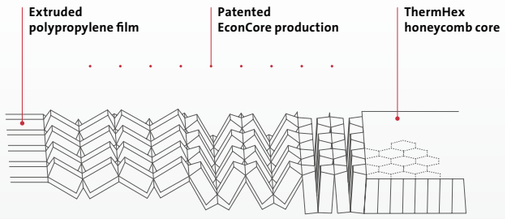
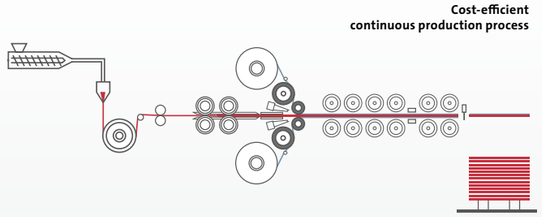
THERMHEX PP HONEYCOMB CORES OFFER TO PRODUCERS OF SANDWICH ELEMENTS A NEW GENERATION OF THE APPROVED CORE MATERIAL

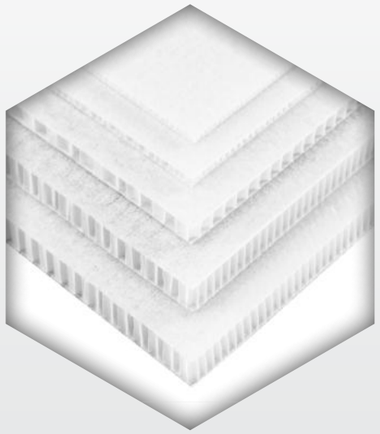
The innovative ThermHex technology for the continuous production of PP honeycomb cores supports the production of highly cost-efficient sandwich structures. Different to traditional production processes, the patented EconCore process allows for a production of PP honeycomb sheets in theoretically endless length. The low consumption of raw materials helps to save on resources and to reduce the CO_2-footprint.
ThermHex honeycomb cores are finished with a polypropylene barrier film. This film avoids the resins to ingress into the open cells during converting and in this way assures stable mechanical properties in the finished part. At the same time, the quantity of resin needed for processing is reduced to a minimum. The second standard surface layer finish is a PET non-woven material, which enables an easy bonding of various types of skin materials with all common adhesives.

YOUR THERMHEX ADVANTAGES THROUGH CONTINUOUS IN-LINE PROCESSING





- MAJOR COST REDUCTION
- SIGNIFICANT WEIGHT SAVING
- HIGH BENDING STIFFNESS
- ENERGY ABSORBENT
- RESISTANT TO MOISTURE, ACIDS AND BASES
- EASY RESOURCE-FRIENDLY CONVERTING
- 100 % RECYCLABLE



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Management System
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THERMHEX PP AND RPP HONEYCOMB CORES

THERMHEX POLYPROPYLENE HONEYCOMB CORES
A NEW GENERATION OF THE APPROVED CORE MATERIAL

NEW PRODUCT

ThermHex COEX
THERMOPLASTIC HONEYCOMB CORES

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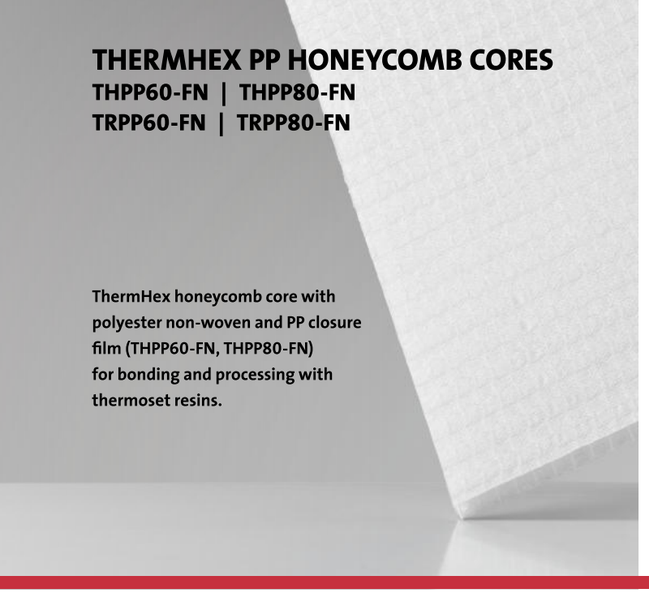
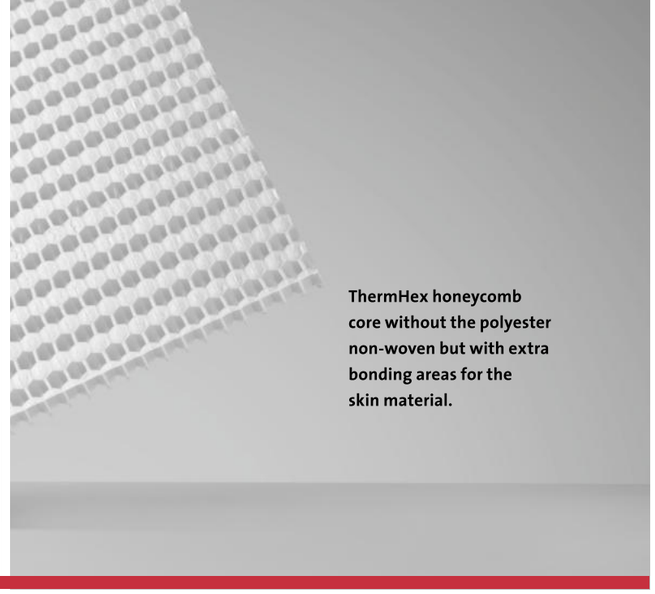
THERMHEX PP HONEYCOMB CORES

THPP60-FN | THPP80-FN
TRPP60-FN | TRPP80-FN



ThermHex honeycomb core with polyester non-woven and PP closure film (THPP60-FN, THPP80-FN) for bonding and processing with thermoset resins.

