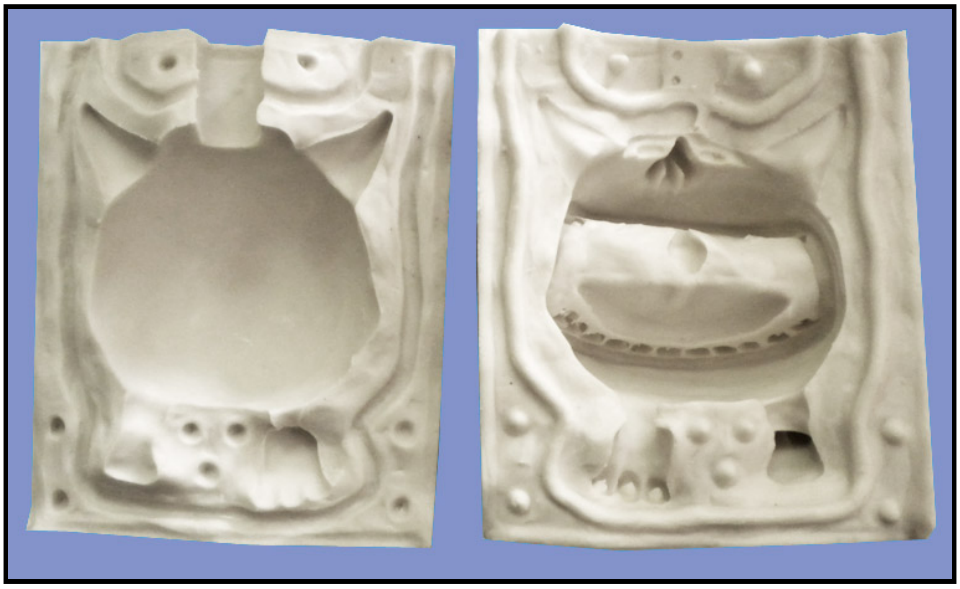


Manufacturing a Flexible Silicone Elastomer Mold

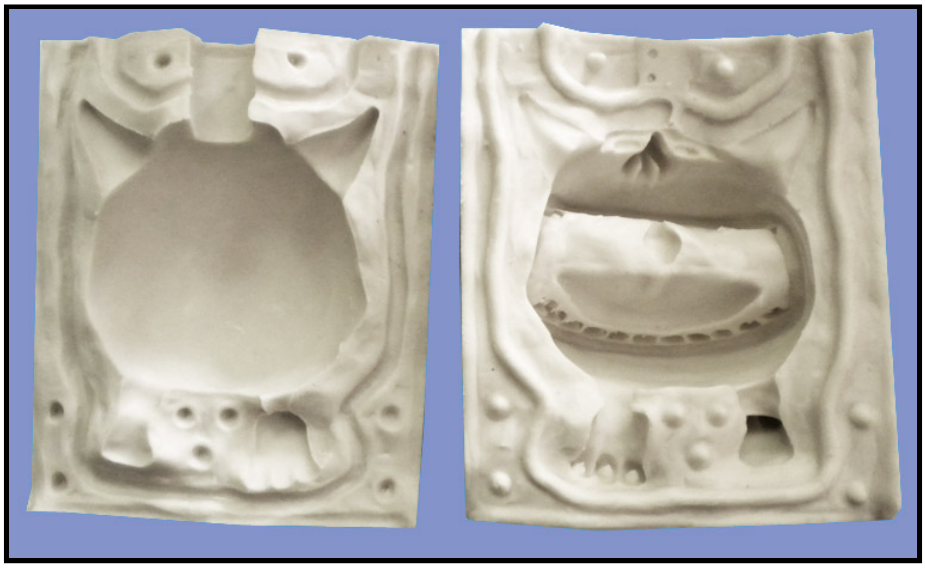
09/03/2013 — Basic techniques

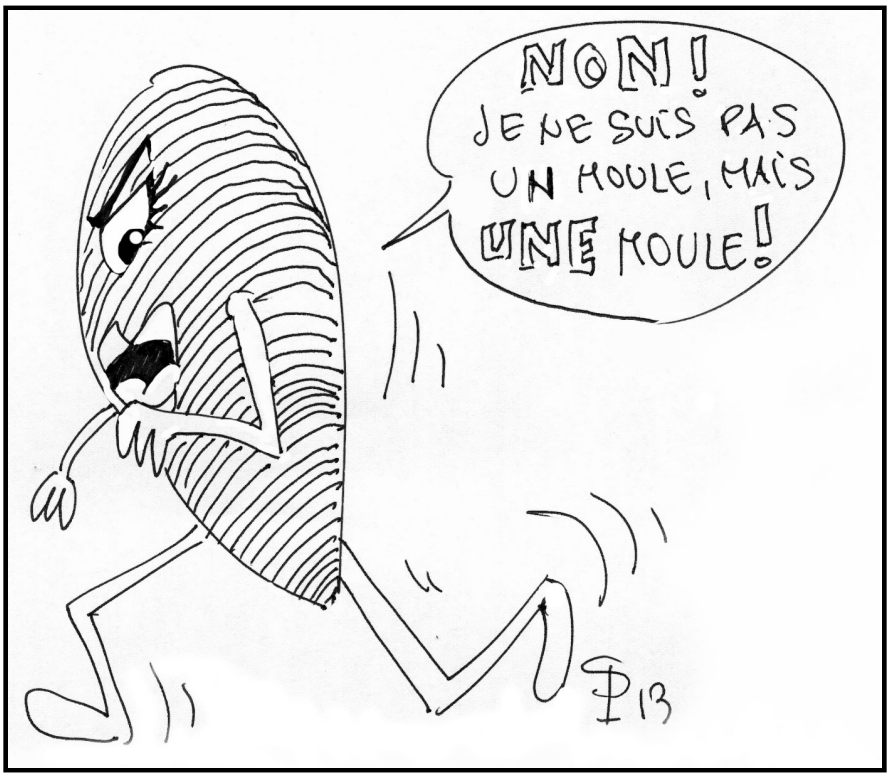


Contents

1. Casting
2. Demolding

Préambule : Le but de ce tutoriel n'est pas de vous faire un cours complet et exhaustif sur les tenants et aboutissants du moulage d'art. Sachez bien que c'est un métier à part entière et parmi les plus nobles qu'il existe encore. La base des techniques est très c...





Preamble:

The purpose of this tutorial is not to provide you with a complete and comprehensive course on the ins and outs of artistic casting. Please be aware that this is a craft in its own right—and one of the most noble that still exists. The fundamentals of the techniques are explained very clearly in Pascal Rosier’s excellent book, *Le moulage*...

Our goal will be to highlight all the main pitfalls encountered by beginners in amateur art casting...

Personally, I’d advise you to start small with simple latex molds and plaster casts, then gradually move on to elastomers and resins. Many specialty shops these days will give you sound advice. We’re no longer in the situation we were in twenty years ago, when you’d be offered paid workshops featuring demonstrations of high-performance products—only to be sold unsuitable and extremely expensive products afterward—all with the aim of