

Shop Note: Casting

The purpose of this shop note is to inform members of the Model Shipwright Guild of Western NY in an approach in the casting of resin parts for model restoration, improvement and scratch building.

The subject matter expertise does not reside within the group so the nature of this shop note is in the form of a high level orientation and reference to instructional material and video demonstrations from vendors and users which are available on the internet.

This content relates to aspects of master part creation, mold creation and casting of parts. Molds described in the material provided will focus on silicone molds. This type of mold can support casting of resin and (indirectly) metallic based parts.

The casting of metallic parts is not specifically covered, however, reference material is provided. Silicone molds do have temperature range considerations and, as such, they are not suited to cast most metals. Generally a master part is made and a foundry is utilized to create multiple parts.

Creating Master Parts

Casting is a method to create identical multiple parts made from a master element. There are several methods to do so.

- A mold can be made from an existing part. The silicone mold material will not bond to it so the existing part will not be harmed in any way.
- A part can be made by creating a carefully machined master (a cannon barrel, for example) that has been turned on a lathe or otherwise machined. The material for the master can be wood, plastic or another stable material. For wooden masters, it is advisable to use a hard, dense wood such as maple, mahogany or cherry which is easily turned. Open grained woods such as oak are not recommended unless grain detail is desired. Any wooden master should be highly sanded, sealed and coated so that the grain pattern is not picked up in the surface of the mold.
- Machinable wax can also be used to create a master. It can be turned on a lathe, carved, sawn, scraped and even melted with a soldering iron to fuse pieces together.

Sources for the material:

- <http://www.mcmaster.com>
- <http://www.mscdirect.com>
- <http://www.grizzly.com>
- http://www.amazon.com/Carving-Wax-Sample-Kit-Machinable/dp/B00EYNA8TM/ref=sr_1_22?ie=UTF8&qid=1455980018&sr=8-22&keywords=machinable+wax

Making Molds

Products are commercially available to facilitate mold making. Alumilite products are listed below as an example. It is extremely important that the weight of the two components of the mixture is measured accurately so that the resulting parts will cure correctly. An accurate digital scale is highly recommended. They are available cheaply on the internet. See the recommended process below.

<https://www.alumilite.com/store/p/920-Alumilite-s-High-Strength-2.aspx>

<https://www.alumilite.com/store/p/1024-Mold-Putty.aspx>

<https://www.alumilite.com/store/p/922-Slow-Set-7.aspx>

<https://www.smooth-on.com/>

- Usually a part must be suspended in a mold dam. (a mold dam is defined as a containment frame to hold the mixed mold material). Using a cannon as an example, the bore hole and trunnion suspension points may be ideal.
- The mold dam can be built out of wood/plywood, foam core or just about any homogenous material. Another method is to use Lego blocks. The uncured mixture is a low viscosity mixture that can seep out during the pour so it is important to seal the joints is completely. Hot glue is quite effective. The dam must literally be able to hold water.
- Cured molds are quite flexible and allow part removal with little effort. The material will return to its cured form for use again.
- Molds can be used a number of times but manufacturer recommendations should be reviewed.
- Two part molds can be created to make fully formed parts.
- A release agent is required for two part molds. The silicone mold material will not adhere to the master part, but it will bond to the cured silicone from the first half of the mold.
- Mold putty is not specifically covered here. However it is a quick and effective way to make a part. Consult the Alumilite web site for further information.

Creating Resin Parts

- Casting materials are measured by weight and the proportions are extremely important in order to achieve a proper cure. A digital scale is recommended.
- Cure times of casting materials vary. It would be advisable to use longer cure time versions as a beginner.
- Most manufactures carry a complete line of resin casting products. The application of the part must be considered when choosing a casting material. If it is an appliqué' the part must be flexible to follow contours. If it is a part such as a cannon, it must be relatively hard. Hardness of the molded product is measured in Durometer Shore

Hardness. There are 3 scales; 00, A and D. Smooth-On, another vendor, has a good explanation of Shore Hardness and examples of various products so one can make an intelligent choice.

- The Shore Hardness may be applied to mold making material as well. Rigid, hard parts are not likely to be effected by the type of mold material but when delicate parts or complicated shapes have to be removed from a mold, it is more easily accomplished if a softer mold material is used.
- Observe the pot or set-up time. Pour slowly and let the material flow over the part, especially if the part has undercuts or relief angles. A piece of glass that can be nestled over the top of the cavity to provide a flat, stable surface when the mold is turned over for casting
- For three dimensional parts that have details on all surfaces, such as a cannon barrel, a 2 part mold is recommended. Hence a pour hole is required in the mold halves. Pour slowly as bubbles or air pockets can form in the cast piece if air is trapped in the mold. Vacuum degassing can help reduce bubbles in both the mold and the casting.
- Rather convincing metal appearance of cast resin parts can be made by dusting the mold with metallic powders sold by manufacturers such as Alumilite.

<https://www.alumilite.com/store/p/953-Alumilite-Metallic-Powder.aspx>

<https://www.alumilite.com/store/p/942-Alumidust.aspx>

Creating Non Ferrous Metal Parts:

It is recommended that vendors be used to create metallic parts because the silicone molds will not endure the high temperatures required. Casting a master part out of machining wax is the preferred way to convey what the modeler wants to produce. The vendor then uses the lost wax process to cast a part in the shape of the wax master. Be aware that the casting process results in a part that is slightly smaller than the wax master – 6% smaller in the case of brass or bronze.

A vendor used by one of our members is the Cranston Casting Company in Cranston Rhode Island. Videos and process explanation can be found on the site as well.

www.cranstoncasting.com