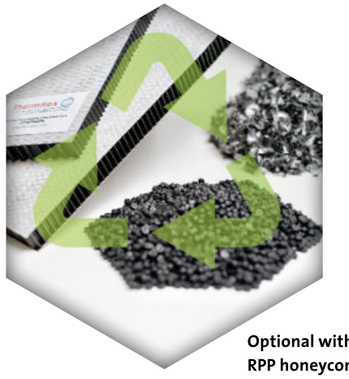


ThermHex honeycomb core without the polyester non-woven but with extra bonding areas for the skin material.

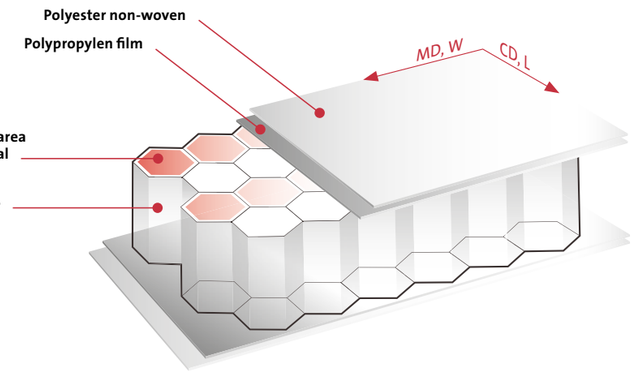
TECHNICAL DATA

PRODUCT DESCRIPTION		THPP60-FN								TRPP60-FN							
Core material		Polypropylen (PP) Color: white								Recycled PP Color: black							
Core thickness (mm)		5	8	10	12	15	20	23	28	5	8	10	12	15	20	23	28
Cell size (mm)		4	8	8	5	5	5	9.6	9.6	4	8	8	5	5	5	9.6	9.6
Cell wall density (kg/m³)		60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Total core density (kg/m³)		128	115	92	88	84	76	76	76	128	115	92	88	84	76	76	76
Weight per unit area (g/m²)		640	920	920	1056	1260	1520	1748	2128	640	920	920	1056	1260	1520	1748	2128
Compressive strength (MPa)*	(ASTM C365)	0.6								1.2							
Compressive modulus (MPa)*	(ASTM C365)	15								40							
Shear strength (CD, L / MD, W) (MPa)	(ASTM C273)	0.4 / 0.2								0.5 / 0.3							
Shear modulus (CD, L / MD, W) (MPa)	(ASTM C273)	14.0 / 5.0								15.0 / 6.0							
Temperatue range (°C)		–30 to +80								–30 to +80							
for processing and application		short-term up to +140								short-term up to +140							
Thermal conductivity (W/(m*K))		0.060								0.065							
Surface finish		50 µm Polypropylen film 40 g/m² Polyester non-woven								50 µm Polypropylen film 40 g/m² Polyester non-woven							
Standard dimensions (CD, L x MD, W) (mm)		1200 x 2500								1200 x 2500							

*Data provided from testing. These are values of an exemplary configuration (thickness, cell size, density)



Optional with ThermHex^{COEX} RPP honeycombs



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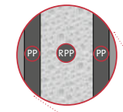
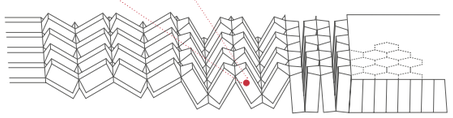


ThermHex^{COEX} THERMOPLASTIC HONEYCOMB CORES



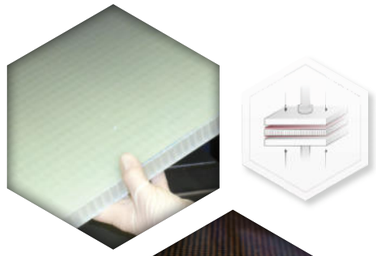
Patent protected by EP4282640 and EP1824667.

TRPP THERMHEX HONEYCOMB CORES WITH PCR PP

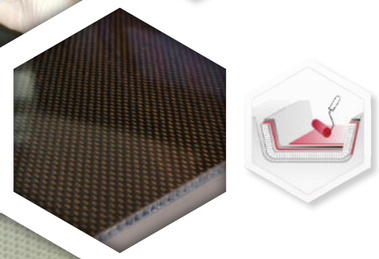
The ThermHex^{COEX} technology enables the usage of low-cost recycled material in the central layer of the sandwich cell wall, while maintaining consistent processing and mechanical properties by using the established virgin compound in the outer cell wall layers.

ThermHex TRPP can use up to 80% post consumer recycled PP in the inner layer. Due to this, the overall recycling content exceeds 25%, thereby fulfills future automotive requirements and meets the increasing sustainability demands.

HANDLING OF THERMHEX HONEYCOMB CORES

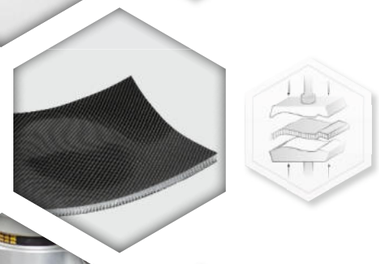


Bonding of skin layer and honeycomb core
During bonding of ThermHex honeycomb core it is essential to use the right adhesive. The adhesive is significantly determined by the requirements of the sandwich compounds.



