



*Oxford Brookes Racing team members celebrate their second place at Silverstone.*

## CASE STUDY | FORMULA STUDENT

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### 3D Printing Fuels Formula Student Success For Oxford Brookes University

**Oxford Brookes Racing**, the top performing UK Formula Student team who took second at the annual competition at Silverstone, say “3D printing is essential” in achieving racing success.

“The ability to use RPS’ NEO800 stereolithography, with DSM Somos® resin and HP Multi Jet Fusion technology has proven the benefits of using the perfect combination of innovative technology and engineering design” say the University team, who had the chance to work with RPS on their Formula style car for the 2018 season. The team made a weight saving of 52% on their intake plenum when compared with their 2017 design, as well as made several performance gains in other areas as a result of working with RPS and employing 3D printing in the manufacture of their award winning speedster.

Each year, OBR surprises judges with innovative and creative engineering design, thoroughly considered cost and manufacturing analysis, inspired business plan presentation and above all, a well-oiled, brave, fiercely competitive, passionate and competent team of young professionals.

However, Formula Student isn’t just about engineering talent. Established in 1998, Oxford Brookes Racing is one of the few UK Formula Student teams who encourage students from faculties across the University to join the team and help build upon their impressive successes. Students in computing, mathematics, marketing, business and communications have previously worked, or are currently working, with the team to create a well-rounded skill set. With the combined minds of such a diverse team, there is always an effort to seek new ways with which the team can use their racecar to keep up with an ever-evolving industry.

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*OBR meets RPS on Frankie's intake plenum.*

**This year, Oxford Brookes Racing have teamed up with RPS to explore the world of 3D printed parts, in an effort to save weight, time and cost, as well as improve the quality of their car. OBR18, or 'Frankie,' was manufactured by taking advantage of the fantastic materials and equipment made available to the team by RPS, such as fitting a 3D-printed intake plenum.**

The intake plenum is a crucial part of the car, feeding air effectively into the engine for combustion. In the past, OBR have tried 3D printing this part in multiple pieces and using various technologies. However, RPS came to the team this year with the right capabilities, using far larger print beds, and recommending the use of their Nylon 12 based HP Multi-Jet Fusion PA12. The experts at RPS also helped the team make some essential design decisions, which meant the team were able to make a weight saving of 52% versus last year's intake plenum made from Alumide.



*The DSM Somos resin mould during the carbon lay up process and the finished, front wing-ready product.*

Nylon 12 is far lighter, at around  $\frac{3}{4}$  of the density. The weight decrease will reduce forces due to vibrations and

car movement on the intake and engine. The team also expects minor weight saving to come from the sensor mount and cable tie hooks – additions which were also advised by the team at RPS during the design phase. The Powertrain section is not the only section that has benefited from these impressive technologies. The majority of the car is manufactured using Gurit carbon fibre, and the aerodynamics package is no exception. The aerodynamics team enjoy the freedom and creativity they have when designing the car, however the intricacy of many of their designs can make them difficult, costly, and time-consuming to produce.

RPS introduced the team to DSM's Somos® PerFORM resin, which allowed the aero team to 3D print moulds to aid the carbon fibre layup process. The 3D printed moulds are able to withstand the heat and pressure of an autoclave, which is essential, and as a result, both the accuracy of parts and the turnaround from design to manufacture is massively accelerated. Saving both time and weight on a project like a Formula Student car



*Driver Robin, one quarter of the OBR driver team, takes Frankie for a spin.*

often results in discovering the recipe for a winning car.

The team need all the time they can get for testing and adjustment, before the car takes to the tarmac at Silverstone. A lighter car can mean a faster car, and for Oxford Brookes Racing, this rings true. The efforts and expertise of the RPS team have helped to attain the highest score for Oxford Brookes Racing in its 20-year history competing, as well as the reliability to thrive in this year's Endurance event after having failed to complete the event since 2015.

The team currently boasts an impressive 2nd place overall result at Formula Student UK 2018, along with 2nd place in Engineering Design, 2nd in Skidpad (1st Internal Combustion), 3rd in Endurance (2nd IC), 4th in Cost and Manufacturing and 5th in Efficiency (2nd IC).

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