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133

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New core filler for aircraft interiors: reduced material, weight and manufacturing costs

Using lightweight materials while offering very high stability and stiffness, sandwich panel constructions are very often used in today's sophisticated aircraft interior structures. In structural applications such as ceiling or floor panels, kitchen or toilet walls, sandwich panels can carry significant loads without material deformation and offer high impact resistance.

Sandwich panels consist of a honeycomb core made from various materials, from aluminium to non-metal constructions, and pre-impregnated glass or carbon fibre-based prepregs, which are laminated on the top and bottom of the honeycomb core and then cured in an oven, press or autoclave.

New core filler

Interior component designers often have to reinforce some local areas of sandwich panels, e.g. the panel edges or the areas where material inserts need to be fixed within the sandwich structure. A typical case is the fixation of seats to the aircraft floor panel by bolts, requiring a series of inserts within the honeycomb core. Here, it makes sense to use a compound filling the honeycomb core, thus increasing the stiffness and strength of the sandwich panels and obtaining the strongest fixation. To save weight while delivering maximum local stiffness, the compound needs to fill the honeycomb core reliably and homogeneously. Von Roll's Next Gen core filler outperforms these requirements, and is seen as the most solid and durable anchor point for this type of point-precise assembly (Figure 1).

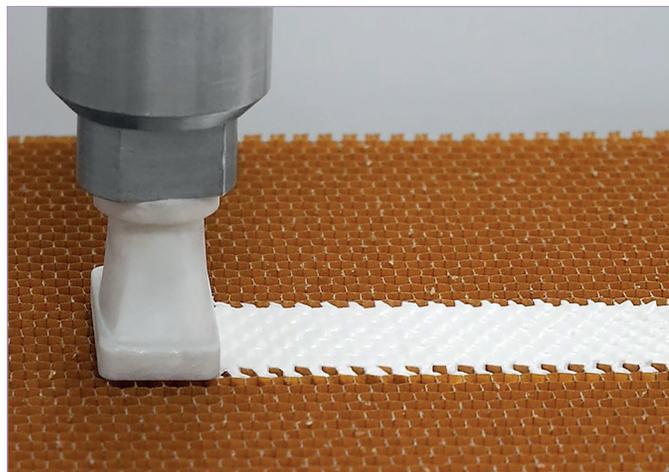


Fig. 1: The automated process can cut production costs by more than 30%

Automated process and material savings

Today's composite sandwich structures are still often produced by manual labour and the application of the compound represents one of the most time-consuming operations. The automation of this process can cut production costs by more than 30% by reducing not only manual labour hours, but also material scrap rates while improving quality and repeatability. The velocity of the robot tool when dispensing the potting material is limited by the maximum extrusion rate, so a material providing a higher extrusion rate vs. state-of-art potting resins allows for higher production throughput.

Core fillers are a costly product due to the

cost of the raw materials used and the complexity of the manufacturing processes. During manual potting operations, manufacturers traditionally make extensive use of the core filler due to difficulties in filling specific target areas or single cells.

The new core filler performed extremely well in Von Roll's internal tests. Its main advantage is its long pot and storage life at ambient conditions as well as its very precise dosability, which makes the material the ideal choice for automated honeycomb potting. Thus, up to 20% material can be saved, leading to a major cost reduction from the very beginning of the aircraft manufacturing value chain and helping the industry to buy less material and avoid

