

SHAPING STYROFOAM

- Written by David Neat author of 'Model-Making: Material and Methods'
- This is an abridged version of this guide, a full version available here: davidneat.wordpress.com
- Wide range of styrofoam are available: yellow, grey and white 1mm - 165mm thick
- Dark grey has replaced the blue in this guide

Styrofoam is one of the easiest materials to shape by normal means e.g. slicing with sharp knives or a hot-wire cutter, sawing with serrated blades, rasping with files, and smoothing with sandpaper.

The real challenge lies in controlling the shape and especially, in this case, how one achieves concave forms.

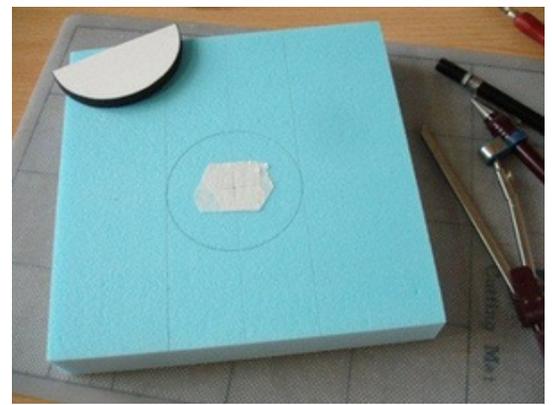
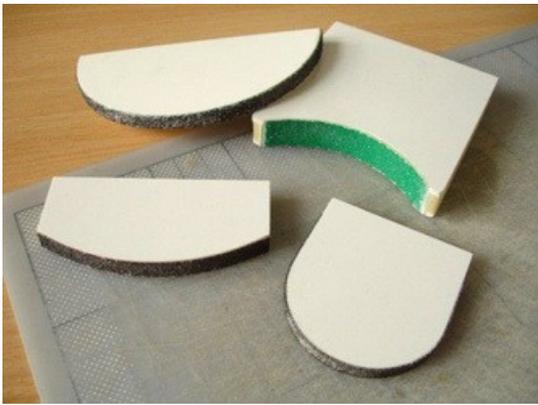
Here are the methods I've employed for a particular model piece which needed a 'bowl-like' form and very regular curves.



I've used the standard blue styrofoam for this, in it's most available thickness (2.5cm). There are other styrofoams, such as orange/pink or white, which are even finer and slightly denser.

I found that blue styrofoam will respond to sanding with even quite a thin strip of sandpaper if this is supported.

I made a 'sanding former' by gluing the strip onto the edge of a prepared shape, in this case a half-circle corresponding to the diameter of the 'bowl' I wanted. I have used a 40 grit sandpaper for this.



First the outline of the 'bowl' needed to be marked on the surface.

Styrofoam is too soft to hold the compass point securely so the centre area needs to be strengthened with some tape. This is then removed.

I then sanded by revolving the former on the central point. If pressed too hard while turning the former will just tear up the foam surface, but this may not matter at first.

After a while sanding will get smoother as one gets used to how the material reacts to the tool.

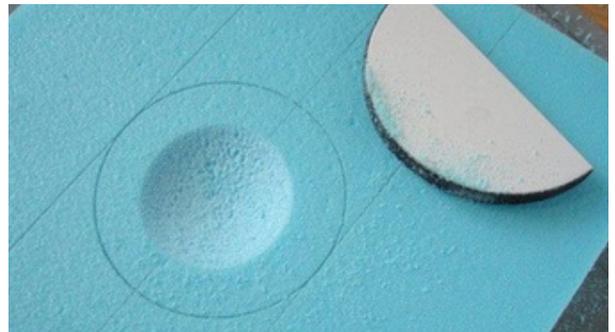
It didn't take long to reach the marked circle.

I then extended the lines from the circle and marked the shape and depth of the concave on the edge ... because here I wanted a 'niche' shape rather than just a circular bowl.

I started hollowing out 'by eye' using another 'customised' sanding tool ... 60 grit sandpaper fixed to a piece of wooden dowel.

As I got nearer to the marked depth I returned to using the previous former to finish off (because it has the right curve) but this time dragging it straight.

The finished 'niche' form can be seen in the photo on the right.



Composite forms in styrofoam (or any rigid material for that matter) are best achieved by deconstructing the intended form into parts or layers to be worked on separately.

For the 'half-ring' which encircles the central bowl I first cut a template shape (using plastic or cardboard) outlining the form. I secured this onto styrofoam (using double-sided tape) and cut roughly round it, being careful not to undercut at this stage.

I use either sharp, thin kitchen knives (i.e. fruit knives) or thin, self-supporting saw blades ('padsaws') to cut styrofoam, but a hot wire will also work well with a bit of practise.

To get a smooth, right-angled edge on the form I've fashioned yet another 'custom' tool .. this time sandpaper fixed to a short length of PVC pipe which has been sliced at a right-angle.

