

Manufacturing 101 for Rubber Molding

Rubber molding is the process of converting uncured rubber into a stable final product. The raw rubber material is compressed, transferred, or injected into a mold and then cured to solidify into the finished part. This process is called vulcanization, which involves adding pressure and temperature to accelerate the curing of the rubber material.

In this eBook, you'll learn more about the different types of rubber molding techniques, as well as their advantages and common applications. We will also explain what might impact final part tolerances and appearance.

Custom Rubber Molding Methods: Types, Benefits, and Common Applications

The principal types of rubber molding techniques are compression molding, transfer molding, injection molding, and liquid silicone rubber (LSR) molding.



Compression
Molding



Rubber to
Metal Bonding



Transfer
Molding



Injection
Molding



LSR
Molding

Rubber Compression Molding

Rubber compression molding involves placing an uncured rubber or elastomer preform into a heated mold cavity. A compression molding press applies high pressure to the mold, forcing the material to fill the cavities. The rubber cures, and any overflow flash is trimmed.

Rubber Compression Molding Benefits

Rubber compression molding has the following advantages:

- + Less expensive tooling compared to rubber injection molding
- + Capable of processing most elastomers and cure systems
- + Eliminates material runners compared to traditional transfer or injection molding
- + Ideal for rubber overmolding onto substrates, i.e. rubber to metal bonding
- + Ideal for material requiring longer cure times
- + Rapid mold changeovers

Applications for Compression Molding

Popular compression molded products include:

- Rubber O-Rings
- Rubber Gaskets
- Rubber Seals
- Over Molded Components
- Rubber Diaphragms



Rubber to Metal Bonding

Rubber to metal bonding is an additional technique that refers to the process of bonding a metal substrate to a piece of rubber. Chemical and mechanical bonding techniques work to bond a range of rubber onto various metal types, including brass, stainless steel, and aluminum.

Rubber to Metal Benefits

Here are the main benefits of rubber to metal bonding:

- + Ensures a tight seal
- + Bond is stronger than the elastomer's physical properties alone
- + Helps with part alignment issues and human error
- + Enables custom designs
- + Reduces the number of individual components in a facility or assembly

Applications for Rubber to Metal Bonding

Rubber to metal bonding is ideal for applications that require the material characteristics provided by the elastomer combined with a metal substrate. Example applications include latches, seals, gaskets, and poppets. Common rubber to metal bonded parts are found in the aerospace, defense, military, government, and industrial markets.





Rubber Transfer Molding

The rubber transfer molding process starts by measuring and cutting the required uncured material and positioning it into the “pot” section of the transfer mold. The transfer mold is then closed and placed into the molding press. The mold plunger compresses the material as heat is applied and the ensuing pressure transfers the uncured rubber through runners into the mold cavities to cure the material to the desired shape. The next step involves trimming or deflashing to remove unwanted overflow material or flash. Transfer molding provides precise control of dimensional tolerances. Although pre-formed materials are required, a single pre-form can fill multiple mold cavities.

Rubber Transfer Molding Benefits

Rubber transfer molding is an effective and accurate alternative to other molding processes. Some of these benefits include:

- + Lower mold costs compared to injection molding
- + Higher labor efficiency compared to compression molding
- + Quicker mold changeovers compared to injection molding
- + Precise dimensional control and complex manufacturing features while minimizing parting lines compared to compression molding

Rubber Injection Molding

The rubber injection molding process uses high consistency uncured rubber (HCR) to create precise, consistent end products. The HCR goes through a heated rotating screw, which applies heat and pressure to prepare the material for injection into the mold cavities. The mold is opened and the parts removed once the rubber reaches the required level of cure.



Rubber Injection Molding Benefits

Rubber injection molding offers the following benefits:

- + **No pre-forms:** The elimination of pre-forms reduces potential variability in material weight and shape and optimizes labor requirements.
- + **Faster production cycles:** Rubber injection molding offers reduced cycle times compared to compression and transfer molding as the injection screw pre-heats material before forcing it into the mold cavities, which enables the material to flow more easily into the cavities..
- + **High-volume production:** It's an ideal process for medium to high volume production.
- + **Rubber overmolding:** The process is capable of producing overmolded components.
- + **Environmental savings:** Rubber injection molding creates minimal flash and material waste.

