

One Piece Fiberglass Mold Construction

Simple Fiberglass Molds
Can Be Used For Making
Duplicate Parts For Many
Applications Including
Hobby & Automotive.
This Manual will
Show you how!

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How To Make And Use A Fiberglass Mold

A fiberglass mold is used to reproduce fiberglass products and is the exact reverse (mirror image) of the item to be produced.

This tutorial will help guide you through the making of your first fiberglass mold. I will use a current project of mine to illustrate the procedures of producing a fiberglass mold. This guide includes many step by step pictures to aid you in your own project. I would suggest that you practice making a mold of a simple object to begin with. Once you have acquired the concepts and skills of mold making you will feel confident in tackling more difficult shapes.

Basic Steps Required For Mold Making

The Following Topics Will Be Discussed And Illustrated In This Manual.

- 1) Making / selecting plug
- 2) Preparing the plug for molding
- 3) Molding over your plug
- 4) Releasing your mold from the plug
- 5) Preparing the mold for use
- 6) Molding your first pieces
- 7) Materials list

This Manual Will Expand On This Basic Series Of Steps Needed To Make A Mold And Pull Parts.

- 1) **Prepare the plug with release wax and PVA**
- 2) **Apply tooling gelcoat**
- 3) **Apply microballoons to angles / details**
- 4) **Apply resin saturated fiberglass mat**
- 5) **Let the mold cure**
- 6) **De-mold**
- 7) **Clean and trim the mold**
- 8) **Apply mold release wax and PVA to the mold surface**
- 9) **Apply gelcoat to the mold**
- 10) **Apply resin saturated mat to the mold**
- 11) **Trim at the “trim stage”**
- 12) **Let part fully cure**
- 13) **Remove part from the mold**

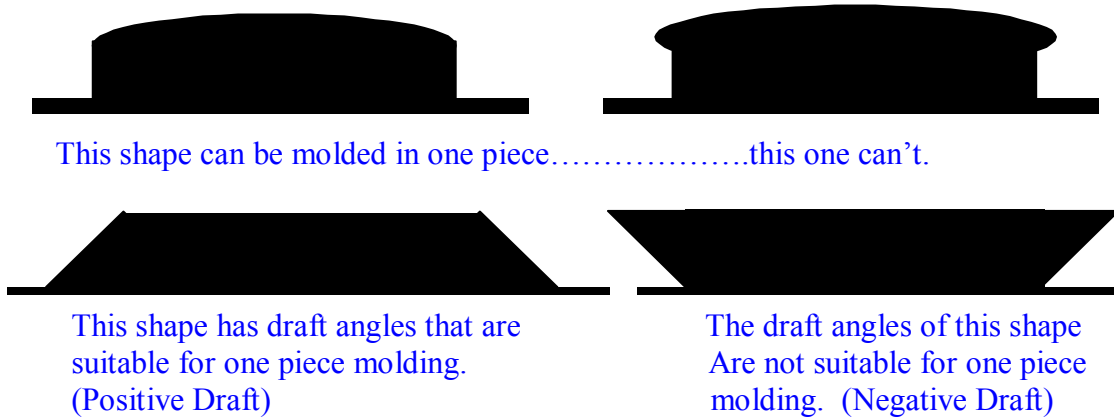
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Basics of Plug Construction

To begin making a fiberglass mold, you must first have or make a plug. A plug is the original item that the fiberglass mold will be taken from. The plug must be exactly what you want to copy since it is representative of the final product that will be produced from your mold. If you are building your own plug for a specific part or item, it will pay huge dividends to spend the extra time to make your plug perfect. **Think of it this way, it is much easier to fix imperfections in your plug than it will be to fix the imperfections of every piece that you create with your mold.** It is important that the plug has the same specifications that are required in the final product.

It is also very important that the plug that you choose does not have opposing undercuts or locks. **Undercuts and locks will make it difficult if not impossible to remove your finished mold from the plug without destroying your work and wasting your time.** Below are cross sectional examples of shapes you can and can not mold in one piece.

Figure 1: Plug Shape and Angle Considerations



Your plug can be made from a variety of different materials. These materials include, but are not limited to wood, plaster, polyester resin, fiberglass, polyurethane foam, etc. The material that your plug is made from must be compatible with the resin system you are utilizing. I have not personally selected any plug materials that were not compatible with the resin that I have used, I do always inquire with the distributor of the resin that I will be using before I begin carving a plug. If the plug is to be made from a porous material such as wood, foam or plaster, the surface must first be sealed with resin or a combination of bondo or glazing putty and paint.

