Technical flax as an alternative to glass for seat shells

C&D ADDER from Zodiac Aerospace, as part of the Fiabilin project, intends to start a paradigm shift in the construction of Premium and Business class seats. The company offers a novel solution based on a flax fibre/ PA11 composite as a substitute for the «standard» glass/ phenolic resin solution, which will provide environmental and mechanical benefits.

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To support this endeavour, the Toulouse facility of C&D ADDER is participating in a collaborative project called Fiabilin to assess the viability of utilizing natural fibres from a renewable source – 100% bio-sourced technical flax – as an alternative to glass in the manufacture of structural composites. The Fiabilin project, supported by the composites technical flax sector (FiMaLin®), is funded by the French government and by the Upper Normandy and Brittany regions, in the framework of the "Investments of the Future" programme. Project goals include achieving better technical performance through component weight saving while significantly reducing the energy consumption associated to processing. Improved LCA (life cycle assessment) and a lower environmental footprint are also targeted. The short-term objective is to produce a composite seat shell demonstrator using natural fibre instead of glass. Another key objective of the project is to develop and establish the supply chain for flax fibres to ensure that the material is commercially available on an industrial scale once the technology is proven.

Fig. 1: New bio-based aircraft interior solution

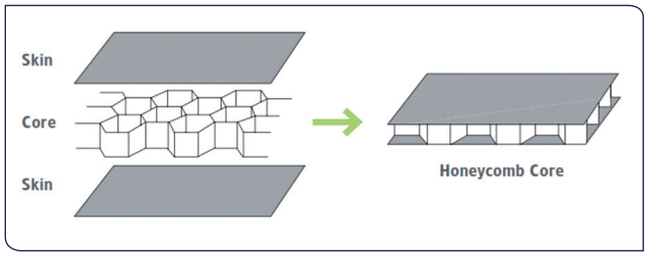

Fig. 2: The sandwich structure

C&D ADDER's team initially focused on Premium and Business class seat components, which offer significant potential for further weight savings. A seat shell from a long range aircraft seat was selected as an initial potential application, the prototype being presented at the JEC, Paris 2014 (Figure 1).

The seat shells are currently manufactured as a composite construction (skin + core + skin, Figure 2) combining glass fibre fabric and a thermoset phenolic resin with a Nomex honeycomb core, which are not bio-sourced nor biodegradable. The ambitious project goals were twofold: to replace the skin materials with more environmentally friendly materials while lowering the weight of the composite seat shells. The glass fibre was replaced by biodegradable flax fibre and the phenolic resin matrix was replaced with PA11 – a high-performance thermoplastic polymer which is bio-sourced and recyclable. The use of a thermoplastic matrix also results in a VOC-free, cleaner production process and eliminates the use of solvents to clean the tools and production equipment.

Development and launching

These materials are still in a development phase and will require further testing and qualification before the product can be introduced. Given C&D ADDER's experience and expertise in composite

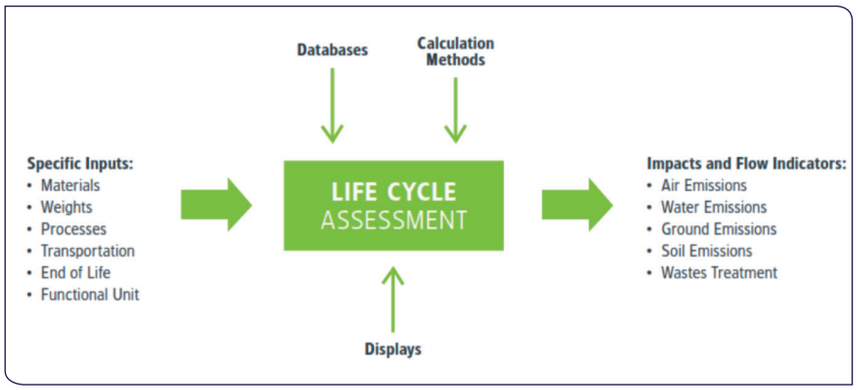

Fig. 3 : LCA analysis

component design and production and the strong commitment of the Zodiac Aerospace group to the introduction of materials with a lower environmental footprint, the path towards the implementation of this innovative material is clear and relatively straightforward.

This is further reinforced by the obvious benefits of the material in terms of performance and ecological impact. The project focuses on the development of a collaborative supply chain from farmer to product manufacturer, setting up the infrastructure for secured mass production and supply of the flax fibres as soon as the technology is qualified.

Key benefits of the innovation

The prototype shells are significantly lighter than the current components, with an approximate weight saving of 26%, resulting in a 2% weight reduction per finished seat shell. This is equivalent to the weight saving of 45 kg for long range aircraft. The reduced fuel consumption results in a significant reduction in the aircraft ecological footprint, equating to around 50,000 kg CO_2 equivalents per seat shell over the life of a seat (Figure 4).

Characterization

While promoting green composite materials by maximizing the number of bio-sourced parts is a major goal, passenger safety and comfort remain the primary objectives of C&D ADDER Toulouse. Its Toulouse facility is fully controlled and certified in accordance with technical specifications defined by specialized authorities and can ensure the final product is not only eco-friendly, but also safe and reliable. The company's certifications include: REACH (Registration, Evaluation and Authorization of Chemicals) standards, FST (Fire Smoke Density and Toxicity) tests, mechanical tests (stress, rupture criteria, etc.) and environmental tests (humidity, fungus resistance, etc.).

Conclusion

This development by a company specializing in the design and manufacturing of industry-leading lightweight composite components is truly ground-breaking. The combination of environmental and cost benefits resulting from the use of a biodegradable, lightweight and high-performance flax/thermoplastic material is highly innovative and demonstrates Zodiac Aerospace's commitment to its responsible research and development philosophy. As a Tier 1 supplier, C&D ADDER is fulfilling its responsibility to ensure that the supply chain for this novel material is fully established and ready to support mass production as soon as the technology is fully qualified. ■

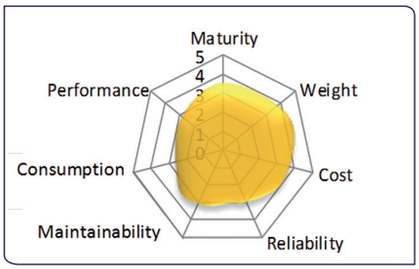

Fig. 4: Performance spectrum

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