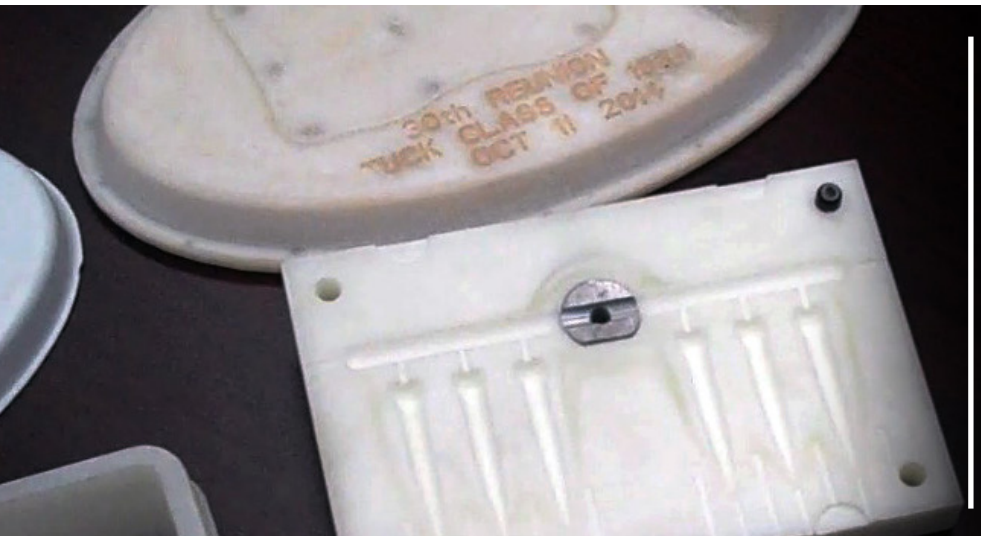


Making the impossible possible

Bi-Link takes the no-compromise road to producing 3D-printed injection molds and parts

It's not difficult to get a rise out of Frank Ziberna, R&D director for Bi-Link, a worldwide engineering and manufacturing company based in Bloomingdale, Illinois. Just tell him something can't be done.

Over the last three years, Ziberna and his colleagues at Bi-Link have heard all about the limitations of 3D printing for creating injection molds and production-quality sample parts: not fast enough, quality's not up to snuff, can't use production-level materials, molds can't stand the heat or pressure. Like the biblical David, Bi-Link has smitten all comers.

From months to days

Bi-Link currently uses three ProJet® 3500 HD Max printers from 3D Systems to produce injection mold tooling and sample parts. The ProJet 3500 HD Max is designed to produce functional plastic parts for professional-grade design and manufacturing applications. It uses 3D Systems' specially engineered VisiJet® M3 materials, offering UV-curable plastic in a range of colors, translucencies and tensile strengths.

The combination of 3D Systems' printers, advanced materials, and a proprietary post-processing tempering technique gives the finished molds greater strength than the original material, according to Bi-Link's president, Ray Ziganto.

The beneficiaries of Bi-Link's capabilities are electronics and medical manufacturing companies around the world—most of which can't be named because of confidentiality agreements—for which Bi-Link delivers what was previously thought impossible.

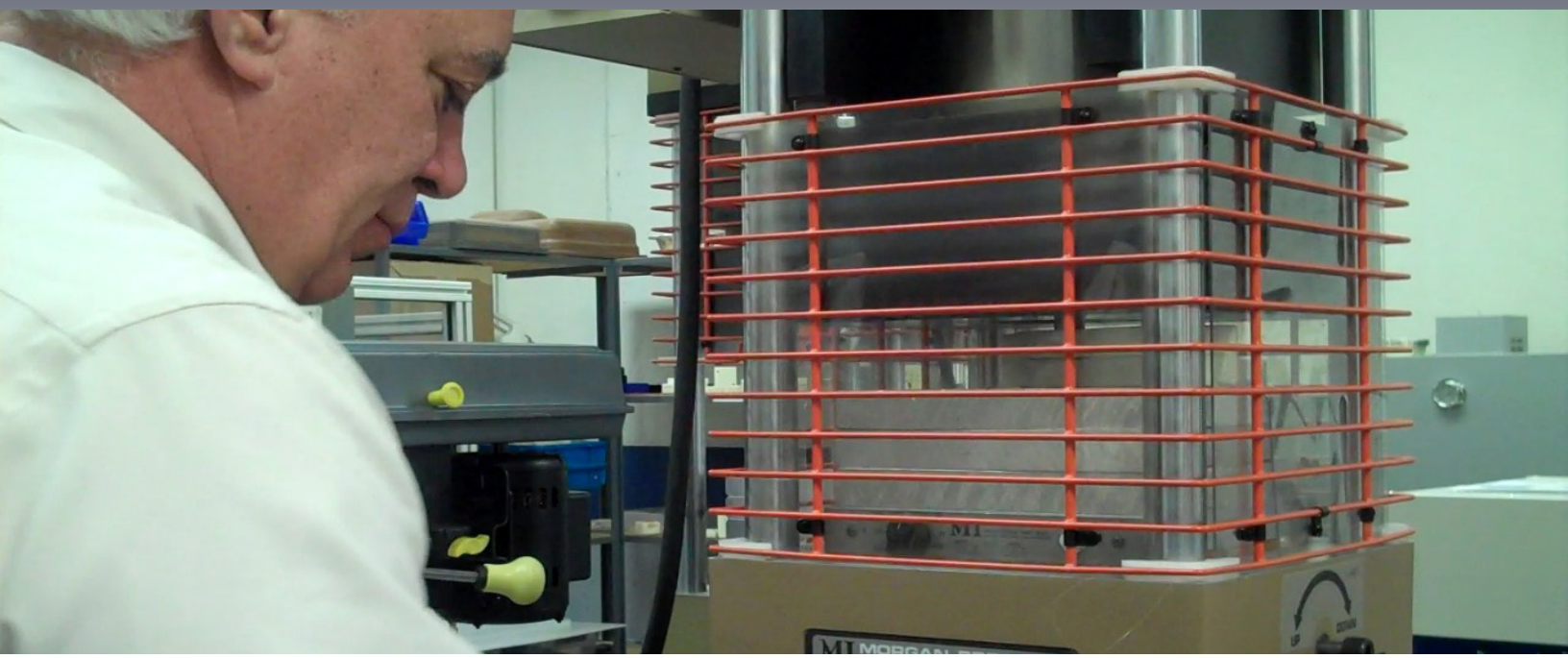
"Customers love this service," says Ziberna. "They would typically have to wait two to three weeks to get just tooling, never mind test parts. With the ProJet 3500 HD Max we made one customer four different part designs over the course of six days, shipping them 10-12 parts for each iteration overnight.

