

## FIBERGLASS MOULD MAKING

Fiberglass mould is basically a hard plastic sheet, formed into desired shape, by laminating fiberglass mat, glass cloth, or woven roving. The laminating material is liquid polyester resin that is catalyzed to cure into a hard plastic material. These types of moulds have long been used in the production of items that normally are by themselves also made of fiberglass reinforced polyester.

Moulds of this type are usually used to produce large decorative items like statues, murals, and decorative vases. The building industry also has some use for fiberglass, such as in the molding of bath tubs, bathroom walls, and decorative or architectural designs. Also in car and boat making industry, for molding bumpers, spoilers, fenders, hoods, boat body or hulls, and many more.

The process of producing these products is basically the same as the process of producing their negative counterpart which is the fiberglass mould or the fiberglass reinforced polyester mould. The well known process is called the Hand Lay-up Process.

**Hand Lay-up Process.** If the hand lay-up molding of a product is most often carried out in a mould which is itself made of reinforced plastic, the hand lay-up process of *making mould* is on the other hand carried out on a *model* which can be either made of metal, wood, plastic, concrete, or any materials that will not melt when in contact with polyester resin or when heat builds up as the resin gets cured. The process is simply laying-up two to three layers of fiberglass sheet one layer at a time, and impregnating or laminating each layer with liquid polyester resin. Depending on the size of the mould, more than two fiberglass layers may be laminated. For very large moulds like those for car hoods or boat body, stiffeners may be imbedded as the third and succeeding fiberglass layers are laid-up.

Discussed below are the steps involved in hand lay-up process. But first let us prepare our materials, tools, and supplies.

**Materials** are normally available from craft supply stores, specialty stores that carries materials for wood lamination, or from plastic chemical companies. These materials are:

- Polyester Resin – choose the semi flexible type and as much as possible in premix form. Premix means the cobalt promoter, a chemical needed for the resin to cure, is already mixed with the resin. The resin in this form is safer to handle because there is no need to buy a separate cobalt promoter, which is a delicate chemical as it can generate spontaneous combustion if accidentally mixed with catalyst even in very small quantities.
- Methyl Ethyl Ketone Peroxide (MEKP) – the catalyst or hardener used to initiate curing of the resin to transform it into a hard plastic material.
- Fiberglass – this may come in the form of surfacing mat, glass cloth, or woven roving. Surfacing mat is good enough for mouldmaking.

- Mould release wax in paste or liquid form
- Styrene Monomer – a solvent chemical used to thin down polyester resin in case there is a need to do so especially in too tight crevices or if spraying of the first coat of resin is adopted instead of brushing.
- Acetone – for cleaning and removing traces of resin on tools, tables, or hands.

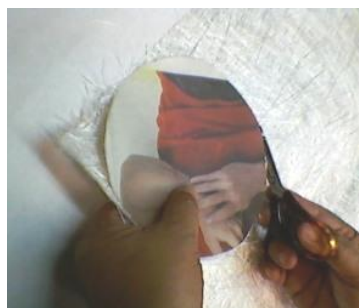
**Tools and Supplies** that can be bought from hardware or do-it-yourself stores consists of the following:

- Paint brush of appropriate size
- Impregnating rollers if the mould is too large
- Scissors to cut fiberglass
- Hacksaw or sharp knife to trim unnecessary flashings or hard parts of mould
- Disposable cans or plastic containers for mixing the resin
- Mixing or stirring rods or disposable popsicle sticks
- Polishing cloth, brush and rags, etc.

For purposes of illustration, take as an example the following:



1. Imagine that the small plastic tub shown above is a model of a bath tub or the top portion of a speed boat body we want to reproduce.



2. Before preparing the model, we first cut appropriate sizes of fiberglass to tailor fit the form of the model. Paper patterns can be very useful in this step.



3. This rectangular pattern goes to the sides of the model, while that in Fig. 2 goes at the bottom. Provide 1 to 3 inches allowance for overlap on fiberglass joints.



