



# Innovation Comes to Life with 3D Printing

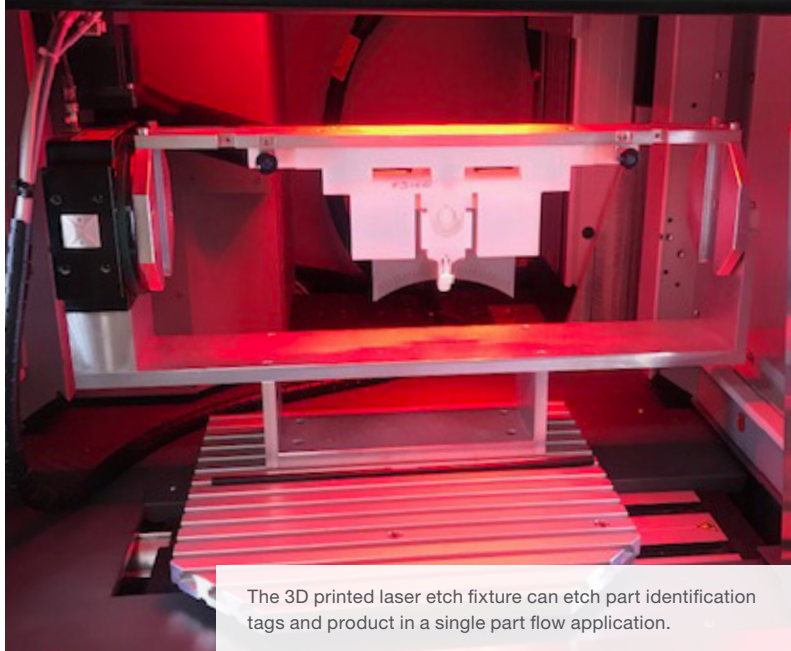
Tooling Becomes the Critical Path at Medtronic

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The Warsaw Medtronic site has utilized FDM printers to help many projects achieve faster speed-to-scale reaction times by reducing the process development times and cutting costs. The printers allow our engineering teams to prototype complex designs and build several iterations of fixtures to ensure we deliver the best possible processes at a fraction of the traditional costs.”

Duane Wilson

Director of Engineering, Medtronic RTG Division



The 3D printed laser etch fixture can etch part identification tags and product in a single part flow application.





Tooling Group, Medtronic RTG - Warsaw

# Time is Everything

As a global leader in the medical device industry, Medtronic's core mission is to transform healthcare through innovation. Central to that is its ability to streamline the production process and get products to market faster. At Medtronic's Restorative Therapy Group (RTG) division, in Warsaw, Indiana, 3D printed gages, jigs and fixtures are the silent heroes that keep manufacturing running smoothly. They support multiple CNC & other machine platforms in a 24/7 production environment. Since the manufacturing areas are arranged as production cells, the modularity of the designs fit each individual cell's needs. They are also helping in metrology, quality control, assembly, laser etch and even maintenance. 3D printed items are used to hold,

position, protect, organize and assemble at all stages of the manufacturing process.

While 3D printing jigs and fixtures saves significant dollars and time versus machining, the financial impact comes from maintaining continuous flow of the production line. Richard Booth, a senior design engineer for gages, fixtures and jigs for over 17 years at Medtronic's RTG division emphasizes, "Time is everything. With 3D printing, if an engineering request comes through and a jig needs to be changed for production to continue, it can be designed, printed, and ready within hours or days vs. two to three weeks with our internal machine shop or six to eight weeks with an outside vendor, at a significant savings."

# Accelerates Time to Market

3D printing is transforming how jigs, fixtures and gages are manufactured at Medtronic — from lightweight alignment tools to holding devices that improve ergonomics, safety, production operations, and time to market.

Tooling becomes the critical path to the launch of Medtronic's innovative, new products and this is where 3D printing really has an impact — accelerating the time to market. The tooling group is often brought in very late to the process, with high urgency, to create the needed jigs and fixtures to get production up and running efficiently. With 3D printing, the team can have the designs complete, printed, and ready to go within one to five days, drastically reducing the time it would take if produced by the internal shop or an external machine shop. This means products are available for hospitals and physicians to use sooner.