discouraging you and ensuring that “the secrets of the gods remain on Mount Olympus”… Certain so-called “pros” will recognize themselves; the Internet revolution and the culture of sharing have finally swept all that away…

You need to think things through carefully before you begin:

-1- How many prints will I make?

-2- What material will I use for casting?

-3- What is my budget?

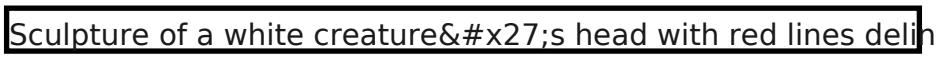


For our demonstration, we'll use the Giant Squig master model created in a previous tutorial. This subject is perfectly suited for an introduction to casting. It has a large surface area—which has the drawback of requiring a large amount of molding material (resin)—as well as details that are both very fine (ears) and simple, and also undercuts (gums). Therefore, we cannot make the mold out of a rigid material (plaster, resin, etc.). Furthermore, since we want to make multiple resin casts (polyurethane or polyester, depending on your preferences and the materials you have on hand), a durable yet flexible material is essential; we'll therefore be working with silicone elastomer...

Note: It is possible to make a latex mold with reinforcements and a cap, but that would require a significant amount of time and expertise, which is not the purpose of this tutorial. Polyurethane elastomer is also an option, but its cost puts it beyond the scope of this tutorial as well...

