Sacrificial Tooling Success

Traditionally, producing sacrificial tools for composite parts involves a multi-step process, which, by implication, means that it can be extremely time-consuming and expensive. Over the last 30 years, composite materials have become increasingly relevant for a number of industrial sectors for applications that demand high performance without the weight associated with metal materials. During that time, there have been many advancements, but producing critical (and often complex) parts with composite materials can be challenging and requires specific expertise and in-depth knowledge.

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>
> Rick Heise
> Swift Engineering

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Evolving Innovation

Swift Engineering Inc., based in San Clemente, California, works on the cutting edge when it comes to composite materials. For more than three decades, Swift has been developing next-generation composite parts for a broad customer portfolio in the automotive, aerospace and defense sectors. As a result, the company has continued to evolve its innovative approach to producing composite parts and is always looking for what is next in terms of materials, processes and techniques, enabling Swift to be a consistent market leader.

In partnership with Stratasys® and using Fortus® 3D Printers, the latest technique that Swift Engineering has adopted is additive manufacturing for sacrificial tooling applications. Often overlooked, tooling applications are proving to be among the most effective applications of additive manufacturing today, and Swift is one company that is realizing this benefit, along with the many other advantages that it brings.

A Game Changer for Tooling

Swift Engineering has long used FDM® technology for prototyping,and even some final production parts, according to Rick Heise, Swift's president and chief strategy officer. More recently, the Swift team has benefited tremendously from using 3D printing to produce the sacrificial tooling required for complex composite parts.

Heise says, "For us, Stratasys' additive manufacturing solutions represent a real game changer because they are allowing us to save a lot of time and a lot of cost within our composite part production process, without compromising part quality or performance."

Swift has a long heritage of developing next- generation composite parts for motorsport applications.

Sacrificial Tooling Success

It is at the front end of the composite manufacturing process that additive manufacturing has proved so valuable. It has allowed Swift to eliminate the time-consuming, multi-piece bonded assemblies traditionally associated with trapped tooling approaches and reduce the lead times for tool production by up to 90 percent. Now, as the part is designed, a one-piece corresponding sacrificial tool can be designed in parallel, and 3D printed using Stratasys' ST-130TM material with custom-designed fill patterns that can withstand consolidation pressures in excess of 90 pounds per square inch. The sacrificial tool is then easily dissolved after curing, which eliminates secondary processes and accelerates composite part fabrication.

Depending on part complexity and size, the tool build can take just days to produce, and frequently less than 24 hours. This, compared with the traditional four to six weeks, or even months, for a machined or cast wash-out tool assembly, affords Swift unprecedented levels of flexibility. These time savings not only permit Swift to meet the increasing demands of shorter client lead times, but also allow much greater design freedom and product iteration cycles that result in innovative part performance and functionality.

Swift uses composite parts for innovative aerospace applications to reduce weight.

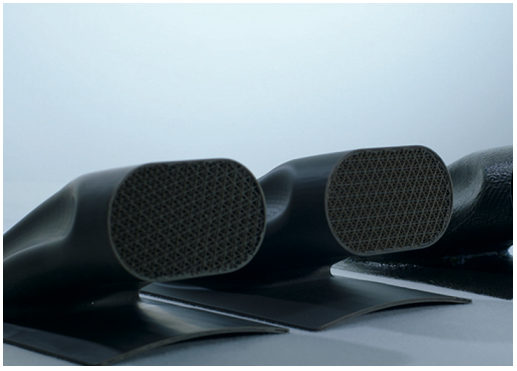
Prior to bagging for cure, the ply lay-up is completed.

Improved Performance & Delivery

Kerry Dang, manufacturing manager at Swift Engineering, says that a number of the company's key applications are benefiting from the Stratasys sacrificial tooling solution, including brake ducts, hood scoops, leading edges and bell housings.

"These are hollow parts with complex geometries that need to be sealed," Dang says. "As an example, the air duct was manufactured using the Stratasys additive manufacturing sacrificial tool procedure. We were able to remove the tool easily without leaving seams inside of the part because the complex tool is built in one piece and requires less post- production work."

Nate Ogawa, Swift's director of product development services, adds that this is "critical for the optimum inner surface quality of the part and means that functionality is improved, compared with traditional sacrificial tooling methodologies that use multiple parts bonded together to achieve the same shapes."



(Left to right): 3D printed tool as-built, sealed tool and final resulting part.

Based on the success experienced with Stratasys' sacrificial tooling solution at Swift Engineering, Ogawa says, "We are starting to rely heavily on additive manufacturing for all our fast turnaround applications." Each time the company does, the rewards translate to happy customers benefiting from getting their innovative composite parts faster and more efficiently..

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