The global CFRP market 2016

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Experience Composites, Augsburg, September 21st 2016
The global CFRP market 2016

BMW 7 series with Carbon Core Technology, estimated production rate in 2016: ~64,000 (IHS) ↔ i3 in 2015: ~24,000 (IHS), image source: BMW
The global CFRP market 2016

Overview

1  The global Carbon Fiber market
   1.1  By manufacturer
   1.2  By region

2  The global Carbon Composites market
   2.1  By matrix
   2.2  By process
   2.3  By region
   2.4  By application

3  Trends and outlook

4  Conclusion
1 The global Carbon Fiber market

Processing of carbon fibers in Wackersdorf plant of SGL Automotive Carbon Fibers (ACF), source: BMW / SGL-ACF
Global demand of **Carbon Fibers** in thousand tonnes from 2010 to 2022 (*estimations*)

\[
A(t_n) = A(t_1)(1 + CAGR)^n
\]

\[
CAGR(t_1, t_n) = \left(\frac{A(t_n)}{A(t_1)}\right)^{\frac{1}{n}} - 1
\]

Constant compound annual growth rate (CAGR) ca. **9-12%**
1 The global Carbon Fiber market

1.1 By manufacturer

Annual, theoretical CF capacity by manufacturer in thousand tons (2015). $\Sigma = 130,9$ kt (2014: 125 kt $\rightarrow +4,7\%$)

- Toray + Zoltek: 27.1
- SGL: 12.0
- Toho: 11.5
- MRC: 10.1
- Form Plast Cor.: 8.8
- Hexcel: 7.3
- Solvay (Cytec): 4.0
- Zhongfu-Shenyi: 4.0
- Aksa: 3.6
- Hengshen Fib. Mat.: 3.0
- Hyosung: 2.5
- sonstige: 13.6

Yearly CF capacity

Growth 2015/2016

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1 The global Carbon Fiber market

Graphic source: Mutel, JEC

Concrete 4,000,000 kT
Steel 1,578,079 kT
Plastics 299,000 kT
Aluminium 49,714 kT
Glass Fibre 4,700 kT
Titanium 192 kT
Carbon Fibre 41 kT

Aluminium: 57,770 kT (2016)
CF: 64 kT (2016)

> x500 by weight
> x50 by revenues

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1 The global Carbon Fiber market

1.2 By region

Annual, theoretical CF capacity by regions in thousand tons (2015).

- USA & Mexico: 43.4 t; 33%
- Japan: 25.0 t; 19%
- China: 13.3 t; 10%
- Taiwan: 8.8 t; 7%
- Hungary: 8.1 t; 6%
- South Korea: 8.6 t; 7%
- Germany: 5.8 t; 4%
- France: 5.2 t; 4%
- Great Britain: 4.0 t; 3%
- RoW: 8.9 t; 7%
- Total: 130.9 kt
2 The global Carbon Composites market

New Airbus Helicopter H160, source: Airbus Helicopters
Global demand of Carbon Composites in thousand tonnes from 2010 to 2022 (* estimations)

\[ A(t_n) = A(t_1)(1 + CAGR)^n \]
\[ CAGR(t_1, t_n) = \left( \frac{A(t_n)}{A(t_1)} \right)^{\frac{1}{n}} - 1 \]

Constant compound annual growth rate (CAGR) ca. 10-12%
2. The global Carbon Composites market

2.1 By matrix

CC revenues in US$ billion by matrix (2015)

- Polymer: 11.6; 65%
- Thermoset: 8.7; 49%
- Thermoplastic: 2.9; 16%
- Ceramic: 1.7; 10%
- Metal: 1.3; 7%
- Hybrid: 0.8; 4%

Total: US$ 17.9 billion
2 The global Carbon Composites market

2.2 By processes

With CFRP production processes generated amounts in thousand tonnes (2015)

