Prototyping for Precision Performance

Briggs Automotive Company (BAC) Speeds Up Development of Mono R Supercar Using Stratasys FDM Additive Manufacturing

Based in Liverpool, UK, BAC is the company behind the BAC Mono and the recently l aunched Mono R supercar. For BAC, the award-winning* Mono R is the very pinnacle of design, engineering and innovation — claiming a number of world-firsts and records that make it a truly groundbreaking supercar.

> “The development of the Mono R needed ultimate precision, something which Stratasys’ industrial additive manufacturing systems lend themselves to perfectly.”

Ian Briggs
Briggs Automotive Company (BAC)
Co-Founder and Design Director

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Case Study

Weighing just 555 kg, the Mono R is the first production car in the world to incorporate the use of graphene-enhanced carbon-fiber in every single body panel. To meet the ambitious performance criteria, its lightweight form had to ensure a purist motoring experience for drivers who rate design, engineering excellence and handling of paramount importance.

However, in producing such a design, the team faced a significant challenge — working against a strict deadline. BAC was scheduled to unveil the car at the Goodwood Festival of Speed, but this deadline was challenged by the need to develop the car's airbox.

Essential for providing air flow to the engine and on-road performance, the airbox has an extremely complex and unique geometry — with the final part needing to be produced entirely in carbon-fiber. The airbox's final design required expensive mold tooling that needed to be machined from a solid metal billet, and the carbon-fiber production process proved labor-intensive. Such rigorous demands meant that the production of a prototype using traditional methods presented huge time and budget hurdles for the team that would be near impossible to overcome without compromising the performance and functionality of the airbox's intricate design.

> “This is just the beginning for BAC in discovering what additive manufacturing can offer us as a design team, and how we can continue to push the boundaries of our industry.”

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Briggs Automotive Company (BAC)
Co-Founder and Design Director

BAC turned to additive manufacturing to produce the Mono R's airbox.