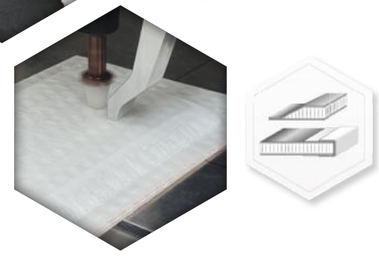
Laminating the skin layer onto the honeycomb core
ThermHex honeycomb cores can be laminated with different methods for example hand lay-up with vacuum moulding. Typical types of resin include polyurethane, polyester, vinylester or epoxy.

Spray-up
For large components or lamination of ThermHex honeycomb cores the fiber resin spray-up suits well. During this process, the merging of the components (resin and reinforcing fiber) as well as the deposition are done with a fiber-resin diffuser.



Forming
Besides forming with heat it is also possible to form honeycomb cores of small thickness (e.g. 3.5 – 10 mm) at room temperature during curing of the skin layers with the help of pressure or vacuum.

Cutting
The cutting of ThermHex honeycomb cores is carried out with conventional tools and methods such as band and circular saws, drawing, rotating and oscillating knives, waterjet and laser cutting, punching and others.



Edge closure and load application
Depending on the kind of procedure, usage and pressure on the finished sheet different edge closures are possible. For load application points, it is recommended to work with inserts that connect the two skin layers, in order to achieve a higher load bearing capacity.

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THERMHEX PP SANDWICH PANELS

The ThermHex PP sandwich panel production is based on the patented ThermHex process. The process enables continuous in-line lamination of thermoplastic skins onto the honeycomb cores in a fully automatic production line.

By using our lightweight panel weight savings of over 80 % are possible compared to a monolithic construction. In comparison to a monolithic organosheet laminate, a sandwich of the same stiffness requires fewer layers of composite, which means considerable cost and weight savings when using the ThermHex PP sandwich panel.

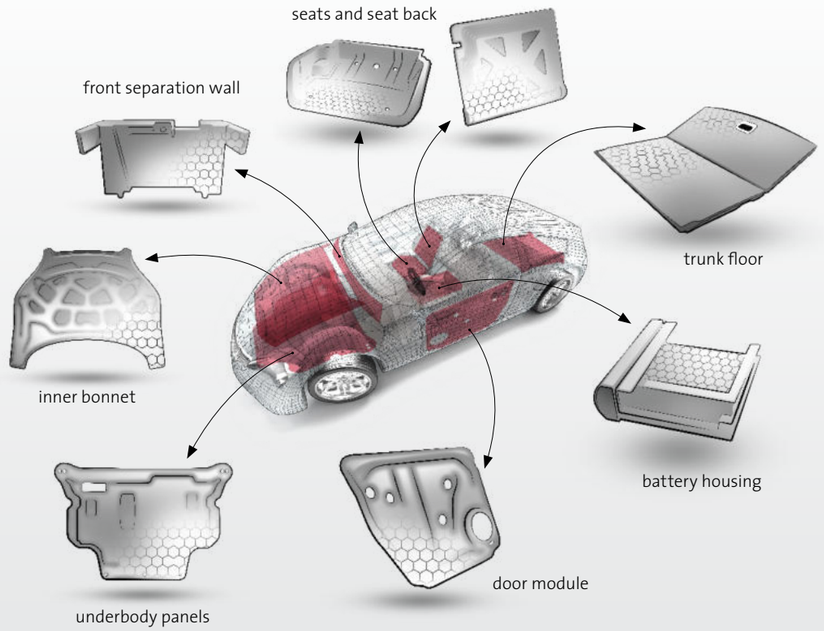
The panel consists of 0°/90° cross ply laminate skin layers (CP) made of continuous glass fiber reinforced polypropylene (GF/PP). The folded honeycomb core material consists of polypropylene as well. This allows an optimal bond between core and skin layers in the lamination process by thermoplastic welding.

The sandwich can be compressed locally to form a monolithic laminate which enables thermoforming of multi-curved shell structures and the formation of stable monolithic joining surfaces in one step. The pressed areas offer the possibility of functional integration by means of injection molding. Hence, complex lightweight parts can be produced very cost-efficiently in short cycle-times which is essential for many large-volume and automotive applications.

PP honeycomb sandwich panels are a lightweight and recyclable replacement of plywood and other conventional monolithic and sandwich panels. Applications include automotive parts, panelling in transportation, cargo boxes, bus floors, solar panels and many others.

ADVANTAGES IN AUTOMOTIVE APPLICATIONS

- HIGH WEIGHT-SPECIFIC STIFFNESS AND STRENGTH
- WEIGHT AND COST REDUCTIONS
- REDUCED RAW MATERIAL USAGE
- 100 % RECYCLABLE PP
- SHORT CYCLE TIMES
- FUNCTIONALISATION BY INJECTION MOULDING



Main automotive applications of ThermHex PP sandwich panels

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JEC WORLD INNOVATION AWARDS WINNER 2025