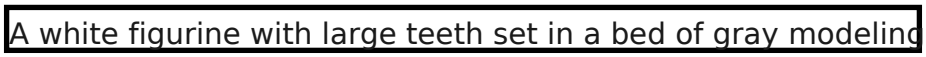
Sculpture of a creature's head with its mouth open; a red line marking the fut

To create your mold, you'll need to start by "thinking through" your design. In other words, where will you place the parting line separating the two halves of the mold? It makes practical sense to choose a parting line that follows a path with as few details as possible. This is important both to ensure the mold is airtight and to make it easier to remove this future parting line from the castings later on. If you place your parting line along intricate details, you'll face hours of tedious deburring...

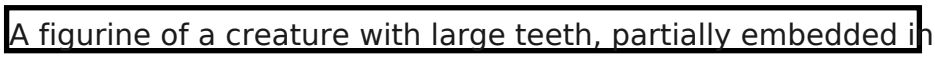


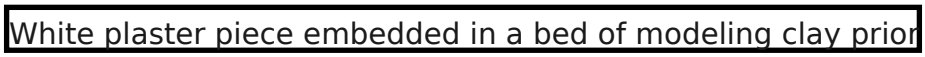
Finally, be very careful not to position your parting line in a way that would "trap" (green cross on the mold) part of the model inside the mold...

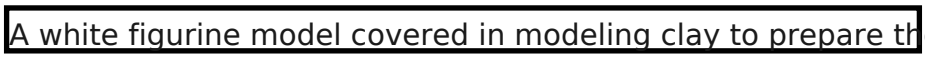




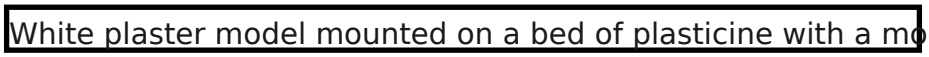
Using soft modeling clay, shape your model...

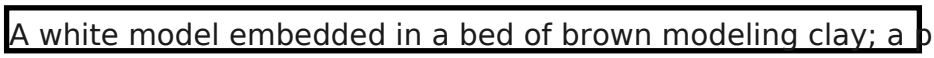






...and build up layers of modeling clay until you get close to the desired parting line...





IMPORTANT STEP: The joint layout...



Using an appropriate tool, create your joint line. It must be exactly at a 90° angle to your workpiece...

Cross-sectional diagram showing the blue model partially embedded in the gray mol

Diagram showing a poor connection between the formwork and the structural memb

Explanatory diagram labeled "OK" showing a part with a rounded profile

This diagram shows you what not to do. Above all, do not round off the edges (a common beginner’s mistake), because while this is certainly easier, one side of the mold would have a very thin parting line—which is not very strong and would therefore quickly corrode and be destroyed by the chemical “aggressiveness” of the casting materials..

A white figurine of a smiling creature encased in a mold made of modeling clay

A figurine of a white monster with a large mouth embedded in a slab of modeling cla

A white plaster cast of a creature with large teeth, made from a silicone mold

Smooth out and neatly finish the rest of your plasticine cake...

Hand placing metal markers on a model surrounded by modeling clay

A white plaster cast of a grimacing creature set in its flexible silicone mold

IMPORTANT STEP: Centering the two sides of the mold. This is a crucial step. Using a rounded tool (in this case, a simple paper clip), first make a centering groove all the way around your model (if possible)...

A plaster cast of a smiling creature made from a flexible silicone mold

Plaster cast of a grimacing figurine removed from a flexible silicone mold

...this will ensure a precise parting line. Next, you'll create centering marks (here, the tip of a paintbrush); their purpose is to guide the closing of the mold...

White figurine of a smiling monster removed from its silicone mold

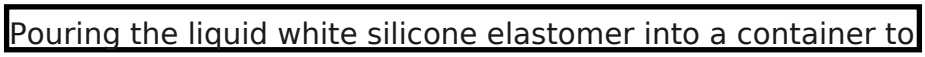
A white creature figurine placed in a beige silicone mold inside a cardboard box

