

Easy processing and sustainable
Core Materials for lightweight structures



**CORE
MATERIALS**



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 - B&C
 - Road Transportation
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3A Composites Core Materials in Numbers

75 YEARS OF
EXPERIENCE



GLOBAL FOOTPRINT
IN SUSTAINABLE
CORE MATERIALS



1,586 No.
OF EMPLOYEES

13,250
ha. **FSC**®
OF
CERTIFIED
PLANTATIONS



FREE EDUCATION FOR
OVER 50 PRESCHOOL
KIDS IN PAPUA
NEW GUINEA



ca.
2 MILLION
TREES PLANTED A YEAR



REDUCING SIGNIFICANTLY
OUR CARBON FOOTPRINT
BY 2020



27–29 m
IT TAKES 4–5 YEARS
FOR A BALSA TREE
TO GROW THAT HIGH



36% RESIN UPTAKE
SAVING THANKS
TO PET SEALX

3A Composites Core Materials

Tailored Core Material solutions for

Architecture



Road



Aerospace



Marine



Wind energy



Rail

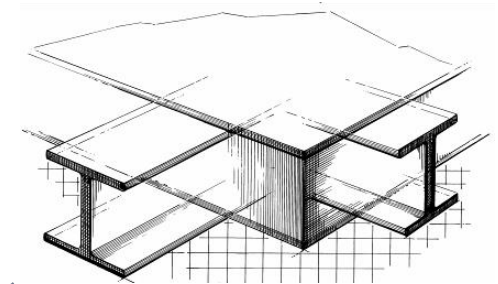
Why Core Materials

Sandwich = Lightweight = Sustainable

What is a Sandwich?

“Efficient distribution of mechanical properties in the structure”:

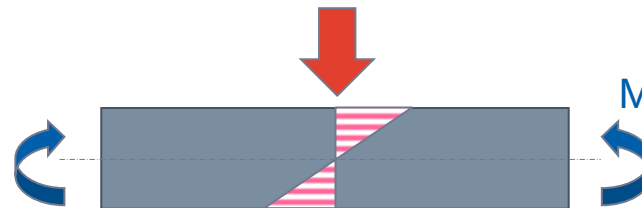
- **Bending stresses: maximum at the extremities (close to surface)**
 - Stiff and Strong material to be concentrated there (= SKIN)



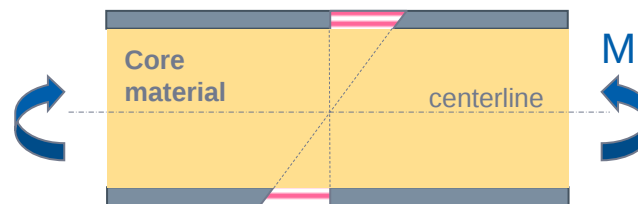
I-beam analogy

- Web → Core
- Flange → Skins

*Distribution of **bending** stresses*



*in a **monolithic structure***



*in a **sandwich structure**:*

Top skin: in compression
Core: in shear
Bottom skin: in tension

Why Core Materials

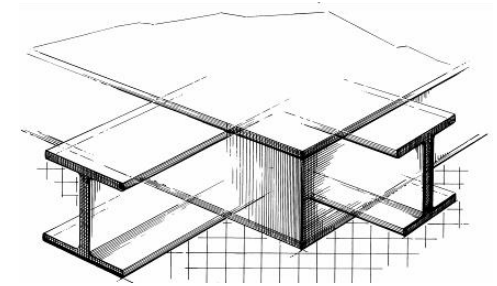
Sandwich = Lightweight = Sustainable

What is a Sandwich?

