

# Rapid Injection Molding Speeds Products to Market at Table Mountain Innovation

Engineer Chris Crowley worked for four different companies over 18 years, and sat in the same seat the whole time. “The company kept changing names,” he says, “beginning as Ohio Medical and going through several acquisitions to end up as GE Medical Systems.” Today Crowley owns his own company, Table Mountain Innovation of Golden, Colo., where he consults with a variety of clients on medical and electronic device development. He hasn’t quite gone coast-to-coast yet, but he does have clients as far east as Wisconsin and west to Hawaii.

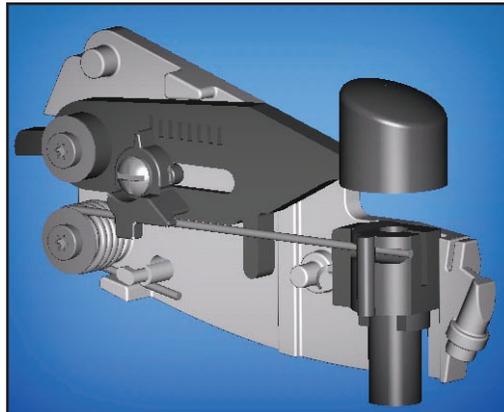
His specialty is electromechanical design, typically of smaller high-tech products. Recent projects have included an industrial thermometer, equipment for a coating process, and a specialized remote control for TV editing stations. “I wouldn’t be much help in the design of a crane or a building,” he says. But he does admit to years of experience with sheet metal, plastic and metal extrusion, injection molding, circuit boards, displays, silicone casting, die cuts, adhesives, fasteners, and a variety of other materials, along with printing, decals, and packaging, all of which he’s been able to apply to recent projects.

“Clients typically come in with a sketch,” says Crowley. “I generally get back to them within weeks with quotes, vendors, Pro/Engineer designs, and maybe even prototypes.” The quick turnaround is nothing new to Crowley. In his 18 years as an engineer or project manager, he brought 17 products to market. Considering that FDA approval of medical products can take between a year-and-a-half and two years, that’s a breakneck pace.

These days, Crowley is increasingly turning to Protomold of Maple Plain, Minnesota for quick turnaround on in-

jection molded prototype plastic parts for the devices he develops. He still uses stereolithography (SLA) for some early stage prototypes, but in many cases he needs more from his prototypes than SLA can provide. “When it’s time for functional testing, I need injection molded parts that look and feel like the finished product,” he says.

Crowley describes a recent experience with SLA prototypes. “We were working on a device with eight moving plastic parts fitted into a space less than 1.5 inches square. The SLA parts all fit together nicely, but when the customer pulled the ‘trigger’ on the device, the action was rough due to the build lines left by the layering process that SLA uses. And, of course, it wasn’t the same resin that we specified for production.”



As planned, Crowley had the next set of prototypes made by rapid injection molding in order to accurately gauge friction forces among the sliding parts. The device’s internal parts were molded of acetyl for its wear resistance and self-lubricating properties; the housing was molded of polycarbonate for strength. As expected, the customers were a lot

happier with the feel of the mechanism’s injection molded parts. “I knew that injection molded parts would look, feel, and perform better than the SLA prototypes, but I was stunned at the degree of difference,” Crowley says.

Crowley points out another advantage of rapid injection molding for prototyping. “Everyone knows the value of rigorous functional testing of prototypes,” he says. “But what they sometimes forget is the manufacturability of the part. The problem with additive processes like stereolithography is that they will faithfully reproduce parts that are difficult, expensive, or just plain impossible to injection mold.”

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“Rapid prototyping (RP) methods, SLA for example, make it easy to create one copy of a part that will be a nightmare to manufacture when you want ten-thousand. If you use only RP, you can go all the way through prototyping of a complex part and never know that a problem exists. With Protomold, that can't happen. Because it's real injection molding, they know – and you know – if the part has manufacturability problems. In a lot of cases, you don't even have to wait for the prototype. Protomold's ProtoQuote™ online quoting engine automatically points out undercuts, along with other problems like thick or thin walls or sharp radii, when you submit your 3D CAD model. That can save my clients a lot of money and headache. And because I usually see a project all the way through production, I'm the first one who'll feel the headache.”

Crowley has ordered a lot of prototypes and injection molded parts over the years. “But,” he says, “until now, I've never gotten custom parts in four days.” Before discovering rapid injection molding, he ordered functional prototypes from traditional injection molders. These used standard steel molds, took eight weeks or more to manufacture, and could cost ten times what he pays for rapid injection molded parts today. At least half the time, those prototypes from expensive hard-steel molds pointed out the need for further changes.

Crowley cites the example of a “drop test.” If a part failed in testing, the solution might be a change in resin. But, he says, if you need a particular resin for its temperature range or chemical resistance, the solution might be thicker walls or supporting ribs. That meant welding, e-cutting, or otherwise retrofitting the original steel tool and remaking the part, a process that could be both costly and time consuming. Today, with parts made by Protomold in aluminum molds, altering the original mold is still an option, but in the worst case a whole new mold can be milled in a few days for very low cost.

Crowley's first experience with rapid injection molding was a revelation. “I sent CAD drawings for a prototype part to our standard molder and to Protomold on the same day. The Protomold quote came back in two hours and was low enough that I could simply expense it. I placed

the order and got the parts five days later. Three days after the parts arrived I finally received a quote from the standard molder. Needless to say, the difference in price reinforced the decision I had made.”

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Crowley sees value in rapid injection molding beyond just prototyping. “Hard steel tooling can be good for millions of parts,” he says, “but many manufacturers never make that many parts from a mold. For many of the kinds of projects I work on – medical devices or industrial and capital equipment – a manufacturer may make only a few hundred assemblies a month. An aluminum mold like the ones Protomold uses works perfectly well for low to medium quantity production. If the mold ever does wear out, Protomold will replace it at their cost. They get you to market faster, provide you with the parts you need for ramp-up, and make it easier and less expensive to make changes downstream. That's hard to beat.”

“Working with Protomold is fun,” says Crowley. “You send your CAD file; you get back beautiful pictures of areas that might be problematic; you make any necessary changes; choose your resins, quantities, finishes, and delivery times; place the order; and then parts appear like magic a few days later! A lot of the company is automated, but I've got a customer representative named Kristy who keeps an eye on my orders, answers my questions, and generally takes care of me. I'm happy, and my customers are happy. No vendor is perfect, but Protomold sure comes close.”

*For more information on Table Mountain, visit [www.tablemountaininnovation.com](http://www.tablemountaininnovation.com). For more information on The Protomold Company, visit [www.protomold.com](http://www.protomold.com).*