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Vacu-Form Molding Tips

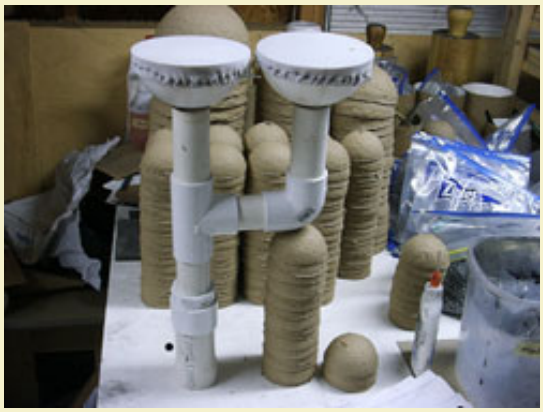

Figure 1: Multi-mold for producing two 4" hemis at once.

Figure 2: Fixture for triming off hemi flange using a band saw.

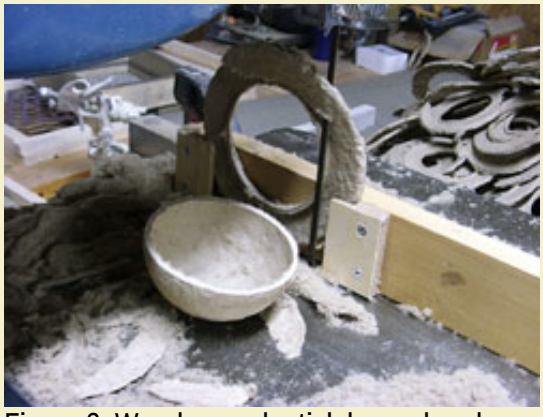

Figure 3: Wooden push stick keeps hands

Introduction:
When Octavio Aguiar first demonstrated the method of making vacu-form shell casings back in April of 2001, I thought the pyro community would be quick to adopt it. Three years later it appears that there really aren't that many people making shell casings in this way, probably due to the fact that most hobbyists tend to build plastic shells instead. For those that are interested in paper shells, there are a few barriers to entry that may keep people from trying the vacu-form method-- mainly the task of building the mold and perhaps also the perception that this is a lot of work to go through to make hemis.

This article presents a collection of improvements to the original process that make it faster, along with some ideas to help in making your own molds.

Multi-Molds:
The most obvious way to decrease the time spent pumping out molds is to pump more than one at a time. Adding a second mold to a single-mold using PVC pipe as shown in Figure 1 will literally cut your time in half. For molds over 3" in size, it becomes impractical to build multi-mold plates as shown in this months Tool Tip. Using pipe fittings to join separate molds is actually easier in this case, and they work just as well. The dual 4" mold shown in Figure 1 was used to produce the 100 sets of kraft hemis behind it in about 3 hours.

Trimming Molds:
One of the more time consuming processes is trimming the excess flange around the rim of the mold. The blisters and sore hands that would result in trimming the 200 hemis shown in Figure 1 would be prohibitive. However, the simple jig shown in Figure 2 allowed all 200 hemis to be trimmed in about an hour using a band saw. The hemi is slipped on edge into a wooden push stick that is slid into the blade with a fence guide behind it. The hemi is clean cut and requires no further sanding, as seen in Figure 3. The cutoff flanges are saved and recycled back into mulch for making still more hemis. The ten

away from blade while trimming.

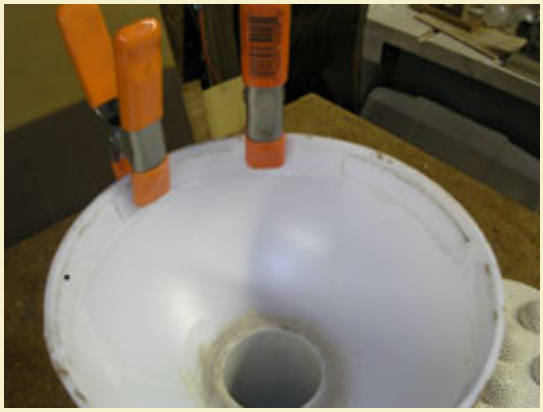

Figure 4: Converting an 8" male hemi into a female hemi.

Figure 5: 3" mold made from store-bought Christmas tree ornament.