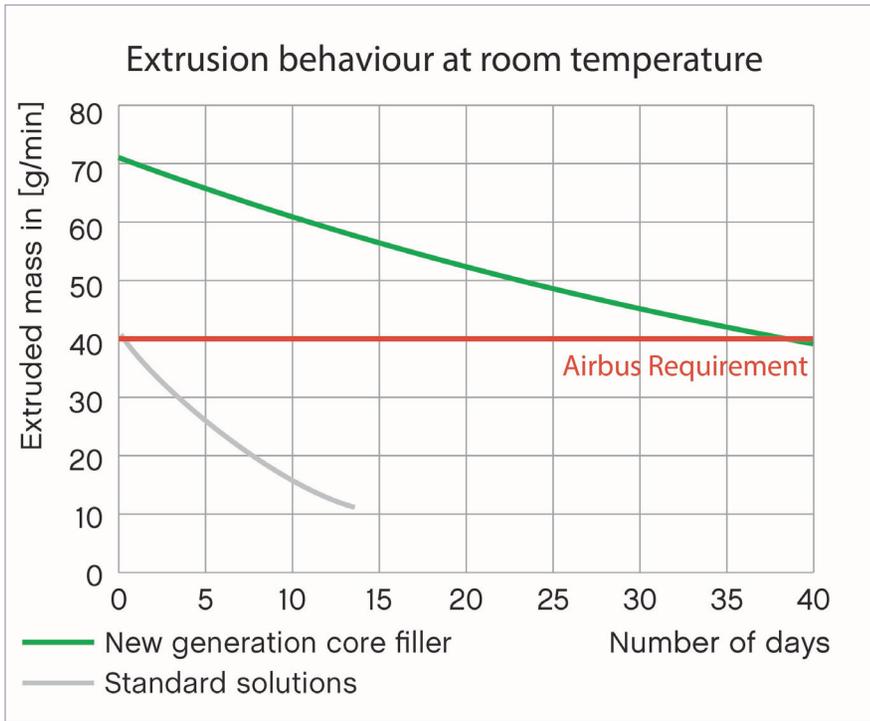


Fig. 2: Improved behaviour at room temperature

scrap production. Due to its extremely low viscosity, for the first time ever, precise, homogenous and reliable filling even of a single honeycomb cell with a size as small as 3 mm is possible, also for automated mass production. Fillings in circles, angular shapes or honeycomb form are possible for the local reinforcements.

As regards environmental and health aspects, the company acts as a pioneer in completely excluding for the first time smell-causing and volatilization-causing anhydrides as well as halogens and solvents. Furthermore, while current core fillers consist of two components that need to be mixed before use, the new core filler comes as a single component directly ready for use.

Manufacturing advantages

The fillers' very low density (0.7 g/cm³ or lower) offers manufacturers significant advantages in terms of weight reduction. With standard curing temperatures between 125°C and 150°C, this core filler is compatible with all types of curing processes and cycle times for common prepregs used

in aircraft interior applications. Furthermore, it is easy to handle and store. While traditional core fillers need to be processed within two or three days, the new filler can be stored and used up to five weeks at room temperature (Figure 2).

Even in contact with humidity, this extended shelf-life is guaranteed. Since the core filler's expansion coefficient is close to zero under the influence of heat or load, it is a material of choice for structural fixations.

The core filler can either be dosed and inserted into the honeycomb core manually with a spatula or using high-precision automation with a robot-based metering system, thus ensuring maximum process reliability. Its low viscosity results in major time savings: when using robots in the automated application process, the extrusion rate is very high, pushing even more material in less time and resulting in much faster production compared to traditional products.

A significant cost reduction through more accurate and repeatable potting drastically reduces material waste, manual labour in the manufacturing process and non-conformities.

Digital solutions

To bring the automated application process to the next level, Von Roll joined forces with Airborne, a frontrunner in digital solutions for composites manufacturing, and Visco-Tec, a supplier of dosing pumps and dosing systems for medium- to high-viscosity fluids, to ensure the flawless filling of aircraft interior panels through a one-hand metering system for this product. The new core filler is compatible with phenolics and epoxies. For example, it is compatible with a new class of Von Roll FST-compliant prepregs belonging to the EP200 family, which provides the highest mechanical properties and surface quality on standard honeycomb cores and can be processed together with the core filler on any type of honeycomb support.

Two variants of the Next Gen core filler are available, EP401 and EP411, in order to offer to the market compatible solutions with or without a dedicated press.

Non-flammability and fire retardancy

Based on decades of experience and successful working relationships with the aerospace industry for products such as plugs or machined panels, this development meets the requirements and regulations of the aviation industry, including non-flammability and fire-retardancy criteria. The company has supplied the core filler to certified European Tier 1s in the aerospace industry and is currently working to qualify the product rapidly. As a global market leader in composites and electrical insulation, part of the company's strategy is to help the aerospace industry to achieve their CO₂ emission reduction goals for better compliance with environmental goals and to develop durable solutions for constantly improved passenger safety and comfort. With its state-of-the-art R&D facilities and modern dedicated aerospace labs in Switzerland, the company helps the industry to save further weight and cost from the very beginning of the value chain on, reduce scrap, lower part costs and achieve faster production. Von Roll will unveil further innovations for the aircraft interior market in the near future. □

More information:
www.vonroll.com