SOLUTION BRIEF

3D Printing for the Factory Floor

Leveraging the Strength of Carbon Fiber

Your goals are clear: high productivity and worker safety, low cost and materials that can withstand the rigors of a manufacturing environment. Traditional manufacturing has its place but it's not the only path to strong parts. Additive manufacturing (AM) using carbon fiber-filled nylon material 3D prints strong, lightweight parts with a high strength-to-weight ratio for rapid prototyping, short-run production parts and even production-grade parts. Factory floors that capitalize on the powerful combination of traditional machining and additive manufacturing realize the most efficient, cost-effective scenario. 3D printing with carbon fiber gives you strong, complex, customizable parts for needs ranging from functional prototypes to full production runs. You can reduce the weight of tools and manufacturing aids and customize them so they're more ergonomic, comfortable and easy to use. The lightweight strength and stiffness of carbon fiber-filled material enables a streamlined process from initial design all the way through manufacturing. Your floor becomes more efficient. Barriers are eliminated, cost and lead times are cut and worker lost-time injuries are reduced. This solution brief demonstrates not only the benefits of 3D printing with high strength-to-weight materials like carbon fiber, but also provides a path to a full-circle solution integrating 3D printing on your factory floor.

Adding 3D Printing to Your Factory Floor

CNC machining isn't going away for long-runs of strong parts. But 3D printing with strong, lightweight, stiff materials like carbon fiber means additive manufacturing can supplement current factory floor processes, adding value in time-to-part, design freedom and complexity. The key is identifying exactly where on your floor AM can help reduce costs of tooling and maintenance and repair. Sometimes, identification of key use cases for AM can be provided by factory floor workers. But this isn't the only place to get insight into the value of AM on your factory floor.

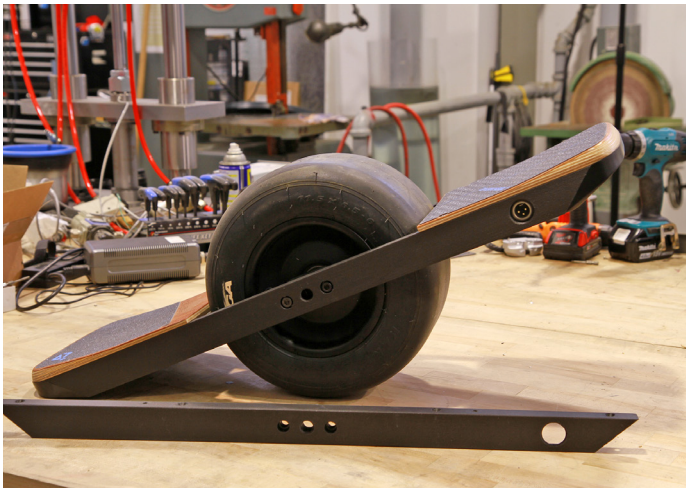
Start by identifying your pain points. Then move to factory floor applications that can be improved by shorter production timelines, which can improve your bottom line. Finally, seek the services of experts in the field of AM strategy and deployment for cutting-edge solutions.

Roadblocks To Efficiency
From worker lost-time to production line inefficiencies, to maximizing production equipment utilization, anything that stands in the way of efficiencies costs you money. Eliminate waste, reduce inventory and learn how to implement smart manufacturing with an IoT-connected factory floor.

Tooling Applications
Non-ergonomic tools can cause worker injury resulting in worker downtime. Long tooling production timelines as well as a lack of surrogate parts are all areas where AM can improve your efficiencies and decrease costs.

Seeking The Right Advice
You need AM advice that doesn't fit a particular process but rather advice that fits your production line. A full-circle AM solution begins with the right strategy from an Expert Services team. The right advice answers not just if AM fits into your workflow but how. A Factory Floor Walkthrough with AM experts can further pinpoint key areas for greater production throughput and help identify time and cost savings.

The Strength Of Your Material Matters



Carbon fiber-reinforced thermoplastic meets the demanding needs of the production environment and can be a replacement for metal tooling. With a blend of Nylon 12 resin and chopped carbon fiber, at a loading of 35% by weight, this material has the highest flexural strength of any FDM® thermoplastic. Carbon Fiber delivers the strength and stiffness you need for rigid tools, prototypes and production parts. Even functional prototypes for the frame rails on a OneWheel motion device.

Know The Limits Of Traditional Manufacuring

Keep Your Factory Floor Humming

Rapid prototyping may be the AM term you're most familiar with but it isn't the only rapid process for 3D printing. Thanks to strong material properties such as carbon fiber, rapid tooling can mean less downtime when tools fail. 3D print replacement parts fast that have the strength necessary to hold up in a production environment. Jigs and fixtures 3D printed with FDM Nylon 12 Carbon Fiber are not only lightweight but have the strength to get the job done, either as stop-gap replacement tools or functional prototypes.

