



Tooling for Rotational Molding



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In 1976, three years prior to plastic production surpassing steel production the Association of Rotational Molders was established by a group of people who believed unity would be beneficial to all participants in the rotational molding industry. Many original pioneers are still actively involved in the industry today. The companies they established have grown, merged, and prospered.

Numerous items make a company strong. The buyer/supplier relationship is a key force behind growth and profits. The management of partnering with vendors has also brought the industry forward, such as the alliance between rotomolders and tooling vendors. George Renshaw, owner of Trend Tooling stated, "Sherman McKinniss from Rotonics Manufacturing Inc. was very instrumental in helping Trend Tooling in its start up days 30 years ago."

When asking tooling vendors, "What's changed?" There has been innovation, organizational change, creative thought, and a lot of little things that have made a huge difference. All this has had a critical impact on the long term success of designing quality tools and products.

"The innovations of CNC machine capabilities and e-file data transfer, along with consumer recognition of quality - you get what you pay for - are the big changes." indicates George, "Cheap molds are like cheap shoes. You feel the pain each time you use them."

A good mold design can improve profitability. "Take, for example, one of the newer mold design technologies using cast in pins to heat molds more quickly. Faster heating and cooling results in shorter cycle times which in turn saves molders time and energy costs. Location of parting lines can determine the number of pieces of a mold which, if kept to a minimum results in lower operating and maintenance costs." states Sandy Scaccia of Norstar Aluminum Molds. "Tooling vendor and manufacturer presence during the on-site consultation is beneficial in directing part designers away from features that may seem simple but would result in expensive mold designs. In addition, the tooling vendor working in conjunction with the rotomolder can collaborate on design considerations that will make the part easier to mold thus, keeping part costs down." For example, there are products where the shape allows incorporation of a molded-in routing trim guide eliminating the

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need and expense of secondary routing fixtures. Sherman emphasizes, “The most important point is to join forces with the manufacture prior to making a mold.”

Each type of tooling has benefits and product design parameters. CNC molds are number one in producing high quality parts, with tight tolerances, and trouble free operation. These tools are rapid to market and can be accurately reproduced with ease. The advantage of a CNC machined mold manufactured from rolled aluminum is its strength over cast aluminum. It is a solid dense material eliminating any chance of porosity.

It was not very long ago a rotational mold CNC machined from solid aluminum plate cost roughly four times that of a cast aluminum mold. Trend Tooling confirmed they now manufacture a large percentage of their molds by CNC from solid aluminum for the same cost as cast aluminum. However, there are some exceptions to this. A large rotational mold with a complex form can sometimes be manufactured by the casting method at a lesser cost than CNC machined. Therefore, cast aluminum molds and fabricated molds are still viable in rotational molding if preferred by the customer or if size and configuration dictate that method. The problem with fabricated molds is that dimensions are difficult to hold and if more than one mold is required it is possible that they will be dimensionally different.

The biggest changes to mold design over the years has not been in the physical shape or size. That is pretty much dictated by the design of the part. Rather changes have been in how the molds operate to accommodate the demand for more complicated shapes and less labor requirements. This has resulted in more advanced clamping, mounting, and venting systems along with operator friendly features to ease handling during loading and unloading.

“It is 2007 and some molders are still running molds held closed with four or five vice grips. The mold flanges are chewed away by the grips, the outside of the molds original shape is distorted from all the plastic build up due to poor closing at the parting line.” declares George of Trend Tooling. Who proceeds to tell of a customer that brought a mold to him years ago; “It looked like something that had come through the Earth’s atmosphere from outer space. The flanges were chewed away, distorted parting line surfaces looked like someone had blasted them with a shotgun. The guy asked me if there was anything I could do to get him back into production as he was just unable to get good useable parts any more. (Imagine that!) I recommended he run it through the band saw.” The customer replied, “I can’t do that I have over five thousand dollars invested

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in this mold.” George told him run it through the band saw or he would have ten thousand dollars invested and no usable parts. The recommended estimation for the life of a mold is approximately 5000 pieces.