The photographs on the next page are of plugs that I have made for a current project of mine. Hopefully you will recognize them as pieces of a model of Speed Racers' Mach 5.

Figure 2: Main Body Sample



Main Body

Figure3: Under-nose Section Sample



Under-nose Section

Figure 4: Under-tail Section Sample



Under-tail Section

While I won't bore you with the details of how the pieces of these plugs were built, I will briefly discuss how they have gotten to this point. These plugs were built from a combination of mahogany door skin, foam, bondo and glazing putty. FYI, I like to put at least a 1/8 inch coat of bondo or glazing putty over foam in order to create a solid, non-porous surface. These plugs were shaped, sanded and filled until they were just about perfect. I then applied three double coats of high build automotive primer sanding each coats' imperfections down in between coats with 220 grit (follow the paint manufacturers recommendations for the timing on this part).

Once I had removed all of the remaining imperfections, I progressively wet sanded the model with 400 grit - then 600 grit and finished with 1200 grit. You don't want to remove much material when sanding at this point. You want to create a nice smooth surface that has a polished look.

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Once wet sanding is complete, polish the surface by applying a coat of polishing compound by hand or low-speed power buffer. **You want to produce a smooth glossy finish; any scratches or rough areas will at the least show up in your mold and may fight you when it is time to de-mold your plug.** You can polish the plug over and over again to produce the desired finish.

Preparing The Plug For Molding

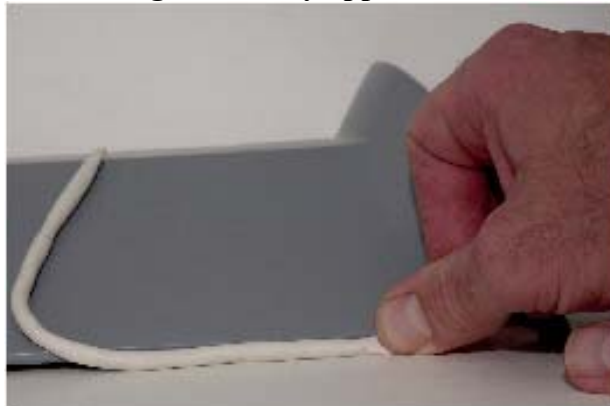
Materials Needed: Clay, Mold Release Wax, PVA

Since my molds require a flat, even underside, I mounted my plugs to pieces of 1 inch thick melamine covered particle board with plenty of room around the perimeter of my plug. The plugs can be seen mounted to the boards in the previous pictures.

Both melamine and mda make a good base for this application as they are non-porous and inexpensive. The plugs were screwed to the board from underneath.

After the plug has been attached, the gaps between the plug and the board have to be filled with modeling clay. I like to press the clay into the gaps with my fingers and then use the eraser of a pencil to push it flush. Excess clay is removed with the corner of an old credit card. (See Photos Below)

Figure 5: Clay application 1



Be sure to force the clay into the gaps. **You don't want your resin to seep underneath!**

Figure 6: Clay application 2



To ensure proper filling, use an eraser head to push the clay deeper into the gaps.

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Figure 7: Clay application 3



I like to use an old credit card to remove excess clay.
You must use something that won't scratch the plug or the base.

The plug is now prepared for the application of Mold Release Wax or another suitable mold release such as Part-All or TR-Hi-Temp wax. These waxes are in a paste form and have a high carnauba content. Five thin coats of wax are recommended but I always do six just because. Using a clean, lint free cloth, apply the first coat by hand using an overlapping, circular motion paying close attention to make sure that wax covers all areas, especially any nooks and crannies. Allow the wax to dry to a haze (30 - 40 min) and polish up by hand using a clean, dry, lint-free cloth. Allow several hours between coats. Repeat this process 5-6 times. For my project, I also applied wax to the melamine surface that I mounted my plug to.

Figure 8: Release Wax



Release Wax: Partall manufactured by Rexco
has always given me excellent results.

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Figure 9: Wax On



Wax On: At least five coats. Notice that I covered some imperfections in the base board with masking tape. It is OK to do this. Just make sure to wax over the tape and apply PVA to it just like the rest of your project.

Figure 10: Wax Off



Wax Off: Buff the plug to a smooth, glossy finish.

