Filler Skills

Model Building
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Scope

This handout discusses how to apply body fillers and glazing putty. These materials are used after the parts of your model have been assembled, but before the model is painted. With them you can fix mistakes, smooth surfaces and add features like fillets.

Materials

The most common body filler is a polyester resin brand named Bondo. It is available in auto parts stores, hardware stores and even art stores. While Bondo is a good, dependable product, there are other brands of body filler with different characteristics, made from different materials. Some have a particularly low density, others are reinforced with fiberglass. It is unlikely that you will need these more specialized products, but you should know that they exist.

Glazing putty is also available in a variety of brands and formulations. These vary mainly in their drying time and workability. For model building you want the fastest drying time possible. Don't buy the type of putty that requires exposure to UV radiation in order to dry. It is fine for fixing your car outside, but bad for working on a model inside, late at night.

Although Bondo is widely available your best source for products and advice is an automotive paint store.

Body Filler

Body filler is an important component in modelmaking because it has three periods of workability. By taking advantage of the different properties of these stages you can create effects and features with Bondo that would be very difficult to do otherwise. The three periods of workability are the putty stage, the carving stage, and the sanding stage.

Before you can use it in any stage, you must mix up a batch. Body filler consists of two parts: resin and hardener. To use it scoop out as much resin as you think you will need and wipe it onto a smooth, disposable surface such as a scrap of acrylic or plywood. Clean up around the rim of the can and put the lid back on. Next, squeeze out a little bit of hardener next to the resin. You need very little hardener; a bead one inch by one sixteenth of an inch is enough for 2 or 3 tablespoons worth of resin. Mix the two together until the mixture is a uniform pink color. Fold the mixture over several times to make sure that you have no unmixed pockets of resin or hardener.

Putty Stage

Now apply the Bondo to your part. This is the putty stage. Use a putty knife, palette knife, or scrap of wood. At an automotive paint store you can buy plastic spreaders designed for working with body fillers, but they are generally too large for using with models. In the putty stage you must play a balancing game. You want to use as little Bondo as possible to make it easier to clean and finish later, but you don't want to use too little and have to apply another layer of Bondo later. It is better to err on the side of too much. Bondo shrinks a little when it dries so you need to overfill cracks slightly. Make sure that the Bondo is a little higher than the level of the part around the crack and that the Bondo overflows the edge of the crack a bit.

The key to success here is to apply the Bondo quickly and then leave it alone until the next step. Try to avoid overworking it, and do not expect to get it down perfectly. You will be able to make it perfect in the later steps. The more you work with it in the putty stage the

further you will spread it and the more clean up you will have to do.

Carving Stage

Once you have finished with the putty stage you will need to wait for a while. At some point, approximately 10 or 15 minutes after you mix the Bondo, the magic Bondo moment occurs. This is the point where the Bondo changes state enough that you can cut and carve it. In order to discover when this moment has occurred do not test the Bondo on your part; check the excess Bondo on the mixing scrap. In this stage, using a sharp x-acto knife or, if you have Bondo'ed a large area, a rasp, you can cut and shape the mixture. Exactly what shaping you will do depends on what you are making but, for example, if you need a bead of Bondo to stop exactly at a certain point, you should spread it too far in the putty stage and then in the carving stage cut the bead back. This is also a good time to remove as much excess material as possible. Use your knife to peal the waste Bondo off the surfaces of your part.

Just as in the putty stage, don't try to do too much in the carving stage. If you have filled cracks you can remove the obvious excess Bondo, but don't try to cut it down flush with the surface of your part. As soon as you notice that the Bondo is becoming difficult to cut cleanly, that it is beginning to tear rather than cut, stop working. The Bondo has set beyond the carving stage and if you keep working with it, you will ruin the work you have already done.

You need to let the Bondo set up completely before the next stage. At this point you should set your tools down and take a break. The Bondo will probably be hard in another 20 minutes, but I recommend waiting an hour or more before sanding it. If you sand too soon and tear the Bondo you will have to do everything over again, so it is worth waiting a little bit too long to be sure it is dry.

Sanding Stage

The sanding stage is the period of both drudgery and of finesse. If you have applied too much Bondo, or did not do a good job cleaning up in the carving stage, you will have a lot of sanding to do. Once dry, Bondo is quite hard, and so sands slowly. Also watch for the fact that the Bondo will be harder than most of the other materials used in model making. This means that as you sand, you risk removing the rest of your part and leaving the Bondo.

On the other hand, with careful sanding you can make the Bondo application greatly enhance your work. You want to begin with a rough grit and move through successively finer grits to get a smooth surface in the desired configuration. A sanding progression of 100/220/320/400 works well. Wet sand Bondo exclusively, because it will immediately plug up the paper if sanded dry. Just as with foam, use sanding blocks. Taking the time to make a sanding block with the correct contour is always a better idea than trying to fake it with the wrong block.

