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Laser sintering helps improve hybrid car acceleration

Stephen Lambert, a research engineer at Warwick Manufacturing Group, has used an EOS plastic laser sintering machine in an application for Westfield Sportscars in which he was asked to design a hybrid car that would accelerate faster.

For this, a 1.6 litre/200 brake horsepower (BHP) petrol engine driving the rear wheels of a Westfield Sport Turbo 1600 was supplemented by fitting two electric motors, each rated at 75 kW/100 BHP, to give the vehicle a four wheel drive boost for up to three minutes during a race. F1-style inboard suspension was added to drive the front wheels independently. The motors are brought into play by the driver pulling a pair of 'push to pass' paddles behind the steering wheel, the torque being blended in according to the throttle position.

To maximise both the power and the time that the electric drive is available to the front wheels, it is important to prevent excessive heating of the 396 lithium ion phosphate cells that supply the axial-flux motors, a challenge as the only space available was under the driver's seat.

The cells were stored in rows side by side, in two battery boxes machined from solid plastic, however engineers from EOS instead suggested two arrays of 11 plastic modules so each cell could be retained in its own cylindrical cavity, 18 per module.

Rapid manufacturing in an EOSINT P-series laser-sintering machine, driven by data derived from slices taken through the CAD model of the new battery box, was used to produce the modules from layers of fused EOS PA 2200 polyamide powder. This e-Manufacturing technique allowed air channels to be created between each cell cylinder and between adjacent modules as they are bolted together. This means significantly enhanced cooling of the 3.6 volt cells due to air flowing around them while current of up to 100 amps is being drawn, boosting the performance of the batteries and the electric motors.

As a result, the Westfield Hybrid in four wheel drive mode is now capable of achieving 60mph in 3.5 seconds, compared with 5.5 seconds when only the rear wheels are driven.

University of Warwick WMG principal fellow, Dr Steve Maggs, said: "Following the success of this prototype, there is potential for the system to be rolled out for production and sale by Westfield Sportscars.

"In fact, the system that has been developed is pioneering in that it can be integrated into any motor vehicle and therefore has numerous exciting potential applications in both motorsport and the automotive industry."

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