“Efficient distribution of mechanical properties in the structure”:

- The farther away from centerline the higher the impact on stiffness

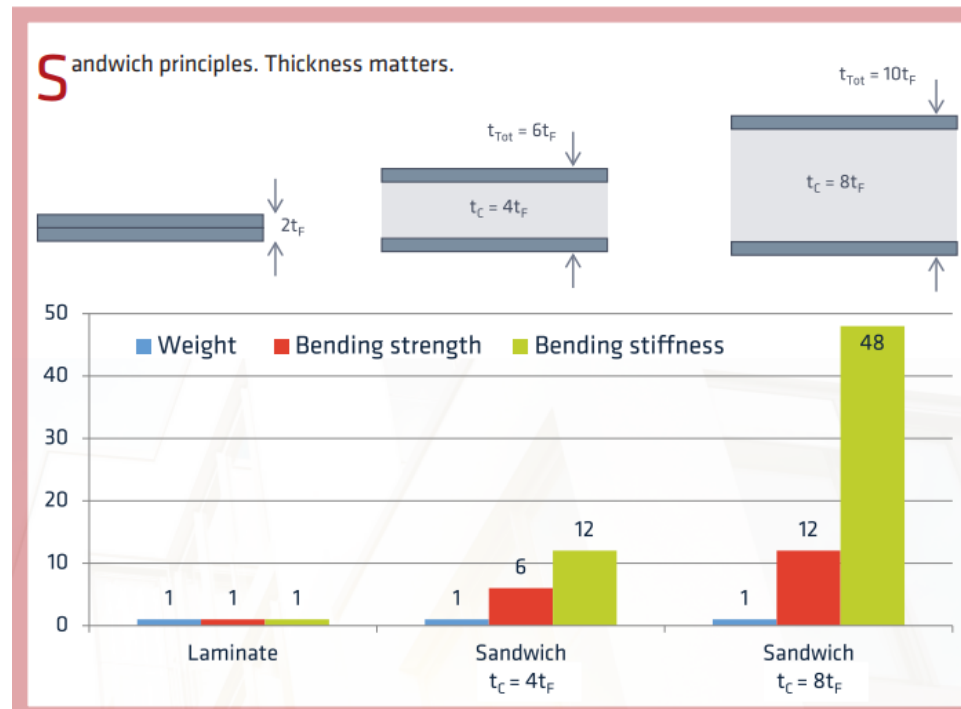
→ Separate skins as much as possible (=CORE)



I-beam analogy

Function of Core:

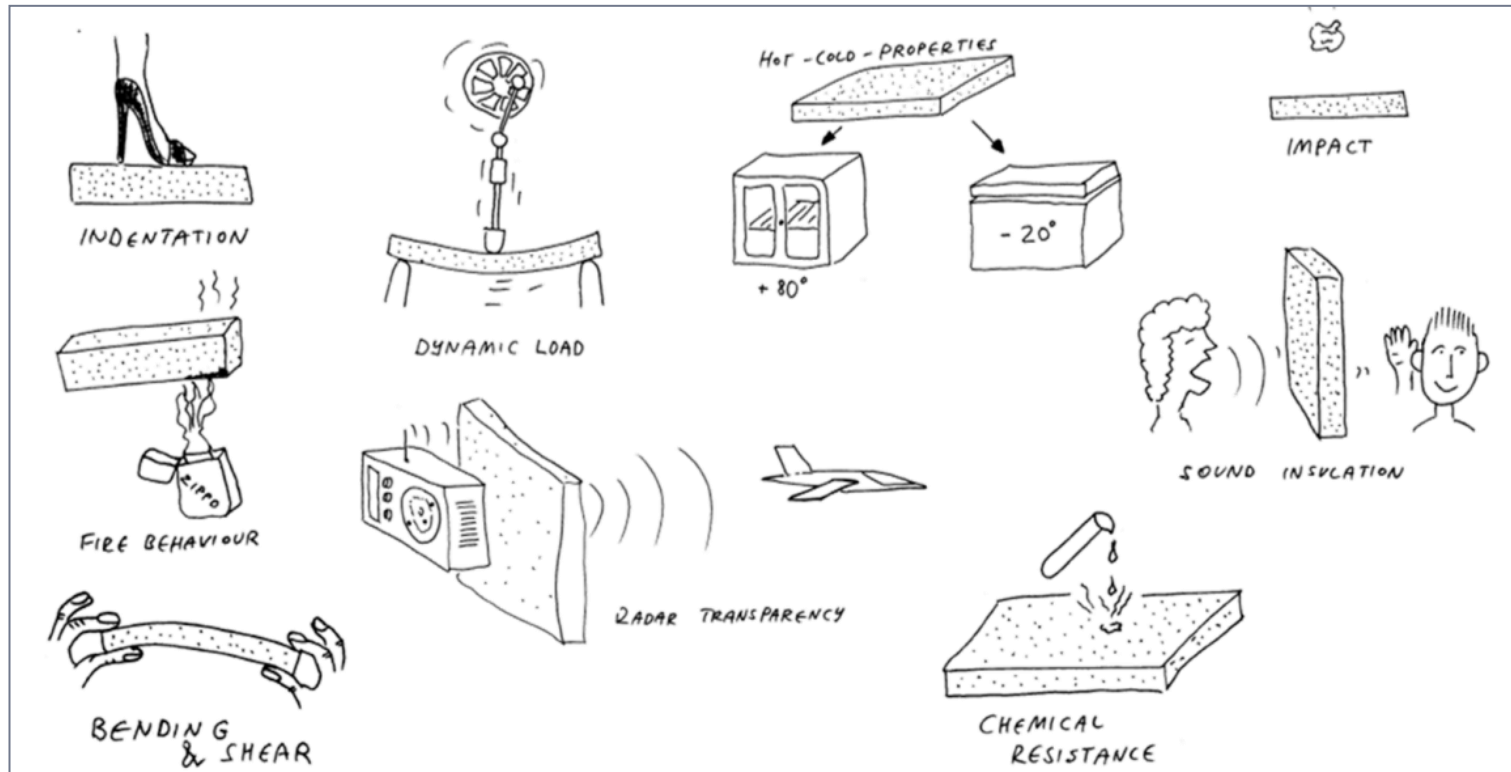
- Transfer loads between skins
- Keep skins apart (under load)