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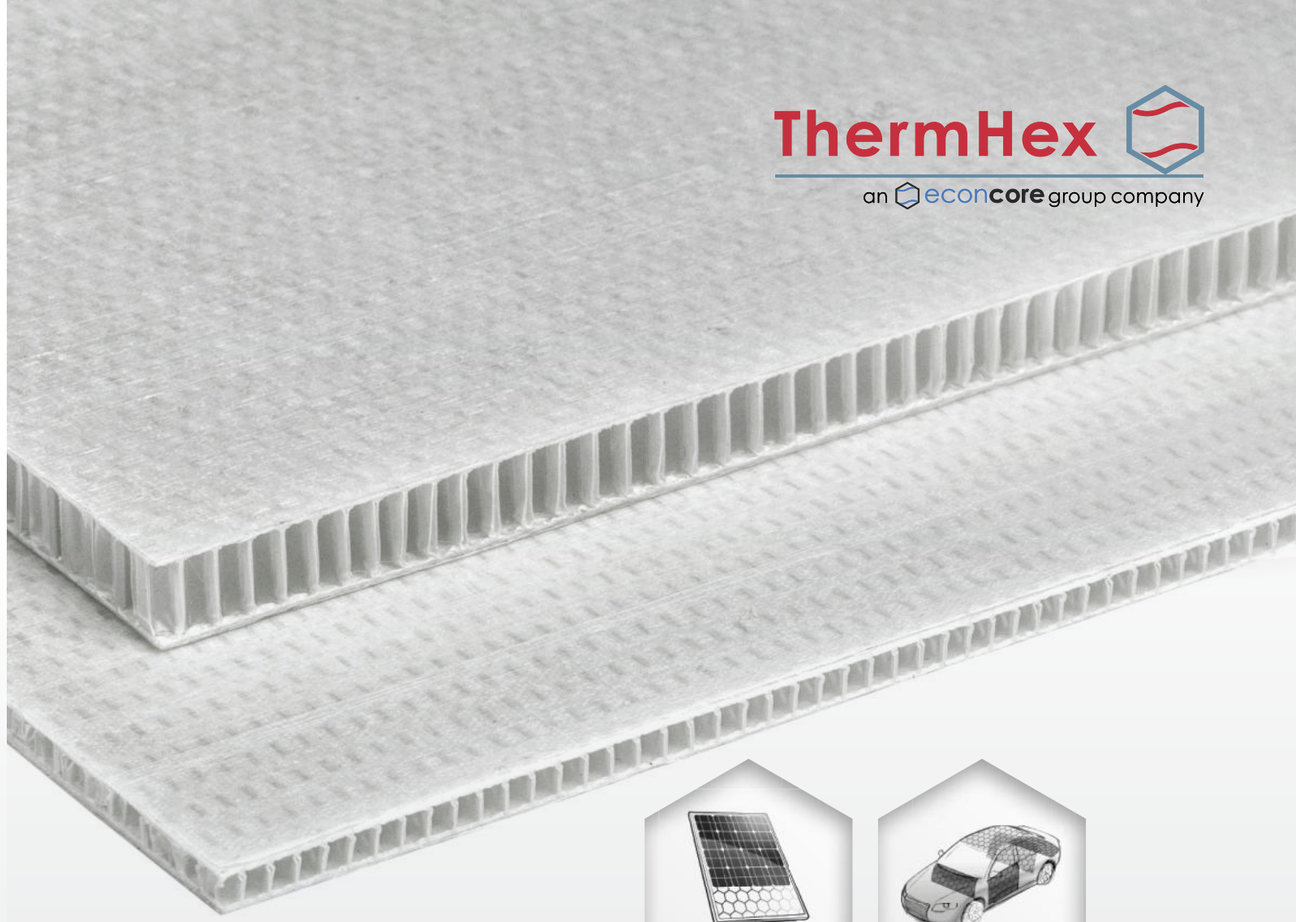

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THERMHEX PP SANDWICH PANELS

THERMHEX POLYPROPYLENE HONEYCOMB CORES WITH GF/PP COMPOSITE SKINS

NEW PRODUCT

ThermHex COEX
THERMOPLASTIC HONEYCOMB CORES

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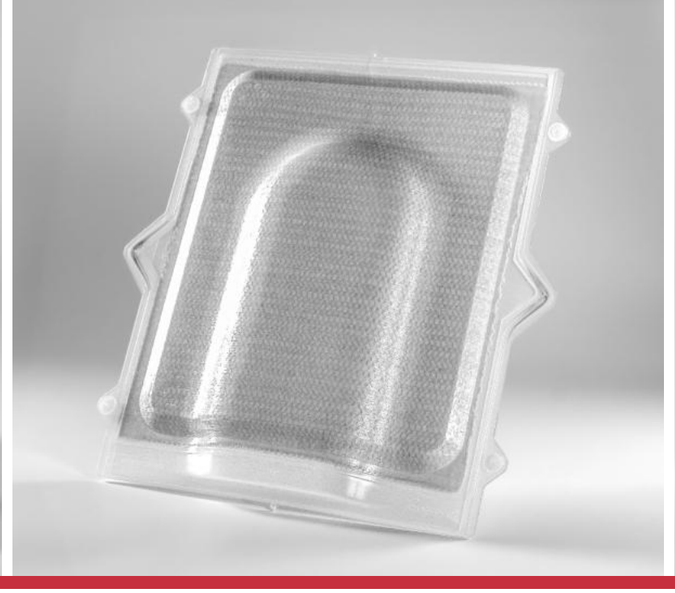


