PLASTICS MOLDING: Real Parts, Real Fast

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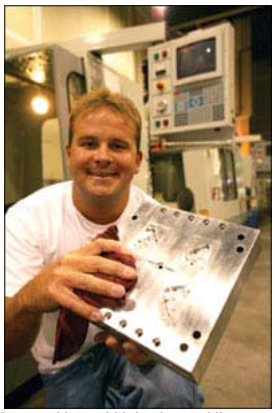
Web-based system speeds design process, lowers costs.



Protomold's rapid injection-molding process enables design engineers to make straight pull-through molds with complex geometries.

Manufacturers and design engineers looking to shorten product development schedules may find some key time- and cost-saving benefits in the emerging field of rapid injection molding. The innovative process lets design engineers submit 3D CAD drawings via the Web to quickly obtain their prototype or low-volume production parts. Unlike rapid prototyping methods, rapid injection molding can create in a matter of days, real, injection-molded parts in a wide range of production-grade resins and plastic materials. Compared to traditional injection-molding methods, rapid injection molding typically cuts both costs and lead times by as much as two-thirds.

While most traditional rapid prototyping methods enable design engineers to quickly create prototypes that can fairly accurately emulate the look of a finished part, they typically aren't made using production-grade materials. Such prototypes are usually good for testing form and fit, but often prove too fragile for rigorous physical testing. Rapid injection molding solves this problem with its ability to quickly manufacture parts in production-grade materials—at only a fraction of the time and cost normally required to produce the required tooling.

CNC and 3D CAD

In rapid injection molding, the 3D CAD file used to generate the mold design is downloaded into Protomold's software system, which then automatically outputs tool paths for the high-speed HAAS CNC machine centers to manufacture the molds.

Developed by The Protomold Co. of Maple Plain, Minn., rapid injection molding is made possible due in part to the recent advent of affordable 3D CAD systems and high-speed computer numerical control (CNC)

machining equipment. When used in combination, these technologies enable the quick and accurate manufacture of injection molds, thereby speeding the creation of prototypes and making affordable the production of low-volumes of injection-molded parts.

At the front end of Protomold's rapid injection-molding process is ProtoQuote™, the company's proprietary Web-based price-quote and design analysis system. After accessing the company's internet Web site at www.protomold.com, design engineers simply upload their 3D CAD-based designs and answer a series of prompts related to product specifications, including the surface finish required, molding material and delivery time frame.

Protomold then supplies an interactive ProtoQuote that provides pricing and a detailed analysis of the submitted CAD-based prototype design. The ProtoQuote detailed design analysis gives design engineers a wide range of suggestions for improving their design before the first parts are ever made, speeding the mold-creation process considerably.

The software is designed not only to provide a cost breakdown, but also to give design engineers and manufacturers a detailed look at how their design might be improved before the actual manufacturing process begins. And by suggesting these design improvements, Protomold indirectly helps improve the quality of the injection-molded products it makes for its customers.

After an order is finalized using ProtoQuote, the software uses the 3D CAD file as the basis for the automated generation of the mold design, including core and cavity geometries, shutoff surface generation, gate-design layout and ejector pin placement. The software automatically outputs the tool paths directly to internal CNC machine cells to manufacture the necessary mold components used for rapid injection molding. Because the process is largely automated, the molds can be manufactured quickly and at relatively low cost, giving design engineers the flexibility to create several different prototype versions before settling on a final product.

"We often have customers who need to make some minor design enhancements after the end user has completed the functional testing of an earlier prototype version," says Bradley Cleveland, president and CEO. "These changes, which may require some re-cutting of the tool we've already manufactured, would normally be cost prohibitive due to the high costs associated with re-cutting a conventional injection-molded tool. But in the case of rapid injection molding, the process of creating a new tool is fast, relatively easy and very cost-effective."

The entire rapid injection-molding process gives design engineers the ability to quickly make design changes and improvements to a prototype, reducing a process that can normally take months or weeks of vendor collaboration to just hours.

Growing support

Trapeze skipped rapid prototyping and went directly to functional testing and production ramp-up of its Mobility Point housing, shown here with its mold.

Although the rapid injection molding process is relatively new, Protomold finds a growing number of customers are relying on it. One company that recently discovered rapid injection molding, Trapeze Networks, collaborated with its design firm and Protomold to manufacture a wide range of parts used in a new product line.

Based in Pleasanton, Calif., Trapeze Networks markets the Mobility System™, a proprietary line of products used in conjunction with wireless local area networking (WLAN) systems. Using Protomold's rapid injection molding process, Trapeze skipped the rapid prototyping step of new product design and instead went directly to functional testing and production ramp-up, faster and more cost effectively than they had believed possible.

The company's initial plan was to consider a two-step approach to product development. In the first step, the company intended to use so-called rapid prototypes to verify form and fit. In the second phase, once the design had been refined and stabilized, they would use a conventional injection-molding process to get working parts and premium-quality prototypes to test functionality. On the advice of its design engineering firm, Santa Ana, Calif.-based designsUNLIMITED, however, Trapeze Networks decided to try rapid injection molding.

David Hargis, director of hardware engineering, Trapeze Networks, was surprised by the low cost for rapid injection-molded parts and placed the order. Trapeze called Protomold a few days later asking about a potential change to the design, and was told that the molds were complete and ready for molding. Trapeze received its parts just five days after it placed the order.

Once the initial testing was completed, Trapeze proceeded with placing a high-volume production tooling order from a current supplier and was quoted an eight-week lead time. After showing this supplier what Protomold accomplished in one week, the company was able to renegotiate the production-tooling lead time to four weeks. During the interim from low-volume to high production, Trapeze was able to use parts made from Protomold to support their production ramp-up while the high-volume tooling was manufactured.

"The overall relationship between Trapeze, Protomold and designs UNLIMITED has opened a new door to improving our product development cycle," says Hargis. "This collaborative is a great example of three complimentary skill-sets working together in a very effective manner."

—Article furnished by Protomold Co., Maple Plain, Minn

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