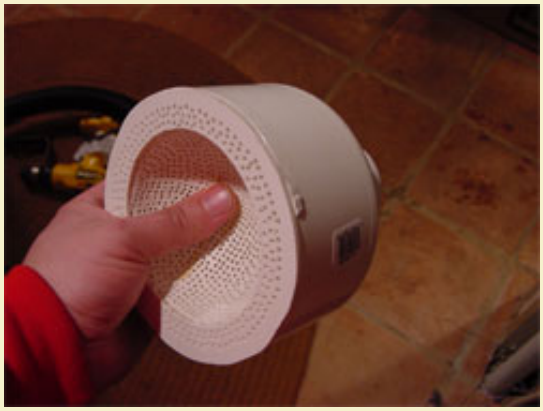

Figure 6: PVC endcap used to house a 4" mold.

sets of 8" hemis shown in Figure 1 were made from the flange cutoffs resulting from the 200 4" hemis!

Converting 8" Hemis:
The plastic shell casings make excellent housings for your molds, but only the "female" side that contains the inner ledge to support the mold plates are desirable. Rather than dispose of the other "male" hemi, simply give it a "sex change" by gluing a ledge inside of it using cut up pieces from another plastic shell. Glue made from 50/50 acetone/xylene is painted onto the inside lip of the shell and the pieces to be clamped, then held in place using spring clamps as seen in Figure 4.

Pre-made Molds:
Rather than make your own mold using fiberglass or melted plastic, another option is to find plastic hemis that are already the correct size and drill them full of holes. Figure 5 shows a 3" mold made from plastic Christmas tree ornaments that are sold in hobby-craft supply stores such as Michaels. These are actually clear plastic hemis that come apart at the center just like a plastic ball shell. In a pinch you could probably use one of these store bought "shells" to build a plastic ball shell, with the unique feature of being able to see the contents of the shell after it has already been loaded and closed!

Mold Casings:
While plastic shell casings make great mold housings, there are a variety of things that can work well. Flower pots, bowls or anything with an inner ledge that can be used to support your mold plate against the strong suction forces that will be pulling on it. Figure 6 shows a PVC end cap being used as a mold casing for a 4" mold. The back side of the PVC cap was drilled out and fitted with a PVC coupler that connects to the shop vac hose. Since the mold in this example was also made from PVC, the entire assembly could be strongly held together using only PVC cement.

Removing the Blender Process:
One of the biggest bottlenecks of making vacu-form hemis is the mulching of the paper. Cutting and blending the paper accounts for 50% of the process time, and even when alternating between two blenders it is still hard on the motors and blades.

A common product found in many hardware stores is a type of insulation called "blown-in" insulation. This is nothing more than shredded newspaper that has been vacuum packed into large bales, as seen in Figure 7. A 22lb bale of this pre-shredded paper costs about $7, and a single pound of the material will yield about a 15 gallon batch of mulch. Simply

Figure 7: Blown-in insulation eliminates the blender process for making the paper mulch.

Figure 8: 6" hemis made from the shreaded newspaper insulation.

add one pound of dry insulation to a 15 gallon bucket, fill it up with water and then add 4 cups of wheat paste.

This type of mulch tends to draw out thicker on your mold and requires more work to flatten out, also resulting in slightly thicker hemis. It will work fine for shells 3" and above, but is not recommended for very small shells due to the space consumed by the thicker walls. Insulation mulch does eject easier from the mold however, and for some reason the outer surface does not get rough and wrinkled the way kraft hemis do. The nature of the fibers allows the shells to dry just as smooth as when they were wet, and the shrinkage is just the same as for kraft.

Another option is to mix the insulation mulch with kraft mulch in a 50-50 ratio, which produces a shell casing more like the 100% kraft variety while still saving you some time with the blender. These 50/50 hemis also have the advantage of finishing smoother than the 100% kraft versions.

A 100% insulation hemi is not quite as strong as a 100% kraft hemi, but they are plenty sturdy and will work just fine for building shells. Figure 8 shows a batch of eight 6" hemis, cranked out in about 15 minutes and dried in one day. One 22 lb bag of insulation will produce 265 of these hemis, enough to make 132 shells! If you reprocess the flange cutoffs, you will be able to get up to 342 hemis from one bag (171 shells). If you were producing 8" hemis, one bag of insulation would give you 214 of them. Compare the $7 for one bag of insulation to the $396 you would spend on 132 6" paper hemi sets ($3/set), or $834 on 107 8" hemi sets ($7.80/set)!

How Large Can We Go?

I have made vacu-form hemis up to 8" in size. While it may be possible to go beyond this, I know of nobody who has even tried it. With commercial paper 12" shell casings costing around $20 a set, and since plastic shells in this range do not exist, the desire for a cheap and easy way to make large shell casings definitely exists. Building the molds for such large casings would be a considerable task however, and there might be problems with the damp hemis caving in after being ejected when produced in such a large size. One solution could be to let the hemi dry on the mold former before removing it.

Large shell casings are the next direction for vacu-form development, and I hope the engineering types out there might find interest in pursuing this challenge.