Build a frame around your mold using a non-porous material (smooth cardboard, MDF covered with aluminum foil, Novolam, etc.). Calculate the volume of elastomer needed to cast the first side of your mold; if you use too little, your model won’t be sufficiently covered, and if you use too much, you’ll waste material on unnecessary thickness. Generally, a minimum thickness of 5 mm at the thinnest points is recommended, up to 8 mm or 10 mm. *Keep in mind that if you plan to make many casts, you’ll need an appropriate thickness. Similarly, if your subject is large, the chemical reaction will be more intense: the more material there is, the more vigorous the reaction, the higher the temperature rise, and the greater the corrosion of the mold—so you’ll need an adequate thickness of elastomer.*

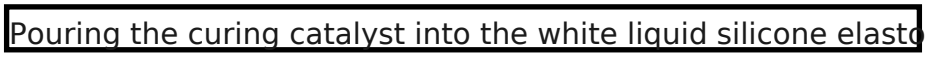
HOW TO CHOOSE THE RIGHT ELASTOMER? As explained above, you'll be using a silicone elastomer for art casting. It will be tear-resistant, provide high-fidelity detail reproduction, and be compatible with composite casting materials. Once you've determined this, you'll still be offered several varieties, particularly in terms of "Shore" hardness. In simple terms, the higher the "Shore" hardness, the stiffer your elastomer will be (though no less tear-resistant), and therefore your mold will stand on its own without needing a form or frame to support it!

Casting

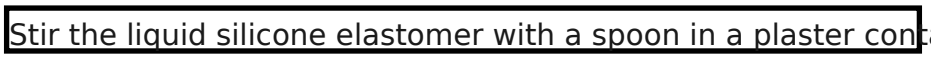

Supplies for silicone molding: scale, jar of RTV 70, acetone, paintbrush, and spoon


Pouring the liquid white silicone elastomer into a container to prepare the mixture

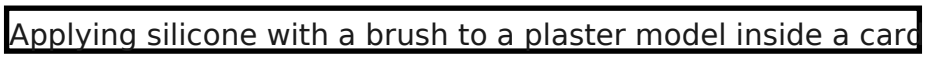
Casting the first side. You will have taken care beforehand to store your various materials and tools at workshop room temperature (between 15 and 20°C) and away from excessive humidity. Prepare all your equipment...

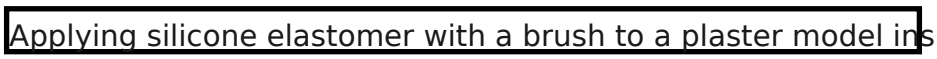

Pouring the curing catalyst into the white liquid silicone elastomer in a container


Mix the white silicone elastomer with a spoon in a small container


Stir the liquid silicone elastomer with a spoon in a plaster container

Be sure to read the instructions for use for your product carefully, especially the “Pot Life.” This refers to how long the mixture remains usable after the catalyst has been added, before it gels. Prepare the required amount of elastomer and add the catalyst. Note the time. Mix thoroughly; the catalyst will form gray streaks in the elastomer. Mix until the mixture is completely homogeneous. Be sure to scrape and mix the edges and bottom of the container thoroughly as well. Keep a close eye on the clock...


Applying silicone with a brush to a plaster model inside a cardboard mold


Applying silicone elastomer with a brush to a plaster model inside a mold

Carefully apply paint to the details of your model using a soft brush. Always keep an eye on the clock...



Imprints of the parts in the white silicone mold cast in a cardboard box

Cardboard mold containing a master part ready for pouring silicone elastomer

Pour the rest of the mixture in a thin stream from the lowest point of the mold. This will allow the elastomer to rise gradually and cover all the details one by one. Allow it to cure according to the technical data sheet (usually between 24 and 36 hours)...

A plaster model encased in modeling clay within a casting mold

Hands removing the modeling clay from the mold to take the piece out before applyi

Hand removing modeling clay from the mold around the piece, with a spatula nearby

Once the first side has cured, you can flip your work over and begin removing the modeling clay. CAUTION: Do this carefully, always holding your model firmly against the first side. If you do not do this and allow your model to come loose from the first side of the mold, there is a risk that when the second side is poured, elastomer will seep between the model and the first side...

White silicone half-mold in a cardboard box with the imprint of a figurine

White silicone mold in a mold box with the imprint of a figurine and positioning pins

A plaster model coated with petroleum jelly in a cardboard mold next to a pot

Thoroughly clean off any remaining modeling clay. Assemble a frame. Insert the sprues. Make sure your frame is tight and leak-proof...