Why Core Materials

Selection criteria

Many requirements → very depending on application



and...

€/MPa

MPa/density

Cost or manufacturing process

Global availability

Sustainability (production) ...

3AC Core Materials AIREX®/ BALTEK®

The broadest selection of Core Materials worldwide

We offer the whole range to satisfy every need

PET

AIREX® T92 AIREX® T10
AIREX® T90

- Good FST and fatigue
- Easy processing
- High temp. resistance
- Recyclable



Balsa

BALTEK® SB
BALTEK® SBC

- Extremely stiff and strong
- Good FST
- High temp. resistance



Universal Cores

PVC

AIREX® C70
AIREX® C71

- Good mechanical props. vs. density
- Good impact resistance

AIREX® R82 → outstanding FST and dielectric properties

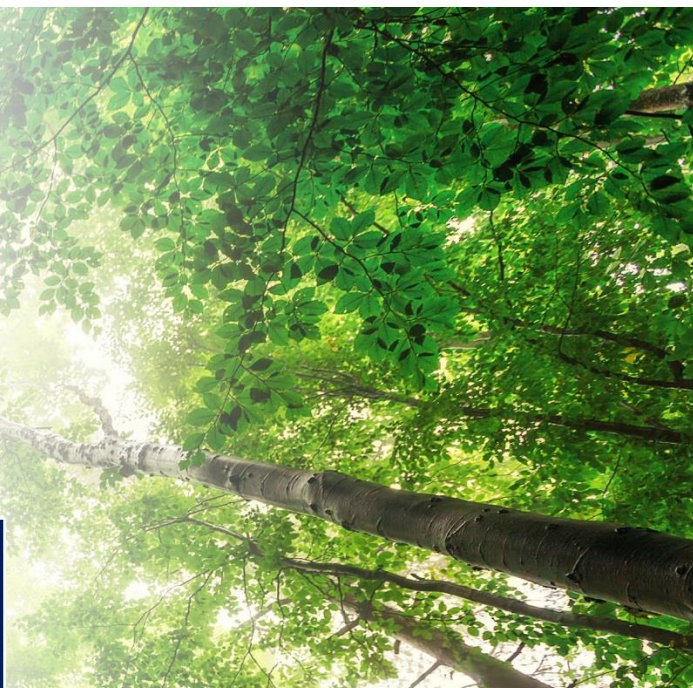
AIREX® C51 → good formability

AIREX® PX → for very high loads & standalone applications

BALTEK® VBC → for high performance solutions

3AC Core Materials

BALTEK® End-grain BALSA – the Green Core



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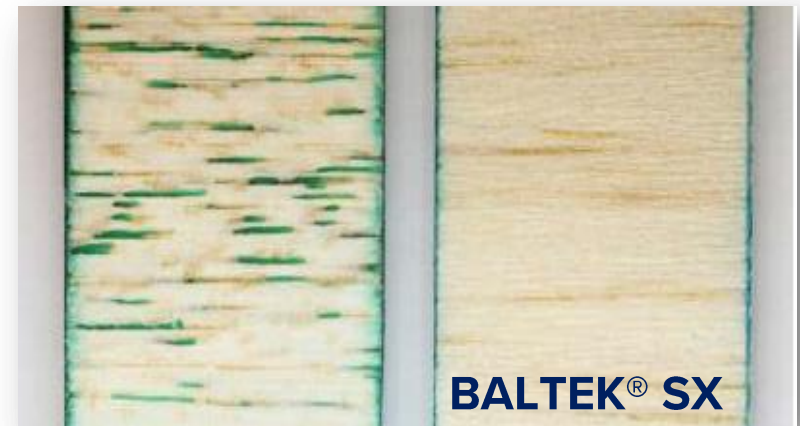
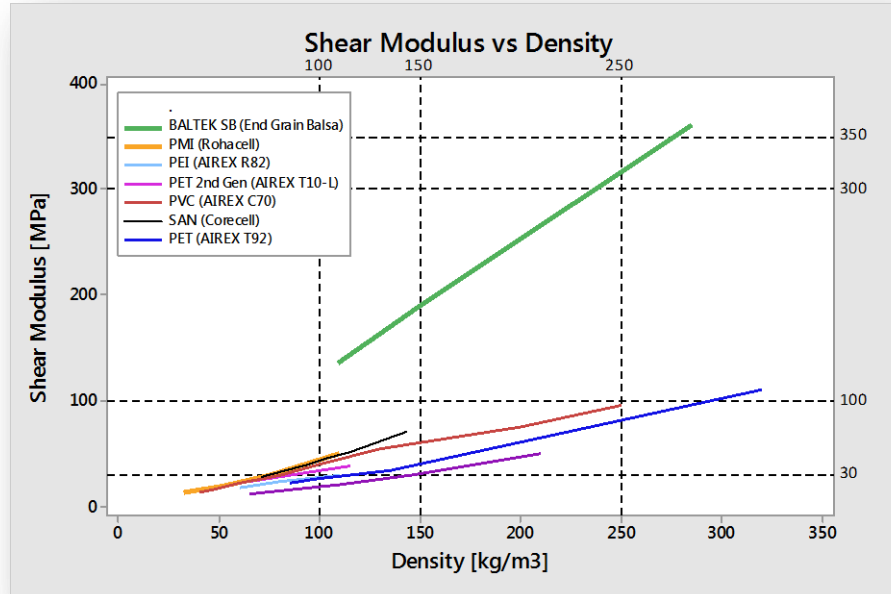
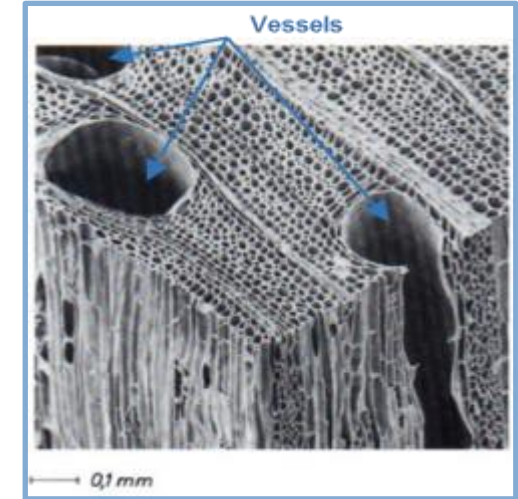
Plantations in Ecuador and Papua New Guinea