TECHNICAL DATA

MEDIUM DENSITY PP HONEYCOMB WITH 0.35 mm CROSSPLY SKINS FROM PP/GF UD TAPES

THPP80-CP580		6THPP80–CP580	12THPP80–CP580	15THPP80–CP580	20THPP80–CP580
Sandwich thickness (mm)		6.0	12.0	15.0	20.0
Skin layer thickness (mm)		0.35	0.35	0.35	0.35
Core thickness (mm)		5.2	11.2	14.2	19.2
Cell size (mm)		4.0	5.0	5.0	5.0
Sandwich density (kg/m³)		280–290	180–190	165–175	145–155
Core density (kg/m³)		80–90	80–90	80–90	80–90
Weight per unit area (g/m²)		1700	2240	2510	2960
Bending stiffness* (CD, L / MD, W) (Nm)		90 / 70	420 / 290	600 / 400	1000 / 420
Compressive strength (Z-direction) (MPa)	(ASTM C365)	1.2	1.2	1.2	1.2
Compressive modulus (Z-direction) (MPa)	(ASTM C365)	25	40	40	40
Shear strength (CD, L / MD, W) (MPa)	(ASTM C273)	0.5 / 0.3	0.5 / 0.3	0.5 / 0.3	0.5 / 0.3
Shear modulus (CD, L / MD, W) (MPa)	(ASTM C273)	15 / 6	15 / 6	15 / 6	15 / 6

HIGH DENSITY PP HONEYCOMBS WITH 0.5 mm CROSSPLY SKINS FROM PP/GF UD TAPES

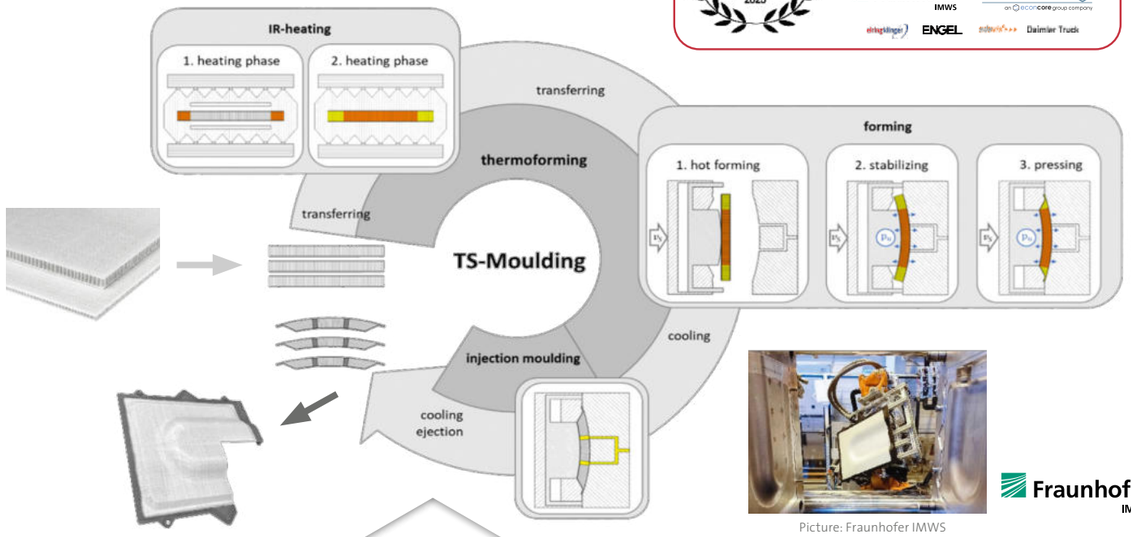
THPP120-CP820		6THPP120–CP820	12THPP120–CP820	15THPP120–CP820	20THPP120–CP820
Sandwich thickness (mm)		6.0	12.0	15.0	20.0
Skin layer thickness (mm)		0.5	0.5	0.5	0.5
Core thickness (mm)		5.0	11.0	14.0	19.0
Cell size (mm)		4.0	5.0	5.0	5.0
Sandwich density (kg/m³)		400–410	260–270	235–245	210–220
Core density (kg/m³)		120–130	120–130	120–130	120–130
Weight per unit area (g/m²)		2450	3200	3590	4240
Bending stiffness* (CD, L / MD, W) (Nm)		140 / 125	590 / 475	900 / 600	1600 / 700
Compressive strength (Z-direction) (MPa)	(ASTM C365)	2.0	2.4	2.4	2.4
Compressive modulus (Z -direction) (MPa)	(ASTM C365)	60	140	140	140
Shear strength (CD, L / MD, W) (MPa)	(ASTM C273)	1.2 / 0.5	1.2 / 0.5	1.2 / 0.5	1.2 / 0.5
Shear modulus (CD, L / MD, W) (MPa)	(ASTM C273)	50 / 16	50 / 16	50 / 16	50 / 16

Core material	Polypropylen (PP)
Temperature range (°C)	–30 to +80, short term up to +140
Thermal conductivity (W / (m*K))	0.060–0.070
Fire-resistance	Normally inflammable, higher grades of fire-resistance can be obtained in sandwich elements when using specialised surface modification.
Chemical resistance	Excellent resistance to water, most acids, bases and salt solution, limited UV resistance
Standard dimensions (MD, W × CD, L) (mm)	2500 × 1200

* at 400 mm span length in 3P8-test

THERMOPLASTIC HONEYCOMB SANDWICH PROCESSING

JEC WORLD INNOVATION AWARDS WINNER 2025
Thermoplastic Sandwich Panel Moulding
Winner of the JEC World Innovation Award
Category: *Automotive & Road Transportation - Process*
Fraunhofer IMWS · ThermHex an econcore group company · ENGEL · Daimler Truck

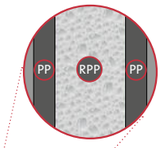


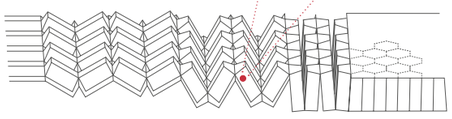
Picture: Fraunhofer IMWS

Fraunhofer IMWS

Complex shaped functionalized sandwich parts

Edge finishing on ThermHex PP sandwich panels





Patent protected by EP4282640 and EP1824667.

