The process uses carbon fibre and nylon commingled yarns that are embroidered onto a nylon carrier film to produce a net-shaped preform. This can then be press moulded in less than five minutes under high pressure and at high temperatures to produce the saddle.

A prototype, developed through an industrial collaboration with Witney-based Shape Machining Limited, is just one third the weight of an equivalent conventional saddle.

As part of the process, the team modelled a variety of designs to arrive at the optimum shape and fibre orientations with the aim of maximising strength and informing laminate design. Mechanical properties were determined by simple pull-tests of unidirectional carbon fibres that were manufactured using the ShapeTex™ process.

The mould design also presented challenges given the complex geometrical features of the saddle shape, including curved surfaces, cutouts, and net edges.

The saddle rails – 3D printed as a more cost effective option for prototyping – were bonded to the saddle using an acrylic adhesive most compatible with the composite material. This was then mounted on a frame and tested by a small number of different riders, retaining its structural integrity throughout.

Though limited in scope, the functional testing demonstrates the potential of this manufacturing technology for load bearing applications.

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Summary

- Software modelling produced designs to optimise fibre orientation to maximise shell strength and inform laminate design.
- A two-part press-tool was designed taking into account the complex geometrical features of the saddle.
- A non-woven fabric blend of recycled short carbon and nylon fibres was stitched onto a 2D preform.
- The finalised preform was moulded under high pressure and temperature.
- Composite filament saddle rails were bonded to the shell using adhesives and subjected to load bearing trials.