All molds require a good, solid and reliable clamping system. A bolt through clamping system stands the test of time as well as easy maintenance. There must be sufficient clamp sets around the mold and all clamping bolts need to be used to prevent powder leakage and control flash build up. Over tightening of clamping devices is a major reason for repair costs. Once a bolt has been sheered off the area is then susceptible to powder leakage and the start of flashing problems on the products. Trend suggests replacing all those 600 ft. lb. impact wrenches with 80 ft. lb. wrenches to eliminate the sheering off of bolts.

Thick flash is expensive and time consuming to trim. Ugly parting lines lead to scrap and rejected parts. Further advice from Trend Tooling is to supply operators loading the resin with a three inch paint brush and instructions to brush away all traces of powder from the flange area prior to closing the mold. This will help to prevent flash build up.

One vendor stated that “The best mold is only as good as the framework that supports and protects it.”

“Some mold makers construct a frame out of 1.75” steel tubing 1/56” thick”, according to Trend Tooling. This type of framing is detrimental to all aspects of molding. The mold is encased in a steel frame. The clearance between the mounting plate and the molds is insufficient, restricting airflow by shielding the heat. Aluminum will expand at almost twice the rate of steel. Therefore, the aluminum mold will expand and contract at a different rate than its steel frame causing the mold to distort. This type of frame also shields and deflects heat away from the mold surface resulting in longer cycle times that cut into profits. George suggests a frame should be made from the same material as the mold itself. That way the mold and the frame are free to expand and contract in unison, thus avoiding any distortion.

Norstar has always been a proponent of using springs in their framing systems. This is done to provide a degree of “float” for the mold within the solid mounting system. The spring mounted system allows for this difference in thermal expansion and keeps the mold from distorting under these forces. In addition the spring mounting system provides for uniform force to be exerted over the parting line of the mold to further avoid distortion.

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Over the past 15 years the major changes in tooling have come from the add on items that enhance the performance of the molds such as improved venting devices along with several grades of Teflon coatings.

Also, mold maintenance plays a large part in “improved profitability”.

“Maintenance starts with training the guys that use the molds day in and day out on the proper way to handle molds. It comes down to common sense and taking an active role in care of the equipment. Thoroughly clean molds before storage. Store molds out of severe weather elements. Operators have the responsibility to notice degradation in parts in any area and bring attention to it. Beyond that, keeping parting lines clean and clamps in proper working order is the first line of defense” according to Jim Henry of Midwest Pattern, Inc.

What is interesting and sometimes frustrating in rotational molding is asking two or three “experts” in our industry the same question and receiving 2-3 slightly different solutions. An example is tooling vendors discussing stress relieving of cast molds.

Sandy Scaccia of Norstar Aluminum Molds: “During the casting of the liquid aluminum the melt must go through a cooling phase which inherently causes stresses to be set up in the casting. The stress relieving process eliminates these pent up stresses. The temperatures in a normal rotational molding oven can relieve this stress, however, the casting may move, resulting in misfit parting lines. For this reason the casting and the finished mold is stress relieved at the mold maker so that the parting lines will stay fit in during the molding operation.”

George Renshaw of Trend Tooling: “After a mold has been shot peened the parting faces don’t quite come together. The method of bringing these faces together is to clamp the mold closed and run it through a cycle in the oven at a determined temperature. In this cycle the molecular structure of the aluminum will relax. Cool the mold in a conventional way and there you have it, a stress relieved mold. Be aware the aluminum will be a little more pliable.”

I proceeded to consult with a “true” expert, rotomolding pioneer Sherman Mckinniss. So who’s right? His response, “They both are.” That sums it up. There is no best answer, just a lot of good ideas. As an industry we must not just look for good ideas but good new ideas.

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