3AC Core Materials

BALTEK® End-grain BALSA – the Green Core



- Highest specific Properties (vs. Density)
- 100% Natural product
- Sustainable production - FSC certified
- No Temperature sensitivity in operation
- SealX variant for reduced Resin Consumption in vacuum infusion



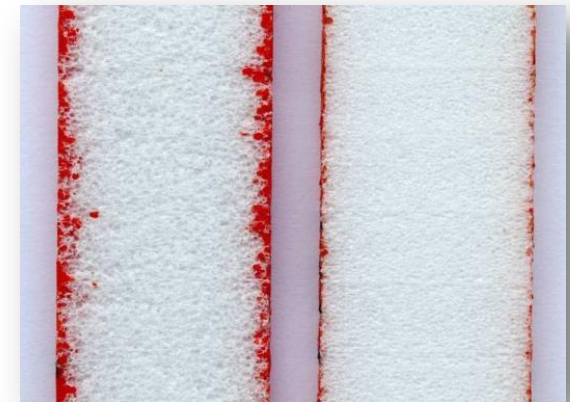
3AC Core Materials

AIREX® PET core materials – 100% recyclable



AIREX® T92, AIREX® T90 (FST-grade)

- 100% **Recyclable**
- **Easy processing** - temperature insensitive, **no outgassing** issues, styrene insensitive
- Excellent **Fatigue** performance
- Non-toxic fumes
- Consistent mechanical properties (low variability)
- **Moisture** insensitive and **Water** resistant
- Low **Resin consumption (SX)**
- Quality control (e.g. full traceability)
- No thickness limitation
- Interesting **cost per mechanical property**
- Thermoformable

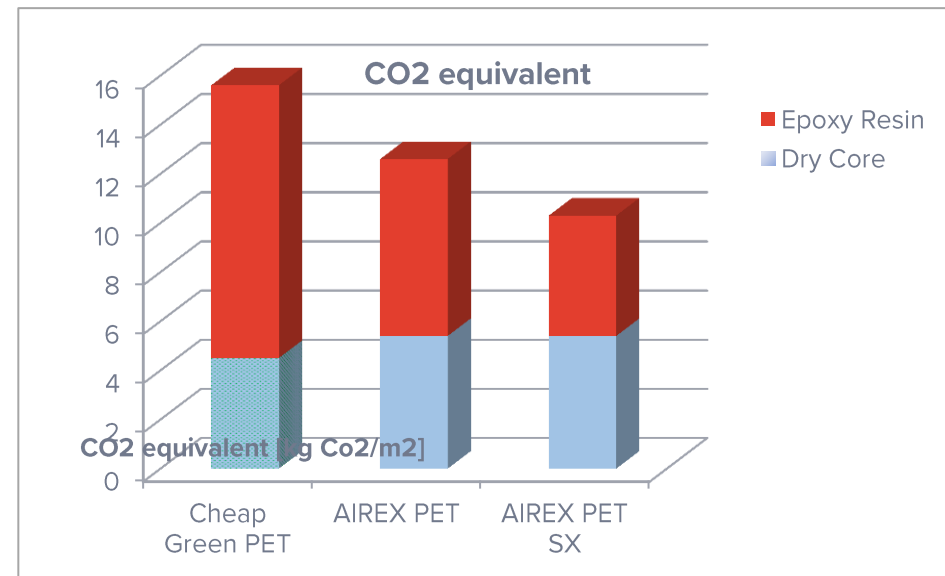
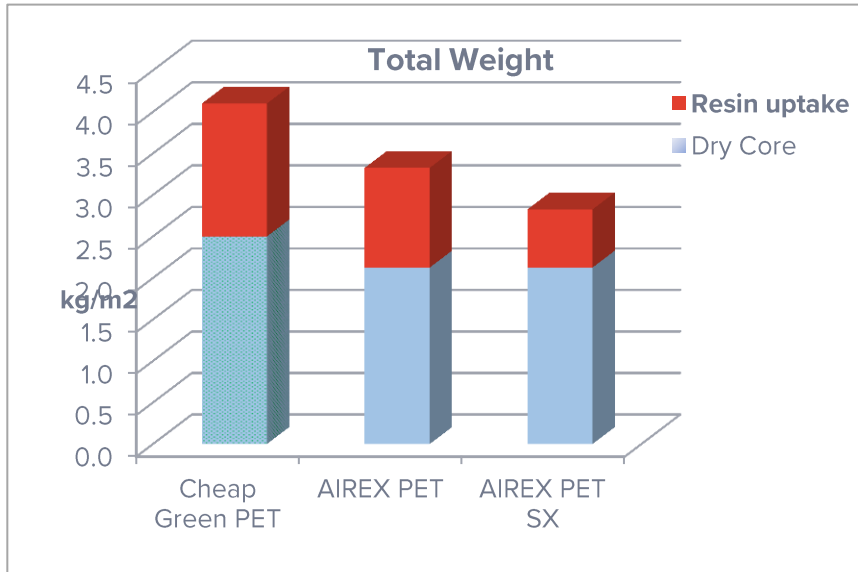


