Fraunhofer Research Institution for Casting, Composite and Processing Technology IGCV

reTHINK – „CFRP – Recycling and Sustainability“
Processing routes for recycled carbon fibres

M.Sc. Michael Sauer

16.11.2016 @ JEC Asia
SUNTEC International Convention & Exhibition Centre,
1 Raffles Boulevard, Suntec City,
Singapore 039593

18.11.2016 @ KMITL
King Mongkut’s Institute of Technology Ladkrabang,
Central Library 5th floor, Chalongkrung Road,
Ladkrabang District, Bangkok 10520

21.11.2016 @ UCSI
UCSI University, North Wing Campus, Taman Taynton View Cheras,
Lot 12734 Jalan Choo Lip Kung, 56000 Kuala Lumpur
First step

Definition of Input-Wastestreams

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<thead>
<tr>
<th>Dry</th>
<th>Prepreg</th>
<th>Laminate</th>
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Removal of matrix by Fibre-Matrix-Separation
First step
Definition of Input-Wastestreams

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Processing of discontinuous (semi-finished) products?

Direct route

Separation route
Input-Wastestreams

Definition of framework conditions

- Effective Processing of rCF
- Quality of Input-Material
- Homogenity of Input-Material
- Impurities within Input-Material
- Impurities during process
- Abrasivity
- Fibre-Shortening
- Electrical conductivity
- Industrial Safety
- Price

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Processing of recycled carbon fibres
Definition of framework conditions

Processing of recycled carbon fibres

Definition of framework conditions

Fibre-Volume-Content

Young’s modulus $E_2$

Boundaries

$E_{f,2} / E_m = 25:1$  
(E-glass / epoxy)

$E_2 = \varphi E_{f,2} + (1-\varphi) E_m$

$\frac{1}{E_2} = \frac{\varphi}{E_{f,2}} + \frac{1-\varphi}{E_m}$

Fiber volume content [%]

Processing of recycled carbon fibres
Definition of framework conditions

Fibre-Orientation

Processing of recycled carbon fibres
Overview of different technologies

- Compounding
- SMC/ BMC
- Non-woven
- Yarn-Building
- Patch-Processing
- ...
Processing of recycled carbon fibres
Web-based Nonwovens
Web-based Nonwovens

Wet Lay-Up
Web-based Nonwovens

Wet Lay-Up
Web-based Nonwovens
Dry Carding

Classical textile processing (Example: Autefa Solutions)

„Fibre-Opening“ and first alignment

Carding-Process

Semi-finished product

Additional: Stabilisation

mechanical

thermal
Processing of recycled carbon fibres

Web-based Nonwovens – Dry Carding
Processing of recycled carbon fibres

Patch-Processing

\[ \sigma_M = 80\% \text{ vCF} \]
\[ E = 100\% \text{ vCF} \]

Processing of recycled carbon fibres

Patch-Processing
Processing of recycled carbon fibres

Conclusion

There are several interesting methods for the processing of rCF

- Some needs to be adapted
- Some needs to be upscaled
- Some new (combinations) needs to be developed
Processing of recycled carbon fibres

Contact us

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