

Product design for aviation with resin-soaked fibreglass fabrics

The JEC Europe 2015 will take place in Paris from 10 to 12 March, the world's leading exhibition on composites. Here, the German federal state of Saxony-Anhalt will present itself as a highly specialised centre of competence for composites and lightweight construction. In hall 7.3, stand L71, the state's investment and marketing society (IMG) will give an insight into versatile innovations and pioneering material solutions from Saxony-Anhalt. Also present: P-D Aircraft Interior, developers of a production process for pre-pregs that saves up to 35 percent of energy.

Floor plates for aeroplanes, ultra-light and super strong. Bumper bars for Leipzig's trams, soft and yielding for improved personal protection. Two million flexible laminates as couplings for Shanghai's subway. Or elegantly glossy luggage compartment doors for a Lamborghini. P-D Aircraft Interior from Bitterfeld-Wolfen produces pre-pregs, sandwiches and components from high-tech glass and carbon fibres with numerous application possibilities. Thanks to the innovation that the company has developed together with the Fraunhofer Institute for Mechanics in Halle, not only has energy been spared and costs reduced in the production of fibre reinforced plastic, but also the safety of components has been increased. The invention was awarded the Hugo-Junkers prize of the state of Saxony-Anhalt in 2014 for its resource efficiency.

The business manager of P-D Aircraft Interior, a Preiss-Daimler group company, Gerhard Müller knows that "safety is the key argument in aviation". At the Bitterfeld-Wolfen chemistry park, the company developed ceiling panels, super-light and strong interior side walls, so-called side-wall panels, noise-reducing ventilation ducts as well as mirror panels all for aviation. The graduated process engineers stand a good chance of landing the manufacture of floors for Boeing or Airbus with the new process. But Gerhard Müller also finds the producers of smaller passenger or light aircraft interesting.

Thanks to a new recipe, the epoxy resin soaked fibreglass fabric no longer has to be stored or transported at minus 30 degrees Celsius until further processing. They can now be stored at a maximum of 35 degrees Celsius for three months. When heating, the resin still develops the desired flow behaviour in order to connect it with the phenolic resin-impregnated aramide paper in a sandwich. 35 percent more energy can be saved thanks to this chemical change to the resin. And what is even more important to aviation: "The thawing process is dropped and with it the risk of the air humidity that can damage the pre-pregs," explains Müller. "This increases the product safety and quality reliability." Several of the company's components from Saxony-Anhalt are being tested by Airbus. They will be simulated for around two years to make sure that the products can withstand heavy-duty use without changing their properties.

Manufacturers of residential house doors are not as concerned about safety, this mass market is dominated by price pressure. Energy saving in manufacture as well as the advantages of having a value-added chain within the Jürgen Preiss-Daimler group of companies also have an effect. The Preiss-Daimler group of companies are cultivating a strategic partnership in China where the glass fibres are produced. The sister factory in Oschatz which finely weaves the fibres belongs to the P-D fibreglass group. At P-D Aircraft Interior's industrial warehouse in Saxony-Anhalt, these fabrics then pass through into the impregnation machine, the so-called treater. They are impregnated with resin and guided over a roller system so that the resin is optimally distributed in and on the fabric. The manufactured laminate can then be wound dry onto rolls, stored or further processed. The sheets are then cut, pressed into each other and connected with a flexible or strong honeycomb into a sandwich.

"We subsequently design the components according to the properties that are required", explains Müller. Sometimes, the focus is on fire protection, or on flexibility or flexural strength, on weight, scratch resistance, water or oil resistance, ageing behaviour or resistance to impact. In this way, the range stretches from rigid flooring to extremely flexible couplings for subway carriages.

The client's desired properties are achieved with the selection of fabric, the suitable resin combined with optimal press cycles. "We have gathered experience in the past ten years and know what we and our machines can do", says Gerhard Müller. He emphasized the extraordinary cooperation with the Fraunhofer IWM in Halle/Saale, the legacy of Hugo-Junkers and the region's tradition of chemistry. The company builds upon the idea of making aeroplane wings significantly lighter, replacing thick steel plates with thin sheets which are bound together with cross bars – an idea developed by Junkers, the aviation pioneer from Saxony-Anhalt. This step towards light-weight construction was perfected with the sandwich. The company benefitted from the chemical region of Saxony-Anhalt's know-how in developing the new resin recipe. "We have well trained and motivated experts and technical-college engineers who alternately work in production and product implementation", says Müller. With 19 members of staff, the company today stands for innovation in Saxony-Anhalt's plastics industry in the sense of Hugo Junkers.

Photo: Competence in composites and light-weight construction: Dr. Gerhard Müller, Kevin Kohlbaum, Kristian Hauck and Peter Beyer with products from their company P-D Aircraft Interior (aircraft side-wall panel and ventilation duct, tram bumper, storage compartment door for a luxury car)

Photo: IMG / Bettina Koch

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