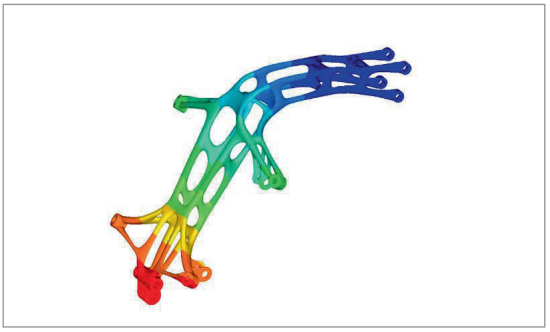
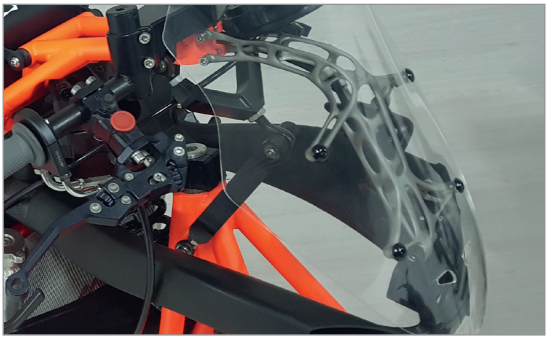
BOTTPOWER Designs Lightweight Bracket for Motorbike

Using Altair software, the optimal design for aerodynamic loads was found





About the customer

From Valencia, BOTTPOWER is a Spanish motorsport engineering company that specializes in designing and building custom motorbikes for racing and street use. They design and build parts, systems, and prototypes for other companies. BOTT stands for “Battle of the Twins,” a racing category for motorbikes with two-cylinder four stroke engines.

The company is managed by David Sánchez, a mechanical engineer with years of experience in mechanical design and motorbike racing. He is now in his 14th season working as a data and race engineer in championships like the CEV – Spanish Championship, World Championship Moto2, and WEC – World Endurance Championship.

Their challenge

The project challenge was to design a lightweight stay bracket for their motorbike that could withstand the main and aerodynamic loads. The goal was finding the optimal weight and stiffness ratio to reduce weight while ensuring safety measures. All of this had to be done quickly in order to arrive on time at Addit3D, Spain's most important 3D-print fair, to showcase the bike.

Two engineers on the team already had experience with Altair, so the team chose Altair HyperWorks™ for finite-element analysis (FEA), Altair Virtual Wind Tunnel (VWT) for computational fluid dynamics (CFD), and Altair Inspire™ for topological optimization.

Our solution

The team started with a simple CFD model in VWT to calculate the aerodynamic load. Next, they created a virtual tunnel and placed the windshield in the exact position as it would be on the bike to calculate the aerodynamic loads for the bike while driving 300 km/h.

BOTTPOWER

Industry

Motorcycles

Challenge

Design of an optimized lightweight stay bracket for a motorbike

Altair Solution

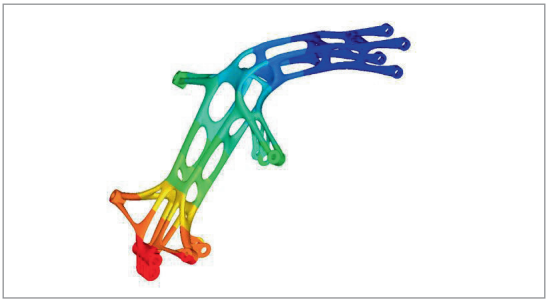
CFD Model Setup and Topology Optimzation using Altair HyperWorks and Altair Inspire™
FAE Model Setup and Virtual Testing using Altair HyperMesh™ and Altair SimLab™.

Benefits

- Increased Strength of the Bracket
- Remarkable Weight Reduction
- Precise Behaviour Prediction
- Improved Shape Design

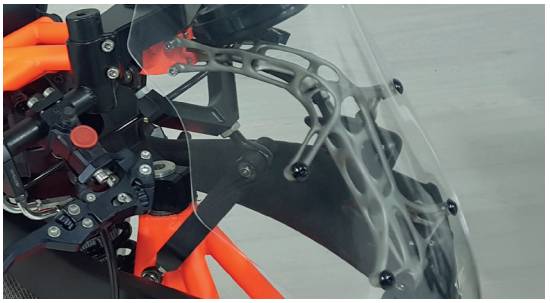
Inspired by earlier sketches, they moved forward by creating a drawing with the maximum external volume as design space. Next, they introduced the calculated aerodynamic loads on the design space in Altair Inspire, so the software could remove as much material as needed to achieve an optimal weight and stiffness ratio. Even though the bracket could have been designed much lighter, the two engineers wanted to make sure it had a good safety factor. This way, the bracket's behavior is more predictable, so it can drive fast over the curbs or resist a small crash.

Lastly, the engineers used Altair HyperMesh™ to setup an FEA model to study the stress levels, deformations, and safety factors of the part. When they were tasked with meshing the small pieces, the obstacle was solved with Altair SimLab™, which is mainly used for the design of solid models using geometrical shapes such as tetrahedrons or hexahedrons.



CAE Model of the optimized windshield bracket

Final design of the windshield bracket



Mounted windshield bracket

"Working with Altair HyperWorks and Altair Inspire enabled us to quickly and intuitively find the optimal solution for the aerodynamics of the bike's bracket and create a lightweight design. Thanks to the precision of Altair's simulation software, especially for more critical and structural parts of our motorbikes, we can develop in confidence."

David Sánchez
Bottpower

Results

Thanks to topology optimization with Altair tools, the final design fit perfectly. The design also complimented the rest of the components like the headlights, tachometer, action camera, and windscreen. The new design was lighter and stronger than previous versions and had a cleaner, more appealing shape.

The team will continue to design light composite parts with Altair tools being key elements in the process. Additionally, they plan on conducting aerodynamic development using Altair software before the race bike hits the road.