

Desktop Metal™

[E-BOOK]

Case Study: Alpha Precision Group

APG
Alpha Precision Group

www.desktopmetal.com



00 Overview

A leading international provider of metal parts, APG (Alpha Precision Group) was formed in 2016 through the merger of several companies with more than half a century of experience in the powder metallurgy industry. Based in Pennsylvania, the company today specializes in press and sinter and metal injection molding (MIM) manufacturing of components for the automotive, aerospace, defense and consumer markets.

01 The Challenge

Every year, billions of complex metal parts are made, and many of them go through some form of post-processing - whether grinding, machining, welding or drilling - before finding their way into consumers' hands.

A variety of manufacturing aids are needed to facilitate or automate that post-processing, but those jigs, fixtures and tooling need to be designed and manufactured themselves.

And that often creates its own set of challenges - ranging from competition for limited machine shop resources to long lead times and the high cost of outsourcing to design restrictions based on manufacturability.

For APG, those challenges often come down to one thing - speed.

To win jobs, the company must be able to respond to bids quickly, create the tools for a particular job as fast as possible and get finished parts out the door, and do it all while making sure machine shop resources are available for both internal jobs and customer orders.

And one of the key tools APG uses to maintain that balance is the use of additive manufacturing.

02 Enter 3D Printing

Using 3D printing, APG engineers can significantly speed up the design and manufacture of jigs, fixtures and tooling - printing parts in a matter of days and deploying them on the manufacturing floor in less than a week.

That rapid turnaround time means APG is able to deliver parts

to their customers faster, who in turn are able to bring their products to market more quickly.

In addition to speed, 3D printing offers the company far more design freedom than conventional manufacturing, enabling them to significantly lightweight the parts they print - in some cases by up to 30 percent - resulting in less wear-and-tear on machinery and less downtime on the manufacturing floor.

The benefits of 3D printing at APG aren't limited to speedier production or reducing wear on machinery, though.

The technology has also opened the door to designing improved workflows, particularly when it comes to machining, that might otherwise be too time- and labor-intensive to pursue.

A main target for those improvements was the post-processing of parts in CNC machines.

Rather than requiring staff manually tighten and loosen fixtures used to hold parts, engineers designed a custom-made ratchet screwdriver tool that automates the process, and printed it in just days. The end result is that a single operator is now able to run as many as five machines at once, leading to greater efficiency.

03 New Manufacturing Techniques Mean New Business

Using the Studio System™, APG was able to dramatically cut - in some cases by 90 percent - both the cost and lead time needed to create manufacturing aids.

Those savings have translated into an increase in manufacturing capacity, as APG is able to more quickly turn around customer jobs, and has freed capacity in the company's internal machine shop for other work.

In addition to their current work, 3D printing is helping APG win new business.

APG engineers are using the Studio System™ to quickly create prototype parts that customers can use for testing, market testing and design iteration before investing in hard tooling and full-scale manufacturing.

The company has also used additive manufacturing to support existing customers by producing small numbers of replacement or aftermarket parts.

04 Why Desktop Metal™?

After investigating several 3D printing technologies, APG selected the Desktop Metal, Studio System™ for both its office-friendly design and price.

Other additive methods, like laser powder bed fusion, require massive upfront investments - often \$1 million or more for equipment and facilities, and are both slow and produce parts which require extensive post-processing, increasing labor costs.

The Studio System™, by comparison, eliminates the use of loose powders and dangerous lasers, and uses a technology called Bound Metal Deposition™ in which rods of metal powder and binders are heated and extruded to shape a part.

With a price tag that's up to 10 times less than alternative systems, it's an easy-to-use, end-to-end solution for printing metal parts in-house, and can print in a wide range of materials - including H13 tool steel, 4140 chromoly steel, 316L stainless steel and 17-4 PH stainless steel - allowing users to print parts that precisely fit their needs.

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With the Studio System™, we've seen immediate value. One example is a fixture used for high density stainless steel sensor bosses, which pushes a thread checker into a part on the manufacturing line. It is a wear item, so it needs to stand up to repeated use. With the Studio System™, we are able to produce this part ourselves at 83% cost savings as compared to traditional manufacturing and in just days instead of weeks or months, meaning we're never waiting for the part and can keep the line running at all times. The Studio System™ is enabling us to constantly be asking ourselves how can we do this better, resulting in significant time and cost savings.

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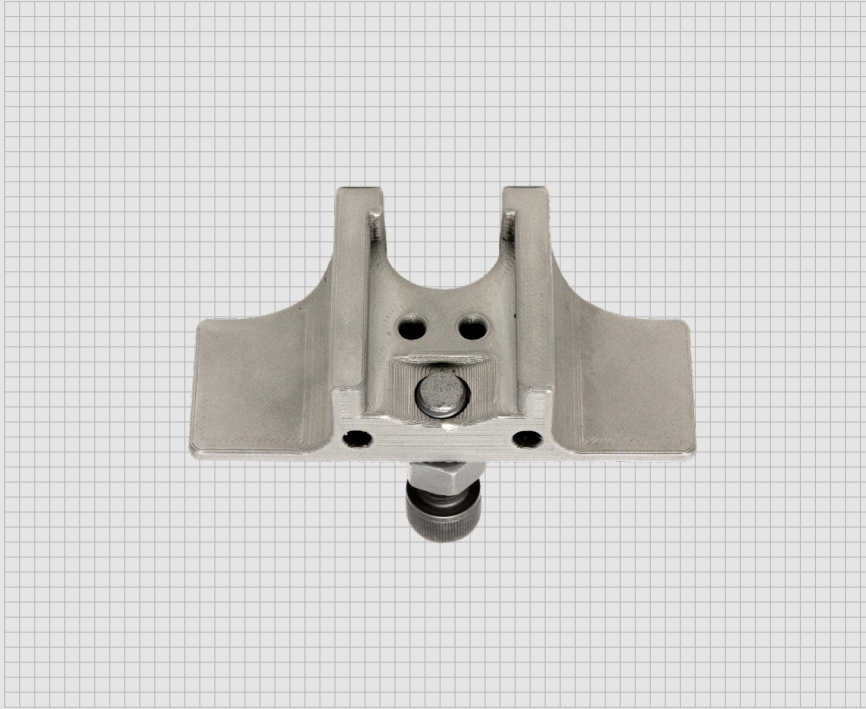
Nate Higgins

Business Unit Manager, Alpha Precision Group



04 – Why Desktop Metal?

