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ITA presents its textile value chain from fibre to component at JEC World 2016 in Paris

Paris, 8-10 March 2016 The Institut für Textiltechnik of RWTH Aachen University (ITA), Germany, exhibits at the booth of AZL and 8 partnering institutes of RWTH Aachen University "Composites in Action – Composites 4.0 – JEC Group in Partnership with AZL", booth no. C80 in hall 6. There ITA presents its expertise based on the textile value chain from the fibre to the component with the following main exhibits:

1. Pressure vessel produced on a Multifilament Winding Machine „MFW-48"

The MultiFilament Winding Machine „MFW-48" was developed and built by Murata Machinery Ltd., Japan. It allows high productivity of preforms for applications in composites and features very good mechanical properties in fibre direction. MFW-48 is the first machine of its kind in Europe which shall be installed at ITA prospectively.

In the MFW process, a large number of bobbins are processed simultaneously. Reinforcement fibres, e.g. Carbon fibres, are deposited on a mandrel and can be gradually wound and stacked on the mandrel. The mandrel moves in horizontal direction and rotates. This enables production of tubular structures with a unidirectional non-crimp reinforcement structure (picture 1 "Pressure vessel shape overwrapped with MultiFilament reinforcement structure", source: Murata Machinery Ltd.)

To produce a full layer of reinforcement structure covering the whole mandrel surface, the mandrel has to be moved through the machinery only once. This leads to a very short manufacturing time for every single layer and an overall high preforming productivity (picture 2 "Concept of MFW and MFW 48 machine", source: Murata Machinery Ltd.).

The local availability of this new machine type at ITA will allow interested European industry partners to benchmark, prototype and validate their potential composite products with a real non-crimp reinforced fibre structure.
A video sequence showing the machinery and its working principle can be viewed at the ITA stand. In addition a demonstrator will be displayed. For further information please contact michael.lengersdorf@ita.rwth-aachen.de.

2. Car roof segment based on integral reinforced fabrics

The car roof segment was completely produced for the first time out of integral reinforced fabrics (picture 3 "Car roof segment based on integral reinforced fabrics", source: ITA). The textile architecture according to load paths allows the reduction of component weight by a higher exploitation of the fibre properties.
Production costs will decrease through less waste and process steps during preforming because the single integral reinforced layers are manufactures in a single step by open reed weaving. For further information please contact christopher.lenz@ita.rwth-aachen.de.

3. Textile-reinforced concrete table

The table made out of textile-reinforced concrete (TRC) visualises the enormous future potential of this innovative composite material (picture 4 "Textile-reinforced concrete table", source: ITA).
This potential is based on the high load bearing capacity of textile-reinforced concrete components as well as their resistance to corrosion compared to conventional reinforced concrete. The flexible textile reinforcement allows the production of thin, individually shaped and light concrete structures, which offer outstanding mechanical characteristics and durability. The conception for this textile-reinforced concrete table is based on a quadraxial carbon fibre fabric, which is coated with epoxy resin. As a result the tabletop has almost isotropic properties which allows a thickness of only 15 mm.

The potential target groups are manufacturing companies specialised on textile- or concrete products as well as construction companies. Those companies will be able to extend and diversify their range of products due to the increased possibilities of design and application of textile-reinforced

concrete components. Moreover those components represent an interesting alternative to private users and small construction companies because they are applicable with less machine expenditure than conventional reinforced concrete and can be applied in new areas which were not suitable for concrete until now. For further information please contact till.quadflieg@ita.rwth-aachen.de.

Please find attached some further exhibits of ITA at JEC World 2016:

4. 3D-woven omega stringer

The 3D-woven omega stringer is made out of 12 k carbon fibre-roving produced on a conventional narrow weaving machine. A cost and time reduction is possible compared to conventional prepreg and multi layer laminate. Due to a near-net shape production there will be little to no scrap. The production technique is suitable for conventional narrow weaving looms; hence there is no need for specialised machines.

The 3D-woven omega stringer is an example for the direct profile weaving based on a typical reinforcement profile as it is used e.g. for reinforcing the pressure bulkhead of an airplane (picture 5 "3D-woven omega stringer", source: ITA). Target groups for this technology are the aerospace and automotive industry.

ITA demonstrates with this know-how its expertise in an automated near net shaped production of 3D reinforcement profiles e.g. I-, T- and Omega-Profiles with an established process on conventional narrow weaving looms. The technology is immediately available. For further information please contact philipp.huber@ita.rwth-aachen.de.

5. Demonstration of the process chain precursor production - composite structure „From the fibre to the component"

ITA demonstrates at JEC 2016 the inhouse process chain for carbon fibre production (picture 6 "From the fibre to the component", source: ITA).
It can determine influencing factors on the mechanical properties (e.g. fibre – matrix adhesion). This might be interesting for the target group manufacturers of precursor or carbon fibre. The carbon fibre production process has already been tested by ITA. ITA can manage to produce carbon fibre custom-made.

