

## THERMHEX PP SANDWICH PANEL

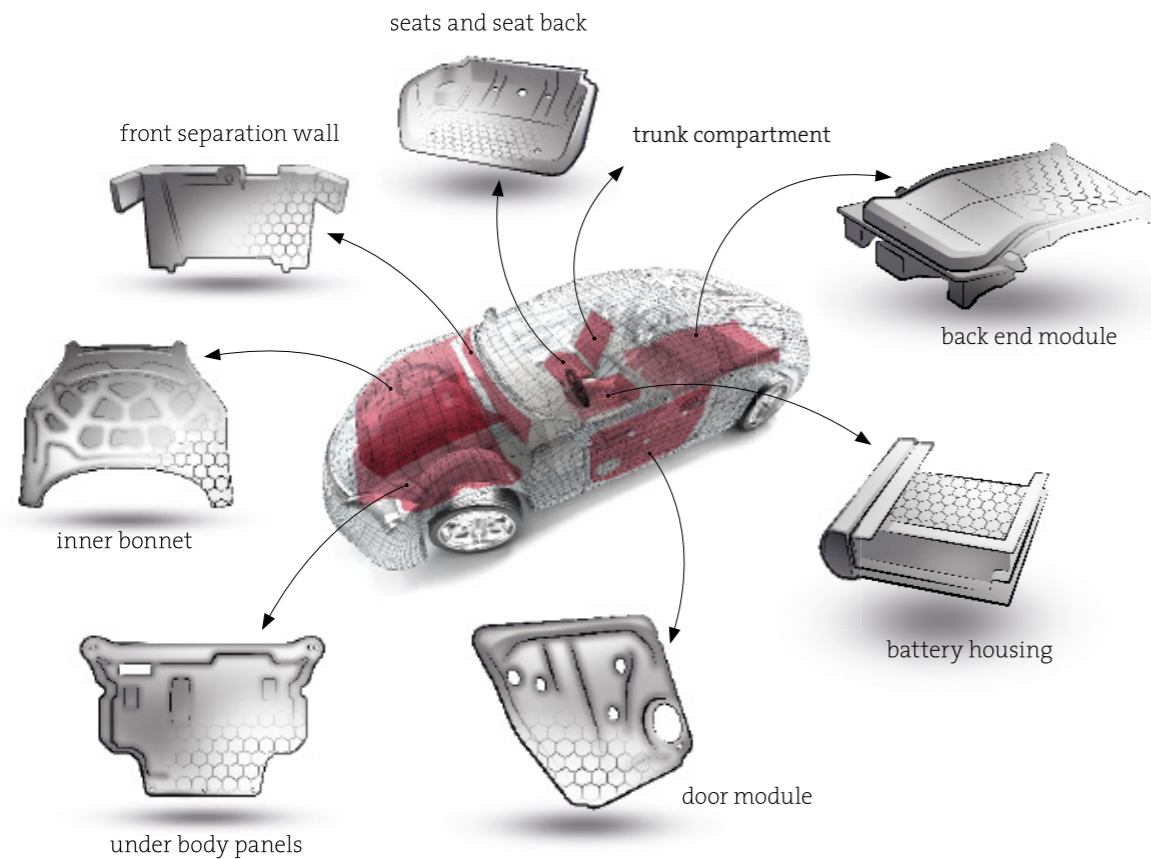
The ThermHex PP sandwich panel production is based on the patented ThermHex process. The process enables the continuous inline production of thermoplastic honeycomb cores in a fully automatic production line.

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 savings when using the ThermHex PP sandwich panel. The panel consists of 0°/90° crossply laminate skin layers (CP) made of continuous glass fiber reinforced polypropylene (GF/PP) and alternatively of skin layers from chopped glass fiber

reinforced polypropylene (GC). The folded honeycomb core material consists of a 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 the 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 automotive applications.



Potential automotive applications

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ThermHex Waben is a licensee of EconCore NV (Belgium), the technology leader for cost-efficient sandwich material production technologies.