After the final coat of wax, allow the plug to sit at room temperature overnight. This will set and harden the carnauba wax. The surface may then be buffed to a shine (by hand or machine). The plug is now ready to be coated with a mold release agent. Poly Vinyl Alcohol (PVA) is the release agent of choice. PVA can now be applied to the surface of the waxed plug using either a spray gun (preferred) or a soft, lint-free cloth.

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Figures 11 & 12: Mold Release & Spray Gun



PVA Mold Release



Typical Spray Gun

If the PVA is applied with a spray gun, apply 4 or 5 mist coats at 50 PSI. If the PVA is applied with a cloth, saturate the cloth and wipe the PVA onto the plug with one pass. The PVA will dry in approximately 30 - 60 minutes (depending on the ambient temperature) and is then ready for the first layer of tooling gelcoat.

Molding Over The Plug

Materials Needed: Air Compressor (optional), Dump Gun (optional), Tooling Gelcoat, Micro Balloons, Fiberglass Mat, Laminating Resin, MEKP Hardener, 16oz Paper Cups, Paint Rollers, Paint Brushes, Latex Gloves, Respirator, Acetone

Figures 13 & 14: Dump Gun & Gelcoat



Dump Gun: For Gelcoat



Tooling Gelcoat

Please remember to catalyze the gelcoat and resin before you apply it to your project. Failure to add MEKP catalyst to your gelcoat / resin may ruin your work.

From this point on, you should always protect yourself from the materials that you will be using. Wear a good quality respirator and gloves whenever using gelcoat or laminating resin. These materials are toxic!

Tooling gelcoat is preferably applied with a “dump gun” at a pressure of approximately 80psi. While gel coat can be applied with a brush or a roller, a spray gun provides full, even coverage. If the gel coat is not put on evenly, cure problems and premature release from the plug may result.

Each gelcoat layer should be applied at a 10 - 15 Mil thickness (think 3-4 very, very thick layers of spray paint). Each gelcoat layer (you should do 2-3) should cure to the point where you can touch the gelcoat without it transferring to your skin or glove before you apply more material to its surface. Depending on how you mixed the gelcoat / MEKP hardener this should take at least 30 minutes. I usually mix 3 or 4 cc of MEKP to one 80% full 16oz cup of gelcoat. Note that the gelcoat gets slightly more MEKP than the resin that we will use later on in this mold building process.

Please be advised that once you have applied the tooling gelcoat that you have reached a point of no return. You must apply at least one layer of fiberglass mat over the gelcoat before you stop for the day. For this reason, you should start your project in the morning. If you gelcoat today and don't lay your first coat of fiberglass until tomorrow, you run the risk of having the gelcoat split from the fiberglass while de-molding. This would be undesirable, disappointing, etc.

Figure 15: Spraying Gelcoat



Spray the gelcoat at a distance of 6 to 12 inches. Make sure to apply the gelcoat evenly. Make sure to spread a drop cloth. Gelcoat is very adhesive and messy. You don't want gelcoat on something that you don't want gelcoat on.

Once you are satisfied that your plug is sufficiently covered with gelcoat, you can prepare for application of the first layers of fiberglass. Before fiberglass mat is laid on the plug, I like to mix a thick (apple sauce consistency) mixture of fiberglass resin and microballoons to brush into the details, angles, depressions and corners of the plug that may give me trouble while trying to lay the fiberglass mat.

Make sure that the mix of resin / microballoons and MEKP hardener that you use cures slow enough to give you adequate time to apply the first layer of mat before this mixture begins to cure.

Please note, I usually use 2.5cc of MEKP per 80% full 16oz cup of resin. On a day that is 75 degrees, this mixture of MEKP to resin will give you about 45 minutes to an hour of work time.

Cooler temperatures may require a bit more MEKP while working with resin in direct sunlight on a hot day will give very fast cure times and require less MEKP. You should experiment with this mixture and apply what you learn to both this and future projects.

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Figures 16 & 17: Micro-ballons & Resin Mix



Microballoons.....add resin and mix to an applesauce consistency. This mixture is brushed into the creases and detail areas of the plug prior to laying the mat. This process creates a better finished product.

You can see in the photo below, I have several cups of resin poured and ready to go. I pour what I think I will need for the job and then I catalyze it as I go.

Figures 18 & 19: MEKP mix & Glass Strands



Don't forget to mix MEKP with resin



Pull the mat apart, the loose strands overlap making your mold stronger.