

HOW TO USE ADDITIVE MANUFACTURING TO IMPROVE YOUR MANUFACTURING PROCESS

INTRODUCTION

If you head up your company's manufacturing operations, you are undoubtedly charged with producing better products faster while cutting costs, increasing production up time, not to mention finding a way to efficiently meet customer demands for customized products, all while supporting your organization's innovation initiatives. These goals sound daunting at best and perhaps even mutually exclusive in some cases.

McKinsey Global Institute estimates that the total sales of direct manufactured goods and tooling will reach \$800B in sales by 2025. And of that, a minimum of \$250B in sales will come from 3D printed products (mostly consumer goods, tooling and direct manufactured products) that will be produced using 3D printing.

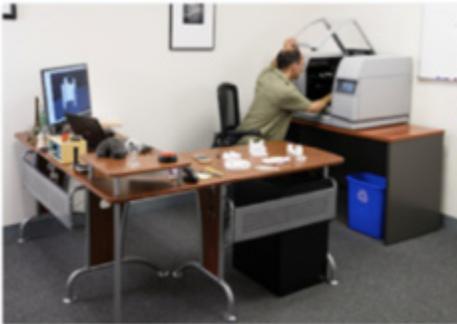
With so much revenue predicted from products manufactured with 3D printers, how can you harness 3D printing technology to meet these goals and significantly improve your manufacturing process?

This white paper will outline three ways you can use additive manufacturing to improve your manufacturing process.

AUGMENT YOUR ADDITIVE MANUFACTURING LAB'S SYSTEMS

You can augment the 3D printers in your additive manufacturing lab with industrial-class 3D printers placed in your engineering and design offices to speed your R&D process and cut costs; right on the production floor to keep the line running – and running efficiently; and in the field so you can accommodate your company's innovation initiatives vs. your innovation initiatives being restricted by the limitations of your additive manufacturing lab and its machines.

Engineering office



Speeds R&D, cuts costs

Production Floor



Keeps production line running...efficiently

Field



Adapts to your innovative processes, not the other way around

At first glance, you might think that lab managers would resist this, and perhaps some would. But the additive manufacturing lab managers we've spoken with say their labs are over-burdened and they welcome the idea of putting printers in their engineering offices so they can print their one-offs, leaving the big jobs for the lab.



In fact, Gary Rabinovitz, Additive Manufacturing Lab Manager at Reebok, said, "A near zero post-processing and environmentally-friendly 3D printer would enable our designers to 3D print themselves and reduce some of the workload from the lab."

And John DiPiano, Director of Product Development at Boston Engineering added about his Rize 3D printer placed in an engineering cubicle, "It's so convenient. Whenever we need to print a part, it's right here. We just print it and we have it. We don't have to wait in the queue for the lab."

Augmenting your lab's 3D printers helps reduce bottlenecks created the over burdened lab, speeds part delivery, design iterations and your all-important time to market, all while cutting costs. According to Boston Engineering, "Not only was the purchase price of the Rize 3D printer a fraction of the cost of the FDM system, the Rize material costs are less than half the cost of the FDM materials, and there are no labor, facilities, disposal and material costs associated with post-processing that must be incurred with the lab's FDM printer."

For example, a global consumer packaged goods manufacturer documented that Augmenting their Fortus lab system with a Rize industrial-class office 3D printer:

- Cut their R&D process by 20% (in number of days) per idea per engineer vs. their Fortus lab system
- Produces 25% more design concepts per engineer than Fortus
- Or, alternatively, they can turn around an additional iteration in the same timeframe
- They estimated that part delays due to the post processing required of their lab machine, equals 48 days per engineer/year x 100 engineers = 4800 days in total of part delays per year – they concluded the lab printer costs millions per year in delays compared to their Rize 3D printer

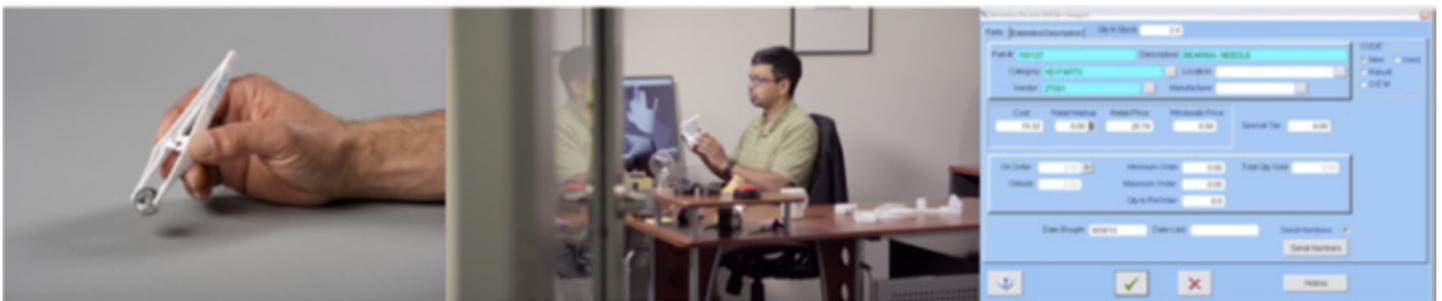
Similarly, Boston Engineering reports that augmenting their lab system by placing a Rize 3D printer in their engineering office sped part turnaround by 50% and cut costs by the same amount.