Optional with ThermHex^{COEX} RPP honeycombs

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THERMHEX PEI HONEYCOMB CORES

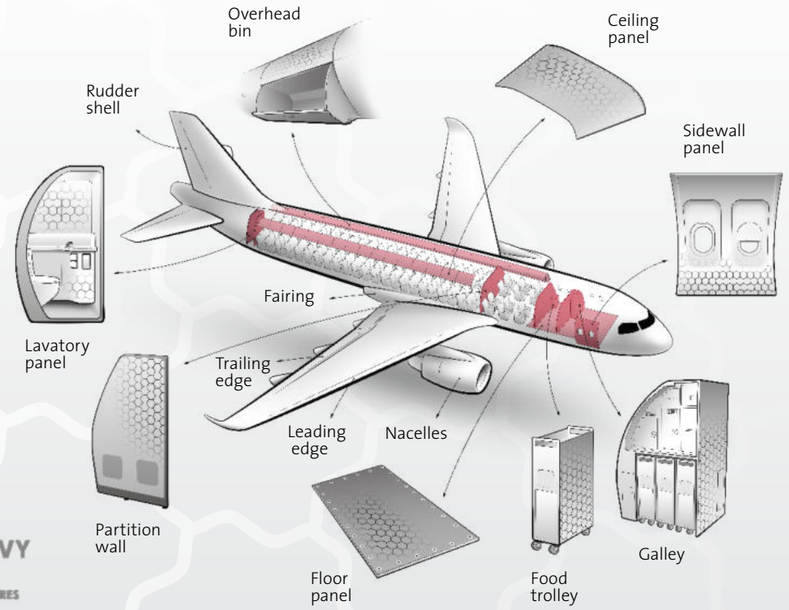
Continuing to work with lightweight materials whilst using sustainable materials is one of the major challenges today's aviation industry faces. Aerospace industry and other high end applications have been favouring non-recyclable thermoset phenolic resin based honeycombs for a long time. To provide a more sustainable alternative, we offer a high performance thermoplastic honeycomb core. This without compromising the markets needs in weight, fire-safety and performance.

The target applications for PEI honeycomb cores are mainly aircraft and railway interior components. With a need for ramp up of production volumes and increasing focus on SHE (safety, health, environment), efficiently produced thermoplastic honeycombs made with the already proven EconCore technology offer great potential. The thermoplastic honeycomb is typically laminated with fibre-reinforced thermoplastic composites, resulting in a mono-material, all-thermoplastic sandwich solution.

EconCore's new patented ThemHex wavy cell wall geometry increases the cell wall buckling resistance and thus the key mechanical properties of the honeycomb core.

ADVANTAGES IN AIRCRAFT INTERIORS

- HIGH WEIGHT-SPECIFIC STIFFNESS AND STRENGTH
- POTENTIAL COST REDUCTIONS
- REDUCED CO_2 FOOTPRINT
- 100 % RECYCLABLE PEI
- EXCELLENT FIRE RESISTANCE
- ENABLES ADVANCED THERMOPLASTIC PROCESSING



ThermHex WAVY
HIGH PERFORMANCE THERMOPLASTIC CORES

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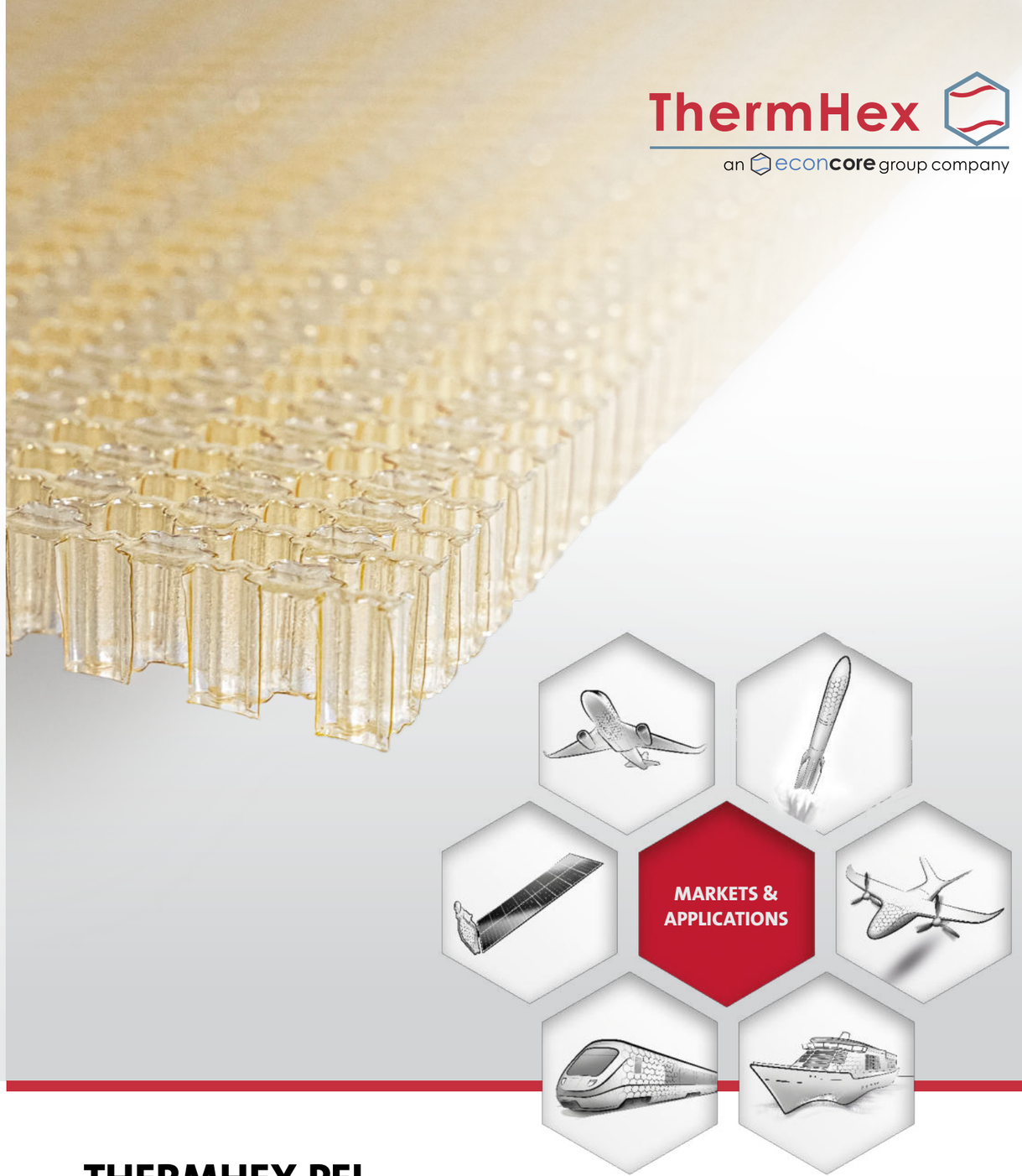

