



ADDITIVE 

CS

CASE STUDY

**Improved Engine Performance
with 3D Printing**





COMPANY

Leeds University

INDUSTRY

Higher Education

APPLICATION

End use automotive components

CHALLENGE

For students to design and manufacture a plenum assembly as part of the Formula Student project at Leeds University.

RESULT

A huge improvement on the previous year's performance in the competition. Optimised engine output through high performance of the 3D printed plenum assembly.

Improved Engine Performance with 3D Printing

BACKGROUND

Formula Student is Europe's most established educational engineering competition. Each year 100 universities from around the globe travel to Silverstone to compete.

AutoDesk approached Leeds University's team about collaborating on part of their project. Students used Fusion 360 for design and simulation of the plenum assembly. GoPrint3D were then asked to help with 3D printing the design using an iterative process. GoPrint3D continued the support in the design and manufacture of the resulting plenum.



CHALLENGE

The intaw is a part of a vehicle's intake manifold and functions as a pressurised air enclosure. A faulty plenum could cause adverse effects on an engine's efficiency resulting from a leak. The plenum needed to act as a pressure chamber in outdoor conditions. It required a design that was strong, lightweight, heat resistant and air-tight.



The plenum printed in Onyx on the Markforged X7 by GoPrint3D.



On behalf of the team, thank you both to Autodesk and GoPrint3D for your sponsorship and support during the past year.

- Biiftuu Aba-Godu,
FS Lead



The completed plenum assembly.



The individual components of the plenum assembly.



TECHNOLOGY

Continuous Filament Fabrication (CFF)

BRAND

Markforged

PRODUCTION

Markforged X7
5 piece assembly
2,686 cm³
Material cost: £504
⌚ 247h

POST-PROCESSING

PostPro3D
5 piece assembly
Single Batch
Total Consumables Cost: £55
⌚ 90 mins approx.

SOLUTION

The Markforged X7 suited the high print accuracy and tolerances required. The plenum was 3D printed in Onyx, because of its high strength and heat resistant properties. Onyx is a composite material consisting of nylon and chopped carbon fibre. Additive Manufacturing Technologies Ltd carried out a surface modification and sealing process through the use of its automated post-processing solution, the PostPro3D. This ensured that the part was air and water-tight.

RESULT

The plenum showed no performance issues and passed a choke test. This checks the gas flow through the part. GoPrint3D helped Leeds University optimise the design to allow individual components to print. This optimisation allowed the team to create a larger plenum than previous years. The result was an increase in the amount of air to the engine, improving performance.





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