HP reinvents with 3D printing technology

Industry sector: Commercial Print, Print-For-Pay

Business name: HP Inc.

Testimonial from: Alejandro Bonillo, HP Production Printing Mechanical Engineer, and Isabel Sanz, HP 3D Applications Engineer

Objective: Optimize the product design process and reduce supply chain costs by exploring new ways to produce parts for high-value equipment that is sold in low volumes.

Approach: Utilize 3D printing to optimize the design and production of certain parts.

Technology: HP Multi Jet Fusion.

Solution: HP Jet Fusion 3D Printing Solution

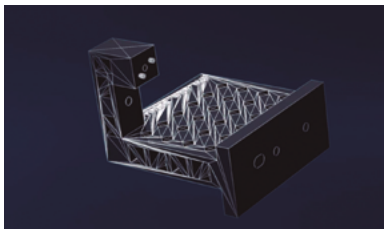
HP builds large-format inkjet printers for corporate clients, print service providers and others with high print volumes. Purchasing a printer in this category is an important decision. HP's latex technology offers excellent quality and reliability and, with the right print volume, outstanding economics. Millions of banners, signs and vehicle wraps are printed each and every month on HP large-format printers.

Recently, HP announced Multi Jet Fusion 3D printing technology. It can create parts more quickly[1] and less expensively[2] than other 3D printing technologies. The engineers who build HP's 2D printers began thinking about how they could use 3D printing to help reduce costs and innovate more quickly.

Challenge

"When designing and manufacturing large-format printers, we'd usually use injection molding and machining for parts. At low volumes, these traditional techniques might not be worthwhile. We wanted to reduce the cost while also improving the speed and flexibility of our design process."

Alejandro Bonillo, HP Production Printing Mechanical Engineer



HP's industrial, large-format inkjet printers are big devices. Really big. They're designed to print hundreds of square feet of material every day. They're built to run reliably, 24/7/365. They're also made of thousands of moving parts. It's a difficult environment in which to innovate and test new ideas.

Traditional manufacturing techniques like injection molding and machining can be expensive for short-run production. When parts are modified or improved, the cost to prototype and produce is significant. HP's engineers wanted a way to innovate faster and more reliably while reducing the overall cost of part production.

Solution

"With HP 3D printing, we saw an immediate opportunity to redesign this crucial part in the most efficient way possible."

Isabel Sanz, HP 3D Applications Engineer

HP engineers decided to see how the company's Multi Jet Fusion 3D printing process could help them in the development of other HP products. They looked at some of the key parts inside their large-format 2D inkjet printers and began to realize that some of them could be produced using HP Multi Jet Fusion 3D printing, which would mean helping to eliminate expenses due to traditional manufacturing methods.

One internal part they identified is called a SOL actuator support. It's a bracket that holds and positions a sensor that calibrates the color quality of print on an inkjet printer.

Because they would be using additive manufacturing, the engineering team had new freedom in how they could design the part. HP Multi Jet Fusion builds parts additively, layer-by-layer. Machining and other subtractive technologies, which remove material to manufacture, are limited in the ways they can produce. 3D printing allowed HP engineers to improve the geometry of the design, creating a lighter part.

HP Multi Jet Fusion technology also helped HP engineers speed up the product development process. Because it's digital and there is so little setup, prototypes could be produced quickly and economically, without sacrifices in part quality. That allowed HP's engineers to create a version of the part in CAD software and then quickly test and iterate their design in the physical environment.

While HP's large-format inkjet printers are designed for a print-shop environment, they're also highly specialized. As a result, some models are produced in very low quantities. Before 3D printing, HP's engineers would either injection mold or machine the parts used in these low-volume environments. 3D printing had the potential to offer better economics, while it also allowed for more customization and reduced the need for inventory.

HP's large-format inkjet printers are also some of the most reliable devices in the printing industry. They're well-known workhorses. For 3D printing to successfully challenge other manufacturing techniques, the parts would have to stand up to the rigors of a commercial environment.