Using a brush, apply a thin, even layer of petroleum jelly to the first side of the mold, taking care not to let it spill over onto the model (otherwise, detail will be lost)...

Imprint of a figurine in a white silicone mold inside a formwork

White silicone mold in a cardboard mold box with a foam block and aluminum tape

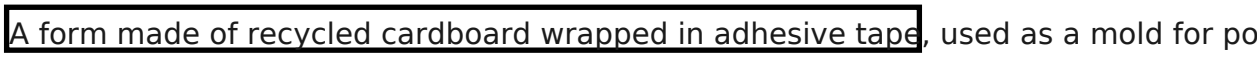
White silicone impression cast in a casting mold for flexible molds

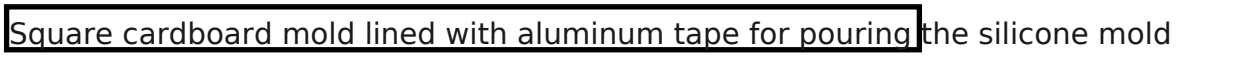
HANDY TIP: To avoid wasting too much elastomer, you can place appropriately sized spacers (in this case, simple pieces of extruded polystyrene) in the right spots. They will prevent the elastomer from flowing into those areas.

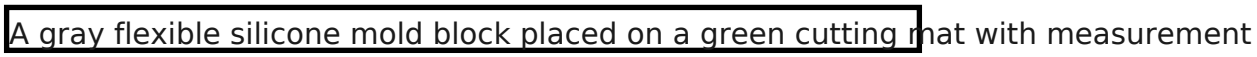
Pour the second side of your mold in the same way as the first side.

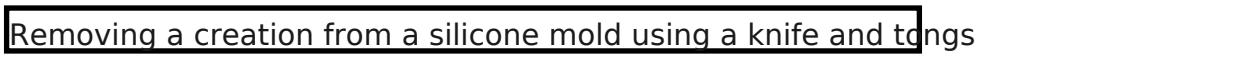
Let it cure for about two or three weeks (generally) at room temperature so that the mold can complete its shrinkage.

Demolding

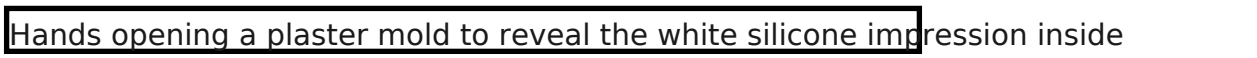

A form made of recycled cardboard wrapped in adhesive tape, used as a mold for po

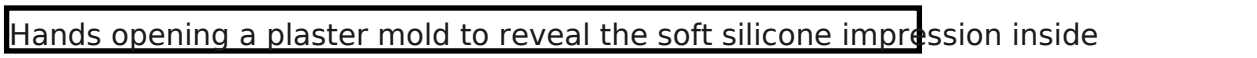

Square cardboard mold lined with aluminum tape for pouring the silicone mold


A gray flexible silicone mold block placed on a green cutting mat with measurement

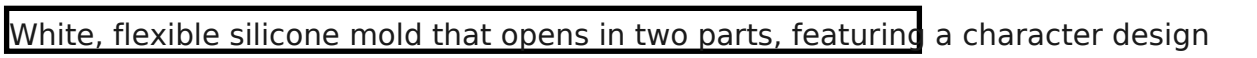

Removing a creation from a silicone mold using a knife and tongs

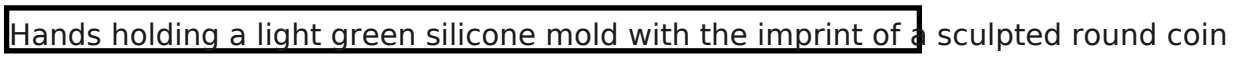
Remove the formwork, then trim all the corners of your mold cleanly. They all form a sort of pointed angle that would interfere with the mold’s clamping later on, especially if you add formwork based on your reasoning (the elastomer’s Shore hardness and overall shape)...


Hands opening a plaster mold to reveal the white silicone impression inside


Hands opening a plaster mold to reveal the soft silicone impression inside

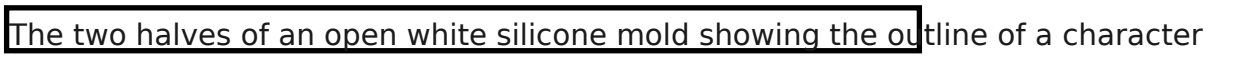
Separate the two halves and remove your model from the mold...


