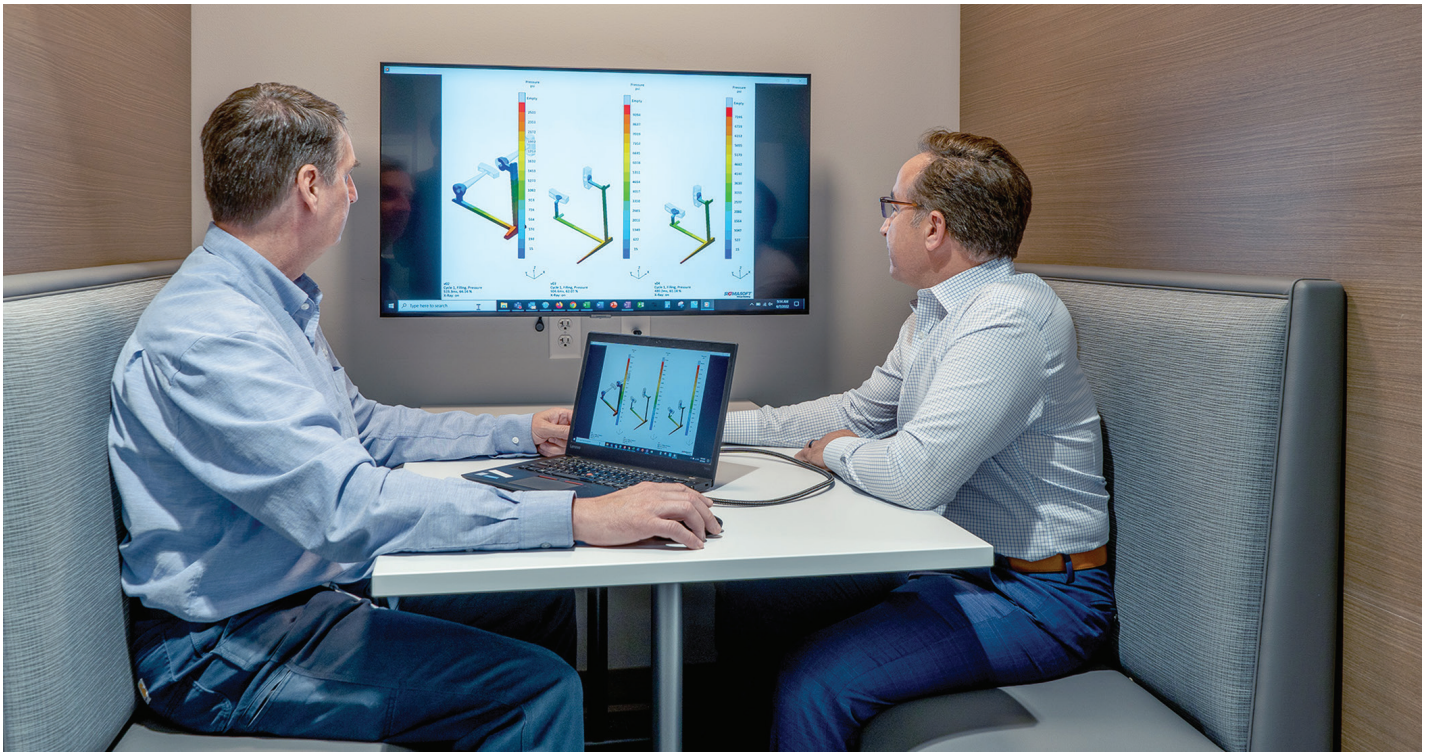


Where the rubber meets the road for component design and manufacturing

Edited by **Mike Santora** • Managing Editor

Optimizing the development of a custom rubber seal can be challenging. Relying on industry specialists and considering potential manufacturing methods and production volumes will enable you to navigate the innovation process. Custom rubber seal manufacturing experts offer a great understanding of how production volumes, methods, materials, and design, interrelate and impact costs and affect performance and time to market. They also contribute diverse skillsets.

One powerful skill is prototyping production-intent custom elastomer components. Prototyping is advantageous, as it allows testing on the live part before committing significant budget and resources to any aspect of component design, giving design engineers the opportunity to adjust and consider the potential production outcomes. By bringing the prototype design, materials, and methods as close to the production equivalent as possible, you will yield accurate component performance results and the highest quality production.

The earlier you involve your custom rubber manufacturer in your product development process, the better. Relying on elastomer manufacturing specialists can help you prevent design and performance issues while achieving budgetary constraints.

