PrimeTex™

“Heaviest carbon tows for lightest woven fabrics”

Bruno Bolzinger – JEC - March 30th, 2011
## Hexcel – Leader in Advanced Composites

<table>
<thead>
<tr>
<th>Hexcel Product</th>
<th>Key Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Fiber</td>
<td>Acrylonitrile</td>
</tr>
<tr>
<td>Reinforcements</td>
<td>Glass Fiber Carbon Fiber</td>
</tr>
<tr>
<td>Carbon Prepregs</td>
<td>Carbon Fibers Resins</td>
</tr>
<tr>
<td>Glass and Other Prepregs</td>
<td>Glass Fibers Aramid Fibers Resins</td>
</tr>
<tr>
<td>Honeycomb</td>
<td>Aramid Paper Aluminum Foil</td>
</tr>
<tr>
<td>Engineered Products</td>
<td>Honeycomb Prepregs Adhesives</td>
</tr>
</tbody>
</table>

**Composite Materials Segment**

**Broad Range of Composite Materials and Applications**

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PrimeTex™ definition

- PrimeTex™: Range of carbon fabrics which have been processed for a smooth, closed weave and uniform cosmetic appearance.
- Fiber tows are flatly woven then spread in both warp and weft direction for maximum fabric closure:
  - Cosmetic and surface finish
  - Reduction of skins porosities risks
  - Improve sandwich skins water tightness
- Hexcel has patents covering its innovative weft insertion and spreading technologies.
- PrimeTex™ quality is measured through fibre coverage ratio named “open factor”.

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Open factor definition

- Open factor is the ratio of the hole areas (white) over the area of the weaving pattern (black and white) on large area – then giving an indication of “fabric openness”

- Light intensity and picture parameters are calibrated
- The more the light goes through the fabric, less important is the fiber coverage.
- That measuring process had been transferred in software used by Hexcel on all PrimeTex™ products
### Open factor measured on 200 gsm, Plain Weave standard 3K fabric

<table>
<thead>
<tr>
<th>Fibre</th>
<th>Open factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grafil TR30S 3K A</td>
<td>9.9%</td>
</tr>
<tr>
<td>Hextow AS2C J 3K HS CP3000</td>
<td>7.5%</td>
</tr>
<tr>
<td>Hextow AS4C GP 3K HS CP3000</td>
<td>9.3%</td>
</tr>
<tr>
<td>Hextow AS4C GP 3K HS CP4000</td>
<td>9.3%</td>
</tr>
<tr>
<td>Tenax E HTA40 E13 3K</td>
<td>8.5%</td>
</tr>
<tr>
<td>Thornel T650/35 3K UC309 GV2</td>
<td>10.5%</td>
</tr>
<tr>
<td>Torayca FT300B 3K 40B</td>
<td>7.0%</td>
</tr>
<tr>
<td>Torayca T300B 3K 40B L2</td>
<td>7.0%</td>
</tr>
</tbody>
</table>

**FT300 3K 40B and AS2C J 3K show better fibre coverage**
PrimeTex™ High Strength 3K, optical properties

Hexforce® 200 gsm, PW, AS2C J 3K
Open factor: 7.5%

PrimeTex™ 200 gsm, PW, AS2C J 3K
Open factor: 0.5%
PrimeTex™ High Strength 3K, mechanical properties

RTM Process, resin XB3518, FVC 55%

- Flexural 0° Strength (Mpa)
- Compression 90° Strength (Mpa)
- Compression 0° Strength (Mpa)
- Tensile 0° Strength (Mpa)
- ILSS Strength (Mpa)
- Tensile 0° Modulus (Gpa)

Lines indicate:
- Hexforce 200gsm, T2/2, FT300 3K 40B
- Hexforce 200gsm, T2/2, AS2 CJ 3K
- PrimeTex 200gsm, T2/2, AS2 CJ 3K

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PrimeTex™ High Strength 6K, optical properties

Hexforce® 285 gsm, Twill 2/2, HS6K
Open factor: 3.37%

PrimeTex™, 285 gsm, Twill 2/2, HS6K
Open factor: 0.1%

Micrographic @0°

Hexforce® 285 gsm, Twill 2/2, HS6K

PrimeTex™ 285 gsm, Twill 2/2, HS6K
PrimeTex™ High Strength 6K, mechanical properties

Process RTM, Resin RTM6, FVC 60%

- Tensile Strength 0°
- Tensile Strength 90°
- In Plane Shear
- ILSS Strength
- Compressive Strength 0°
- Compressive Strength 90°

Hexforce 285 gsm, HTA 6K, T2/2
PrimeTex 285 gsm, HTA 6K, T2/2

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PrimeTex™ High Strength 12K, optical properties

Hexforce® 193 gsm, Twill 2/2, HS12K
Open factor: 5%

PrimeTex™ 193 gsm, Twill 2/2, HS12K
Open factor: 0.3%
PrimeTex™ High Strength 12K & 24K

PrimeTex™ 12K or 24K flat weaving & spreading

Regular carbon fabric weaving

PrimeTex™ advantage for FAW below 400gsm

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PrimeTex™, success stories

Inner Skin:
12K PrimeTex™ 200 gsm PW

Outer Skin:
3K PrimeTex™ 200 gsm PW

BMW M3/M6 composite roof
PrimeTex™, success stories

PrimeTex™ with Standard Modulus carbon fiber
PrimeTex™, success stories

PrimeTex™ with High Modulus carbon fiber

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Where to find PrimeTex™
Thank You

Questions & Answers