The sander can be dragged round the form, keeping it flat on the work surface, and will gradually create a smooth perpendicular edge. The template shape is left on to act as a 'stop' in the sanding. As long as the plastic (or cardboard) is a little more resilient than the foam the difference will be felt once the edge is reached.



The second part of creating this half-ring shape involves fixing similar 'stops' to the top and base of the blocked shape as shown.

Between these edges I used another curved sanding former (smaller circle this time) to create the inside profile.



The other small additions are shaped using much the same methods, starting with a base template to create blocks.

I then fixed profile templates either end, and used a flat sanding block to sand down to the templates. The forms need to be sanded lengthways with a longer sanding block that will be guided by the profile templates.



The rough rock texture around the outside of the bowl was created by slashing with the back of the scalpel and also breaking down using a wire brush.

The most reliable way of gluing separate styrofoam parts together is to use a special 'foam friendly' glue such as UHU Por.

Strong double-sided tape can also fix flat surfaces together very well but is not guaranteed to be permanent.

MORE ON GLUING STYROFOAM

I've bonded pieces of styrofoam together with a strong, double-sided carpet tape for years and they're actually much more permanent than I'd first imagined. A few observations are necessary though! ... the two surfaces have to be smooth and flat against each other; if these surfaces have been sanded to make them fit, all dust should be removed, ideally vacuumed using a brush attachment. For the same reason the best bond occurs between the slightly 'skinned' surfaces of the sheet as it comes. When using the tape it's particularly important to avoid placing it too near to where the styrofoam will be carved or sanded if one wants a seamless join ... but this applies almost equally when using most glues.

If it's impossible to predict, or avoid, gluing in an area which will later be carved through or sanded, I've found some of the following options most suitable because they offer the least resistance.

Spraymount

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Works surprisingly well as a bond between flat styrofoam sheets is spraymount, by which I mean the permanent spray-glue types from 3M.

It should be sprayed on both sides to be joined (different to how it's normally used), and it's best to wait a little i.e. half a minute, before the two pieces are firmly pressed together.

Hot-melt glue



If you want to glue pieces of styrofoam together which do not lie completely flat against each other ... you will need something 'gap-filling'. There's hardly anything more gap-filling and instant than hot-melt glue! Contrary to what you might have read elsewhere, hot-melt glue will work reasonably well with styrofoam ... as long as it's not too hot!

Gorilla glue



Both styrofoam surfaces need a light misting of water first, best with a small pump spray. The glue needs to be applied thinly to just one of the surfaces before the two pieces are pressed together.

The glue expands 3-4 times in volume, so the pieces should be clamped so the excess is forced outwards rather than upwards.



A couple of hours are needed for the glue to cure.

If it is properly cured the glue sands through well . although it is different to the styrofoam it is much more alike than other glues. Also the bond is as strong as they say it is! I think polyurethane grabs on the styrofoam particularly well ... at least, I couldn't pull the blocks apart.

Epoxy resin



I hadn't even considered epoxy resin glue with styrofoam because I'd just assumed it would dissolve the surface as polyester resin does .. one really shouldn't assume anything!

I tried it and it works perfectly on either styrofoam or polyurethane foam .. no damage to the surface, and a very strong bond.

Epoxy glue is very tough though, so it is no good in any area that needs to be cut or sanded.

PREPARING STYROFOAM FOR MOULDMAKING

If a styrofoam shape is being made as a prototype form intended for casting it doesn't need to be made particularly durable ... it only needs to withstand silicone rubber being either brushed or poured over the surface.

It does however need to be sealed, because if not the silicone rubber will grab into the surface too much and become very difficult to separate.

Vaseline (petroleum jelly) is an ideal temporary sealant in this case because it can be easily

brushed or rubbed into the micropores without damaging the surface. If care is taken not to use too much of it the Vaseline will also even out the surface, although I've noticed that most of it is absorbed into the silicone anyway. The only problem is .. it's very difficult to see where you're applying it! The solution is to colour it.

The best way to colour Vaseline is to first mix a little powder pigment, in this case half a teaspoonful, with roughly the same amount of Vaseline to make a thick paste not unlike tube oil paint.

I chose the ultramarine here because it's a strong pigment and finely ground, combining smoothly with the Vaseline .. some powder pigments may be grainy or clump a bit, which is not so good!

The half teaspoonful was sufficient to give a strong colour to c. 50g of Vaseline when I added this to it, but one could use far less pigment.

For example, the pigment will stain a porous prototype, so you have to bear this in mind if you want to keep it or if it's an object of value. There were a couple of larger scratches in the surface which I needed to fill and I've found that soft modelling wax (this one is the Terracotta Modelling Wax) is the easiest to use, worked carefully in with a brush.

