolted through.

DIVINYCELL PY
Our latest addition to our recyclable PET portfolio with high shear strain and very low resin consumption.

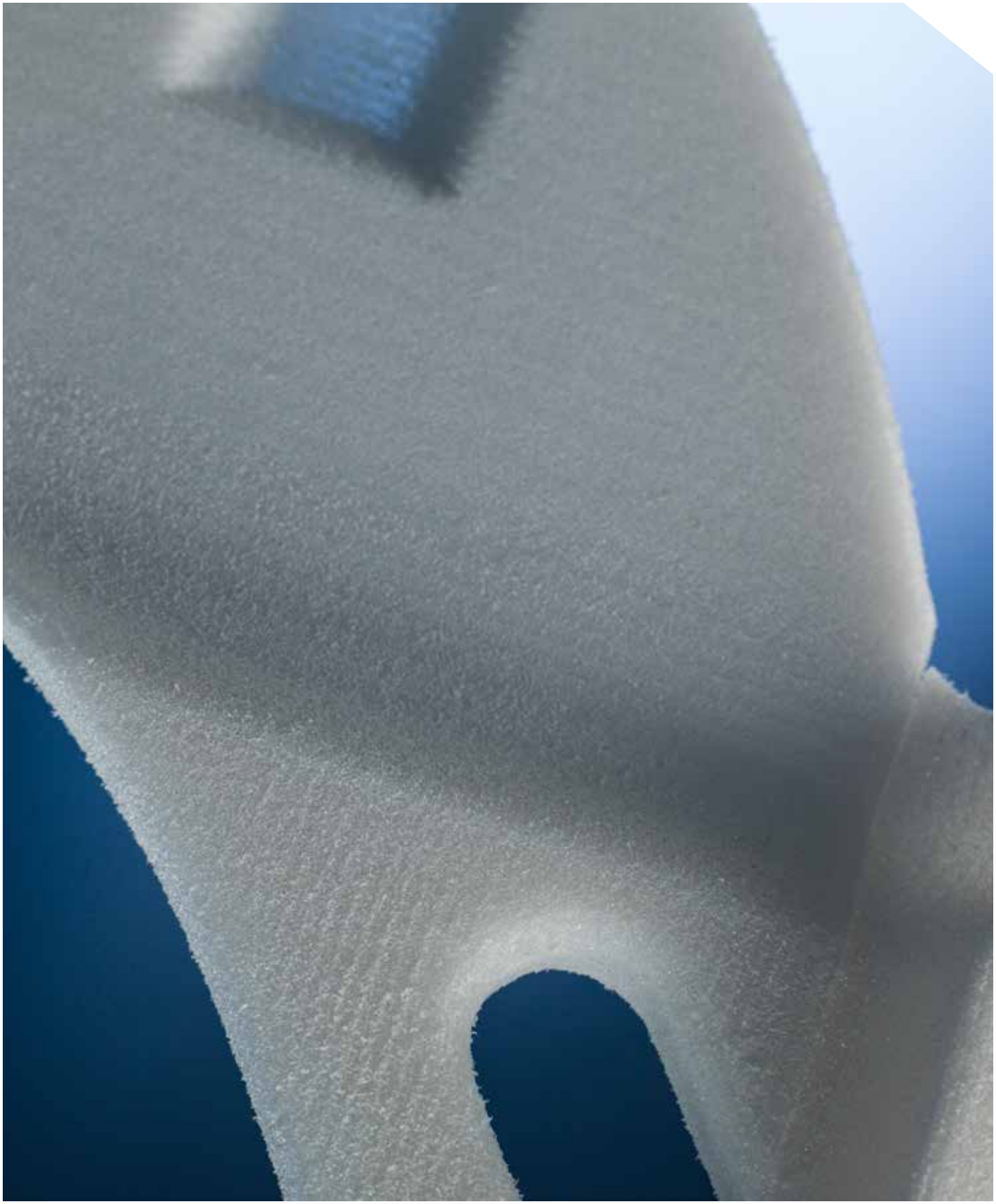
DIVINYCELL HT
An aerospace core available with comprehensive quality certification and traceability.

DIVINYCELL F
A sandwich core with excellent FST properties, suitable in commercial aircrafts interiors.

DIVINYCELL HCP
Core material for subsea applications, used from sea level to 700 meters depth.

DIVINYCELL CY
A core with excellent insulation properties, for low and cryogenic temperatures.

PROBALSA
Cost effective natural core with high compressive properties used in marine, wind and industrial applications.



Diab Group
Box 201, 312 22 LAHOLM, Sweden

Tel +46 (0) 430 163 00
info@se.diabgroup.com
diabgroup.com

November 2017

Diab is a world leader in sandwich composite solutions that make customers' products stronger, lighter and smarter. Diab provides a range of core materials, cost-effective kits, finishing and in-depth knowledge on composites. Diab also provides engineering services for composite technology through Composites Consulting Group (CCG). Diab is a participant of UN Global Compact.