

The Right Products, The Right Expertise:
Tips for Successful Moldmaking with Silicone Rubbers

1. De-Airing

De-airing is recommended for all silicone moldmaking rubbers when not using automatic dispensing equipment.

The small air bubbles that result from hand mixing become trapped in the mixture and, if not removed by de-airing, can interfere with exact surface reproduction. One exception is SILASTIC™ RTV-3112 Mould-Making Base. Due to its low viscosity, this material can be used in many applications without de-airing.

Because the mixture of base and catalyst or base and curing agent will expand during de-airing, it is important to use a container that is between three and five times the volume of the material itself. The higher viscosity silicone moldmaking rubbers will expand the most.

The mixture can be quickly and easily de-aired in a vacuum chamber. This important step usually takes just a few minutes. Entrapped air may be removed by applying a vacuum of 27 to 29 inches of mercury. SILASTIC™ HS Moldmaking series RTV silicone rubbers should not be de-aired for more than 5 minutes. Any more de-airing will change physical properties. In all cases, the material will expand and then contract to its original level. For approximate time to complete de-airing, consult the individual product data sheets.



2. Inhibition

Cure of SILASTIC™ RTV materials may be inhibited by certain contaminants in or on the pattern to be molded.

If in doubt as to possible surface inhibition, a “patch test” is recommended. Brush or pour a small amount of the catalyzed RTV selected onto a noncritical area of the pattern. Inhibition has occurred if the rubber is gummy or uncured after the recommended cure time has passed.

Addition Cure Systems

Inhibition in addition cure systems (platinum cure) such as the SILASTIC™ silicone moldmaking product line can range from tackiness to complete lack of cure. Among materials found to cause inhibition are sulfur-containing modeling clays, natural rubber such as latex and rubber gloves, masking tape, amine- or sulfur-containing materials, and condensation cure (tin-catalyzed) silicone RTVs.

Surfaces previously in contact with any of the materials mentioned may also be inhibited. Water, when present on the part to be molded, can also cause inhibition.

Condensation Cure Systems

Inhibition in condensation cure systems (tin catalyzed) such as SILASTIC™ RTV-31xx series and SILASTIC™ HS Moldmaking series RTV silicone rubbers is not common. However, there are some sulfur-containing modeling clays that can retard the cure of some of the condensation cured RTVs. Complete cure may take days (with severe inhibition), but unlike inhibited addition cure materials, the condensation cure RTVs will cure when the clays are removed.

SILASTIC™ RTV-3081-F Mould-Making Curing Agent, when used with its recommended bases, has been formulated to cure against inhibition-prone clays.

Techniques to Prevent Inhibition

A standard practice to prevent inhibition is the use of a “barrier coating” to prevent the inhibiting agent from contacting the uncured RTV material. A thin layer of clear acrylic lacquer sprayed directly onto the pattern is an effective barrier coating in most instances.

Polyvinyl alcohol (PVA) is another effective barrier coat. This water-based solution can be applied by brushing, wiping or spraying onto the master. It is important the film be completely dry before molding.

After the mold is cast, the film of PVA can be removed from the pattern by placing it underwater and rubbing briskly. The film will dissolve.

3. Thinners



Silicone oil (PDMS) serves as a thinner and can be used with all SILASTIC™ silicone moldmaking rubbers. A wide variety of viscosities are available: 20, 50, 100 and 350 centistokes, with 50 cSt the most common.

Thinners can be used to reduce RTV base viscosity and cured rubber durometer. Reduction of viscosity and durometer can be achieved using 1 to 3 percent of PDMS fluid with minimal effect on physical properties. Further viscosity and durometer reduction can be achieved with increased PDMS levels; however, higher levels of PDMS will affect the mechanical properties, which will require end-user evaluation.

4. Release Agents for Patterns/Masters

A release agent should be used to ensure easy removal of the cured rubber from the pattern/master. For molds cured at room temperature, a simple mixture of 10 parts petroleum jelly to 90 parts solvent is recommended. Suitable solvents include VM&P naphtha or mineral spirits.

The petroleum jelly–solvent mixture can easily be prepared by putting the items together in a suitable container and setting aside overnight. With slight agitation before use, the mixture is ready to apply.

To ensure complete coverage, brush the mold liberally with the petroleum jelly–solvent mixture, then hit with a spray of air from an air gun. The air will aid in evaporating the solvent, eliminating puddling and the resultant loss of detail. This process will leave a thin film of petroleum jelly over the entire pattern/master.