3D PRINT REPLACEMENT AND CUSTOM TOOLING

Print replacement parts on demand to keep the line running

Design and build custom parts in hours to streamline process

Transform physical into digital inventory



The ability to 3D print replacement and custom parts, tools, fixtures and jigs right on your production floor – where and when you need them - can significantly improve your manufacturing process.

This will enable you to:

- Reduce down time and keep the line running
- Design and build custom parts in hours instead of days or even weeks
- Replace your physical inventory with digital inventory to eliminate inventory space, prevent parts from becoming obsolete and ensure you don't run out of inventory

All of this significantly streamlines and speeds the production process, while cutting costs.

3D PRINT SHORT-RUN, CUSTOM END-USE PARTS OUTSIDE THE LAB



The third way additive manufacturing can improve your manufacturing process is by enabling you to 3D print

short-run, customized end-use parts outside of the lab, in the field, whenever and wherever they're needed. Place an industrial-class 3D printer right in your tool shop, auto mechanic shop or your medical office to manufacture one-offs of customized products, including replacement parts, aftermarket and custom auto parts, custom medical and production tooling dental devices and surgical guides.

Breaking the chains of the additive manufacturing lab and placing manufacturing where and when it's needed, results in enormous time and cost efficiency improvements and even enables you to offer entirely new, customized products and services that can't be produced in any other way.

In fact, within the next few years, you'll be able to 3D print products such as hearing aids with both hard and rubber surfaces for maximum performance and comfort, antenna, smart sensors, microchip heat sinks, actuators and circuit boards. And it will even be possible to use additive manufacturing to produce products with flame retardant, conductive and static dissipative materials.

WHAT'S NEEDED

What additive manufacturing capabilities are required to enable manufacturers to implement these three process improvements?

- Products manufactured with 3D printers must possess the same material properties (strength, surface finish, HDT, etc.) as injection molded parts.
- 3D printed products will need to be in the same full color that you expect from parts manufactured using traditional means.
- If you're going to put a printer in your office, on the production floor, in the field or in your medical office, the process must be clean and safe and without harmful outgassing. And, to produce many types of products, the materials must also be safe.
- In addition, the system must be compact and light enough for placement in any office or field environment, yet have a large enough build volume to print most parts needed.
- Since you'll use the 3D printer in part to gain cost efficiencies for your low-volume manufacturing process, it needs to be affordable to purchase and, more importantly, operate.
- And, since the 3D printer will be operated by mechanical and manufacturing engineers, mechanics, soldiers, doctors and people who aren't expert users of additive manufacturing equipment, it must be as easy to use as your typical document printer. You need to be able to send your file to the printer, press 'print' and have your completed product a few hours later.



However, the reality of today's printers is that they can't meet all these requirements. At one end of the spectrum, you have professional 3D printers that serve prototyping and tooling applications. And these systems must or should be located in labs. Or, you have hobby printers marketed as commercial 3D printers that simply can't meet the needs of industrial applications.

