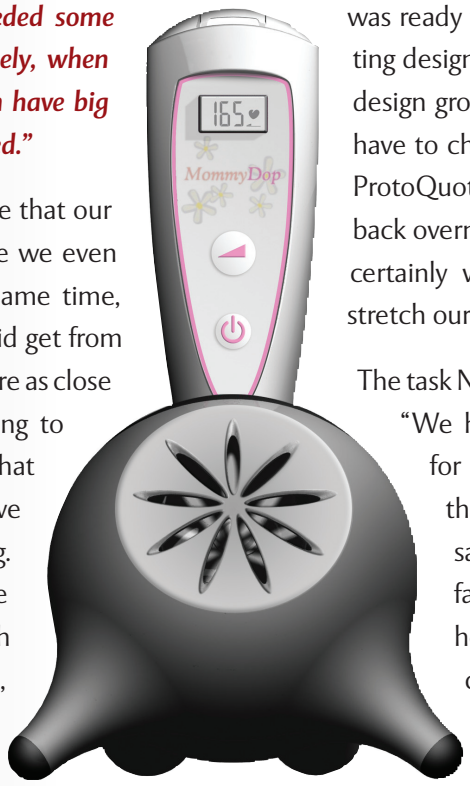
Newman Group Makes Sound Prototyping Choices

Sometimes, Spencer Newman, president of The Newman Group, a medical device manufacturer, wishes he'd discovered Protomold® and First Cut Prototype® a little sooner. "A while back, we were developing our first product and weren't yet aware of all the available tooling options. We thought we had completed the prototyping stage, so we went ahead and had very expensive steel tools made," says Newman. "It turned out that we weren't quite there and needed some minor changes in the design. Unfortunately, when it comes to steel molds, little changes can have big price tags, so it was a difficult lesson learned."



"We now go to great lengths to make sure that our design is fully tested and reviewed before we even begin to consider steel tooling. At the same time, however, we needed one thing that we did get from steel molds, and that was prototypes that are as close as possible to the product we'll be taking to market. We knew we couldn't count on that with additive prototyping methods, but we didn't want to spend more on steel tooling. Fortunately, the industrial design group we work with directed us to Protomold, which gives us parts that are injection molded, just as they would be in steel molds but at a fraction of the cost."

The Newman Group's first product is the BabyBeat Doppler, a fetal ultrasound system designed for home use. "In the past, ultrasound was a relatively complex procedure that needed to be performed in a doctor's office," says Newman. "But it's becoming more common now, in some pregnancies, for doctors to recommend that families rent a system for use at home. The problem is that conventional ultrasound systems are designed for use in an office setting and are, frankly, clinical in design. Our goal was to come up with a user-friendly system specifically designed for a mother, not a healthcare professional."

Like most modern medical devices, the new ultrasound system depends heavily on plastic components. Newman readily admits that he is not a plastics expert, but has gotten a lot of useful information and personalized feedback from Protomold's ProtoQuote® online quoting system. "ProtoQuote is great for speedy quotes, but I especially appreciate the free design analyses it provides," he says. "Well before I was ready to have prototypes made, I started submitting designs to ProtoQuote for feedback. Our outside design group could have given us feedback, but they have to charge us every time they evaluate a design. ProtoQuote, on the other hand gives us detailed feedback overnight and it doesn't cost a cent. ProtoQuote certainly won't replace our engineers, but it does stretch our design budget."

The task Newman had taken on was a substantial one. "We had looked at existing ultrasound systems for some time and began to wonder whether the basic designs could be improved," he says. "Most of the systems out there are fairly similar in design; they use a sensor head consisting of both transmit and receive components, which is placed against an expectant woman's belly to pick up the heartbeat of the developing fetus. Because of the way sound waves travel through tissue, the design of the sensor head is essentially a geometric exercise; its performance is affected by the parameters at which sound is generated and captured. We had looked pretty thoroughly at the electronics and were wondering whether the mechanical aspects – the geometry – could be improved."

Newman's redesign of the sensor head began on graph paper and then progressed to spreadsheets. "Performance depends on the depth and area of intersection of the transmit and receive signals to pick up the fetal heartbeat," he explains.

"Anyone who has seen a mother's belly grow through a pregnancy knows that those can vary a lot from 10 or 12 weeks, when the heartbeat can first be measured, to the time when baby starts kicking; that's the period when the Doppler is typically used. In looking for a design that would work across that entire range, we did calculations and considered different cross sections of the sensor head to see what made the most sense on paper. We also had some questions on how some different configurations of adding or subtracting plastic might affect the performance, but no spreadsheet could provide that answer."

"Numbers on paper are fine for a good start, but we needed to actually test prototypes to see how they work in the real world. We knew that additive processes like SLA or FDM wouldn't work for us, because, while they can approximate the shape of a part, their layering processes can leave voids in the finished part. That might not matter so much in some applications, but voids definitely affect ultrasonic properties. Since ultrasound is critical to what we were doing, we needed prototypes that would be as solid as actual molded production parts."

"While we were working with Protomold, we had gotten an email from their parent company, Proto Labs, about First Cut Prototype, Protomold's sister division. Unlike Protomold, which works from molds, First Cut produces prototypes directly by milling them from blocks of solid material. First Cut's process produces parts in a wide variety of materials. These milled parts are very similar to molded parts, but less expensive if you just need a few of each part. Having Protomold make prototypes costs a lot less than traditional molding, but since we needed just a few copies each of a number of different configurations, First Cut was significantly less expensive than Protomold would have been."

"We had narrowed our design choices down to a handful of combinations of transmit and receive angles along with a variety of wall and cavity configurations. I don't remember exactly how many different total parts First Cut made us – it seemed like a ton – but the cost let us test everything we thought might work. As we got the parts from First Cut, we'd glue each one into the sensor head and then solder the assembly onto the system for testing. By the time we were done, we felt we had a clear winner that outperformed competitive offerings.

"Now that we've finalized the design, we're having Protomold make parts for our product launch in 2008, and will have them continue to manufacture for us, at least for the time being, as the product is rolled out. We think we're very well positioned in this market. Our value proposition is simple: professional performance at a consumer price. The system is easy to use, which is important both because the application is so important and because the folks who will be using it already have a lot on their minds. We are also looking forward to additional applications in vascular assessment. And if the product needs additional modification as we move forward, we know how to get it done quickly and cost-effectively."

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"We now use First Cut's FirstQuote® online quoting system along with Protomold's ProtoQuote. Either way, you just upload a 3D CAD file and get your quotes and analysis the next day. On the current project, we ran several CAD models through ProtoQuote and got suggestions regarding undercuts, wall thickness, and draft. We then worked with the mechanical engineers to work the suggestions into final designs. Those went to First Cut for the test prototypes. By the time we went back to Protomold for the initial production run, we knew we had the right design, and that we'd addressed any potential moldability issues as well."

"We know there are other molders and other CNC machining shops out there, but we haven't found anyone who makes it as easy as First Cut and Protomold do. We're a small shop and we get pulled in a lot of different directions by the demands of the development process. We appreciate anyone who can make things easy for us. We foresee a lot of growth in our future, both with consumers and, potentially, into the professional market. It's nice to know that partners like First Cut and Protomold will provide us with the resources we need to do that."