

Molded Model Boat Hulls

A general overview

Before we begin, one example of the final product.

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- A royal Navy Steam Tug from WWII (60" long).
 - Famous tug known as the Foundation Franklin.



Even Larger

- A US Navy Cruiser from WWII (78" long).
- This is a Brooklyn Class Cruiser.

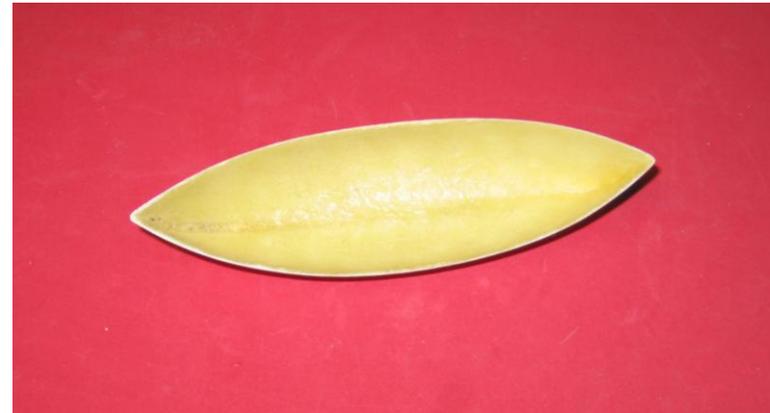


The other end of the extreme

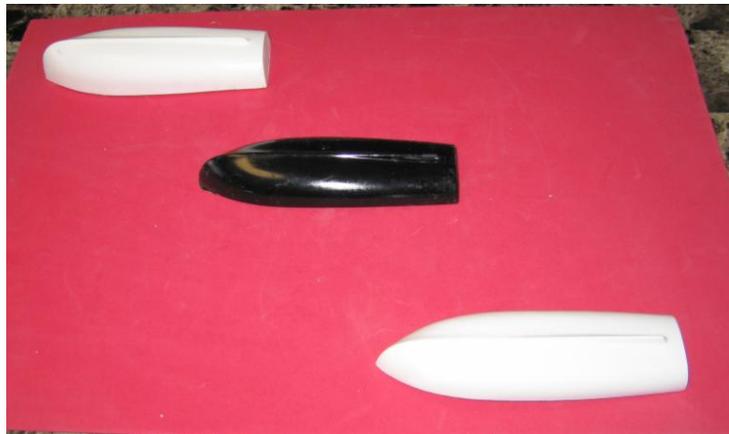
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- A small harbor tug (13" long).
 - This is a fiberglass replacement for the popular Lindberg Harbor Tug.



Or even smaller



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- Assorted lifeboat hulls (roughly 4" long).
 - Currently have molds down to about 2" long.



For purposes of this presentation it is assumed the mold exists. Development of the mold can be another presentation.



Advantages of molded hulls

- Every hull is exactly the same.
- Waterproof.
- Ready for paint or can be molded in desired finish color so no painting needed.
- Only need to create the part once, this becomes the master for the mold.
- More interior space since there aren't any frames and, in many cases, the molded part is lighter as well.

Disadvantages of molded hulls

- Depending on the number of copies needed it may not be worth the time and effort to develop the mold.
- Tricky skill to learn at first, getting started can be frustrating without experienced help and guidance.
- Can be messy and possibly smelly depending on the resins selected.
- You may be sensitive to the chemicals used or become sensitive over time. Adequate ventilation is important.

Materials needed - Resins

Epoxy

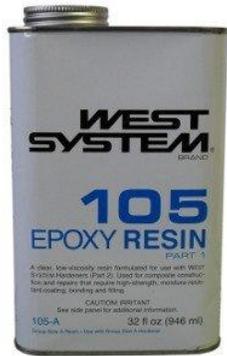
- More expensive than Polyester.
- Nearly Odorless.
- Limited control of working time.
- Colored finishes limited and not as brilliant as Polyester.

Polyester

- Less expensive than epoxy.
- Smell can be overpowering to some.
- Considerable control over working time.
- Gelcoat available to allow for colored finishes. High gloss finish is possible with minimal effort.

Materials needed - Resins

Epoxy



Polyester



Materials needed - Reinforcement

Cloth

- Fibers are oriented at 90 degrees to each other although some specialized cloths are available with a 45-degree layer.
- The weave affects the stiffness but none of the weaves are as pliable as mat.

Mat

- Random chopped fibers held together with a binder.
- Very pliable when wet and strong when cured.
- Uses more resin to saturate which typically makes the part heavier but much stronger and more rigid.

Materials needed - Reinforcement

Cloth

- Generally, produces a lighter part but not as rigid for same thickness layup.
- Much more expensive than mat.
- The molded part has a much smoother inside face.
- Print through is possible.