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## ADVANTAGES

- > Major cost reduction
- > Significant weight saving
- > High bending stiffness
- > Energy absorbent
- > Resistant to moisture, acids and bases
- > Easy resource-friendly converting
- > 100% recyclable

## THERMHEX PP SANDWICH PANEL

ThermHex polypropylene honeycomb core with GF/PP composite skin



**PRODUCT DESCRIPTION**

Higher density ThermHex PP honeycomb with 820 g/m<sup>2</sup> crossply skins from PP/GF UD Tapes

	<b>6THPP120-CP820</b>	<b>12THPP120-CP820</b>	<b>15THPP120-CP820</b>	<b>20THPP120-CP820</b>
Sandwich thickness	6 mm	12 mm	15 mm	20 mm
Skin layer thickness	0,5 mm	0,5 mm	0,5 mm	0,5 mm
Core thickness	5 mm	11 mm	14 mm	19 mm
Cell size	4 mm	5 mm	5 mm	5 mm
Weight per unit area	2450 g/m <sup>2</sup>	3200 g/m <sup>2</sup>	3590 g/m <sup>2</sup>	4240 g/m <sup>2</sup>
Sandwich density	400 - 410 kg/m <sup>3</sup>	260 - 270 kg/m <sup>3</sup>	235 - 245 kg/m <sup>3</sup>	210 - 220 kg/m <sup>3</sup>
Core density	120 - 130 kg/m <sup>3</sup>	120 - 130 kg/m <sup>3</sup>	120 - 130 kg/m <sup>3</sup>	120 - 130 kg/m <sup>3</sup>
Bending stiffness (CD, L/MD, W) *	140 – 125 Nm	590 – 475 Nm	900 – 600 Nm	1600 – 700 Nm
Compressive strength (Z-direction) ASTM C365	2,0 MPa	2,4 MPa	2,4 MPa	2,4 MPa
Compressive modulus (Z-direction) ASTM C365	60 MPa	140 MPa	140 MPa	140 MPa
Shear strength (CD, L/MD, W) ASTM C273	1,2 MPa – 0,5 MPa	1,2 MPa – 0,5 MPa	1,2 MPa – 0,5 MPa	1,2 MPa – 0,5 MPa
Shear modulus (CD, L/MD, W) ASTM C273	50 MPa – 16 MPa	50 MPa – 16 MPa	50 MPa – 16 MPa	50 MPa – 16 MPa

\* at 400 mm span length in 3PB test

**PRODUCT DESCRIPTION**

Medium density ThermHex PP honeycomb with 580 g/m<sup>2</sup> crossply skins from PP/GF UD Tapes

	<b>6THPP80-CP580</b>	<b>12THPP80-CP580</b>	<b>15THPP80-CP580</b>	<b>20THPP80-CP580</b>
Sandwich thickness	6 mm	12 mm	15 mm	20 mm
Skin layer thickness	0,4 mm	0,4 mm	0,4 mm	0,4 mm
Core thickness	5,2 mm	11,2 mm	14,2 mm	19,2 mm
Cell size	4 mm	5 mm	5 mm	5 mm
Weight per unit area	1700 g/m <sup>2</sup>	2240 g/m <sup>2</sup>	2510 g/m <sup>2</sup>	2960 g/m <sup>2</sup>
Sandwich density	280 - 290 kg/m <sup>3</sup>	180 - 190 kg/m <sup>3</sup>	165 - 175 kg/m <sup>3</sup>	145 - 155 kg/m <sup>3</sup>
Core density	80 - 90 kg/m <sup>3</sup>	80 - 90 kg/m <sup>3</sup>	80 - 90 kg/m <sup>3</sup>	80 - 90 kg/m <sup>3</sup>
Bending stiffness (CD, L/MD, W) *	90 – 70 Nm	420 – 290 Nm	600 – 400 Nm	1000 – 420 Nm
Compressive strength (Z-direction) ASTM C365	1,2 MPa	1,2 MPa	1,2 MPa	1,2 MPa
Compressive modulus (Z-direction) ASTM C365	25 MPa	40 MPa	40 MPa	40 MPa
Shear strength (CD, L/MD, W) ASTM C273	0,5 MPa – 0,3 MPa	0,5 MPa – 0,3 MPa	0,5 MPa – 0,3 MPa	0,5 MPa – 0,3 MPa
Shear modulus (CD, L/MD, W) ASTM C273	15 MPa – 6 MPa	15 MPa – 6 MPa	15 MPa – 6 MPa	15 MPa – 6 MPa

