Triple Eight Race Engineering revs up production thanks to HP Multi Jet Fusion technology

Data courtesy of Triple Eight Race Engineering

By 3D printing customized parts for a racecar steering wheel, Triple Eight is able to accelerate production while decreasing costs

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Introduction

Triple Eight Race Engineering—a.k.a. the Red Bull Holden Racing Team—is an Australian motor racing team that competes in the Virgin Australian Supercars Championship, Australia's premier motorsport category.

The team was formed in 1996 in the United Kingdom, running Vauxhall Motors' program in the British Touring Car Championship before expanding to Australian V8 Supercars and purchasing the Briggs Motor Sport team in September 2003.

Triple Eight also provides technical support and manufactures vehicle components for other racing teams such as Tekno Autosports, Charlie Schwerkolt Racing's Team 18, and Matt Stone Racing.

As well as building cars for its own use, Triple Eight has also built cars for other teams. It has provided chassis for DJR Team Penske (owned by Dick Johnson), Paul Morris Motorsport, Lucas Dumbrell Motorsport, Tekno Autosports, Charlie Schwerkolt Racing, and Matt Stone Racing. The team has won the Supercars Championship eight times, the team's championship nine times, and the Bathurst 1000 seven times.

• Industry

Mobility and transportation

• Sector

Motorsports

• Objective

To simplify the manufacturing process and create customizable parts to improve the driver ergonomics of a racecar steering wheel.

• Approach

Triple Eight Race Engineering used HP Multi Jet Fusion (MJF) technology to 3D print components and tooling to produce their racecar steering wheel, which allowed them the design freedom to customize the wheel based on a driver's unique anatomy while also saving time and costs.

• Technology | Solution

HP Multi Jet Fusion technology, HP Jet Fusion 4200 3D Printing Solution

• Material

HP 3D High Reusability (HR)[1] PA 12

1. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 provide up to 80% powder reusability ratio, producing functional parts batch after batch. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.

Challenge

A racing car steering wheel is an assembly that typically includes three parts: an armature and grip (rim), or the part that the driver holds to steer the car (this is typically made from a strong metal like a magnesium alloy); the hub and quick-release mechanism, which connects the armature to the steering column; and various switchgear and lights that are mounted to the armature or hub and allow to driver to exert control and receive information about the state of the car.

Motorsport parts need to be able to withstand the high temperatures inside the cars, which can exceed 65 degrees Celsius (149 degrees Fahrenheit). During races, cars reach speeds in excess of 300 kilometers per hour (186 miles per hour) and generate g-forces up to 2.5 times gravity; therefore, the parts also need to be structurally fit for purpose and durable enough to endure the harshness and vibration that come with racing.

Additionally, race champion Jamie Whincup had wanted a steering wheel that was made from silicon/polymer as current racing gloves feature grips that work well with this material. Time and budget constraints left Triple Eight with few options for producing quality parts. Before acquiring access to HP Multi Jet Fusion (MJF) technology, their only options would have been to use CNC Machining to produce aluminum tooling for the molding of the steering wheel grip, which is expensive and slow, or to use an existing FDM 3D printer, but due to the poor standards of this technology and the amount of post-processing required, they wanted to find another solution.

"The project had been dormant for years as the only option we had would have been to produce the molds with CNC Machining, which is not the best option when there might be iterations needed," said Mark Dutton, Race Team Manager at Triple Eight Race Engineering.

Solution

"In early 2017, EVOK3D (an Australia-based 3D printing solutions company and HP partner) visited our Banyo workshop to show HP MJF parts, and we were blown away with the part quality and strength, compared to what we were used to," Dutton said. **"We realized we need to have access to this technology to improve a whole host of components. This aligned with a broader discussion with HP and resulted in a joint partnership with EVOK3D, HP, and Triple Eight Race Engineering.**

"I honestly can't remember being that impressed ever by plastic 3D printing (than) with the HP (technology)."

The team collaborated with HP 3D Printing and EVOK3D to produce three main pieces for the racecar steering wheel: a two-part mold to form the soft polyurethane exterior that wraps around and cushions the steering wheel; lightweight cores that sandwich the armature plate and form the bulk of the steering wheel rim; and the housing for the mounting of switchgear and lights to the hub.

Triple Eight wanted to 3D print these pieces to accelerate the manufacturing process and allow for lightweighting and customization to enhance driver ergonomics.

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Result

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The design freedom that comes with using HP MJF technology has allowed Triple Eight to reduce the weight of the parts and customize the steering wheel grip based on the driver's anatomy. By tailoring the grip to the driver's individual needs, drivers can achieve better control of the vehicle, execute more precise steering inputs, and benefit from enhanced comfort.

"The refinement you can (achieve) to chase that constant perfection is hammered home in 3D printing," said Dutton. **"The fact that you can print it out of plastic saves weight, and weight is gold in race cars."**

Not only do drivers benefit from these newly designed steering wheels, but Triple Eight enjoys a host of benefits, as well. With other technologies, such as CNC Machining, production costs could reach $3,000 per pair of mold halves, plus the costs of final part production. With HP MJF, the cost of the two halves of the 3D printed mold is only $650, resulting in cost savings of nearly 80%.

Triple Eight also experienced substantial time savings as HP MJF helped accelerate the design cycle and development cycle from 3 or 4 weeks using traditional CNC manufacturing to only to 3 or 4 days.

With HP MJF technology, Triple Eight enjoys **"the confidence you have in that product because the strength is better, the thermal stability is better, the resolution is better,"** Dutton said. **"With some of the harsh environments, you are limited by capabilities of the plastic, whereas with HP, the limits have been pushed further away. We haven't reached them yet, so it's pretty exciting."**

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