Applications for Transfer & Injection Molding Methods

Both transfer and injection molding methods allow manufacturers to control precise part dimensions and create complex features. These two techniques also reduce parting lines.

Common rubber transfer molded and injection molded products include:

- Connectors
- Boot Pads
- Switches
- Housings
- Cases
- Shells
- Buttons
- Seals
- Rubber Grommets
- O-rings
- Gaskets
- Flappers
- Plungers
- Latches
- Vacuum Cups
- Diaphragms
- Poppet Assemblies
- Valves



Liquid Silicone Rubber (LSR) Molding

Liquid silicone rubber (LSR) molding uses a two-part high-viscosity liquid that is mixed with a platinum catalyst, which accelerates the cure rate. Because it is a closed-system molding process, workers never have to contact the uncured raw silicone directly. LSR molding is ideal for high-volume part production.

LSR Molding Benefits

LSR molding and LSR molded parts offer the following advantages:

- + Ideal for high-volume production runs due to fast cure rate
- + Accommodates complex part designs
- + Achieves tight tolerances
- + Biocompatible and antimicrobial
- + No taste or odor
- + Chemical resistance
- + High-temperature resistance
- + Electrically insulating
- + Strong and tear-resistant

Applications of LSR Molding

LSR molding offers an enhanced level of purity compared to other rubber molding processes, which makes it ideal for manufacturing parts in these industries:



Food & Beverage



Dairy



Pharmaceutical



Medical



Semiconductor



What Can Impact Tolerances and the Finished Appearance?

Rubber compression molding, transfer molding, injection molding, and liquid silicone rubber molding all yield highly precise parts. However, several factors may affect the tolerances and appearance of the finished product.

Mold Design

The molds and mold plates within the cavity can affect the dimensional accuracy of the final product. Each mold has unique tolerances, so it is important to be aware of these variations before producing parts with exacting tolerances.

Trimming and Finishing Procedures

While it is natural for excess material to overflow and require trimming, sometimes flash removal can take off more than necessary and affect important dimensions. If the flash trimming process is not consistent throughout the production run, it may result in part inconsistencies.

Heat and Humidity

Since rubber is easily affected by heat and humidity, it must be tested to withstand the conditions under which it will be used. To reduce the negative impacts of heat and humidity, finished parts should be rested at room temperature for a set amount of time after removal from the mold. This will allow the dimensions to set even further and prevent future fluctuations.

Stabilizing the rubber is even more important for products that require exact dimensions.

Shrinkage

After curing, rubber naturally shrinks as it cools. Technicians can analyze the composition of the rubber compound to determine the degree of shrinkage and adjust tolerances accordingly.

Metal Surfaces

For rubber to metal bonding to be effective, the metal surface should be prepared properly. The bonding agent or primer should be optimized based on the types of metal and rubber that require bonding. If not, the bond can fail or lack the proper accuracy of the intended design.

Standards for Packaging

New processed rubber products can distort if they experience temperature differences before they are fully set. Distortion often occurs during packaging and shipment. For this reason, rubber products should be stored at room temperature without any external stresses for at least 24 hours.

Consulting the Experts: Why RD Rubber Technology?

RD Rubber Technology Corporation specializes in critical to function custom molded rubber products for the most demanding applications. We provide one-on-one assistance to make sure your exact needs are met. Our skilled engineers aim to streamline every production process from engineering to final delivery.

We are ISO 9001:2015 and AS 9100:2016 certified, meaning we are dedicated to the longterm performance and reliability of every component we produce. To learn more about our capabilities, [contact us](#) or [request a free quote](#) today.

Contact Us

Request a Quote



12870 E. Florence Ave.
Santa Fe Springs, CA 90670

www.rdrubber.com

sales@rdrubber.com

562-941-4800