4. With the use of rug, apply mould release wax on the model. When the wax dries up, carefully polish the surface with a soft cloth to remove any fine streaks left.



5. Prepare the first coating of resin which will give the mould its good surface finish. Pour just enough so you can finish applying before the resin begins to gel.



6. On the premix polyester resin, add MEKP hardener at 1% to 2% by weight of resin.



7. Mix thoroughly and note the change in color of the resin from pinkish to light amber.



8. Immediately apply the first coat of resin all throughout the waxed area. Do it lightly if brush is used to avoid brushing off the wax.



9. Allow the first coat to gel for about 10 to 20 minutes until it is no longer too sticky to the touch. The actual hand lay-up now begins.



10. Lay-up the first layer of fiberglass either starting at the bottom or at the sides. Press all portions especially the corners by hand, or use a roller.



11. Complete the lay-up one piece of fiberglass at a time, making sure to press firmly on the surface.



12. Provide sufficient overlap for strong fiberglass joints. Note the cuts at the top edge of the sheet to facilitate easy bending for edge wrapping.



13. Impregnate with catalyzed resin with the use of brush. The right side portion here is already impregnated and note the ends wrapped around the edge.



14. Make sure resin penetrates the fiberglass and no air bubble is entrapped. Ends of fiberglass should cover the edge of the model.



15. After 10 to 20 minutes, when the resin has already hardened, cut the excess fiberglass from the edge with a sharp knife or scissor.



16. Repeat steps 10 to 15, this time for the second fiberglass layer.



17. After the last layer has cooled down for about 1 to 2 hours, thump the back side of the model with a rubber mallet to initiate release of mould.



18. With good waxing of model, release is easily done by inserting wedges or thin, pliable, but blunt metal between mould and model.



19. Also, as long as there is no undercut, final release is accomplished with ease by hand.



20. Trim excess or unnecessary protrusion and finish off with electrically driven abrasive disc or sandpaper to smooth up sharp edges.



21. This is the final finish of the fiberglass mould on which replicates of fiberglass tub or your imagined bath tub may be reproduced.

Application of paste release wax on models made of plastic, metal, or glazed ceramics must be applied with two thin layers. The first layer should first be dried before applying the second. A layer of liquid release wax may be added last to further provide good release afterwards. For wood, concrete, or fairly rough surface models, applying filler, latex paint, and acrylic emulsion in that order, may be necessary to cover the pores and smooth out the surface. Then three thin layers of paste wax followed by one layer of liquid release wax is applied. Application of mould release wax must be done very evenly so that practically no streaks of wax is left to dry.

In preparing the first coat of resin, the quantity to prepare is approximately 50 to 70 grams per square feet of the model surface area. Styrene monomer may be added to make the resin more fluid if application of the first coat is by spraying. Usage of styrene may be at 50 to 150 grams per liter of resin. MEKP hardener is added last.

If application is by brush, there is no need to add styrene.

The first coat of resin may not readily adhere on the surface especially the vertical portion of the model. But as the application is continued, and as soon as the resin begins to slowly gelatinize within 10 to 15 minutes after the addition of hardener, it begins to stick well even on vertical surface. It is therefore important to mix only a portion at a time so that the mixture can be made to adhere well, and be consumed before it fully gels.

Impregnating the fiberglass with catalyzed resin is best done by the use of brush. Press the brush firmly to remove air bubbles and ensure complete wetting of the fiberglass.

Make sure to immediately clean the tools and containers every after use so that they can still be reused for subsequent steps. Acetone is the best cleaning solvent, but lacquer thinner may also be used as an alternative.

Be extra careful in separating the mould from the model. Properly waxed model and good model design will provide easy release. Make sure the edges of the mould are not damaged and that the smooth surface remains unscratched.

The surface of the finished fiberglass mould may be polished with polishing compound if desired, to produce a well polished molded product.