THERMHEX PEI HONEYCOMB CORES

THERMHEX^{WAVY} POLYETHERIMIDE HONEYCOMB CORES
THE NEW HIGH PERFORMANCE THERMOPLASTIC CORE MATERIAL

NEW PRODUCT

ThermHex WAVY
HIGH PERFORMANCE THERMOPLASTIC CORES

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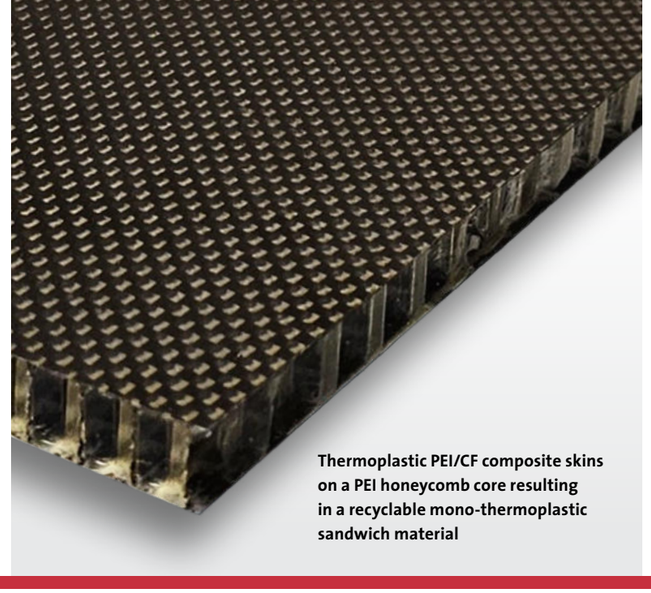
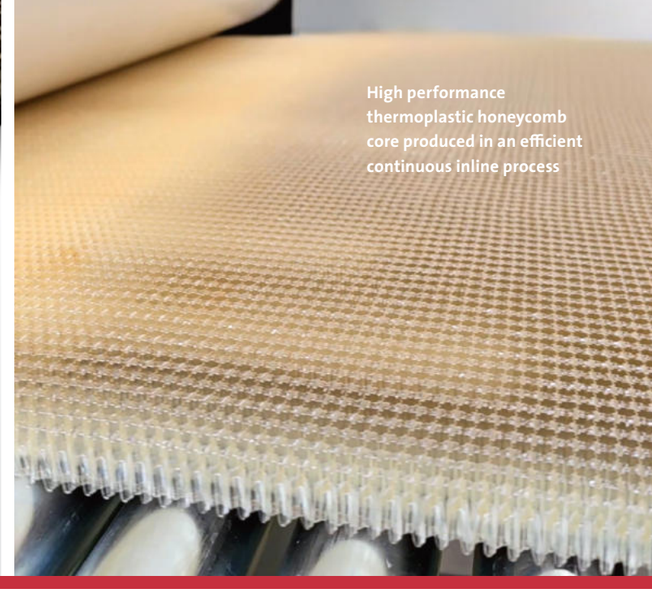
THERMHEX PEI HONEYCOMB CORES

TWPEI32 | TWPEI48 | TWPEI64 | TWPEI80 | TWPEI96

ThermHex honeycomb core with improved buckling and shear optimised patented wavy cell geometry



Thermoplastic PEI/CF composite skins on a PEI honeycomb core resulting in a recyclable mono-thermoplastic sandwich material



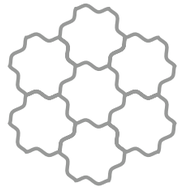
High performance thermoplastic honeycomb core produced in an efficient continuous inline process

