

- Terms to Remember (Wanberg)
 - *Composite: any material made up of two or more dissimilar materials*
 - *Matrix (Matrices): component of the composite that surrounds and holds the fibers in place*
 - *Reinforcements: provide tensile (pulling) strength and some shear (tearing) strength*
 - *Layup: process of joining the matrix and reinforcement together*
 - *Draft: angle of the part's sides in relation to the direction that it will be removed from the mold*
- Types of Fiberglass
 - Twill, 5.79 oz/yd, 0.009" thick – 2 layers required
 - Mock Leno, 20 oz/yd, 0.030" thick – 1 layer required, more epoxy needed
 - Fiberglass Mat, 1.5 oz/sq ft, 0.045"-0.060" thick – 1 layer required, most epoxy needed, does not shape well
- Step by Step Procedure
 - Step 1: Create The Mold
 - Plaster is acceptable for short term projects but is not recommended for repeated use. More durable materials such as metal, wood or fiberglass are preferred. Foam can be used for single use.
 - Step 2: Prepare The Mold and Board
 - **This step helps to prevent the resin from adhering to the mold**
 - Coat the mold and board with a thin layer of wax specified for use with epoxy resins, 3-4 coats recommended for first time molds. 1-2 coats are sufficient for seasoned molds
 - Spray a thin layer of PVA (polyvinyl alcohol) over the waxed mold. This forms a thin film on the mold. Keep it thin, too much thickness detracts from detail.
 - Use clay (or in my case "Silly Putty") around the edges of the mold to prevent undercutting.
 - Place the sealant tape around the perimeter of the board, ensure the seal is continuous. Leave the backing paper in place.
 - Step 3: Layup
 - Layout fiberglass on clean, plastic covered surface.
 - Mix epoxy. Be sure to use the minimal about needed, additional can be mixed in a second container if needed.
 - **Excess epoxy left in the mixing container can cause a chemical fire.**
 - Work the epoxy into the fibers with a plastic squeegee until the material is translucent. Squeegee out excess epoxy.
 - Carefully lay the material over the mold, removing as many wrinkles as possible. If using two layers, smooth the first layer before applying the second.
 - Step 4: The Layers for the Vacuum Bag
 - Perforated release film- thin green plastic that protects the other layers from the epoxy.
 - Breather/Bleeder fabric- similar to quilt batting, this allows the air to flow to the vacuum and also absorbs excess epoxy that is pulled through the perforated film.
 - Bagging film—thin plastic used to envelope the vacuumed areas.
 - A small hole is cut and the through connector to the vacuum is attached
 - The backing paper for the sealant tape is removed and the bagging film is pressed down to create an air tight seal.
 - Step 5: The Vacuum
 - Once sealed, the vacuum pump is turned on and the gauge is set to 20 inches of mercury (approx.. 1440 pounds per square foot)
 - Ideally, the vacuum could be turned off, but since leaks always exist, we have let it run for about 2 hours.
 - We check the residual epoxy and when it is no longer tacky, the vacuum is turned off
 - The assembly remains until the following morning to allow the epoxy to fully cure.
 - Step 6: Removing the mold
 - Tools that may be required are: Putty Knife, flathead screwdriver or other small wedge, compressed air
 - Remove the clay or putty as much as possible.
 - Force some separation between the mold and the fiberglass with the wedge. Be careful not to damage the fiberglass or mold (if possible)
 - If the mold still will not budge, forcing compressed air between the mold and the fiberglass can aid loosening the mold.
 - Step 7: Trim and Finish
 - Trim the excess material from the piece and paint or finish as needed.

Supplementary Texts and References:

John Wanberg, *Composite Materials Fabrication Handbook* #s 1-3

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Etcetera:

Our Current Materials Supplier:

<http://www.avtcomposites.com/cgi-bin/commerce.cgi?display=home>

Inspiration For The Portable Vacuum Pump:

<http://www.vacmobiles.com/?gclid=CMKO9uPs-rkCFc4-MgodOF8A7Q>

More Useful Information:

http://www.fibreglast.com/category/Vacuum_Bagging?utm_source=google&utm_term=vacuum%20bagging&utm_campaign=Vacuum+Bagging+-+Campaign&utm_medium=cpc&utm_content=sifMTbPKc|21163421543|vacuum%20bagging|p|&gclid=CKT20P3s-rkCFfFDMgod4k0AJg

Additional Supplier:

http://www.cstsales.com/vacuum_bag.html?gclid=CI699o7t-rkCFcvm7AodyhkA4A

Other Uses For Vacuum Bagging:

<http://www.woodcraft.com/PRODUCT/2005086/19303/VACUUM-VENEERING-KIT-WITH-PUMP-AND-36-X-54-VINYL-BAG.ASPX?refcode=10INGOPB&gclid=CJ7jmJzt-rkCFe4-MgodEVQAEg>