MANTLE

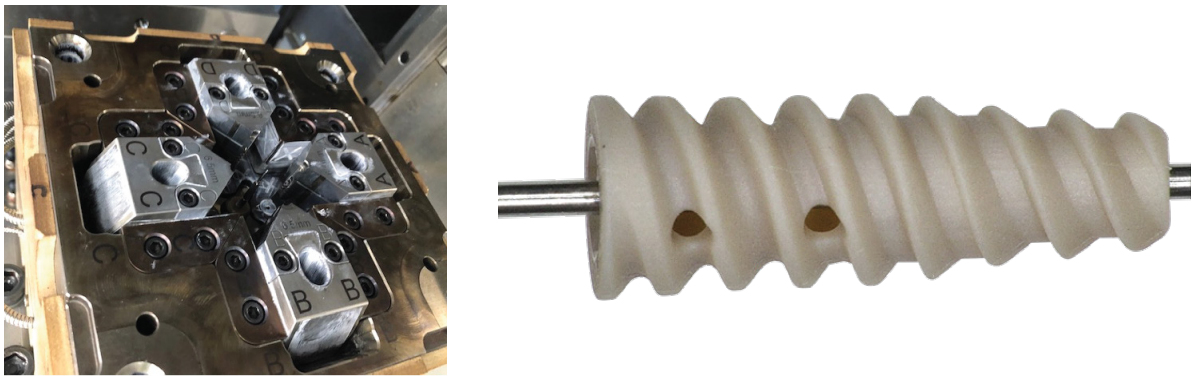
PROTOTYPE TOOL CASE STUDY

Mantle's 3D Printed Inserts Help Medical Device Manufacturer Reduce Lead Time for Prototype Tool from 12 Weeks to 4 Weeks For 1/3 the Cost

- Molded parts met 100% of demanding specifications for dimensions, mechanicals
- Mantle P2X material handled high molding pressures and temperatures without issue
- Mantle 3D printed insert accurate within 0.001" (0.025mm) with surface finish suitable for molding

Case Study Summary

A global medical device manufacturer wanted to assess if a new metal 3D printing technology from Mantle could reduce lead times and costs to produce molds while meeting the demands of high-temperature, high-pressure plastic molding. Using its TrueShape™ metal 3D printing process and P2X material, Mantle 3D printed four nose-detail slides. The slide inserts were then sent to a moldmaker, who installed them in an injection mold. The inserts were accurate within 0.001" (0.025mm) and no modification was required to their surface finish. The entire process of printing the inserts and fitting them in the mold took 4 weeks, which compared to 12 weeks if the mold had been made conventionally. The cost of the finished mold was $21,000, which compared to a cost of $63,000 for a conventionally-made mold. The manufacturer then injection molded parts using high-temperature engineering thermoplastic under high injection pressures. The manufacturer found that the molded parts met 100% of the requirements for geometric precision and mechanical performance.



Picture of the assembled mold (left) and molded part (right)

Customer Profile

A diversified global medical device manufacturer had extensive experience 3D printing both metals and plastics for end-use parts. They had also evaluated polymer and metal 3D printing technologies extensively to see if any were relevant for mold components. However, up to this point, the manufacturer had not found any that met their requirements so they continued to use traditional manufacturing processes to create metal tooling for prototype and production tooling. After learning about the benefits of Mantle's TrueShape™ precision metal 3D printing technology, they decided to participate in a study to evaluate the lead time, cost, and quality of Mantle's printed inserts to produce dimensionally critical parts that are injection molded in a high-temperature thermoplastic.

Product Challenge

Because of the medical device industry's emphasis on quality and patient safety, new product introductions can be time-consuming and complicated when traditional processes and materials are used. For many medical parts, the production materials and the production manufacturing process must be used during prototyping and testing to ensure safety and performance. This requirement means that 3D printed plastic parts often cannot be used during the prototyping phase. Instead, durable injection mold tooling is needed both for initial prototyping and later-stage trials.

The manufacturer's product is a complex, precise component that requires a thermoplastic that is challenging to mold because it requires high temperature and high pressure. Making a prototype tool for the product would normally take 12 weeks. Such long lead times would slow down the manufacturer's ability to develop and launch the product.

The Solution

Mantle's TrueShape technology and P2X material were used to print 4 slide-nose detail inserts. The inserts were printed in 39 hours, with a total production time for all 4 parts of 156 hours. The inserts, as supplied, required no work to meet surface requirements, since Mantle's printing technology can repeatedly achieve a surface finish of 1-3 µm Ra. Furthermore, the parts were accurate within 0.001" (0.025mm) for all critical dimensions. The only post-processing required on the insert geometry was to grind the faces to the shutoff and to cut in a 45-degree dovetail on the backside of the noses via wire EDM so the noses could be inserted in the mold.

Evaluation Results

All 4 inserts behaved just like standard P20 steel during EDM and machining operations. Once the grinding and wire EMD work was completed, which took a total of 160 hours, the molds were installed in an existing injection tool. A high-temperature engineering thermoplastic was run for 16 hours and produced 1800 parts. Afterward, the parts were subjected to metrology and functional testing. The manufacturer found that the molded parts met their stringent dimensional, mechanical, and aesthetic specifications. The total time to produce the prototype tool, including the time to print the inserts, was 4 weeks, a reduction of 66% compared to the normal 12-week lead time for such a prototype tool. The cost of the tool from the moldmaker was $21,000, a $42,000 savings compared to a quote for a conventionally-made tool.

Cost and Time Comparison: Mantle 3D Printed vs. Conventionally Made

Comparison Area	Conventional Inserts	Mantle	Savings
Time	12 weeks	4 days	66% Faster
Cost	$63,000	$21,000 (includes printing and mold/insert preparation)	66% Less Cost

Mantle helps manufacturers bring new products to life faster, cheaper, and more easily than ever before with its patented TrueShape™ metal 3D printing technology. TrueShape™ delivers precision inserts that dramatically cut the time and cost of making production-grade tools, molds, and dies. Mantle tools have been used to produce over one million end-use parts for customers - a number that grows each day. Mantle is headquartered in San Francisco, California. To learn more, visit mantle3d.com.

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