Rennschmiede-Pforzheim

Customer Profile

Rennschmiede Pforzheim is the student-led racing team of Germany's Pforzheim University. Each year Rennschmiede Pforzheim students participate in Formula Student, an international engineering competition to plan, design, and develop a race car. Students build and race the cars with help from various technology manufacturers as they compete against other teams from across the globe.

Challenge

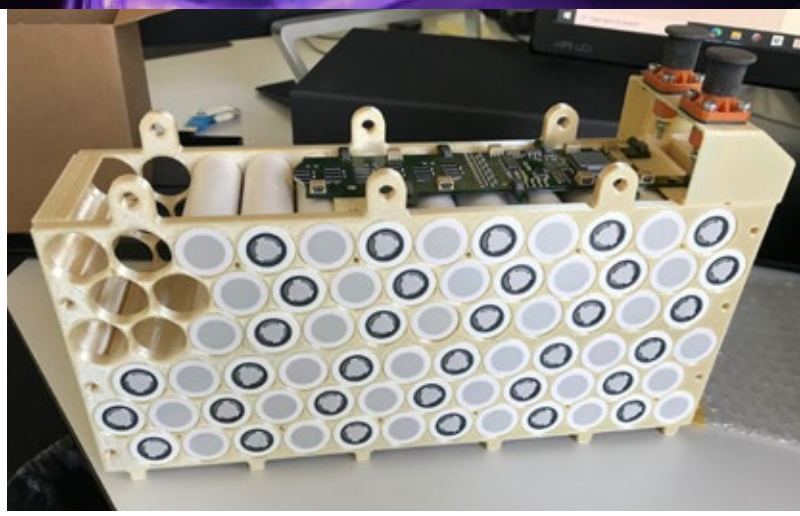
The battery for the Rennschmiede Pforzheim electric race car was designed with 72 individual cylindrical cells. A case was needed to house the cells together to form a single consolidated battery. The case material needed to be non-metallic to avoid conductivity and short circuits between the individual cells. Since only one race car is built for competition, machining or molding the case out of PEEK or other polymer material for this one-off end-use part was costly and impractical.

Solution

The team chose to 3D print the battery case since the process offered the most time- and cost-effective solution. 3D printing also provided ease of manufacture, since the case's complex design incorporated many holes to accommodate each electrical cell. The case was printed with ULTEM™ 9085 resin material due to its excellent material properties including high strength and chemical resistance. Additionally, ULTEM™ 9085 resin satisfies UL94 V0 flame retardant specification, a rulebook requirement the team had to comply with.

Impact

3D printing provided the Rennschmiede Pforzheim team the most effective solution for producing the battery case when compared to the alternatives. Key benefits included:



The completed battery case printed with ULTEM™ 9085 resin shown with some of the battery cells installed.

Design freedom – the ability to configure the case as needed to fit the car and accommodate the battery cells without traditional manufacturability constraints.

Time efficiency – the case was produced in 20 hours – less than a day – vs. a much longer lead times typical with machining/molding.

Material capability – 3D printing offered the best material option in a process that was also the most time- and cost-efficient (such as machining a solid block of polymer material).

Material savings – 3D printing avoided approximately 75% of material waste had the battery holder been milled from PEEK or simlar polymer plate material, resulting in a significant cost savings.

Weight savings – a milled design would have resulted in a heavier part; 3D printing enabled a lightweight design more appropriate for a competitive race vehicle.

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