Mat

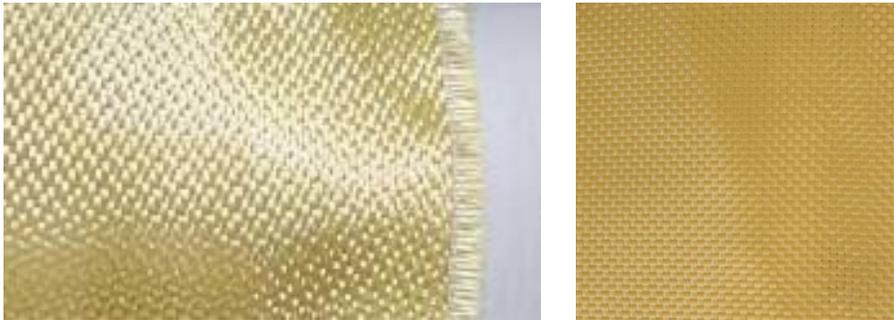
- Inexpensive, 3 different weights available that are appropriate for hobby use.
- Wont work with epoxy as the binder is not compatible with epoxy.

Materials needed – Reinforcement (specialty)

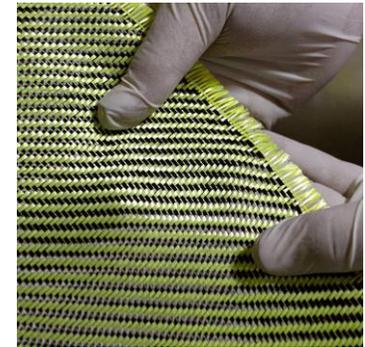
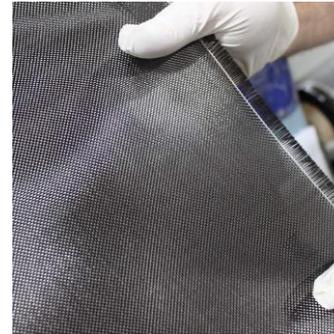
- Kevlar and Carbon Fiber.
- Only needed for super strong and/or light applications.
- Only work with epoxy.
- Very expensive and tricky to use.
- Mainly for race applications.
- If not cured properly can be sensitive to ambient temperature changes.

Materials needed – Reinforcement (specialty)

Kevlar



Carbon fiber



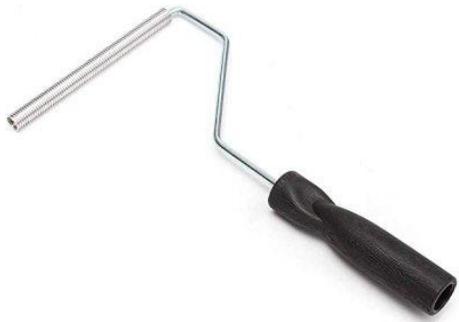
Common (resin independent) supplies

- Mixing cups, stirring sticks and rags for clean up.
- Hardener/Catalyst (this is resin specific).
- Gloves.
- Acetone for cleanup.
- Fillers as needed.
- Wax.
- PVA mold release.
- Scissors.

Common tools

- Inexpensive chip brushes (Harbor Freight).
- Rollers.
- Eye protection.
- Face mask with cartridges for organic vapors.
- Heat and/or AC as shop temperature is critical.
- Sandpaper and hacksaw or abrasive cut off wheel for trimming and finishing.
- Release wedges.
- Cloth/mat patterns.

Tools and Supplies



Basics of laying up a hull

- Wax the mold with a high quality Carnuba or similar wax.
- Spray PVA mold release once wax has flashed off.
- Brush or spray gelcoat into mold and allow to cure completely.
- Use patterns to precut mat or cloth (sometimes both are used together to optimize the advantages of each).
- Brush resin into mold, usually one half at a time but sometimes entire part at once.
- Place mat/cloth into mold, position appropriately and work out wrinkles as best as possible.

Basics of laying up a hull

- Use rollers and sticks to work out wrinkles and bubbles.
- Sometimes bubbles must be cut open to lay down properly.
- Patterns can be refined over time to adjust for and remove problems.
- Once the cloth/mat is rolled out completely add additional layers if needed.
- Once final layer is in place use brush to soak up and remove excess resin. Excess resin adds no strength but does add weight.
- Set aside to dry for a minimum of 24 hours at 65 degrees minimum. The wait time can be shortened with higher temperature, but I would never go less than 12 hours.

Basics of laying up a hull

- Once part is fully cured need to free it up from the mold.
- Start by using a woodworking chisel to break bond with flange.
- Stick plastic strips and wedges between part and mold. Need to break the seal with the mold.
- Complex parts can take considerable time to release from mold.
- Once part is out of the mold trim the excess with an abrasive cut off wheel or hacksaw blade.
- Use sandpaper to finish trim the part.
- Wash the mold release off with warm water.

Basics of laying up a hull

- Don't forget to clean the mold as well before returning to storage. I like to store the master in the mold (or use a spare part if master is not available) to protect the mold face from damage during storage.
- Store the mold and patterns securely for the next use.
- With proper care hundreds of parts can be made from a mold before it wears out. I have pulled 700 hulls from 1 mold.

When things go wrong

- Molding parts can involve a bit of black magic and luck. Even when everything is done correctly a part can go bad and warp, distort or not cure.
- The worst-case scenario is when the part sticks in the mold and won't come out.
- When something goes wrong think back through everything you did to see if you can determine the cause and learn from it. It is almost always because a corner was cut somewhere.
- Keep in mind, parts with undercuts or reverse curves will need a multi part mold or the master will never come out

Assorted pictures for review and discussion