Your rubber component is the final piece of the product design puzzle, and it must fit your

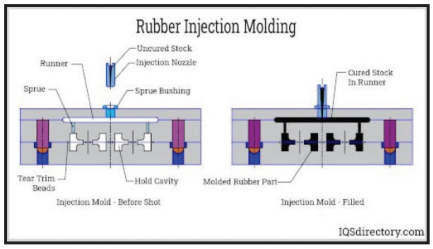
product — there is no room for deviation. Failure to recognize the importance of the rubber component design can negatively impact your costs and product performance.

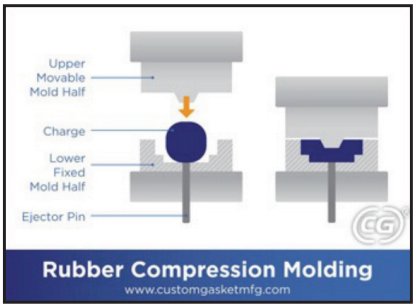
In short, the earlier you talk to your rubber component manufacturing specialist about your project and objectives, the easier you will arrive at the best process and material solution.

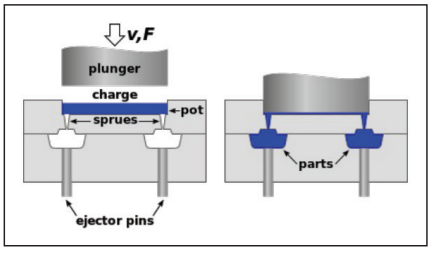
When it comes to manufacturing custom elastomer components, there are three common molding techniques:

Injection molding

Injection molding injects heated elastomer material into the mold under high pressure. The compound flows from the heating chamber to a series of runners and sprues, which direct the rubber into the tool at multiple points. Some materials are better suited for injection molding than others. Elastomers with better flow rates will move through the machine more favorably than highly viscous materials. Injection molding is suitable for high-volume production and can yield better results for components with generally lower geometric complexities. Injection molding is typically an automated process, making operator costs null.







Transfer molding

Transfer molding is most like injection molding. A sheet of rubber material is placed into a pot, located above the top plate, that features gates through which the compound flows into the mold below. Above the pot, a plunger lowers and compresses the material and, while also applying heat and pressure, forces the compound to flow through the top plate gates and fill the entire mold cavity.

During this process, the compound fills the contours of the pot and forms a pad of elastomer that doesn't fill the mold. This pad is disposed of as waste, making transfer molding ideal for lower-cost materials.

Compression molding

Compression molding is suitable for low-volume production. A pre-form of rubber compound is placed into one side of the tool cavity. One half of the tool is closed against the other, and heat and pressure are applied to enable the material to flow and fill the cavity.

Compression molding is suitable for more malleable materials, with medium-hard elastomers working best. This method is often better suited for simple designs, as the pre-form compound is initially very flexible and difficult to insert into complex molds. Additionally, compression molding can have a very high cavity count, which helps to offset labor costs.

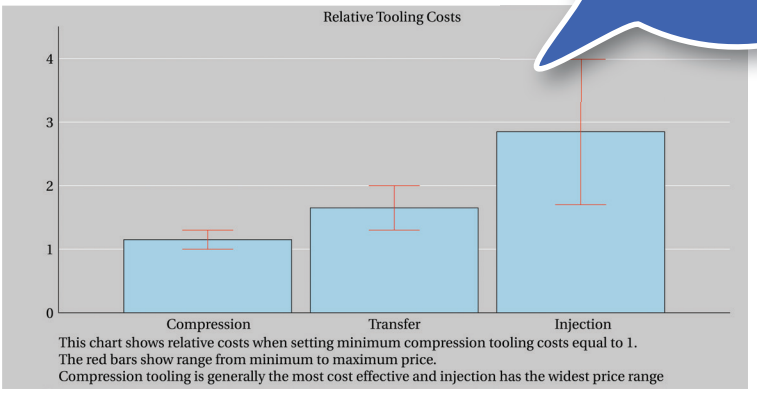
Unlike injection molding, compression molding machines require an operator, making the process subject to labor availability and more human error. Applications for compression molded components range from simple O-rings to complex diaphragms with diameters exceeding 10-in.

Relative Tooling Costs

How to choose the right tool for the job

Tooling, or the mold that forms the elastomer, typically consists of two or more custom-machined cavities and steel plates. In most elastomer molding processes, the tooling plates undergo heat and pressure to force the rubber compound

This chart shows relative costs when setting minimum compression tooling costs equal to 1. The bars show the range from minimum to maximum price. Compression tooling is generally the most cost-effective, and injection has the widest price range.



This chart shows relative costs when setting minimum compression tooling costs equal to 1.
The red bars show range from minimum to maximum price.
Compression tooling is generally the most cost effective and injection has the widest price range