

DSM and 3D printing help Forze Racing promote hydrogen as fuel of the future

The Forze Hydrogen Electric Racing Project - run by students from Delft University of Technology, Netherlands - champions hydrogen as an alternative automotive fuel, positively contributing to the sustainability of new mobility. It uses 3D printed parts made with DSM Additive Manufacturing materials including carbon with Dyneema® to improve performance and help Forze VIII compete against petrol vehicles.

Customer

Forze Hydrogen Electric Racing

Challenges

- Pitting hydro-electric technology against petrol cars
- Improve aerodynamics and reduce weight
- Traditional materials and techniques are heavy and slow

Solutions

- DSM Somos® Taurus, application development solution and UnionTech SL technology
- Carbon with Dyneema®

Benefits

- Helps increase race performance by reducing car weight by 5%

- Cuts time to produce and finish automotive parts
- Heat-resilient material produces engine-ready parts
- Smooth finish and structure ideal for complex engineering



“Forze champions hydrogen as the fuel of the future. DSM Somos® Taurus helped us develop an essential part for the Forze hydro-electric fuel cell that’s light weight and heat resistant which makes it ideal for Forze VIII, the latest generation of the car.”

Wouter Van Gijsegem, Aerodynamics Chief, Forze Racing

Government, industry and education are striving to find cost-effective and long-term alternatives to fossil fuels. One group is a team of students from the Delft University of Technology in the Netherlands. Each year over 50 students take over running Forze Hydrogen Electric Racing, a project at the forefront of hydrogen fuel cell technology.

Forze is a zero-emission racing car which the students design, build and run as a commercial enterprise. The current car, Forze VIII, is designed to compete against petrol-fueled vehicles from manufacturers like BMW, Porsche and Audi. In the Dutch Supercar Challenge, Forze VIII became the first Forze vehicle to complete a 60-minute race.

The primary 2018 Forze sponsor - BWT (Best Water Technology) eco-water treatment products - leads other organizations supporting the project. One sponsor whose support, advice and additive manufacturing materials have helped Forze over several years is DSM.

Challenges

Forze VIII needed two air in-take ducts to cool electric motors. But the ducts are complex shapes and must be light, yet strong enough to withstand heat and race track conditions. Forze VIII has been redesigned and constructed mainly from carbon fiber to reduce weight and improve aerodynamics. A 100kg cut in weight gains a 3-second speed increase. The ducts could be made using carbon fiber or metal coated in carbon fiber, but this was costly, time consuming and heavy.

Somos® Taurus Advantage

“When we presented the challenge of making the air ducts, DSM suggested one of its newest materials Somos® Taurus. It is highly heat resistant, holds complex shapes and is impact resistant against track debris. We felt it was perfect for the job.”

Wouter Van Gijsegem,
Aerodynamics Chief, Forze Racing

Somos® Taurus has been developed in collaboration with the automotive industry and is ideal for automotive applications. While many stereolithography (SL) materials are used for prototyping, Somos® Taurus is robust enough to be used in finished products. It is dark grey so does not need to be painted.

The Forze team sent the design files to the DSM Additive Manufacturing team who contacted one of its production partners, UnionTech Inc., to make the parts. UnionTech distributes a range of UnionTech SL machines and materials, especially from DSM. It used a UnionTech Pilot 450 SL machine to make the ducts.

Benefits

The ducts made using Somos® Taurus are lighter and more heat resistant than those made with other materials. They are around 200g compared to 1kg using carbon fiber and have a smooth finish, making a significant contribution to performance. Van Gijsegem adds: “When the parts made using Somos® Taurus arrived, we were very surprised at how light they were.”

Another benefit of Somos® Taurus is finish quality. Van Gijsegem: “We could have 3D printed the ducts with a more brittle material and wrapped them in carbon fiber.

Reducing production time

“The UnionTech software and hardware along with the quality of the Somos® Taurus material enable us to produce 3D printed parts for the Forze project that reduce tooling time, come with a smooth finish and are as close as you can get to an injection-molded part.”

Peter Hansford, Director EMEA, Union Tech Inc.

But, without a lot of grinding and painting, this wouldn’t achieve the same smooth surface as Somos® Taurus. A high-quality finish is essential because any air turbulence or drag impacts performance.”

DSM also supported Forze’s commercial operation by inviting the team and car on its stand at a German automotive event.

As well as Somos® Taurus, Forze is using another material from DSM. Carbon fiber is light and strong but not very impact resistant. For vulnerable areas of the car, DSM recommended carbon with Dyneema®. It is a hybrid of pure carbon and Dyneema® fiber and can handle impact forces up to 100% better than pure carbon alone. Carbon with Dyneema® is used on the vehicle’s under surface and wheel arches where surface debris gets kicked up by the wheels.

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