# Supercar engine transformed with additive manufacturing

DSM and British supercar maker Briggs Automotive Company (BAC) collaborated to build a Formula 1-inspired ram-air inlet system that is lighter, less expensive and easier to build versus traditional manufacturing methods. Pairing BAC's award-winning design knowledge and DSM's expertise transforms the automotive manufacturing process, resulting in a lightweight, sustainable solution.

### Customer

Briggs Automotive Company (BAC)

### Challenges

- Decrease overall weight of the Mono R supercar to improve performance and lower CO2 output
- Improve design and development of air inlet runners and trumpets
- Produce automotive parts faster, quicker and at a lower cost than traditional manufacturing

### Solution

- Novamid® ID1030 CF10 and Somos® Taurus
- Collaboration with DSM and 3D printing ecosystem

### Benefits

- Lightweight solution for critical engine parts
- Design and production flexibility
- Manufacturing lead times and costs reduced by 50%
- Proves additive manufacturing as a viable solution for automotive part production

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*"The benefit of DSM materials and 3D printing is the freedom to optimize the features and geometry of parts and - for the new air intake system – the ability to significantly improve production. For us, collaborating with DSM opens the door to all kinds of opportunities that were really difficult to achieve in the past."*

Ian Briggs, Design Director, BAC

## Challenges

Manufacturers are challenged to find fast, low cost and more efficient production processes. Such was the case for British supercar manufacturer, Briggs Automotive Company (BAC), which was designing a lightweight, high performance, road legal supercar. BAC's Mono R supercar – which won the prestigious Design & Innovation Award at the 2019 Northern Automotive Alliance Awards - is described as "the very pinnacle of design, innovation, engineering and performance". It also boasts a top speed of 170 mph with an acceleration of 0-60 mph in 2.5 seconds.

BAC and DSM identified over 40 end use parts on the Mono R supercar that can be 3D printed using stereolithography, selective laser sintering, fused filament fabrication and fused granulate fabrication. Among other parts, the Mono R features a 3D printed ram-air inlet system.

The airbox sits on the car body and includes four trumpets and runners that drive pressurized air into the engine. Typically made from an aluminum diecast composite, additive manufacturing resulted in lightweight end use parts that helped BAC avoid additional costs and time to produce multiple design iterations.

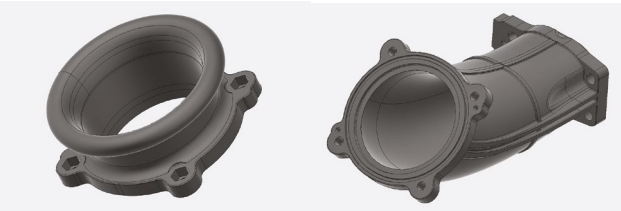
## Solution

BAC and DSM identified a combination of DSM materials to create air trumpets and runners that accommodate the heat, air pressure and wind speeds they encounter. The inlet runners were printed by Makerpoint using Novamid® ID1030 CF10, a durable material ideal for stiff, structural parts used in aggressive, high-temperature environments.

The runners sit between the engine and trumpets and mitigate wind loads through the airbox of 170 mph, air pressure and heat. Finding the right material and design was key. BAC and DSM modified the initial design to create runners that would maximize airflow while standing up to harsh conditions.

In addition to the physical curvature of the runners, finish was also tested and refined; a gloss finish reduces drag, a rougher finish can increase turbulence to have a richer fuel and air mixture.

Each runner can be designed slightly differently to accommodate the various pressures each encounters as



air rushes through the airbox. The design flexibility afforded through additive manufacturing made this process less costly and quicker than traditional manufacturing and resulted in increased stability.

The trumpets, printed by Rapid 3D, were made using Somos® Taurus, a stereolithography material with excellent surface quality and isotropy. Somos® Taurus minimizes part finishing and painting, making it ideal for the automotive and aerospace industries.

## Benefits

BAC reduced manufacturing time, cost and overall car weight by utilizing additive manufacturing. By using 3D printing and eliminating expensive tooling, BAC estimates they shortened production time and cut part production costs by more than 50 percent.

Decreasing the overall weight of the supercar allows for improved performance, as well as reduced CO2 emissions. Additive manufacturing provided BAC an improved design process when creating the runners and trumpets, ensuring the team spend time developing ideal parts.

Ian Briggs, Design Director at BAC, says, "DSM's collaborative approach to the production lifecycle is fantastic. It points to a whole new way of designing and manufacturing parts. Through this collaboration we are learning what materials work best, how to alter design to maximize the additive process, what printing equipment to use and how other partners come in to improve and advance the manufacturing process."

DSM's materials expertise and 3D printing ecosystem paired with BAC's automotive knowledge and award-winning design and engineering innovation paved the way for the innovative BAC Mono R. The result is a road-ready supercar that utilized 3D printing for peak performance and handling – a testament to the use of additive manufacturing in the automotive industry.



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