Hawthorn COMPOSITES

ORPC RIVGEN® FOIL & STRUT

CASE STUDY

PROBLEM

How to fabricate 2 large complex composite parts needing to be made with higher throughput and lower cost.

OPPORTUNITY

Deliver a solution that moves away from pre-preg with an autoclave cure to dry fiber layup, resin transfer molding, and an oven cure to speed up the process and reduce cost.

SOLUTION

Deployed lower cost, thick, braided dry-fiber materials and industrial grade epoxy with resin transfer molding (RTM) to significantly reduce fabrication time and overall composite part cost.

RE-ENGINEERING THE COMPOSITE PARTS

Through collaboration with ORPC and our partner, A&P Technology (A&P), we re-engineered the ORPC foil and strut to achieve the same structural results of the composite parts made by hand lay-up of pre-preg according to a detailed ply schedule with an autoclave cure to a custom braided, dry fiber ply schedule, combined with resin transfer molding of an industrial grade epoxy resin and an oven cure.

DETAILS OF THE SOLUTION

To construct the foil, Hawthorn Composites (Hawthorn) used an automated table cutter to cut the ply kit that includes a combination of unidirectional Zero carbon fabric, BiMax (+/- 45˚) carbon fabric, and QISO (0˚ +/- 60˚) carbon fabric that were much thicker than the original pre-preg material, resulting in significantly less lay-up time. For the strut, Hawthorn cut the ply kit using a thick QISO (0˚ +/- 60˚) fiberglass fabric, which was laid up in an RTM clamshell mold. It required 36 plies to achieve the client's specified dimensions and requirements.

RESULTS

The re-engineered foils and struts met ORPC's structural and specification requirements while delivering significant benefits. The Hawthorn manufactured foil accomplished a 70% reduction in production time and ORPC received a 35% reduction in overall cost, The Hawthorn manufactured strut resulted in ORPC receiving an overall 20% reduction in cost.

THE HAWTHORN ADVANTAGE

Hawthorn Composites utilizes dry fabrics/preforms, resin infusion, and novel manufacturing methods to make complex geometry composite parts that are equal or better in performance and quality to baseline manufacturing methods at significantly lower cost.

ORPC Modular RivGen® Power System

ORPC FOIL CONSTRUCTION PROCESS

The custom braided carbon fiber fabric is cut to precise ply shapes using an automated table cutter and plies are kitted. An operator lays the kitted plies into the upper clamshell mold and lower clamshell mold. The plies are held in place using a tackifier spray.

The upper clamshell mold is flipped and lowered into position on the lower clamshell mold using an overhead crane and fork lift. Once in position the mold halves are bolted together.

A trim and drill fixture is used to drill precise holes. Then metallic backing plates are bonded onto the foil in 3 locations which allow the foil to be integrated into the RivGen® Power System with downstream assembly.

Foils are painted with a clear coat epoxy paint to protect them from UV Light.

Three completed foils are shown that make up one half of the finished RivGen® Power System

ORPC STRUT CONSTRUCTION PROCESS

First, 36 plies of A&P QISO braided fiberglass are cut on an automated table cutter and kitted. Plies of kited fiberglass are laid up by a technician into their respective clamshell mold halves. The upper clamshell mold is flipped and assembled to the lower clamshell mold half.

The molds are bolted together and infusion hardware is installed. A vacuum leak check is performed on the mold and once passed, the mold is installed into the infusion stand, placed into the oven, and plumbed for infusion.

The part is then infused and cured following the resin manufacturers recommendations. After the cure is complete, the mold is removed from the oven and the demolding process begins before the strut cools.

The strut is placed onto a high-speed CNC router bed and is drilled and trimmed to the customers specifications.

A finished strut is shown. Six foils and six struts are used in the RivGen® Power System.