

Vocabulary II

FIBERGLASS: A composite word meaning basically Glass Fiber. The word only refers to part of the matrix however. A more accurate term would be the two common acronyms: FRP (Fiber reinforced resin) and GRP (Glass reinforced resin)

Fiberglass first became mainstream in boat building as a weight and labor saving material. Parts were easily replicated and mass production was improved.

HAND LAY-UP: The traditional method of fiberglass (GRP) boat building has remained unchanged for decades. Typically a builder constructs a mold, greases the mold then applies the finish coat (gel coat) to the molds interior surface. Then the builder lays down a layer of glass cloth generally chopped strand mat to avoid a checkered pattern on the finished hull. This cloth is wetted out with polyester resin using a paint roller. A grooved bubble roller is used to remove air bubbles (called "voids") Subsequent layers of cloth are laid down and wet out until the entire thickness is achieved. The hull is allowed to rest for a time then removed from the mold. All in all a very sticky job. Hand lay-up is fraught with pitfalls. The human factor and skill of the laminator is crucial to maintain the proper fiber to resin ratio. A laminate that is resin rich or resin poor can be weak, heavy, flawed etc. Typical hand layout produces an 8-10% area of voids. If the laminator misses his curing schedule and the layers are allowed to dry too much between layers the entire surface must be abraded before applying the next layer. The process also requires the workers to don protective clothing, gloves and respirators. Open buckets of resin and solvents are prevalent. I have done plenty of it and it can be very difficult to do a neat job on a big project. Every FRP boat in existence was made in this fashion for decades.

PRE-PREG: Means simply previous cloth saturation. This is a process that allows the laminator to precisely determine how much resin is applied to the cloth. It provides greater accuracy and strength than hand lay-up and has less voids as well generally around 2% area. Typically the hull is placed under vacuum while curing.

CHOPPED LAMINATE: This is crazy to watch. Again the same mold is used but instead of laying down sheets of fabric and wetting it out a long glass thread is run through a gun that "chops" it into itty bitty pieces and blows it with resin against the mold. Many price point mass production boats are built entirely with this process. The result tends to produce low quality highly flawed hulls at great cost savings. Voids can regularly exceed 10% by area.

INFUSION: This is the laminating process, which many builders are adopting. Again we use the same mold but have added large flanges on the top edges. The gel coat finish is sprayed in and the cloth is laid down. Now instead of wetting out the cloth the remaining cloth is all assembled in mold while dry. This is called the stack. Core material if being used is placed in position and the stack of cloth is tacked in place with spray adhesive. Now a plastic bag is placed over the whole mold and a vacuum introduced. Once all the air is removed and the stack checked for wrinkles or other problems a valve is opened and resin is drawn into the mold. The negative pressure draws the resin up through the fiber stack until the whole boat is wet out. This process produces very high quality pieces of predictable and repeatable ratios, weight, strength and cost. Voids are typically less than 1%. Post curing in a giant oven can produce perfect results.

VOIDS: Many of you have heard me comment on these pockets in GRP hulls and have seen me take chalk to their hulls during survey. They (voids) come from two sources and may be most accurately and generally described as space in a laminate that is not filled with resin or cloth or core. In some cases a void is an air pocket created during the lamination process. Inside sharp corners are very difficult to roll out. That why in non-infused hulls it's rather common to find voids in the chines and strakes and transom corners. The other source for voids is far more sinister. These not-so-empty pockets are created by VOC's in the materials being laminated. Volatile Organic Compounds remain in suspension during lamination then begin to slowly off-gas. In the future these tiny pockets may allow tiny droplets of water inside where it mixes with the remaining compounds and Viola! A blister is born.

COLD MOLDING: Truly a custom builders medium. Commonly utilized by the flared bow battle wagon builders in the Carolinas cold molding is multiple layers of thin wood laminated together at opposing angles with epoxy resin. The result is a hull that is strong and light, with an epoxy skin inside and out. The hulls are built upside down on frame type jigs called molds. After the hull is completed and righted the molds are removed and may be re-used. If building a custom boat from scratch this would be my first and second choice.

RESIN: Kind of a catchall word. Traditionally the word resin refers to polyester resin. Currently builders are using Vynalester and epoxy resins as well. The Vynalester and epoxy resins offer many benefits to laminating boat hulls but of course are far more expensive. The current trend for hand lay-up builders is to laminate the first few layers with Vynalester resins to prevent voids and blisters then switch to less expensive polyester resins for the bulk of the laminate.

SYNOPSIS: Cost / vs. / quality:

First choice when comparing laminating methods between builders.

- 1) Cold mold –pure custom and not found much in production or open markets.
- 2) Closed molded or infused or SCRIMP. All use various methods of drawing resin into a cloth stack and all offer good strength to weight, void free blister resistant hulls.
- 3) Pre-preg. The choice of Americas Cup builders. More common in European sailboats, Deadrise hulls and NE custom builders.
- 4) Hand lay-up. Good stuff if you can trust your laminator. I have always said that I want my laminators to be roommates and date sisters. That way if one is hung over or sick they both are. The hull will be all good or all bad, not half good or bad. That explains why I often find lots of issues with only one side of a large hull where two workers were required for lay-up.
- 5) Chopped laminate. Price point entry-level fabrication. Light in weight, cost and quality.