\* at 400 mm span length in 3PB test

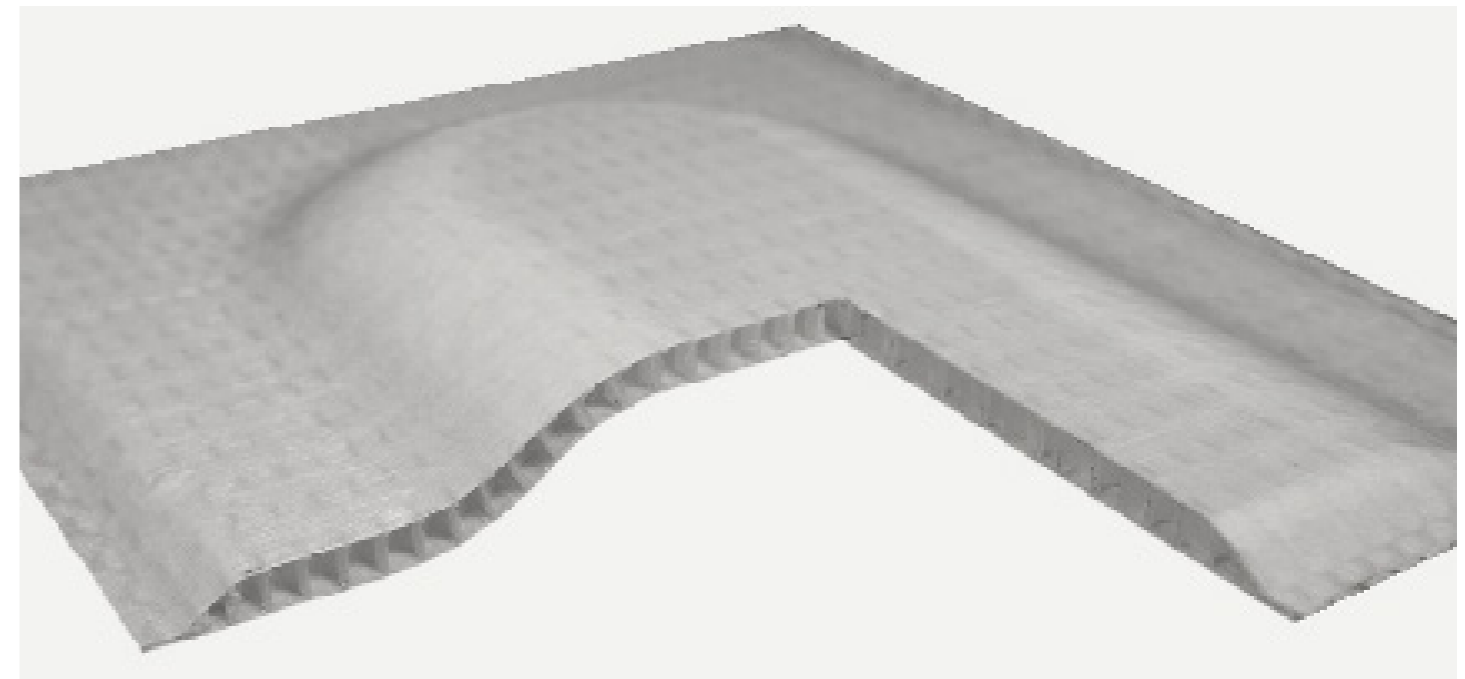
**PRODUCT DESCRIPTION**

Medium density ThermHex PP honeycomb with 340 g/m<sup>2</sup> skins from PP/GF chopped strand mat