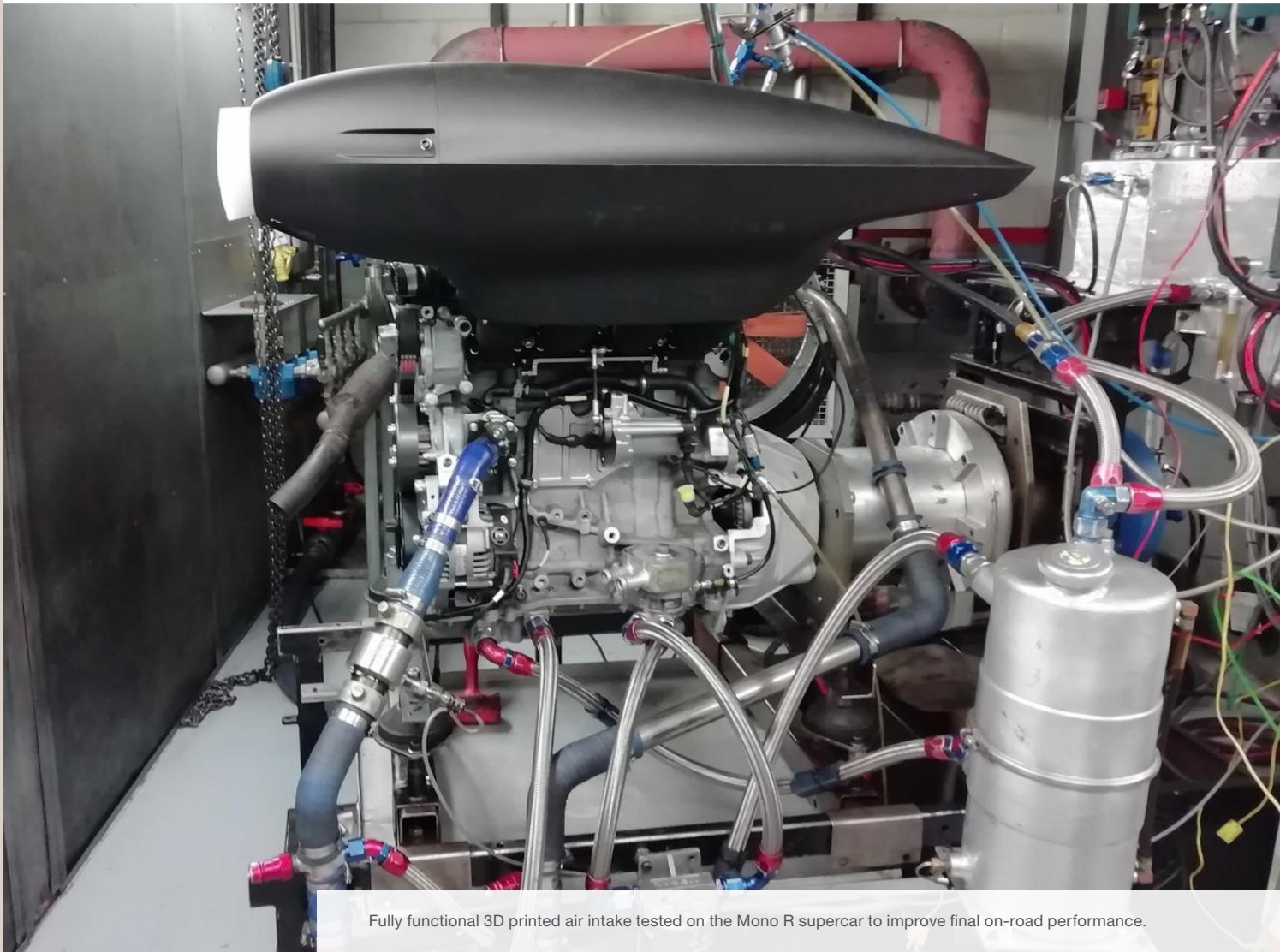
Slashing Design Development Lead Times

BAC turned to additive manufacturing as the solution and sought the help of Stratasys® and it's UK platinum partner, Tri Tech 3D. Using the F900™ production 3D printer — Stratasys' fastest FDM® 3D printer — the team produced the airbox far quicker than would have been possible using traditional production methods. It was then fitted to the car for on-track testing to assess the part's design and performance.

"Access to quick, efficient, industrial-grade additive manufacturing was a game-changer for this development process," explained Ian Briggs, BAC Co-Founder and Design Director. "Within hours we were able to produce an accurate 3D printed prototype of the airbox and install it on the car for testing. This enabled us to reduce our design-to-manufacture time significantly."

For Briggs and his design team, creating a prototype using these traditional processes within the short timeframe available was simply unfeasible.

"The lead time to produce one prototype of the airbox using traditional machining methods surpassed two weeks. If there were any problems with the prototype produced, then any design iterations would add double that amount of time. This was a delay we just couldn't afford," he explained.



Fully functional 3D printed air intake tested on the Mono R supercar to improve final on-road performance.

Under Pressure

However, it was not just turnaround times that the team had to consider. With engine temperatures expected to surpass 100 ˚C, the prototype needed to withstand the high pressure of incoming air as well as the extreme mechanical and thermal loads created during test drives.

Thanks to the engineering-grade materials available on the Stratasys F900, the team was able to produce the airbox in FDM® Nylon 12CF™ material — a carbon-fiber reinforced thermoplastic that can endure temperatures of over 140 ˚C. Nylon 12CF offered the design team the chance to test the complex airbox design in a material that accurately mimicked the real thing.

“Access to the carbon-fiber reinforced Nylon 12CF was integral for this development process. The prototype was as close performance-wise as if we had produced the prototype in carbon-fiber reinforced plastic made from a mold. It also withstood the tests on the track with ease,” explained Briggs.

The Mono R is 20 mm lower and 25 mm longer than its predecessor, meaning that every single millimeter mattered. To effectively test the airbox, it needed to accurately fit the car — with no room for error — despite its large and complex geometry. This was helped by the printing tolerances of the F900, which enables parts to be produced to 0.089 mm accuracy.

“The freedom of design offered by Stratasys’ industrial 3D printers was essential for the airbox. We were able to tweak the design and not worry that the final 3D printed version wouldn’t match the exact size or geometry we needed,” Briggs added.

To continue innovating in the future, the team at BAC has now shifted its mindset to include designing with the capabilities of additive manufacturing in mind.

“The development of the Mono R needed ultimate precision, something to which additive manufacturing lends itself perfectly. We saw this first-hand with the use of Stratasys’ industrial system in the production of the airbox, and for the first time its effects were felt throughout the car,” concluded Briggs.

* Winner of Design & Innovation category at Northern Automotive Alliance Awards 2019, having demonstrated “an outstanding vision for design and provided unique, innovative solutions”.

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