When casting a two-part mold, it is extremely important to completely cover the cured half of the mold with a good release agent to prevent the two halves from bonding together. Straight petroleum jelly can be used, as well as a solution of 30 to 50 percent petroleum jelly. Dusting with talc or baby powder has been found to be effective, as well as the use of Teflon aerosols.

For Silicone Molds. When first cast, silicone rubber molds exhibit natural release characteristics. Over time, however, the reactant agents in most casting resins will deplete mold lubricity and parts will begin to stick in the mold. A release agent should be used at the first sign of sticking and reapplied only when sticking reoccurs.



When using a silicone release agent, it is necessary to burnish the release agent only on the area(s) where sticking occurs.

If using a silicone release agent in an aerosol container, there are cautions to be taken. Silicone can cause nonwetting spots (fisheyes) in nearby areas where painting is being performed. It is best to use silicone oil (PDMS) and rub it into the mold where **sticking is occurring. Wiping off any excess will prevent non-wetting areas on the piece(s) cast from the mold.**

5. Calculating Material Needs

A few simple calculations can help determine the amount of material you'll need to cast your mold:

- Find the specific gravity of the moldmaking material you have chosen. (This data can be found in the product selection guide or in the product data sheets.)
- Calculate the approximate volume of the mold.
- Multiply the volume by the specific gravity.
- Add 10% to cover loss during mixing and handling.

Example:

- Product specific gravity = 1.21
- Mold volume = 1000 cm^3
- 1.21 x 1000 = 1210
- 1210 + 10% = 1331 g of product should be prepared

6. Patching Torn Molds

Using a steel brush, abrade the area to be patched, then clean the tear with a good grease-cutting solvent such as naphtha or mineral spirits. Be sure the solvent has completely evaporated before proceeding.

Because silicone rubber sticks so well to itself, for the strongest patch, it is recommended that you use the same silicone rubber that was used to make the mold. DOWSIL™ 732 RTV Adhesive/Sealant can also be used to repair torn molds.

7. Compression Casting

When using silicone rubber materials to do compression casting, holes must be drilled to permit venting. One hole for every 25 square inches of surface area should be sufficient. Maximum size is 1/16 inch.

8. Oak Wood Patterns

When using new oak wood patterns, a microsized porosity often occurs at the open grain of the wood. To avoid this, apply some petroleum jelly to a clean cloth and gently rub the surface in the direction of the grain.

9. Mold Box Release

A coating of DOWSIL™ 236 Dispersion on wooden mold boxes prevents resins, especially polyurethanes, from sticking to the mold boxes.

10. Mold Life Extension

Barrier Coating

The use of a barrier coat when casting polyurethanes can greatly extend mold life, in some cases up to 200 percent. The barrier coat should be sprayed into the silicone mold prior to each casting. When the cast part is removed from the mold, the barrier coat becomes the outer skin of the casting.

The barrier coat can then be stained or painted, an important feature.

Note that this type of barrier coat is different than the barrier coat mentioned in *Techniques to Prevent Inhibition*.

Reconditioning

Reconditioning can be accomplished by burnishing a low viscosity PDMS fluid into the surface. When the mold is to be put back in use, any excess fluid should be removed from the surface. This is necessary to ensure that the cast parts will be paintable. Non-wetting or fisheyes can occur on the surface of the cast parts if all excess PDMS fluid is not removed.

Bake-Out

A bake-out is recommended to remove the hardeners, plasticizers and other materials that leach out of the casting materials and are gradually absorbed into silicone molds.

Bake molds for longer times at lower temperatures, such as 90°C (200°F) for six hours to overnight, or at higher temperatures, such as 120°C (250°F), for one to two hours.

11. Library Life

To extend the library life (shelf life) of a cured silicone rubber mold, it is important to thoroughly clean the mold before storage. If possible, a bake-out (see Bake-Out, in Mold Life Extension), followed by wiping the mold with a solvent, is best. If a bake-out is not possible, wiping the mold out with an aggressive solvent such as toluene will still help considerably. After cleaning the mold, apply a thin film of PDMS fluid (low viscosities of 20, 50, or 100 centistokes are best). Placing a master of wax, plaster or wood in the mold will help retain the mold's shape.

Molds made with condensation cure (tin catalyzed) systems may revert (soften) if placed in airtight storage. For maximum library life, Dow recommends platinum cured molds.

Caution

Always provide adequate ventilation when using any solvent. In addition, all solvents should be completely evaporated before catalyzed RTV rubber is applied to the master pattern. When using any solvent, avoid heat, sparks and open flame. Follow the manufacturer's directions on container labels, including precautionary handling statements.

Health and Environmental Information

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