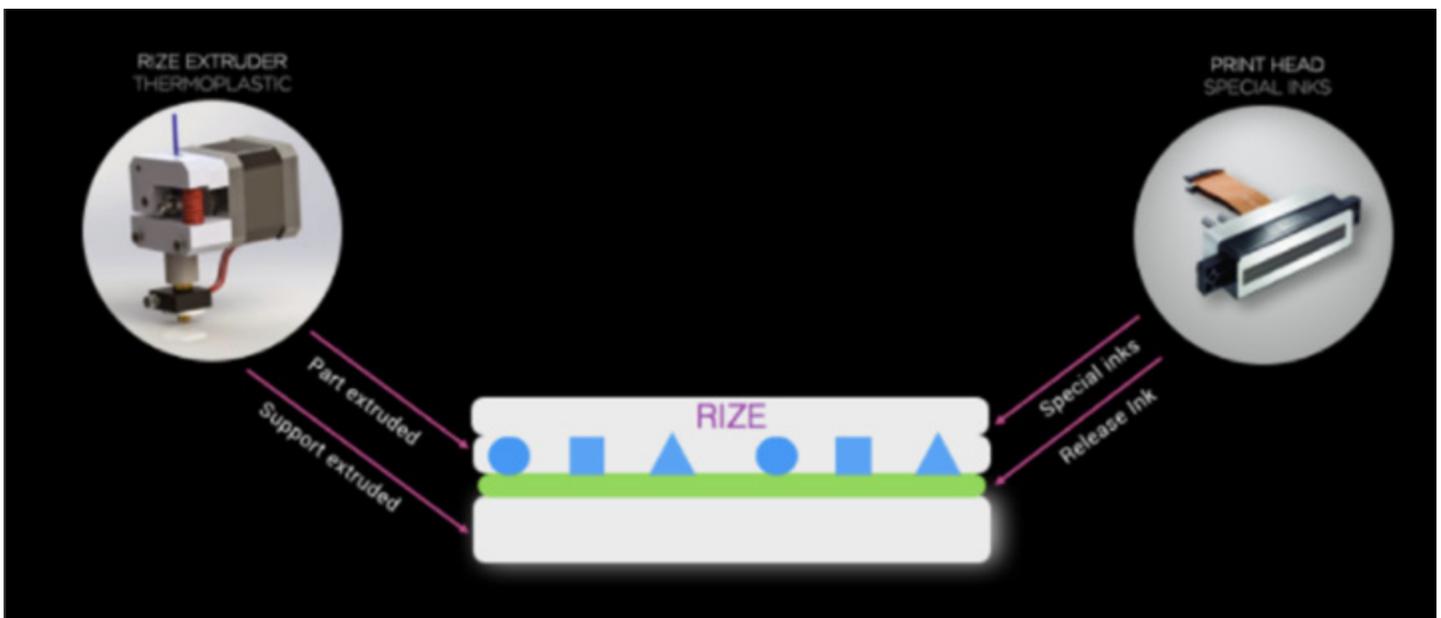
At the other end of the spectrum, in the realm of serving manufacturing applications, we have the metal 3D printers, as well as HP and Carbon. But all these systems must remain in the lab; they cannot break out into the manufacturing environment and they require you to make sacrifices in complexity, time, cost, and even material properties.

There's an enormous unmet market between prototyping and manufacturing for functional prototypes and custom one-offs of production parts on demand in an office, next to the assembly line, mechanic's shop...you name it, that those technologies can't address.

Rize is changing how products are designed and manufactured, providing the only additive manufacturing technology that enables manufacturers and other commercial users to speed R&D and production processes up to 100% and save millions of dollars by 3D printing injection molded-quality parts on demand, virtually anywhere, quickly, easily, cleanly safely and affordably.

Rize's dual extrusion/jetting Augmented Deposition technology enables you to 3D print replacement parts and custom tooling in the field. Looking ahead into the not-too-distant future, we'll be able to print products like industrial brackets with composite materials, functional fillers; microchip heat sink with defined microstructure

Rize's patented Augmented Deposition process



materials; multilayer batteries with smart sensors and hearing aids with variable hardness. We'll even be able to print products that are flame retardant, conductive and more.

So, returning to our original checklist of improvements you strive to make to your manufacturing process and how using Rize additive manufacturing technology to augment your AM lab; produce custom and replacement tooling, fixtures and jigs on the production floor and build one-offs of custom, end-use products in shops and doctors' offices meets those needs:

- You need to speed your production process. Using Rize technology to build injection molded quality parts on demand, outside the lab, can speed your process by up to 100%.
- You need to cut costs. Using Rize can save you millions per year in labor, facilities, materials, time to

market and other significant expenses.

- You need to reduce part errors and since Rize increases the number of iterations each engineer can complete per design, the accuracy of the part improves. Plus, you can enhance the accuracy and efficiency of your production line by printing custom tools on the fly.



- Customers demand increasing customization and it's a way for you to differentiate from your competitors. But it's difficult to customize efficiently. Rize cost and time efficiently enables you to produce one-offs of customized, injection molded-quality end-use products.
- More and more companies have VPs of Innovation or Chief Innovation Officers who are charged with turning processes and products on their heads to differentiate themselves and make the kinds of improvements we've discussed. While lab machines restrict innovation and require a company to work around its limitations, Rize accommodates your needs. You can run it virtually anywhere, by anyone in the company at any time.

ABOUT RIZE

Rize is transforming how products are designed and manufactured with our patented and versatile Augmented Deposition industrial 3D printing technology for your lab, office or virtually any remote location that enables you to produce low volumes of injection molded-quality parts on demand, faster than any other 3D printing technology, significantly speeding your R&D and production processes. Our deeply experienced team of former Z Corporation and Revit materials, hardware and software experts, with over 20 3D printing patents, is fulfilling an unmet need for a completely office-safe and affordable 3D printing platform that can be used successfully across a wide variety of commercial applications, including, functional prototyping, tooling, fixtures and jigs and customized end-use products.