INTERPLASTIC CORPORATION
Thermoset Resins Division

MARINE CASE HISTORY

A Hull of Epic Proportions

An engineering alliance between Intermarine Savannah and Interplastic Corporation's Thermoset Resins Division lead to the successful creation of a 123 foot (37.5 m) long hull using the vacuum infusion process (VIP) and certification of the yacht by Det Norske Veritas (DNV), one of the world's leading maritime classification societies. The hull is one of the largest composite parts ever made using vacuum infusion.

Advanced Engineering Challenges

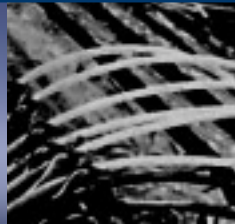
One of the biggest obstacles Intermarine engineers faced using vacuum infusion on this hull was the height restriction. From keel to shear, the hull was over 16 feet (4.9 m) high and the bow was even taller. "In theory, you should be able to draw resin up to a height of about 29 feet (8.8 m) using a hard vacuum (the limitation being atmospheric pressure)," explains Belle Gall, Intermarine's composite research director. "However, in practice it becomes difficult at heights over 14 feet (4.5 m). To conquer this obstacle, we decided to reduce the height by rolling the hull halves onto their sides and infuse the two hull shells separately." This added more work for mold preparations and a steel frame to support each of the hull halves was designed and fabricated to enable the molds to be positioned on their sides. When the infused halves had fully cured, they were aligned and irrevocably joined by an infused patch that runs the length of the keel.

The VE/VIP System

Buck Younger, Intermarine's vice president, new boat construction, says previously their company used traditional hand lay-up for major FRP construction but there were strong reasons to switch to VIP. "The weight of the finished part is very consistent and predictable, as are the strength and physical properties. The vacuum infusion process also provides a good working atmosphere for our employees because they are working basically with dry glass. Most of the fumes emitted during the vacuum process are contained and absorbed by the vacuum filter. VOCs are reduced."

The resin that Intermarine originally chose for their operation was expensive and its manufacturer offered little technical support - said Gall. "When we spoke to Interplastic, they sent their lab staff here, at their own expense, to investigate our processes and problems. Then they designed a custom vinyl ester resin that works specifically with the vacuum infusion process. They remain an integral part of our team with continuing technical support." The resin, CoREZYN® VEX-169-826, is now Det Norske Veritas-certified.

A well-designed vinyl ester resin brings powerful benefits to any FRP part but when combined with the vacuum infusion process, it's a real showstopper.



Most importantly, the CoREZYN® vinyl ester will deliver extremely high strength-to-weight ratios, making finished parts remarkably strong yet lightweight. Laminates can be thin with fewer worries about cracking and breaking. The resin's physical characteristics allow it to absorb, flex and bend beyond the limits of many traditional resins. Its resistance to osmotic blistering/pressure makes it the deciding factor for any marine application and it is "the resin of choice" in the marine industry. (Detailed information about these vinyl esters can be found at www.ResinNavigator.org.)

Clear tubes connect the resin distribution manifold, on the left side, to the resin feeder lines (dark-colored lines) along the hull half.

Simply put, in the VIP, a vacuum compresses the fiberglass and holds the core with an even pressure. It also pulls the CoREZYN vinyl ester resin through the laminate stack, infusing it with uniform pressure and compression. While this compression limits the amount of resin each ply of fiberglass will hold, it is completely uniform and the glass is fully saturated. The resin fills all the voids in the fiber bundles as it moves towards the vacuum source and also carries trapped air with it, eliminating voids on its way. "The infusion process compresses the resin and glass so well you can see right to the core," concludes Gall. The resin-to-glass ratio is reduced to less than 40% of the total laminate volume. The resin type, the absolute saturation and the elimination of any voids, cinches the strength and durability of the laminate.

Powerful Finish

All of the composite, as well as all of the yacht's exterior parts, are post- coated with Interplastic's clear Iso/NPG® gel coat as the bright, clear exterior finish. Its purpose is to seal the laminate in a corrosion resistant "see-through" layer, making any imperfections more obvious. This specific clear gel coat is specified by Det Norske Veritas for VIP.

Obviously a yacht of this magnitude is expensive and complex. Det Norske Veritas (DNV) was selected over other maritime certification organizations because their rules are very structured, more engineering-driven and the product's components are evaluated to assess overall quality. Younger also believes buyers like knowing someone other than the builder's shipyard has done a QA on the boat. "Having DNV certification allowed us to prove to potential customers that our design quality assurance was deeper, more thorough, more modern and therefore, our yacht was of a higher quality."

Interplastic Corporation is a specialty chemical company with its headquarters in St. Paul, Minnesota. It is focused on the production and distribution of unsaturated polyester resins, vinyl ester resins and gel coats for the composites and cast polymer industries. Their vinyl esters are the resins of choice in the marine industry for composite hulls and decks and for highly accurate tools and masters.

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