ITA‘s part in carbon fibre fabrication consists of testing the new precursor materials and of optimising the carbon fibre production and energy efficiency. For further information please contact philipp.huber@ita.rwth-aachen.de.

6. Folded Textile Reinforced Concrete Element

The folded textile reinforced concrete element enables new design possibilities for TRC facade elements. A new folding tool realises the folded TRC-structure. The folding process is performed during the green stage of the concrete matrix. The process allows folded and curved geometries for ventilated façade panels (picture 7 “Folded textile reinforced concrete element”, source: ITA).

The target group comprises textile manufacturer, TRC producers and architects. The new developed tool enables a small scale serial production (50-100 elements). ITA develops the textile reinforcement for the TRC-folded elements. This includes locally adapted biaxial warp knitted fabrics with a specially designed bending behavior. Marketing is planned to start at the end of 2016. For further information please contact andreas.koch@ita.rwth-aachen.de.

7. Braided profile made out of thermoplastic fibre reinforced plastic with integrated inserts

The profile was manufactured by overbraiding a mandrel with a hybrid yarn (picture 8 “Braided profile made out of thermoplastic fibre reinforced plastic with integrated inserts”, source: ITA).

ITA determines with this exhibit its expertise in the area of braiding pultrusion. The inserts are directly over braided. There is no need for processing after consolidation. Therefore no fibre cutting is necessary. Further advantages are short production times, high production efficiency and less process steps. This technology is of high interest for the branches automotive and aerospace industry and ready for the market prospectively in 2017 to 2020. For further information please contact jens.schaefer@ita.rwth-aachen.de.

8. Laser drilled preform with integrated insert

This demonstrator shows the highly precise laser processing of carbon fibre preforms for the integration of tailored fasteners or inserts (picture 9 "Laser drilled preform with integrated insert", source: ITA).

It exhibits the potential of laser processing of carbon fibre preforms for composites. Process steps and times can be reduced by using this laser technology. With this method ITA determines its expertise in preforming and insert integration. For further information please contact sebastian.oppitz@ita.rwth-aachen.de.

9. Locally reinforced fabric with integrated insert

The reinforcement of the locally reinforced fabric with integrated insert can be installed directly during the fabric production (picture 10 "Locally reinforced fabric with integrated insert" source: ITA).

The reinforcement design proceeds in accordance to the load paths. Further advantages are a weight-optimised part scheme and a reduced number of preforming steps and waste. ITA moulds the reinforcement design and conducts the testing. For further information please contact christopher.lenz@ita.rwth-aachen.de.

10. Radial braided basaltic fibre structure

The radial braided basaltic fibre structure withstands temperatures exceeding 800 °C. It has a density less below 3 g/cm³. These properties offer a wide range of applications due to higher robustness even at high temperatures e.g. in turbine and engine development (picture 11 "Radial braided basaltic fibre structure", source: ITA).
ITA determines its expertise in braiding of the preform. For further information please contact martin.kolloch@ita.rwth-aachen.de.

We are looking forward to welcoming you on our booth "Composites in Action – Composites 4.0 – JEC Group in Partnership with AZL", booth no. C80 in hall 6 (JEC 2016, ITA, hall 6 booth no. C80).

Pictures with caption

1. Pressure vessel shape overwrapped with MultiFilament reinforcement structure, source: Murata Machinery Ltd.
2. Concept of MFW and “MFW 48” machine, source: Murata Machinery Ltd.
3. Car roof segment based on integral reinforced fabrics, source: ITA
4. Textile-reinforced concrete table, source: ITA
5. 3D-woven omega stringer, source: ITA
6. From the fibre to the component, source: ITA
7. Folded textile reinforced concrete element, source: ITA
8. Braided profile made out of thermoplastic fibre reinforced plastic with integrated inserts, source: ITA
9. Laser drilled preform with integrated insert, source: ITA
10. Locally reinforced fabric with integrated insert, source: ITA
11. Radial braided basaltic fiber structure, source: ITA

About the Institut für Textiltechnik (ITA) of RWTH Aachen University

The Institut für Textiltechnik (ITA) belongs to the excellence university RWTH Aachen. Its core expertise consists of textile related production technologies and high performance materials. With the opening of the Centre for High Performance Materials in December 2012, ITA offers small and medium sized companies direct access to scientific research especially in the fields of high modulus fibres and composites. ITA provides research and development services and advanced training and creative workshops in cooperation with its partner company ITA Technologietransfer GmbH. Furthermore, ITA graduates students in various textile related courses. Please find further information at www.ita.rwth-aachen.de

Started in winter semester 2015/2016, ITA is offering the new international Master degree ‘M.Sc. in Textile Engineering’ in cooperation with RWTH International Academy. Related information under www.master-mechanical-engineering.com/course/msc-textile-engineering