

3D Printed Jigs and Fixtures

More Profitable Production for Your Factory Floor

Whether you know them as jigs and fixtures or simply manufacturing tools, these production aids are a key part of the manufacturing process. For decades they've been machined from metal and welded or assembled together. But traditional material and fabrication methods are time-consuming and expensive and can mean decreased efficiencies on the floor as well as increased costs. There's a better, faster way to make jigs and fixtures that can lower your costs and increase efficiency while also making them more ergonomic. It's called 3D printing.

3D printing has moved beyond just prototyping. Its ability to dramatically lower production times and costs, often while increasing functionality. What's at stake is the ability to improve your current operational efficiency, as well as the ability to capitalize on new product and market opportunities.

If you haven't considered 3D printing in your manufacturing operation, you're missing an opportunity to streamline production and lower cost.

Leveraging the Power of 3D Printed Manufacturing Tools

Jigs and fixtures are widely used throughout manufacturing in both fully automated and manual operations to help improve quality, decrease cycle time and reduce costs.

Going beyond jigs and fixtures, manufacturing tools that serve as operational aids further broaden the opportunities. They range from organizational bins and tool holders that maximize production efficiency to templates, guides and gauges to quickly check production quality. They include sophisticated robotic end-effectors and rudimentary trays, bins and sorters for conveyance and transportation. No matter the name, description or application, manufacturing aids increase your profit and efficiency while maintaining quality.

Despite these benefits, many manufacturing facilities don't use them to their fullest. That's usually the result of a traditional manufacturing mindset that associates making these tools with long lead times and high cost. However, 3D printing stretches limited resources by providing a simple, automated, fast and inexpensive way to fabricate jigs and fixtures. When you substitute 3D printing for traditional tool-making methods, you can reduce their manufacturing cost and accelerate delivery. In many cases, the savings you achieve more than justifies the investment in a 3D printer.

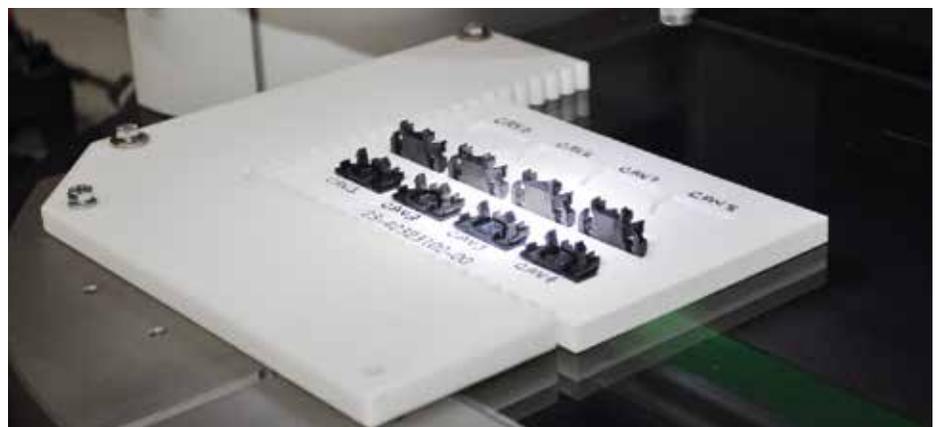
But there's an even larger impact on the bottom line: 3D printing lowers the justification threshold for a new tool by simplifying the process, lowering the cost and decreasing lead time. This allows you to potentially address unmet needs throughout the production process, adding more tools where they were previously difficult or impossible to justify. The more manufacturing tools you deploy, the more opportunity you'll have to increase efficiency and lower cost.

With 3D printing you have the power to:

- Improve process throughput
- Lower inventory costs by producing on demand
- Re-apply skilled workers more productively
- Reduce scrap and rework



Thogus Products is an injection molder that specializes in low-volume manufacturing and highly engineered materials. By 3D printing their factory-floor tooling instead of outsourcing, Thogus achieves dramatic cost savings. In one particular example, Thogus produced a 3D printed CMM fixture overnight, saving 70-90% on lead time compared with outsourcing.



"The machine shop wanted \$1,500 for the fixture. I made it for less than \$200 in materials."

Natalie Williams, Thogus quality manager

Better Design, Better Performance

3D printing not only lets you make tools faster and for less cost, it also optimizes tool performance through improved design. If you think your existing manufacturing tools are sufficient to get the job done, you're not alone. Many manufacturers believe it's just too expensive and time-consuming to redesign tools to optimize their performance. This "good enough" approach, even if it increases cycle time or adds to the scrap rate, might seem justifiable as the cost of doing business to meet production schedules. The truth is, this is the wrong mindset, because it's based on a conventional manufacturing philosophy.

3D printing reduces the cost of producing a tool and gets it into useful service by the very next day. While a redesign may only drive out a few seconds from an assembly operation, that time adds up. If the fixture is used to make 500 items per day per worker, a two-second savings reduces direct labor by 70 hours per person per year. For the same part, a one percent reduction in scrap saves 1,250 parts per year. Putting more jigs and fixtures into service with optimized designs means a nice bump to your bottom line.

Solaxis Ingenious Manufacturing is a tooling supplier to companies in the transportation industry. Solaxis redesigned and 3D printed a jig used to assemble automotive door seals that shaved four seconds off each assembly cycle. Although four seconds may seem like a small number, the supplier that uses the tool performs 250,000 assembly cycles per year. The result is a labor savings of over 270 man hours. The original 150lb. weight of the tool was also reduced to only 28 pounds, making it much lighter and more ergonomic.



"Just that cycle time gain alone justifies the price of the jig, so their ROI is achieved within 12 months."