"That's a two- or three-month design and test cycle compressed to a week. For medical parts, we are creating the second and third revisions for a customer before competitors have even produced the first test part."

No compromises

The sample parts created by Bi-Link use the same material as the customer's production parts, whether it is liquid crystal polymer (LCP), polycarbonate, polystyrene, elastomer or other thermoplastic materials. Bi-Link has even developed 3D-printed molds for insert-molding applications.

"The customer doesn't have to cut corners or make concessions in design," says Ziberna. "We provide parts with the actual material they will use in production, so they don't have to make design adjustments or modify parts."



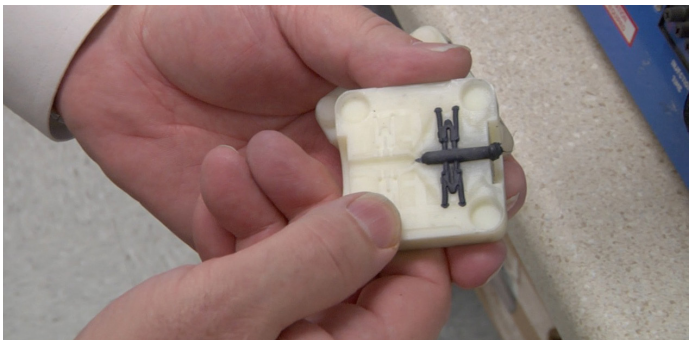
No corners are cut when it comes to performance, either. Bi-Link's molds often are subjected to temperatures of more than 600 degrees Fahrenheit and withstand several tons of pressure with no degradation, according to Ziberna.

"You can put the 3D printed mold in the Morgan (a small plastic molding machine) and exert eight to 10 tons of pressure and it doesn't mind," he says.

Forms, fixtures, insert mold tooling, hybrid tools, thermoforming -- Bi-Link can do just about anything up to 10 inches long. As many as 200 parts can be manufactured from a typical injection mold printed in the ProJet 3500 HD Max and finished with Bi-Link's tempering process. A customer that provides Bi-Link with a CAD file in the morning can be making parts the next afternoon from the 3D-printed mold.

The sample parts and injection molds aren't limited to simple patterns. Ziberna is happy to show the level of detail Bi-Link can achieve, rattling off features such as deep cores and recesses, tiny holes, clamp inserts in the mold, thin walls, small undercuts, and fine 1.5mm teeth.

"We make no concessions on tolerances," he says. "We demand the same quality for parts as we get out of a steel mold. Any part you can manufacture, we can produce from a 3D-printed mold -- exact material at a lower cost and one-fifth the lead time."



The customer perspective

One is tempted to believe some of this might be bluster, until the process is demonstrated in real time, the parts are examined closely, and a customer verifies everything Ziberna says.

Curt Thornton, principal engineer for surgical R&D at Teleflex, based in Research Triangle Park, NC, is happy to provide testimony. Teleflex is a global provider of medical devices used in critical care and surgery. The company uses Bi-Link for both prototype and production components, usually 100 parts or less.

"I've been really impressed with the insert molds that Bi-Link has made from the 3D Systems printer," says Thornton. "These tools really give us an assembly that represents a production process at a fraction of the cost."

Thornton says that Teleflex has used the 3D-printed molds to produce more than a dozen different components from materials that include polycarbonate, ABS (acrylonitrile butadiene styrene) and LCP. He expects 3D printing to continue playing a major role in his company's experiments with new designs and materials.

"You never know what new materials or processes will be required to produce a complete product. Bi-Link's 3D printing tools and expertise give us options for low-volume prototypes that were not available in the past."

A future so bright...

Naturally, Ray Ziganto, Bi-Link's president, has a vision for the future of 3D printing for injection molding and tooling.

"It's time to start looking beyond the obvious uses of 3D printing -- creating a physical representation of a CAD model -- and really challenge the capabilities of the technology," he says.

Ziganto sees a wider range of materials coming into the 3D printing mainstream, including greater use of metal and metal replacement parts for tooling and components, bio-compatible materials for implants and other applications requiring human contact, conductive materials for electronics, and elastomers for wearable products.

"I'd love to see the technology be able to better handle different variations of tooling for processes such as RIM (reaction injection molding), metal-fab/stamping and wire-forming," he says.

With 3D printing capabilities roughly doubling every 18 months for the last 10 years according to 3D Systems, it's a good bet that Ziganto's wish list will be fulfilled. In the words of Curt Thornton of Teleflex: "The future of 3D printing is limited only to one's imagination."