3D Printing vs. Traditional Manufacturing



[Part Example]

Coining Fixture

Used to achieve precise details and smooth surface finishes, coining uses closed dies and high pressure to force parts to conform to the shape of the die. Coining fixtures require custom geometry for each application and superior wear resistance to stand up to repeated use cycles.

APG engineers created this fixture to ensure a feature on a specific part met the tolerances specified by a customer. Using the Studio System™, the company was able to design this fixture, print it from 17-4 stainless steel and begin employing it in just three days, dramatically reducing the downtime for their manufacturing floor.

[Material]

**17-4 PH
Stainless Steel**

[Cost Saving]

76%

[Time Saving]

84%

04 – Why Desktop Metal?

3D Printing vs. Traditional Manufacturing



[Part Example]

Thread Checker Fixture

This fixture is responsible for pushing a thread-checking tool into a part, called a sensor boss, used for mounting sensors on automobile exhaust systems. An important quality control step in the manufacture of these parts, threading is critical for the proper function of the sensors - if it is not formed correctly, the sensors can't be installed correctly and could fail.

Normally \$600, APG engineers were able to design and print this fixture for less than \$100. Printing allows the company to quickly replace the high-wear fixture when needed, reducing downtime on the manufacturing floor.

[Material]

17-4 PH

Stainless Steel

[Cost Saving]

83%

[Time Saving]

90%

04 – Why Desktop Metal?

3D Printing vs. Traditional Manufacturing



[Part Example]

Assembly Line Screwdriver Tool

For CNC operators, the process of repeatedly loosening and tightening screws in workholding fixtures to change between parts or machining steps is both time- and labor-intensive, and can add up to costly manufacturing delays.

To avoid those delays, APG engineers developed this tool to automate the process. Using the Studio System™, they were able to print this tool - with its complex ratchet assembly - in only a few days, versus several weeks of machining. This tool makes it possible for a single operator to run up to five CNC machines at a time, making for a far more efficient workflow and significant cost savings.

[Material]

**17-4 PH
Stainless Steel**

[Cost Saving]

93%

[Time Saving]

87%

05 Evaluation

Many of the parts manufactured by APG must meet extremely tight tolerances. Whether they're creating custom jigs and fixtures to ensure consistency and reliability in manufacturing, or sample customer parts to win new business, it's critical that parts meet the required tolerances.

Geometry, however, isn't the only consideration for the company - it's also critical that parts are metallurgically sound, and able to stand up to repeated use.

To explore the use of metal 3D printing, the company tested parts printed on the Studio System™ for both their dimensional tolerances and metallurgical properties.

06 Tolerances

Overall, APG engineers found that printed parts had tolerances that could stand up to comparison with traditionally manufactured parts.

When manufacturing internal jigs and fixtures used during post-processing of customer parts, nearly all the parts printed on the Studio System™ could go into use without the need for post-machining.

For some customer parts, secondary machining was necessary to make sure parts met requirements for surface finish or hole size. However, APG engineers believe these steps can be avoided by working with customers early in the design process to identify the critical features of each part.

07 Metallurgy

To evaluate the material properties of 3D printed metal, APG engineers printed a number of sample parts, which were then halved to allow metallurgists to examine both the metal density and grain structure.

Tests revealed that the printed metals showed hardness levels, density and grain structure in line with what would be found in parts created via metal injection molding (MIM.)

08 Summary

By almost any measure, the Studio System™ has been a success for APG. Using additive technology, engineers have designed and printed a variety of manufacturing aids at dramatically lower cost and in significantly less time than using traditional methods.

Those benefits translated into increased manufacturing capacity, less material waste and an optimized workflow, while the ability to lightweight parts reduced stress on machinery.

The company has also leveraged 3D printing to win new business by quickly producing sample parts for customers and position themselves as a leader in cutting edge manufacturing.



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About APG (Alpha Precision Group)

Alpha Precision Group was formed in 2016 through the acquisition and merger of Alpha Sintered Metals LLC, Precision Compacted Components Inc., and Precision Made Products LLC.

These legacy companies represent a unique blend of technologies, manufacturing experience, market segmentation and product offerings.

With histories dating back 50 years and more, APG companies have been pioneers in material and process improvement technologies which have both shaped and advanced the powder metallurgy industry.

About Desktop Metal

Desktop Metal, Inc. is accelerating the transformation of manufacturing with end-to-end metal 3D printing solutions.

Founded in 2015 by leaders in advanced manufacturing, metallurgy, and robotics, the company is addressing the unmet challenges of speed, cost, and quality to make metal 3D printing an essential tool for engineers and manufacturers around the world.

In 2017, the company was selected as one of the world's 30 most promising Technology Pioneers by the World Economic Forum, and was recently named to MIT Technology Review's list of 50 Smartest Companies. For more information, visit www.desktopmetal.com.

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