AIREX® T92
SealX

Sustainability factors

Life Cycle Analysis – PET core ≠ PET core

Sandwich components using different PET cores with equivalent mech. performance:



▪ Lighter part

- Lower energy consumption
- Less resin consumption
- Cost efficient - lower total cost

▪ Lower CO₂ equivalents - due to

- Lower resin consumption
 - Lower core material (polymer) mass
 - Better specific properties
- Equivalent core material cost

Data source:

- Life cycle data brochure producer green PET
- Life cycle data for Epoxy resin
- Resin uptake from own tests

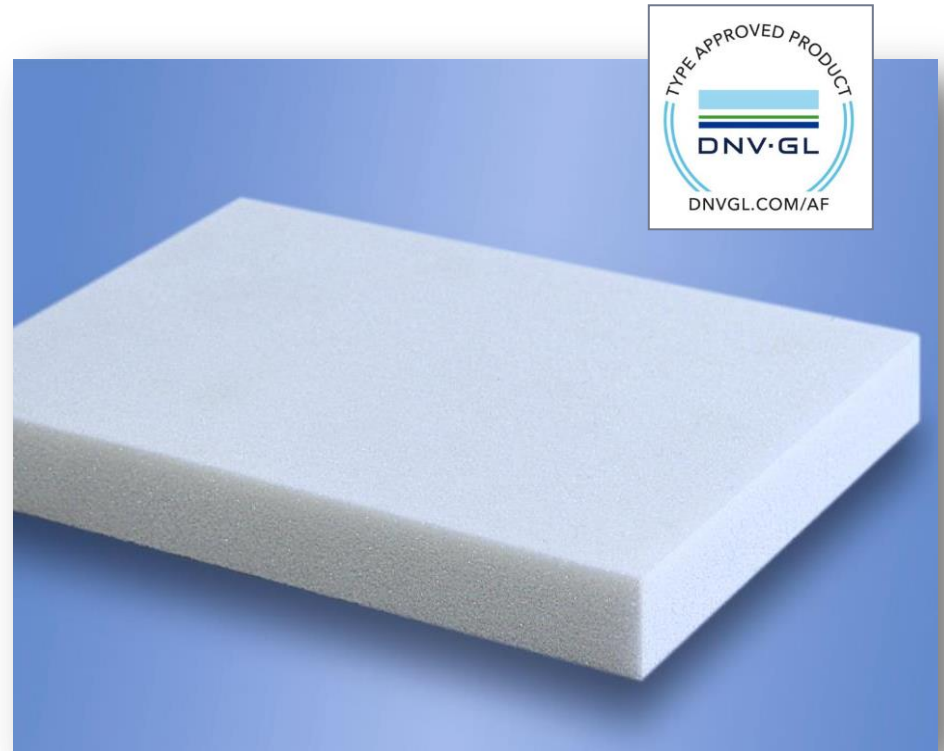
3AC Core Materials

AIREX® PET core materials – 100% recyclable

AIREX® T10 - The new generation PET Foam core

In addition to the usual AIREX® PET advantages:

- No weldlines
- Fully homogenous cell structure
- Good shear elongation
- Higher specific mechanical properties
vs. standard PET cores (welded)



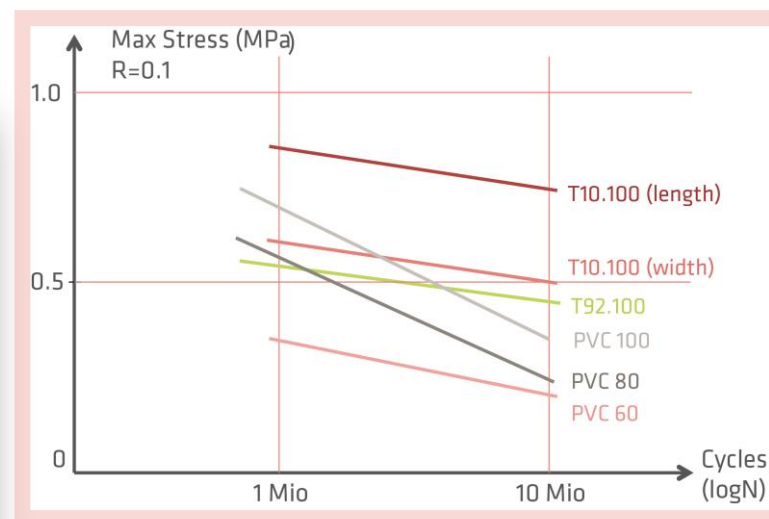
Applications for AIREX® PET cores

Marine



Easy Substitution of PVC cores with AIREX® PET:

- AIREX Cores: **AIREX® T10, AIREX® T92**
- Apply ISO 12215-2 design rules and DNV-GL properties
- **Easy Processing:** No outgassing/bubble issues, styrene resistant
- Higher **Fatigue** performance



- AIREX® T92.100/T10.100 for most parts
- AIREX® T92.80 for small parts
- AIREX® T92.60 for stringers
- AIREX® T92.320 for transoms

Applications for AIREX® PET cores

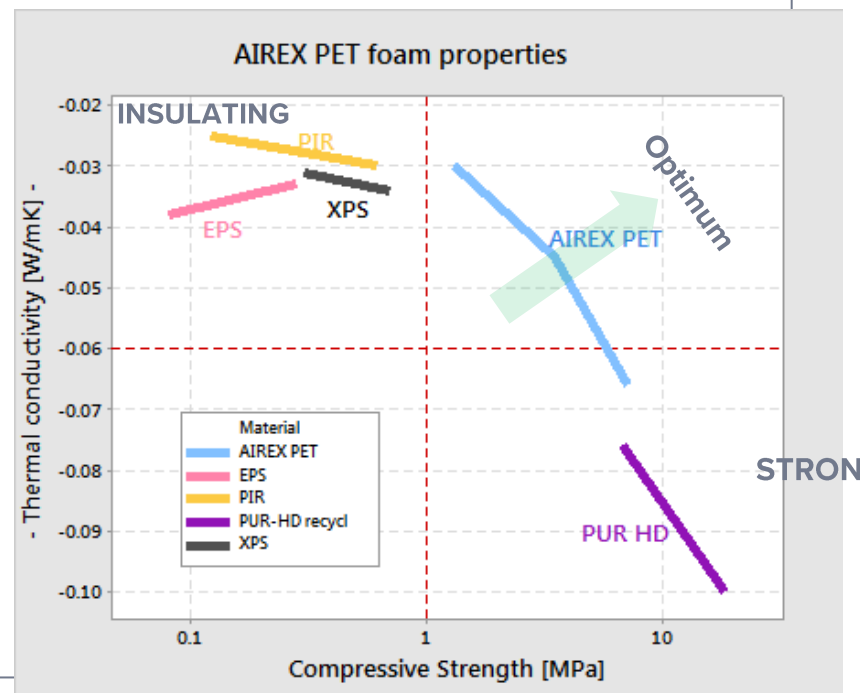
Building and Construction

AIREX Cores: **AIREX® T10, AIREX® T92, AIREX® T90 (FR)**

- Substitute Wood parts: $\Rightarrow$ **Water resistant** structural parts
- Substitute XPS and PU: $\Rightarrow$ Self-supporting **insulation** elements
- Retrofitting (e.g. Balconies): $\Rightarrow$ Stiff and **Light**

Architecture

Lightweight, insulating
3-D shaped structures.