- Prepreg layup process with/without autoclave; 39.1; 43%
- Pultrusion and winding; 24.6; 27%
- Wet lamination & infusion process; 9.6; 10%
- Press and injection processes; 10.6; 12%
- Others; 7.1; 8%

Total: 91 kt
2.3 By region

CC demand in thousand tonnes by region (2015)

North America; 44.3; 38%
Europe; 40.8; 35%
Asia & Pacific; 26.8; 23%
RoW; 4.6; 4%

Total: 116.5 kt
2 The global Carbon Composites market

Tips of 58.5 meter long rotor blades for Siemens SWT-3.6-120 wind turbines on a jack-up vessel, source: Siemens
2.4 By application

CC demand in thousand tonnes by application (2015)

- Aerospace and Defence; 35.2; 30%
- Automotive; 25.5; 22%
- Wind Turbines; 14.5; 13%
- Sport & Leisure; 13.9; 12%
- Civil Engineering; 5.6; 5%
- Others; 20.3; 17%
- Marine; 1.5; 1%

Total: 116.5 kt
### 2.4 By application

CC revenues in US$ billion by application (2015)

<table>
<thead>
<tr>
<th>Application</th>
<th>Revenue (US$ billion)</th>
<th>Market Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace &amp; Defence</td>
<td>10.9; 61%</td>
<td></td>
</tr>
<tr>
<td>Automotive</td>
<td>2.2; 12%</td>
<td></td>
</tr>
<tr>
<td>Wind Turbines</td>
<td>1.4; 8%</td>
<td></td>
</tr>
<tr>
<td>Sport &amp; Leisure</td>
<td>1.3; 7%</td>
<td></td>
</tr>
<tr>
<td>Marine</td>
<td>0.1; 1%</td>
<td></td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>0.4; 2%</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>1.6; 9%</td>
<td></td>
</tr>
</tbody>
</table>

Total: US$ 17.9 billion

The global Carbon Composites market

<table>
<thead>
<tr>
<th>Application</th>
<th>Price (US$/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace &amp; Defence</td>
<td>310</td>
</tr>
<tr>
<td>Automotive</td>
<td>86</td>
</tr>
<tr>
<td>Wind Turbines</td>
<td>97</td>
</tr>
<tr>
<td>Sport &amp; Leisure</td>
<td>94</td>
</tr>
</tbody>
</table>

The global CFRP market 2016

Slide 18
Automated production of the “Research Pavilion 2014-15” of University of Stuttgart’s Institute for Computational Design (ICD) and Institute of Building Structures and Structural Design (ITKE), source: Moritz Doerstelmann, ITKE
3 Trends and outlook

Estimated development of CC demand in thousand tonnes

\[ A(t_n) = A(t_1)(1 + CAGR)^n \]
\[ CAGR(t_1, t_n) = \left( \frac{A(t_n)}{A(t_1)} \right)^{\frac{1}{n}} - 1 \]

Total 2015: 117 kt
Total 2022: 245 kt

Total 11.2% \( a \)

9.4% \( a \)
17.0% \( a \)
9.5% \( a \)
10.1% \( a \)
5.7% \( a \)
11.6% \( a \)
12.9% \( a \)

Aerospace & Defence
Automotive
Wind Turbines
Sport & Leisure
Civil Engineering
Marine
Others
Ariane 6 in 4 Booster configuration with CFRP Boosters presumably from MT Aerospace and AVIO, source: ESA
## Core messages and forecast

- The global CF and CC market is and **stays** a promising business field with stable annual growth rates of **9-12%** over several years.
- The pressure of competition for CC increases due to hybrid lightweight material mixes (use of CC only where necessary and useful). Meanwhile CC settles its place in the material mix.
- Cost savings in material *and* production costs will be essential for an increasing share of CC in future applications.
- But: The market behaviour is more inertial than expected → positive as well as negative outliers not to be expected.
- Stimulation by taxes and laws (e.g. in automotive, civil engineering and wind energy sector) can bring additional dynamics into the CF and CC market.
Thank you very much for your attention.
Questions?

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