Result

"With 3D printing we were able to optimize a design that required less material, lowering our design and production costs. HP's Multi Jet Fusion allowed us to create functional parts faster. Once the new design was approved, we went immediately into production, using the same file, the same equipment and the same material as we used in prototyping."

Isabel Sanz, HP 3D Applications Engineer

Using additive manufacturing, HP's engineers were able to design for performance instead of struggling with the traditional limitations of designing for manufacturing and assembly. Additive manufacturing enabled them to accomplish what would not have been possible using other techniques. The resulting part was lighter and less expensive, but as reliable as the old version.

HP's engineers conducted a cost analysis based on the quantity of parts typically needed for the production of HP's 2D printers. They determined the setup costs of injection molding would be too high. The better option was to machine them from aluminum. The cost for that was **$22** per part. The same part 3D printed using HP's Multi Jet Fusion technology would cost less than **$5.89** per part, which meant a **73%** cost reduction.[3]

In addition, because the part was printed using an engineering-grade thermoplastic material, the weight of the part was significantly less.[4] The machined version weighed 355 grams. The re-engineered, 3D printed version weighed just **44** grams. A reduction of **88%**!

Removing material helped drive production cost down, but weight is also a factor in logistics. Lighter parts will help reduce costs throughout the supply chain.

The fit and finish of each part were also critical. The consistent quality of HP's Jet Fusion 3D printers ensured tight tolerances could be met. The dependability of HP's 3D printing solution confirmed that a part made today would perform the same as one made earlier.

This allowed the engineering team to qualify the part for "just-in-time" manufacturing. No physical inventory would need to be kept at the factory or in the field. Instead, new and replacement parts could be manufactured "on demand."

While manufacturing on demand helps reduce the cost of manufacturing and servicing HP's large-format inkjet printers, it also minimizes waste. Each part that can be digitized doesn't have to be stored in inventory. As changes are made, there's less chance of obsolescence.

For HP the impact is significant. The freedom of design that 3D printing enables allowed the engineers to build a better, less expensive part. The quality and reliability of HP's Jet Fusion 3D printers allowed them to develop, prototype and manufacture the part more efficiently.

Where will HP go next? Engineers will be looking at how other areas of the business can benefit from a new, digital workflow and HP's Jet Fusion 3D printing technology.

1. Based on internal testing and simulation, HP Jet Fusion 3D average printing time is up to 10x faster than average printing time of comparable FDM & SLS printer solutions from $100,000 USD to $300,000 USD on market as of April 2016. Testing variables: Part Quantity-1 full build chamber of parts from HP Jet Fusion 3D at 20% of packing density vs same number of parts on above-mentioned competitive devices; Part Size 30 g; Layer thickness: 0.1 mm/0.004 inches.
2. Based on internal testing and public data, HP Jet Fusion 3D average printing cost-per-part is half the average cost of comparable FDM & SLS printer solutions from $100,000 USD to $300,000 USD on market as of April 2016. Cost analysis based on: standard solution configuration price, supplies price, and maintenance costs recommended by manufacturer. Cost criteria: printing 1 build chamber per day/ 5 days per week over 1 year of 30-gram parts at 10% packing density using HP 3D High Reusability PA 12 material, and the powder reusability ratio recommended by manufacturer.
3. Based on internal testing and public data, HP Jet Fusion 3D average printing cost-per-part is 73% lower than the cost of the same part printed using machining technology as of January 2017. Cost analysis based on: productivity bundle solution configuration price, supplies price, and maintenance costs recommended by manufacturer. Cost criteria: printing 500 builds chambers per year/ 6 days per week at 11% packing density using HP 3D High Reusability PA 12 material, and the powder reusability ratio recommended by manufacturer.
4. Based on internal testing and public data, HP Jet Fusion 3D average printing weight-per-part is 88% lower than the weight of the part printed using machined technology (355g). The weight reduction is based on the change of material (to HP 3D High Reusability PA 12) and the re-engineering and lightweight applied to the design of the 3D printed part.

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