Case Study

Robot Bike Co.

Developing a Fully Customizable Additively Manufactured Mountain Bike

Robot Bike Company (RBC) is a new startup established in the UK by aerospace engineers and mountain biking enthusiasts who identified the potential of combining additive manufacturing technologies with carbon fiber to, in their own words, “create the best bike frames possible.” To deliver a customizable, lightweight, high strength bike, RBC’s frame was intended to be created from carbon fiber, a material very common in the industry. The carbon fiber tubes, as well as the bike’s other components and systems were to be joined by additively manufactured titanium ‘nodes’, manufactured based on the specification of individual riders. Altair ProductDesign’s engineering team was tasked with optimizing these joints, which included the head tube, seat post and chain stay lugs, to ensure they were as lightweight as possible and still able to withstand the forces of downhill mountain bike riding, all while being fit for the AM process.

Solution

In order to meet the tight timescales of the project, Altair ProductDesign utilized SolidThinking Inspire. The technology allowed the team to quickly take the existing designs into the environment and apply a variety of loading data that the bike frame would be required to withstand during use, in addition to constraints such as the nodes’ allowable size, and fixing point locations. solidThinking Inspire used this data to output a new geometry layout that removed material where it was not required to meet the performance targets.

In addition to designing weight efficient components, Altair ProductDesign was also able to look for opportunities to simplify the frame design to lower the cost of production. One such example was the chain stay lug which was originally a three piece assembly of two symmetric titanium components and an interlinking carbon fiber tube. Utilizing the Altair software suite and engineering expertise, the team was able to build in the additive manufacturing requirements from HiETA Technologies and Renishaw, to redesign the lug as a single component, optimized for mass, performance and manufacturing cost.

Result

Altair ProductDesign conducted a technology transfer process with HiETA Technologies to ensure that the company would be able to utilize Altair’s simulation technologies in future product development processes directly. The optimization work conducted by Altair ProductDesign successfully delivered mass optimized designs for the additively manufactured titanium frame nodes. The new material layout, driven by SolidThinking Inspire and interpreted by the Altair team, created innovative, organic looking design solutions which were highly optimized for AM.

“Altair has assisted Robot Bike Co. to further reduce the weight of our frame whilst also ensuring that stresses are kept below a pre-determined maximum. This has allowed us to provide a life-time warranty and give our customers confidence that the product will be enduring..”

Ed Haythornhwaite, Co-Founder, Robot Bike Co.