

Engineering suspension performance through high-precision composite tooling

Delivering motorsport-grade manufacturing accuracy for custom enduro bicycle frames



Key products

BE978

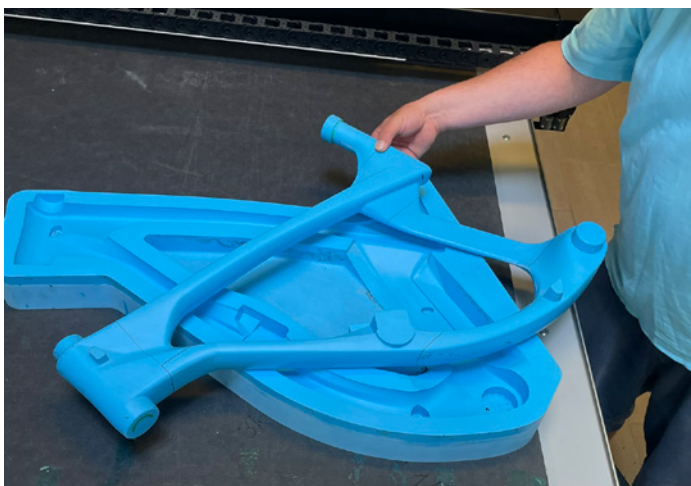
Challenge

Fattomonki, a Budapest-based manufacturer of custom-built composite bicycle frames, set out to develop SISU, a high-performance enduro mountain bike frame design capable of delivering race-ready performance while maintaining the craftsmanship and individuality of a bespoke product.

SISU, combines advanced composite engineering, and simulation-led design to create a highly customised frame designed for aggressive riding and competitive enduro racing. Every frame is manufactured using a "one man, one frame" philosophy, placing exceptional demands on manufacturing precision and process control.

One of the most technically demanding aspects was the development of the monocoque rear triangle. The structure incorporates three bearings positioned on a common axis, which act as critical reference points within the suspension system. The positional accuracy of these bearings directly influences suspension performance, sensitivity and long-term reliability.

Due to the monocoque construction of the frame, opportunities for correction after manufacture were extremely limited. Any deviation from the intended geometry introduces unwanted stresses, increase friction and compromises suspension behaviour. To achieve the required performance, Fattomonki needed a tooling solution capable of delivering exceptional dimensional accuracy, repeatability and excellent surface quality throughout the manufacturing process.



Formula One DNA in bicycle manufacturing

Base Materials' extensive motorsport pedigree includes work across high-performance industries such as Formula One, World Endurance Championship, World Rally Championship and Formula E. This expertise provides access to proven composite tooling principles developed in demanding engineering environments, supporting the development of a bespoke mountain bike platform.

Solution

Selected for its dimensional stability, machining characteristics and ability to maintain tight tolerances, Base Materials' BE978 high-performance epoxy tooling material formed the foundation for accurate and repeatable composite manufacturing.

The tooling strategy focused on achieving geometric precision throughout the monocoque structure, particularly within the rear triangle assembly where bearing alignment directly influences suspension performance. This enabled critical reference features to be manufactured accurately and consistently, ensuring the position of bearing interfaces remained aligned with the original engineering intent.

The manufacturing process also supports Fattomonki's proprietary WOODcore technology, an advanced composite construction approach that integrates balsa wood directly within selected areas of the carbon fibre laminate structure. By combining carbon fibre with engineered wood core sections, WOODcore delivers an exceptional balance of stiffness, low weight and vibration damping, helping to improve ride comfort and reduce rider fatigue without compromising performance.



“When developing the SISU platform, precision was not simply desirable, it was essential. The performance of the suspension system depends directly on the accuracy of the bearing locations and the quality of the manufacturing process.

Working with Base Materials has given us access to tooling solutions and engineering expertise that support the level of precision we demand from every frame we build. Their material systems and guidance have helped us refine our approach to tooling design and better understand manufacturing possibilities.”

MIKLÓS KALLAI

Founder of Fattomonki

Because WOODcore is integrated directly into the laminate structure, the positioning, thickness and fit of the core material have a direct influence on frame stiffness, vibration behaviour and geometric accuracy. As wood exhibits different thermal and moisture-related characteristics compared to the surrounding composite laminate, manufacturing precision is critical to ensuring consistent structural performance.

Working with Base Materials, Fattomonki was able to manufacture moulds and production fixtures capable of supporting the tight tolerances required across both the frame architecture and WOODcore construction process. This provided greater confidence that the suspension system would perform as designed, while ensuring consistent core positioning, uniform laminate thickness and reliable reproduction of the intended structural characteristics in every frame produced.

Rather than compromising with inferior material alternatives, Fattomonki selected tooling solutions from a provider capable of supporting the performance standards expected from a highly customised, race-focused product.

The coordinated use of digital design, machining, advanced tooling materials and proprietary composite construction technologies directly influenced the performance of the finished structure. By enabling accurate control of key suspension interfaces and WOODcore integration, the tooling supports the core objective of the SISU frame design while maintaining ride quality, responsiveness and structural integrity.