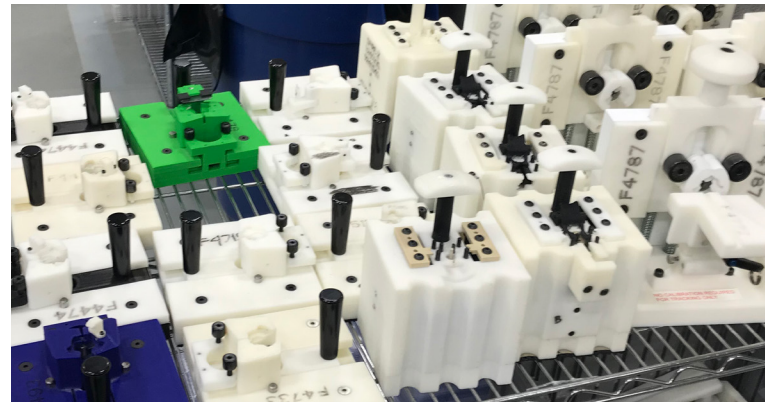
An additional advantage of 3D printed jigs and fixtures is that they can easily be modified or tweaked at minimal or even no extra cost. If a fixture needs to be replaced or modified to keep production running, it can easily be redesigned and printed within hours and put back into production. The ability to reproduce in multiples so manufacturing can have several sets of fixtures in production at the same time further increases efficiency. For example, while one fixture loaded with product is being processed, another loaded fixture can be traveling to the next operation. All this increases availability of these life-saving innovations to clinicians and, ultimately, delivers the best available care to patients.

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Time is everything. With 3D printing, if a change notification comes through and a jig needs to be changed for the various production processes to work, it can be designed, printed, and ready within twenty-four hours vs. two to three weeks with our internal machine shop or six to eight weeks with an outside vendor at a significant savings.”

Richard Booth

**Senior Design Engineer, Medtronic RTG Division**



3D printing provides the freedom to design lightweight, complex and ergonomic gages, jigs and fixtures.



3D printed inspection gages.

# Unlimited Design Freedom and Precision

To manufacture jigs, fixtures, and gages, Medtronic has turned to FDM® (fused deposition modeling) printers because they provide the freedom to design lightweight, complex, ergonomic shapes that make manufacturing more efficient. Employing industrial-strength thermoplastics means reliable manufacturing aids for product assembly, including alignment tools, part identification gages, and holding devices, all designed to stand up to the rigor of a harsh production environment while meeting medical industry standards. Printed to precise specifications, they are a perfect fit for the job. “Traditional manufacturing methods cannot deliver the shapes or the level of precision needed,” according to Booth. FDM can hold tight tolerances in complex geometry and can build much faster and more repeatable than traditional machining. This is very important when duplicate fixtures and gages are needed. FDM can also produce features that are not possible to create by any other means.

Now, with unlimited design freedom and the speed with which 3D printing can produce parts, designs of all shapes and sizes can be optimized

— whatever their complexity — through several iterations on demand, with ease. “Best of all,” according to Booth, “Complex geometries can be produced at no additional cost, whereas with machined jigs and fixtures we were often limited due to the high cost of production. For example, an FDM fixture that costs \$1,000 to build internally could potentially cost \$20,000 when machined on the outside. On average, we estimate FDM parts cost 80% less to produce when compared to machined parts. Over a four-year period we estimated a \$6 million savings versus what would have been spent if we had contracted the parts to an outside machine shop.”

Workstation being outfitted with 3D printed tooling mounts and holders.



# Safety First with Ergonomics Personalized

Jigs and fixtures don't replace people at Medtronic, but instead, make their work easier and more efficient. The materials used in 3D printing are lighter than metal, reducing the load on workers and improving safety. Also, unlike solid metal, FDM jigs and fixtures can be printed with a variable-density infill to further reduce weight.

Jigs and fixtures with complex, ergonomic designs are easily produced to improve worker interaction and comfort. Customizable guards and lightweight holding devices serve to reduce workplace injuries.

For example, Booth says, "Lighter tools and jigs are easier to move — cutting the risk of repetitive strain injury for operators and making the process more efficient. And safer working conditions positively impact worker productivity." The bottom line: "3D printed tools enable custom designs to best fit the requirements of the user and the operation. Personalized tools are easier to use, boost productivity, and create a better working environment all the while reducing process time, improving efficiency and time to market."



Storage for laser-etched fixtures.

# Digital Inventory Saves Physical Space

Physical storage space and its cost, along with end of life disposal, are often areas of concern with traditional jigs and fixtures. With FDM printed parts, digital libraries are being used to store the source files instead of renting or maintaining storage spaces for tons of equipment.

To Medtronic, meaningful innovation is a corporate commitment to improving patient lives around the globe. By streamlining the production process to get products into the hands of health care practitioners around the world faster, 3D printing has become an integral component of that goal, extending beyond new product development into manufacture and cost-effective delivery of care.

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