Time and Talent in Moldmaking

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A new process delivered via a standard machining center promises to streamline machining of injection mold tooling and even answer the declining availability of toolmakers.

Is the way injection molds are made getting ready to change? Today, mold cores and cavities are made on CNC machining centers; they are milled out of tool steel. And they will almost entirely continue to be made that way for some time to come. But a very different means of making cores and cavities that has now fully come to market still uses a CNC machining center — albeit a modified one — and still works in tool steel — albeit initially in a non-solid form. The California-based startup Mantle is now out of beta testing and has begun shipping the production version of its "TrueShape" system for rapid, streamlined creation of injection mold tooling.

The company's process starts with steel in a paste form. It works this way: Metal paste developed by Mantle is 3D printed and CNC machined in a single operation, and then through controlled sintering becomes a fully dense mold core or cavity, in steel equivalent to H13 or P20. Rough milling and EDM are avoided, as is drilling of cooling lines, which in TrueShape can easily be 3D printed conformal to the tool geometry. Tool performance is equivalent to a mold made traditionally (one molder has taken a TrueShape mold past 1.65 million cycles), but the pacing is faster: Printing and sintering a core and cavity take two to three days, compared to the much longer lead time more commonly required for injection molds. The system consists of machine, software, furnace and material supplied by the company; a video at gbm.media/mantle offers more detail about the operation of this moldmaking process.

Ted Sorom is Mantle's cofounder. He says the TrueShape process competes against conventional moldmaking on cost and time, but time savings are proving more significant for driving adoption.

He explains: "For large OEMs [making plastic parts], the cost of mold tooling is already factored in. They expect it." By contrast, he says the lead time for molds is a factor increasingly slipping out of their control, affecting how quickly they can adapt and innovate. Mantle's process answers the mold lead time challenge by providing a production tool quickly enough to eliminate the need for a prototype tool (perhaps machined from aluminum) by eliminating the distinction between production and prototype tooling.

Another Mantle leader, Chief Commercial Officer Paul DiLaura, explains the consequence: "We offer time savings through faster validation," he says, whether that is validating a fully new design or a design change. Where there is a validation requirement for plastic parts, even a small design change might introduce a major delay. DiLaura quotes a beta user, Nicolet Plastics, saying one of this company's leaders noted this difference with the Mantle system: "It lets us get a production tool in prototype time." This enables validation of both design and process simultaneously. The fast »

The Mantle process rapidly 3D prints and machines mold tooling made from H13 or P20 steel, using a machining center that has been modified to incorporate the metal paste layering.

moldmaking "de-risks production," DiLaura says. "If the part design works, then you begin production with the same tool."

Sorom notes the time to make a mold with this system, in addition to being shorter, is also more predictable. This led to a discovery: TrueShape is also an estimating tool. "We know exact time and material use," he says. "Job quoting is much easier," which is an advantage pointed out to Mantle by early users.

But the most significant advantage of the TrueShape system might relate to the people involved in moldmaking, including toolmakers and plastics engineers. These skilled personnel are, of course, still needed; someone has to design the mold, and someone has to finish, fit and build the mold after the core and cavity are made. TrueShape's solution can eliminate roughing, EDM and prototyping, but not knowledgeable people. But as DiLaura points out, it can allow those people to do more.

Nicolet Plastics is an example of a company able to benefit from this, he says. The injection molder relies on an in-house toolmaking department with experienced team members. Any retirements from this team would likely cause in-house toolmaking capacity to decline, due to the potential difficulty of finding a suitable replacement toolmaker. Streamlining the process — through easier quoting for engineering and fewer steps in moldmaking — amplifies the capability of knowledgeable people by freeing some of their attention and time. Thus, even if the toolmaking talent pool decreases, the remaining team members might still deliver just as many molds.

An example of a mold tool made from the Mantle process. The process produces mold tooling suitable for production-scale injection molding of plastic parts. Precise details are possible through CNC cuts that complement the 3D printing. Watch video about the process at gbm.media/mantle.