Reduce Downtime
Downtime is lost revenue. With 3D printing you can have your part replaced in a fraction of the time of traditional tooling methods. All with user-friendly software that makes everyone a 3D printing expert.

Increase Efficiencies
Need a new tool to improve your line efficiency? With 3D printing you can design in GrabCAD Print™, then move seamlessly to print, all in less time than traditional manufacturing with comparable strength and less cost.

Decrease Waste
Additive manufacturing by its very nature is less wasteful than traditional machining. Instead of cutting material away to form a piece, material is added layer-by-layer to form a part that has essentially no waste. This is not only more cost-effective but more green.

The Right Material Can Drive Design

Thule Embraces FDM Nylon 12 Carbon Fiber

A big user of 3D printing, one hurdle remained for the outdoor company, Thule – the ability to print prototypes with the stiffness and strength of fiber- or glass-reinforced injection molded parts that would enable the company to perform functional testing. Early adopters of FDM Nylon 12 Carbon Fiber, the company can now move beyond design validation to actual road-testing of clamp mechanisms for products like their rooftop kayak rack.

"We've made rotating parts, like our clamp mechanism that has teeth that fit into each other that wouldn't hold up without the capabilities of Nylon 12 Carbon Fiber. They'd break off or bend completely over, without breaking."

– Rob Humphries, prototype engineer, product development at Thule

Strong Manufacturing Applications

3D printing's value for manufacturers lies in its ability to reduce cycle time and lower cost. The combination of 3D printing's design freedom and Stratasys' material capability and reliability gives manufacturers powerful leverage to achieve economical customization, short-run production and functional prototyping.

High-strength materials, like FDM Nylon 12 Carbon Fiber, let you replace heavier metal materials to create lighter parts and tools.

Consider the following use cases as you look for opportunities within your production operation to lower your manufacturing and product development costs.

Manufacturing Aids
Fast production of fixtures, jigs, check gauges and inspection tools lets manufacturers improve task cycle time efficiency, reduce tool cost and get more tools faster than traditional means.

Functional Prototypes
High-strength materials make functional prototyping achievable, reducing development time, lowering development cost and accelerating time to market.

Ergonomic Optimization
3D printed tools are lighter and can be optimized for specific tasks, increasing worker safety and job efficiency.

Use Case Highlight

Utah Trikes

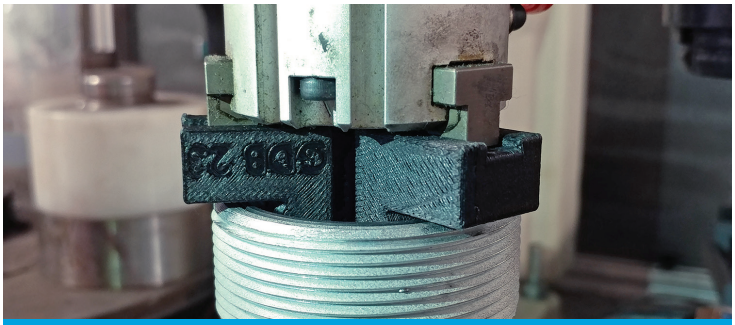
The ability to use Stratasys FDM Nylon 12 Carbon Fiber in all stages of the manufacturing process gives Utah Trikes more time to perfect their designs. The company uses 3D printed nylon 12 carbon fiber for prototypes, tooling and short-run production parts due to its superior mechanical properties. Being a manufacturer of customized products, 3D printing with FDM Nylon 12 Carbon Fiber gives Utah Trikes the ability to reduce product development time.

"Stratasys FDM Nylon 12CF™ parts can be printed faster, with superior stiffness-to-weight performance and with better repeatability than any other 3D printing technology we've seen."
– Ashley Guy, Utah Trikes president and CEO

Use Case Highlight

Dixon Valve & Coupling

Dixon Valve & Coupling relies on 3D printing to reduce their manufacturing costs with strong, rapidly-produced tooling in the form of gantry locators, fixtures and holding jaws. Labor is a significant expense for Dixon and the ability to 3D print these tools dramatically reduced that cost, quickly justifying further investment in 3D printing.



"We saved 88% in time and cost by using 3D printing versus standard manufacturing."
– Rodney Everett, Dixon Valve & Coupling industrial engineer

MULTIPLY YOUR TOOLING CAPABILITIES

Tooling applications are one of the largest opportunities you have to gain the time, cost and ergonomic efficiencies of 3D printing. Because Stratasys 3D printers work with a broad variety of thermoplastics, including high-strength carbon fiber nylon, PEKK and ULTEM™ resins, you can apply 3D printing to multiple tooling applications.