Applications for AIREX® PET cores

Truck walls & floors

Substitution PUR 40kg/m³ with AIREX® PET 60kg/m³ core - proved:

- Lower **Total weight**
- Lower **Total cost**
- Improved structural integrity (impact resistance, Fatigue, ...)
- Moisture insensitive
- Similar thermal insulation in operation
- Same total thickness

PU 40

PET 60

	PU 40	PET 60
Skin thickness / side	2mm	1mm
Total thickness	17mm	17mm
Total weight	6.9 kg/m ²	4.2 kg/m ²
Stiffness	100%	130%

Truck bodies

Lightweight body panels with perfect surface quality.



Summary

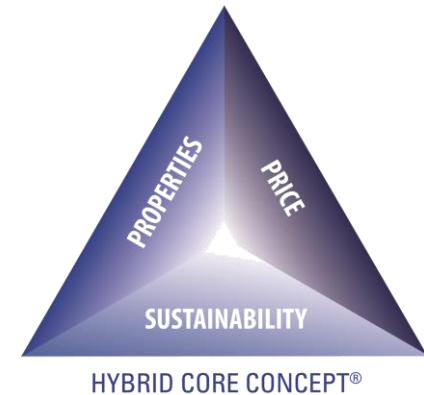
Structural Core Materials – Selection

HYBRID CORE CONCEPT®

... optimize each sandwich structure to its defined goals

Within the triangle of

- Properties (weight, stiffness, heat resistance, damage tolerance etc.)
- Cost (material, resin uptake, finishing, processing, life cycle etc.)
- Sustainability (CO₂ footprint, recyclability, overall life cycle analysis)



Using one single core material may be simple and good enough

however

Intelligent combinations of different materials is the

better solution in most cases!



Summary

How to increase efficiency and sustainability AND reduce total Cost?

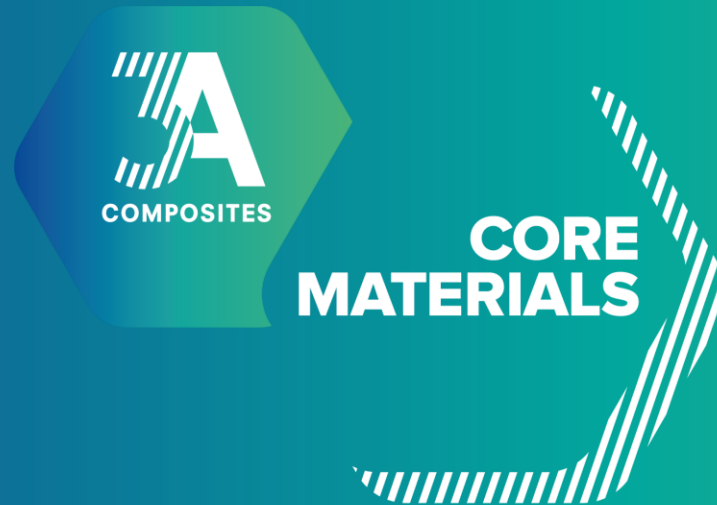
- **New Design:**

- Performance - Stiffness/Strength:
 - SKIN: keep fiber reinforced skins as thin as possible
 - CORE: optimize core **Thickness** and **Properties**
- Sustainability:
 - Use **recyclable** cores
 - Consider **resin consumption**

- **Existing sandwich Design/manufacturing process:**

- Switch to Eco-friendly core (recyclable) – e.g. from PVC to **Balsa** or **PET**
- Optimize specific Properties (Density dependent) – **BALTEK®** or **AIREX® PET**
- Minimize Resin uptake (infusion technologies) - Seal**X** PET and Seal**X** Balsa

Thank you for the attention



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