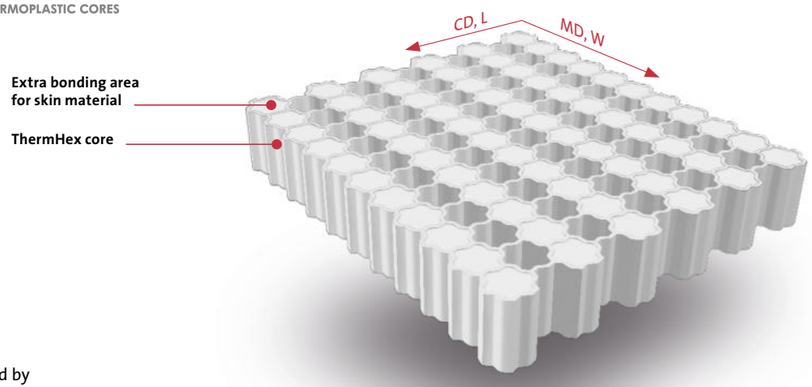
TECHNICAL DATA

PRODUCT DESCRIPTION		TWPEI32	TWPEI48	TWPEI64	TWPEI80	TWPEI96
Core material		Polyetherimide	Polyetherimide	Polyetherimide	Polyetherimide	Polyetherimide
Core thickness (mm) (other geometries available upon request)		7* | 10* | 12	7* | 10* | 12	7* | 10* | 12	7* | 10* | 12	7* | 10* | 12
Cell size (mm)		6.4	6.4	6.4	6.4	6.4
Cell wall density (kg/m³)		32	48	64	80	96
Compressive strength (Z-direction) (MPa)	(ASTM C365)	0.4	1.1	2.0	2.9	3.8
Compressive modulus (Z-direction) (MPa)	(ASTM C365)	20	50	65	75	85
Shear strength (CD, L) (MPa)	(ASTM C273)	0.5	0.6	0.7	0.8	0.9
Shear strength (MD, W) (MPa)	(ASTM C273)	0.2	0.3	0.4	0.5	0.6
Shear modulus (CD, L) (MPa)	(ASTM C273)	18	22	25	28	31
Shear modulus (MD, W) (MPa)	(ASTM C273)	4	9	11	13	15

Fire resistance	Fulfills all requirements of Federal Aviation Regulation (FAR 25.853)
Standard dimensions (MD, W × CD, L) (mm)	2500 × 1200 (* 7mm and 10mm currently available in 400 mm width and ≥ 48 kg/m³)
Temperature range (°C)	-55 to +180

ThermHex WAVY
HIGH PERFORMANCE THERMOPLASTIC CORES

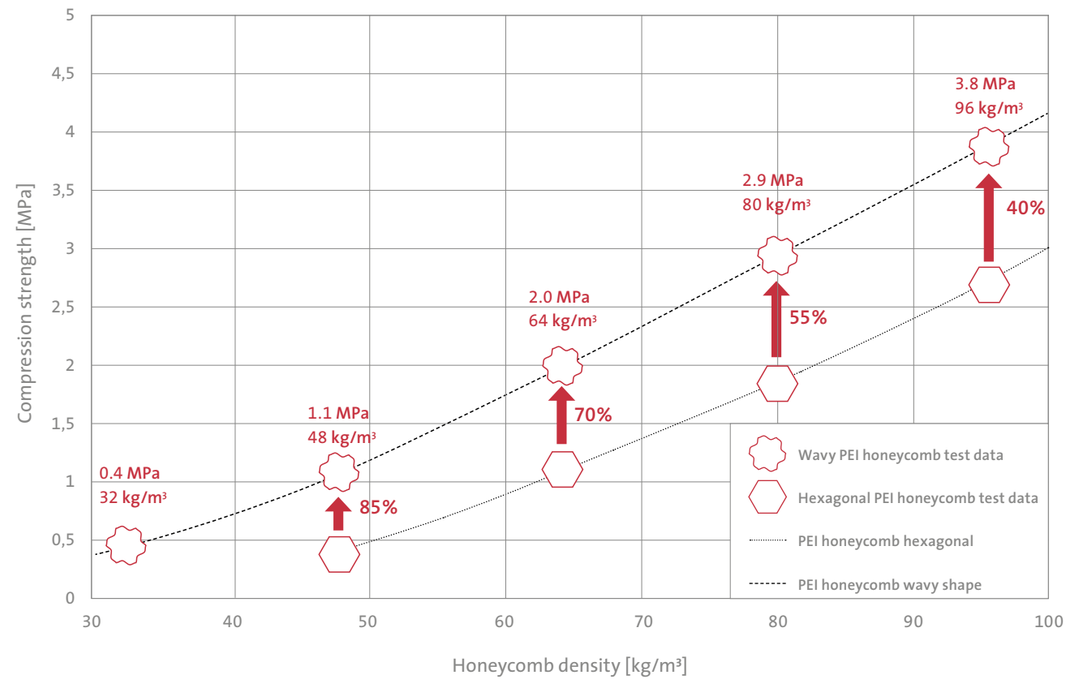




ThermHex^{WAVY} PEI is protected by Patent EP4275877 and EP1824667.

THE COMPRESSION STRENGTH OF THERMHEX^{WAVY} PEI HONEYCOMB CORES

Flatwise compression strength (bare, not stabilised) in function of honeycomb cell wall density



ThermHex^{WAVY} PEI honeycomb core is a continuously produced thermoplastic honeycomb core with exceptional fire resistance and temperature stability.

Besides thermoplastic PEI/CF or PEI/GF composite skins, which can be bonded by thermoplastic welding, also conventional thermoset e.g. epoxy prepreg skins can be bonded to ThermHex^{WAVY} PEI honeycombs.

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