Common manufacturing aids like holding fixtures and other production line tools are easily implemented and represent a vast opportunity for savings with 3D printing. Essential to the production process, these tools are usually prevalent on the factory floor. However, they are typically expensive and time-consuming to produce when made with traditional methods and materials and can be 3D printed more quickly, for less cost, and easily optimized for worker safety and efficiency.

Beyond common manufacturing aids you'll also find additional opportunities among more specialized tooling applications that include the following:

Thermoforming Tools
These tools are usually made from wood, RenShape board, cast aluminum or machined aluminum billet and are usually expensive, with long production lead times.

Hydroforming Tools
Hydroform tooling made from aluminum or other metals requires considerable time to program for CNC machining, particularly for complex shapes, and results in considerable material waste.

Composite Tooling
Used to form composite structures, this tooling is usually bulky, heavy and costly with lead times consisting of weeks or even months depending on size and complexity.

These applications are well-suited for 3D printed replacements for limited-run production or to evaluate designs prior to investing in high-cost hard tooling. High-strength materials like FDM Nylon 12 Carbon Fiber are strong enough to replace metal tools in certain applications. ULTEM 1010 resin is capable of autoclave cure and provides a much more cost-effective way to make lightweight composite lay-up tools.

Use Case Highlight

Genesis Systems Group

Genesis builds and implements robotic automation systems and needed a faster, lighter, less-costly robotic end effector for gripping and trimming composite parts. Using high-strength ULTEM 9085 resin, Genesis made a new end effector resulting in a 94% weight reduction compared to the traditional gripper, enabling the use of a smaller robot motor. Production turn time was also reduced by 85%, from 20 days to three.

"Normally, it would take weeks to get traditional grippers made. With the FDM gripper, you can have a new end effector complete and bolted up to the robot within a day or so."

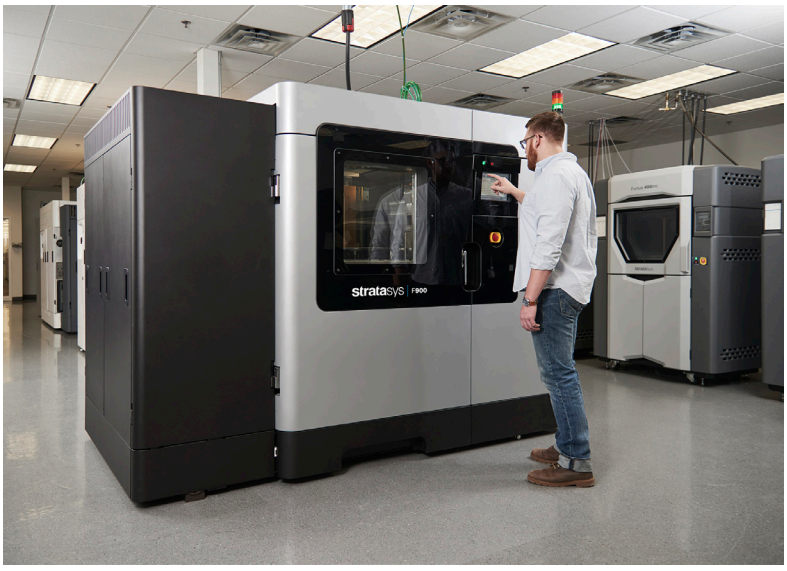
– Doug Huston, Genesis Systems Group technical advisor

Manufacturing-Ready 3D Printers

Many manufacturers believe the status quo is good enough; is your company making this costly mistake? The truth is that 3D printing, often alongside time-proven technologies, is essential to efficient manufacturing. In the race to zero inventory and point-of-use creation, traditional manufacturing cannot compete with the time and cost savings of 3D printing. In addition to the design freedom and cost and weight savings of additive manufacturing, Stratasys FDM printers complement existing technologies and give you the power to lower production cost, reduce time-to-market, increase manufacturing efficiency and trim supply chains. The Stratasys F900™ is MTConnect-ready, so you have full factory floor connectivity. Our broad material selection lets you cost-effectively match your design requirements with the right material, from economical engineering-grade materials to advanced, high-performance polymers like carbon fiber nylon, PEKK and ULTEM. GrabCAD Print software makes it easy to go straight from CAD model to finished print while giving you access to critical print information.

Need help realizing the full potential of 3D printing for your factory floor? Let Stratasys Expert Services' Strategy Consulting or Operations Consulting teams validate 3D printing for your business and help map specific areas ripe for AM integration on your factory floor.

What's your current manufacturing methodology costing you? Contact a Stratasys representative and see how 3D printing can lower your costs.



Explore 3DP

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