When sanding the Bondo along a crack you have filled, don't be surprised if you sand most of the Bondo away. Keep feeling with your fingers until the transition between the part and the Bondo is undetectable. This process is called feathering, because the edge of the Bondo begins to look like (an be as thin as) the edge of a feather. Be sure to use an oversize, flat block when sanding out a filled crack. If you use a small block, or just hold the paper in your hand, you will tend to get a depression along the crack. The Bondo will be flush with the edge of the crack, but the whole area of the crack will be lower than the surrounding part. With a larger block, keeping it parallel to the surface of the part, you remove Bondo until you begin to touch down on the rest of the part. At that point you know you shouldn't take the Bondo down very much further.

No matter how carefully you apply Bondo, once you have finished sanding it you will find im-

mistake is where you didn't apply quite enough Bondo because you can't sand down any further without changing the look of the part, but the surface is not quite smooth. As long as these imperfections are small and shallow, you can fix them with glazing putty.

Glazing or spot putty is the companion to Bondo. You will nearly always need both in order to create a completely smooth surface. Bondo is used for creating the structure and building up the surface and spot putty for filling the minor imperfections. There are major differences between Bondo and glazing putty. The first is that glazing putty is not a two part material: you apply it and let it dry. The second is that glazing putty has no strength. You cannot use it to fill cracks or create fillets or any of the things that Bondo can do. Also, glazing putty must be applied in very thin layers. Thick layers sink and crack as they dry.

To use glazing putty, first clean and dry the Bondo surface. Then wipe the glazing putty over the imperfection in a thin layer. Use a palette knife, a lint-free rag, or your finger. Because it sands quite easily, use the putty to cover a larger area than you think necessary. After you apply it, let it dry completely, about 30 minutes. Again, it is better to wait a little too long because if you sand it before it is dry the putty will tear and roll up.

Once the putty is dry, sand it with the last grit you used on the Bondo, usually 400. Sand lightly until the Bondo begins to reappear and you will see that the glazing putty remains in the imperfections. If the scratches or pits are not completely filled repeat the process, continuing to use a thin layer of putty. If the imperfections are at all deep you may need to repeat the process three or four times. Be patient and don't rush. If you sand too soon or use too much putty you will get a bad result. You will need to sand it all off and start again.

Additional Techniques

Creating Fillets

One of the most common use for Bondo in model building beyond filling cracks is creating fillets. A fillet is the small radius that found at the juncture of most surfaces in plastic parts. The practical reason for fillets is that even small ones greatly strengthen plastic parts. Although subtle, fillets also have an aesthetic effect and are so ubiquitous that if you leave them off your model, people will say that your model looks odd and boxy but they won't be able to say exactly why. So realism dictates that you be able to add fillets where appropriate.

The technique to use depends on whether your fillet is on a straight joint or a curve. For a straight fillet you need to find a rod or tube that has the radius that you want for your fillet. The rod should also be quite a bit longer than the joint. A smooth plastic rod works best. Using your putty knife, overfill the joint where the fillet will be with Bondo. Next, press the rod into the joint to create the fillet. Remove the rod, not by pulling it straight out, but by dragging it along the axis of the joint until it is clear. Immediately wipe the Bondo off the rod. Then, carefully using your putty knife, remove the Bondo that smooshed out from under the rod. Don't get over zealous here, if you can't remove the material without touching the fillet wait until the carving stage to peal away the excess.

To put the finishing touches on the fillet you will need to wait until the sanding phase. Wrap the sandpaper around a rod in order to keep the fillet round. Because the sandpaper increases the diameter of the rod you will probably need to find something with a smaller diameter than the rod you used to make the fillet. Generally you can find a drill bit with the right diameter.

Making a fillet along a curved surface requires that you have a flat tool with the radius you want. You could use a radius gauge or the end of a palette knife. If you don’t have the correct size you can make a template out of thin acrylic or styrene that has the radius you want. Use this tool to apply the Bondo and create the fillet at the same time. If the edges of your template meet the edges on both sides of the fillet you will also be able to do most of the cleanup at the same time as well.

when you drop the model you have spent hours working on and flatten one of the corners, you can fix it with Bondo. Begin by cleaning up the damage. Cut or sand away the broken parts so that you are left with clean, smooth surfaces. Next make a few scratches in the surface that will be covered by the Bondo. These scratches give the Bondo something to grab and increase the durability of the repair.

In the putty phase you just want to be sure you have applied enough Bondo. Put a good sized blob on the corner, one that is definitely larger than the finished repair will be. Be sure that you have enough Bondo to give you plenty of room to feather the repair into the adjacent surfaces of the part. Leave the Bondo alone until the carving phase.

In the carving phase you want to remove most of the excess. Using the adjacent surfaces as guides, cut away the Bondo until it is very close to the final size. Again, leave it a little large so you can sneak up to perfect in the sanding phase.

When sanding, be sure to use a flat block that is large enough to contact the Bondo and the adjacent surface. Gauging off each surface in turn, sand the Bondo to its final size and then lightly feather in the edges. Fix the imperfections and finish up the feathering with glazing putty.