Francois Gilbaut, Solaxis Ingenious Manufacturing president

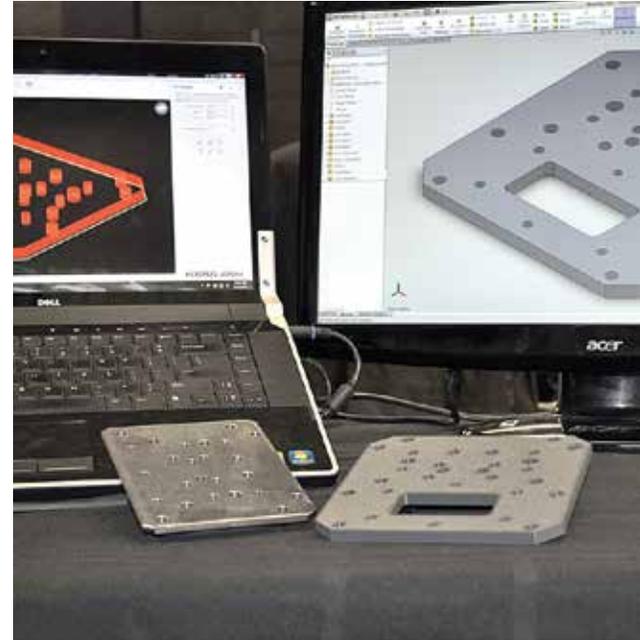
Cost Breakdown

Start with Jigs and Fixtures . . . Then Production

You aren't alone in wondering how to justify the cost of a 3D printer. But one of the quickest ways to achieve ROI is to implement broad use of 3D printing through the many opportunities for jigs and fixtures, manufacturing aids and organizational devices. The design freedom available to you for 3D printed jigs and fixtures, the ease of implementation, as well as the cost savings with AM mean financial justification gets a quick start with 3D printing.

Then carry the savings out to the production floor and calculate the reduction in labor costs and profit gains from speeding your product to market.

Two manufacturers found one-year jigs and fixtures profit gains ranged from \$60,000 to \$230,000 from just a few fixture-related applications.



55

—
seconds saved
per PCB

Digi Electronics

Conformal coatings protect sensitive electronic components at Digi. Prior to 3D printing, Digi would purchase machined aluminum carriers for printed circuit boards (PCBs), and prior to the coating process, technicians would manually apply tape to mask uncoated components.

Each board took 60 seconds for technicians to apply and remove the tape. Over its total production runs, the labor cost would be \$135,000.

With hybrid carrier and masking fixtures produced through FDM® additive manufacturing, Digi reduced masking labor by 55 seconds per PCB – for a yield of \$123,750 in labor savings.

Rapid Prototype + Manufacturing LLC (rp+m)

Rp+m is a strategic partner of Thogus, a custom plastic injection molder. Patrick Gannon, engineering manager, says brightly colored production aids can be found everywhere on the floor. From their focus on 5S operational efficiency to the quality assurance lab, rp+m is forward-thinking with their use of 3D printed jigs and fixtures. Gannon cites one fixture used extensively in the inspection process which will save Thogus \$23,625 by eliminating seven hours from the inspection process for each batch. Gannon expects a minimum of 10 similar situations each year for a total savings of \$230,000. With results like these, Thogus has easily justified its investment in rp+m's six FDM additive manufacturing machines.

7

—
hours saved
per batch

Print On Demand

It often takes more resources to inventory jigs and fixtures than it does to remake them, so companies adopt a management approach called digital warehousing where only the digital file is carried in inventory. It may seem unthinkable to scrap a perfectly good manufacturing tool, but for those with infrequent use, this approach reduces cost and labor.

Instead, you simply make a fixture when it's needed, and then digitally warehouse its design for future use. This print-on-demand approach is also handy for replacing a broken tool or when you need duplicates to meet increased production demand.

If you're new to 3D printing, service bureaus can provide you with a simple, low-cost service to get introduced to the benefits of 3D printed tooling. They bring expertise, flexibility and finishing services that accelerate results. They're also a good answer for organizations that experience capacity constraints and need help with additional production or projects that require special materials that aren't available in-house. [Stratasys Direct Manufacturing provides a wide range of technologies and materials to solve your tooling needs.](#)

Maximize Production Efficiency

3D printing can lead to big changes that maximize profits by driving out every wasted second and penny from the manufacturing process. But that's not to say that 3D printing is an outright replacement for traditional manufacturing methods. Rather, 3D printing should be viewed as a complementary technology that adds value and opens new possibilities. CNC machining, injection molding and other conventional manufacturing methods still have their place. But as this solution brief has shown, 3D printing jigs and fixtures is one area where the technology can make substantial improvements in efficiency and cost reduction.

If you have a CAD file and access to a 3D printing system, you are ready to start making manufacturing tools with as little as 15 minutes of hands-on labor. Combine the simplicity with typical time and cost reductions of 40 to 90 percent and you will understand why 3D printing spurs companies to make more jigs, fixtures and other manufacturing tools than ever before. Perhaps most importantly, starting now with jigs and fixtures and other tools puts you and your manufacturing team on the path to rethinking your production process and even your business model.

To reach these achievements, many companies rely on the Fortus 450mc™ and Stratasys F900™ 3D Printers. That's because unlike other 3D printing platforms, the Fortus 450mc and F900 have a proven record of reliability, consistent build results and are easy to operate. They're based on the FDM (fused deposition modeling) process, a proven 3D printing technology. These printers also give you the broadest array of engineering thermoplastics to choose from, including high-performance materials such as FDM Nylon 12 Carbon Fiber, PEKK and ULTEM resins.

Consider this: what would the ability to easily and quickly create tools that save time on a multitude of tasks mean to your production schedule and your organization's bottom line? [Contact a Stratasys representative to find out.](#)

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