Silicone Elastomers 2011
December 6-7, 2011 – Chicago, IL USA

ADVANTAGES OF A COLD RUNNER SYSTEM

Richard Finnie
M.R. Mold & Engineering Corp.
2700 E. Imperial Highway, Unit C, Brea, CA 92821 USA
Tel: 1-714-996-5511 Fax: 1-714-996-6029 email: **rick@mrmold.com**

BIOGRAPHICAL NOTE

Rick Finnie is the owner of M. R. Mold & Engineering Corporation. His career started during his teenager years as a tool and cutter grinder servicing the metal working industries. In 1977 he transitioned to the mold making industry. After 8 years rising from apprentice to lead mold maker he started M. R. Mold & Engineering Corporation. **M.R. Mold & Engineering** is known globally for its EXPERTISE and EXPERIENCE in liquid silicone rubber (LSR), gum stock silicone, plastic injection, compression and transfer molds for its customers. We are now in our 26th year of business.

ABSTRACT

Today in the elastomer industry, we are all facing the challenge of our customers wanting cost to market reduced with lower pieces prices, shortened cycle times and using green technology. This presentation will give an overview of how a cold runner system help to achieve these results with elastomer molds.

PAPER

We have gone through many changes within our industry. Rising steel costs, quicker deliveries, shorter cycle times – because of these, there has been a shift in thinking relative to the traditional cost of raw materials and the cost of wasted materials. A few years ago, the pricing was stable and had been for years. We have seen an increase up to 300% in polymer pricing from a few years ago. A cold runner system can be the answer to cost effective molding.

Advantages of a Cold Runner System

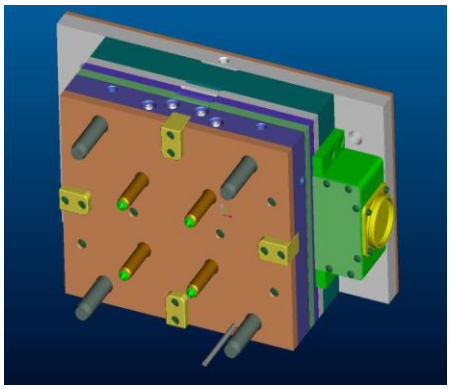
Polymer Type	ASTM Desg.	Traditional Pricing per Lb. (Pre-2000)	Current Pricing per Lb. (Post-2010)	Increase in Price
Natural Rubber	NR	$0.60	$2.50	**317%**
Butyl Rubber	BR	$0.85	$3.00	**253%**
Styrene-butadiene Rubber	SBR	$0.65	$1.50	**131%**
Nitrile Rubber	NBR	$0.75	$2.00	**167%**
Ethylene-propylene Diene Monomer	EPDM	$0.80	$2.70	**238%**
High Consistency Silicone Rubber	VMQ	$3.50	$4.50	29%
Liquid Silicone Rubber	LSR*	$4.50	$5.20	16%

The table above shows the pricing of rubber materials over the past several years. The contrasting differences in price for organic rubber polymers is a cause for huge concern when it comes to runner and transfer pad waste. Cold runner injection molds are a way to reduce that waste to zero.

Cold runner systems are used to enable projects to be more cost effective by eliminating runners and material waste. Cold runner systems make automation easier, allowing for faster cycle times.

There are pros and cons of using a cold runner system versus a conventional runner system. Although a cold runner system adds to the cost of a project, there are many instances in which a single cold runner system can be used on more than one project. The cold runner system allows you to place a gate almost anywhere on the part. With high production volumes, using a cold runner can reduce cycle time through the ease of automation and a waste less design.

However, a cold runner system does increase the maintenance costs on the overall tool. Skilled technicians are required to maintain a cold runner tool, which equates to additional training costs. Spare components and replacement components: i.e., nozzles, seals, nozzle tips, valve gate pins, etc. are an added expense. There is also a risk that the cold runner can cure if the chiller is turned off or fails. The molder has to consider if there is enough daylight on the molding machine to allow for a taller mold with a cold runner.

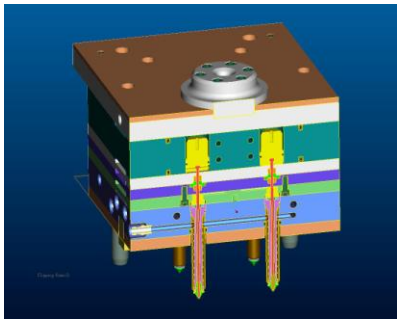


Example of a 4 Drop Cold Runner

Example of a 24 Drop Cold Runner

Cold runner systems can be equipped with either Open Nozzles or Valve Gate Nozzles. Open nozzles are less expensive, have less maintenance and can have tighter nozzle spacing. The molding machine requires less daylight for an nozzle system. Open nozzles have their challenges. Controlling gate remnant and nozzle drool is a delicate balancing act within the injection cycle. A cured plug from the open nozzle will be injected into the following shot. There is no control over individual nozzles. The molding machine must be equipped with a diving nozzle. Injecting with maximum pressure and velocity for the first stage of the injection cycle can be abusive to the molding machine.

When using valve gates with a cold runner system you experience more reliability with repeatable gate remnants. Valve gate nozzles give you individual control over each nozzle. Valve gates require less processing skills. The process allows lower injection pressures, therefore enabling it to be used for large and small parts. With these benefits, come drawbacks. Valve gates are more costly because of their complexity. A pneumatic mechanism is required to control the valve gates. The valve gate mechanism might require larger cavity spacing. The valve gate pneumatics require more daylight on the molding machine.



Cross Section of Valve Gated Cold Runner

Cold Runner Design

Nozzles – Depending on the manufacturer, the nozzles of a cold runner system vary. Some are welded assemblies, which have to be discarded if particulate of any type gets inside the water jacket. There are also nozzles with a removable water jacket, which allow for easy cleaning. The water flow channels on nozzles vary from manufacturer to manufacturer. Smaller water channels allow for less cooling and are easily blocked.

Nozzle Tips – Some nozzle tips are firmly mounted in the end of the nozzle. There is a cold runner system that offers spring loaded nozzle tips. This advantage allows for thermal expansion of the mold when heated, keeping the nozzle in constant contact, preventing leakage.

Runner Manifolds - Various cold runner systems offer gun drilled runner manifold designs. These designs can have “dead spots” at the end of the channels and are difficult to clean. A split plate runner design allows the material to follow a continuous path within the cold runner system. There are no “dead spots” for the material to find and ultimately cure. This type of design allows you to disassemble the plates, clean the elastomer from the runner channels and reassemble for maintenance ease. This design allows for quick material and color changes.

Piston Assembly – There are cold runner systems that use external air hoses and barb fittings. With the use of gun drilled air passage ways, this eliminates the need for air lines and barb fittings to each nozzle. This prevents damage to hoses and errors in connection.

Pneumatic Connections – Cold runner systems can be equipped with external air lines. Others are equipped with an air terminal box using a quick disconnect coupler. The mating umbilical cord interfaces with the molding machine which makes the connection from the valve gate controller to the cold runner system error free.

Conclusion

The objective of a cold runner system is to save time and material. As a result, using a cold runner system in conjunction with elastomer molds saves your company money. Eliminating the wasted material of a runner system not only reduces material costs, but also provides efficient automation and reduces the cycle time. It is not uncommon for a cold runner system to pay for itself within a year, and with the versatility of using a cold runner on multiple projects, there is an even more rapid return on investment.