100% polypropylene composite kayak

Legacy Paddlesports and Milliken jointly developed one of the lightest, toughest personal watercraft available on the kayak market. The Ultimate kayak is made from an easily recyclable thermoplastic composite material.

The material used for this application, Milliken's Tegris composite material, is characterised by its high stiffness-to-weight ratio and exceptional impact performance, making it ideal for watersport, armour and motorsport applications. The use of this 100% polypropylene (PP) composite to produce the Ultimate™ kayak is the result of a close collaboration between Milliken and Legacy Paddlesports (Greensboro, North Carolina, USA).

The Native Watercraft Ultimate 12

An original composite

Tegris is made from a co-extruded polypropylene tape yarn with a highly drawn polypropylene core for strength properties within a lower melt polypropylene matrix for composite processing. The interior layer delivers the high stiffness to the material while the skin layer acts as the matrix material bonding the composite together. Thus, the material is fully recyclable and safer to handle than glass-filled composites. It is fully compatible with polypropylene recycle streams. While the material has unique properties, these all return to standard PP upon full melting normally encountered in recycle extrusion. The tape yarn is then woven into a fabric, and multiple layers of fabric are stacked and consolidated with heat and pressure to form rigid sheets. The thickness of the sheets depends on the number of layers of fabric in the structure. The sheet stock can be used for panel applications or can be moulded using pressure thermo-forming processes. The fabric can also be moulded using the same processing techniques. Tegris also allows for the creation of a wide variety of composite structures. The thickness of each layer after forming or consolidating is 0.12-0.14 mm depending on the temperature and pressure used. A single layer weighs 0.11 kg/m², which allows for composites to be "tuned" with precision based on impact or stiffness requirements.

A demanding application

The Ultimate kayak is the first commercial application to feature formed, large, three-dimensional parts made from Tegris fabric. Legacy's advanced boat design has received significant accolades from the industry. To produce this model in the Tegris material, Milliken created a specific mould based on a machined aluminium tool and a poured silicone plug. The shape of the plug ensures the fabric achieves full contact with the aluminium tool once under pressure in the mould, which is key to producing top quality parts. The required pressure is between 10 and 20 bar, and the temperature window is 140°C to 160°C.
Milliken has developed an attractive, diamond weave fabric with good drape and mouldability for the kayak. Silver fabric was chosen for its improved UV durability relative to the natural white fabric also offered by Milliken. The material's impact performance is so good that it is being used as an armour solution against ballistic threats. This way, the kayak can withstand rock shocks. It also maintains this performance level even at low temperatures (-40°C). To boost the abrasion resistance of the material and prevent UV surface degradation, Milliken uses a specially developed film technology which allows film to be moulded onto the fabric surface during the part forming process. The film allows easy colouration, with Legacy selecting olive- or gold-coloured interior and exterior films for the Ultimate kayak.

Enjoy the nature

Conclusion

The Ultimate kayak, belonging to Native Watercraft (a brand under Legacy), already exists in polyethylene and glass composite materials with weights respectively of 25 and 22 kg. The use of Tegris allows to achieve 16 kg together with good abrasion resistance, strength, stiffness and recyclabilty. ■

More information: www.nativewatercraft.com
www.tegris.milliken.com

KNOW-HOW