White, flexible silicone mold that opens in two parts, featuring a character design


Hands holding a light green silicone mold with the imprint of a sculpted round coin

...Move slowly, using twists and stretches...


White creature figurine next to its soft silicone mold


The two halves of an open white silicone mold showing the outline of a character


A white, flexible silicone mold, open to reveal wooden pieces held between the finge


Silicone mold and thin-walled molded parts attached to their sprue cluster

...use rounded wooden tools to help if necessary.

MOLDING

You're almost at the end of the process—here comes the long-awaited moment of the first casting!

Depending on the shape of your part, its complexity, and other factors, you will have opted for ingot casting, casting with degassing, investment casting, etc. Please refer to the book by Pascal Rosier.

-For this project, the "Giant Squig," I decided to use the lost-wax casting method.

-In other words, pour only a small amount of the mixture (about one-fifth in this case) into the mold and slowly rotate the mold in all directions. The resin will gradually coat all surfaces and fill in all the details.

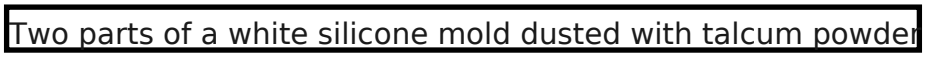
-Before the resin hardens, place the mold upside down over a bowl; the excess resin will drain out.

- Once the resin has fully cured, repeat the process once or twice.

-Finally, pour in the necessary amount of resin to completely fill your mold, up to and including the sprue...



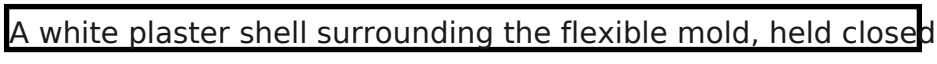
Two halves of an open white flexible silicone mold showing the impression of a figuri



Two parts of a white silicone mold dusted with talcum powder using a brush

Preparing and protecting the mold. Talcum powder works well as a release agent and to protect your mold.

NOTE: You can significantly extend the life of your molds by using a specialized silicone spray. Another option is to spray on rust-proof paint from a can. The downside is that you have to wait for it to dry completely before using the mold. The layer of paint will form a very effective protective film; you can almost double the number of casts using this method...



A white plaster shell surrounding the flexible mold, held closed by rubber bands

A white plaster mold held closed by rubber bands against a dark background

White silicone elastomer mold block held in place by rubber bands

A B

Mold clamping. This is a key factor in the success of your castings. If it’s not tight enough (A), the mold will leak. If it’s too tight (B), the casting material won’t fill all areas and/or the mold will leak, and the casting line will be misaligned. The mold must be clamped correctly...

At this point, please refresh your memory by rereading our tutorial on the hazards of casting materials. We won’t hide the fact that the ideal situation is to cast *outdoors* only during the mid-season (between March and May, and between September and October)!

Transparent vacuum chamber with pump and pressure gauge for degassing silicone

Silicone molding supplies: cans, scale, cups, gloves, and wooden molds on a workbe

Preparing the workstation for ergonomic use.

Most resin-based casting materials (such as polyurethane) suitable for casting small parts, figurines, models, and figurines have a fairly short working time, so it’s important to organize your workspace accordingly—and depending on whether you’re right-handed or left-handed...



In this photo, the countertop is set up for a left-handed person:

-1- Let's take a look at the resin

-2- So you can weigh it, measure it out, and mix it

-3-4- You can pour it into the molds

(-4- Once poured into the molds, some of them can be degassed immediately in the vacuum chamber right next to them. We’re taking advantage of the resin we bought for the squig to cast other parts we made earlier...

So the squig is cast upside down...

Let it harden sufficiently before removing it from the molds. A common mistake is to remove the part based on the amount of hardened resin left in the bowl, when in fact the resin in the molds is not yet hard...This is because the quantities in the molds are much smaller (especially for small parts), so the chemical reaction is less intense and slower...







You can remove it from the mold, inspect it, and compare it to the master model.

If it is deemed satisfactory, keep it and always place it back in the mold when storing it so that the mold does not lose its shape...


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