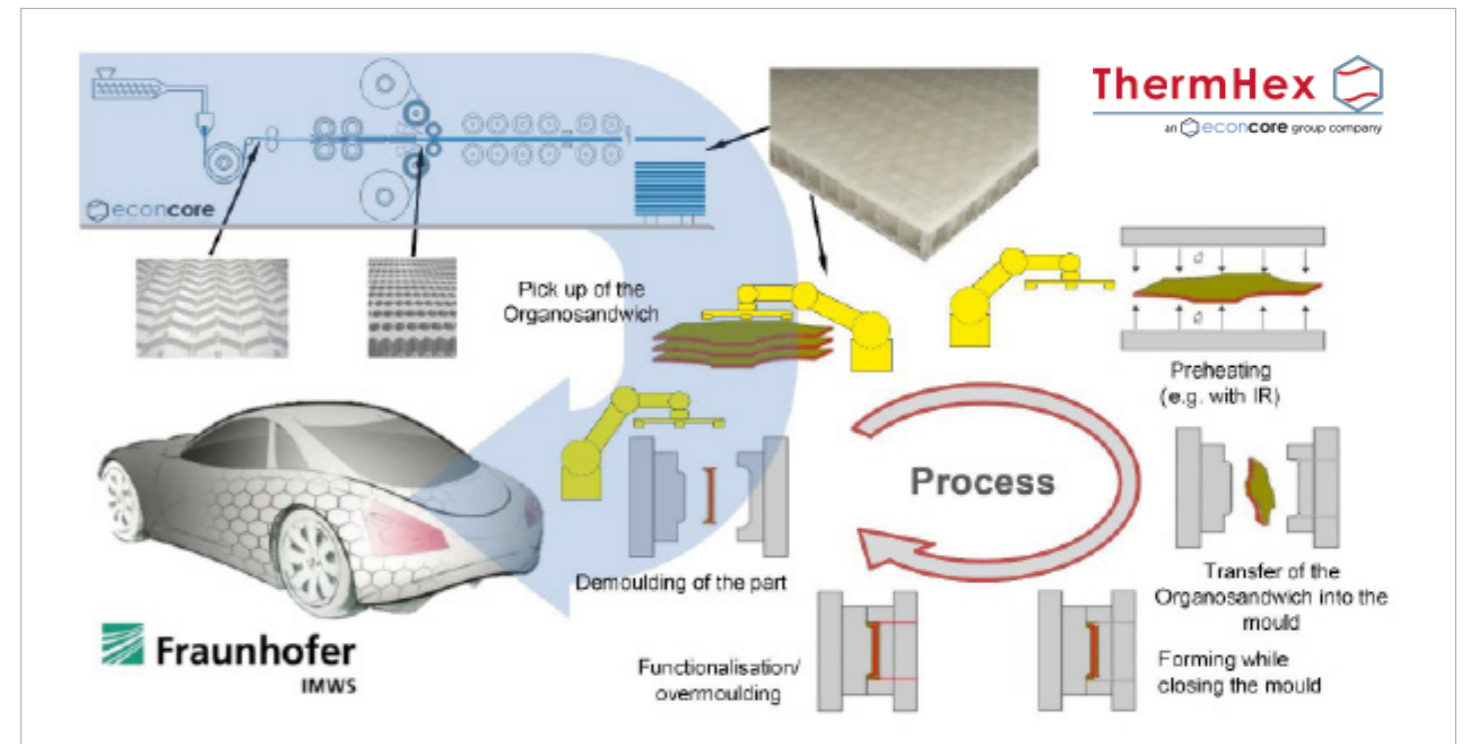
	<b>6THPP80-GC340</b>	<b>12THPP80-GC340</b>	<b>15THPP80-GC340</b>	<b>20THPP80-GC340</b>
Sandwich thickness	6 mm	12 mm	15 mm	20 mm
Skin layer thickness	0,25 mm	0,25 mm	0,25 mm	0,25 mm
Core thickness	5,5 mm	11,5 mm	14,5 mm	19,5 mm
Cell size	4 mm	5 mm	5 mm	5 mm
Weight per unit area	1220 g/m <sup>2</sup>	1760 g/m <sup>2</sup>	2030 g/m <sup>2</sup>	2480 g/m <sup>2</sup>
Sandwich density	200 - 210kg/m <sup>3</sup>	140 - 150 kg/m <sup>3</sup>	130 - 140 kg/m <sup>3</sup>	120 - 130 kg/m <sup>3</sup>
Core density	80 - 90 kg/m <sup>3</sup>	80 - 90 kg/m <sup>3</sup>	80 - 90 kg/m <sup>3</sup>	80 - 90 kg/m <sup>3</sup>
Bending stiffness (CD, L/MD, W) *	28 – 18 Nm	110 – 80 Nm	170 – 120 Nm	320 – 220 Nm
Compressive strength (Z-direction) ASTM C365	1,2 MPa	1,2 MPa	1,2 MPa	1,2 MPa
Compressive modulus (Z-direction) ASTM C365	25MPa	40 MPa	40 MPa	40 MPa
Shear strength (CD, L/MD, W) ASTM C273	0,5 MPa – 0,3 MPa	0,5 MPa – 0,3 MPa	0,5 MPa – 0,3 MPa	0,5 MPa – 0,3 MPa
Shear modulus (CD, L/MD, W) ASTM C273	15 MPa – 6 MPa	15 MPa – 6 MPa	15 MPa – 6 MPa	15 MPa – 6 MPa

\* at 400 mm span length in 3PB test

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 specialized surface modification.
Chemical resistance	Excellent resistance to water, most acids, bases and salt solutions.
Standard dimensions	2500 mm x 1200 mm



Picture: Fraunhofer IMWS



Picture: Fraunhofer IMWS/ Sven Döring