Case study

SIGMADESIGN achieves design freedom at low volume with HP Multi Jet Fusion technology

HP's Multi Jet Fusion technology helps lowering the cost of manufacturing industrial equipment

INDUSTRY SECTOR
Professional service - product development

OBJECTIVE
Optimize the product design process and reduce manufacturing 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

Summary

SIGMADESIGN is a product design, development and engineering services firm. They offer solutions that help clients take their products from concept to production and beyond. Among other services, the company provides industrial design, quality assurance and testing, and engineering support, in addition to end product manufacturing.

SIGMADESIGN worked in partnership with HP to develop the HP Fusion 3D Printer’s line. Once they had access to the capabilities HP’s Jet Fusion 3D Printing Solution provides, they began thinking of ways they could use the product.

One of the company’s clients needed a fruit labeling machine. It’s a high-value product that is not sold in high volume. In the process of developing and improving the product SIGMADESIGN began looking for ways to use HP’s Multi Jet Fusion technology to assist with making parts for the machine. Their goals were to save money and time while simultaneously improving the design.
**Challenge**

“When designing and manufacturing fruit labeling machines, we’d usually use injection molding and machining for parts” says Matt Cameron, VP of Engineering at SIGMADESIGN. “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.”

The fruit labeling machine is an industrial device. It’s designed to apply labels to fruit produce in the simplest, most cost effective way. The machine applies thousands of labels per hour, yet is also precise enough to ensure no fruit is damaged.

Fruit labeling machines are compact devices, made up of thousands of moving parts. A traditional manufacturing technique like machining is expensive, especially for short runs of complex parts. There’s also significant cost when parts need to be changed or modified.

**Solution**

“We with the HP Jet Fusion 3D Printing Solution,” says Mr. Cameron, “we saw an opportunity to redesign the fruit labeling machine. We could develop parts faster and produce them in short batches, pretty much on demand.”

SIGMADESIGN’s engineers have worked with 3D printing before but have often found it limiting. One of the parts they considered was a vacuum applicator fitting. It was originally machined, but its design which included a right angle, created a design constraint for production.

The company created a more efficient design that removed the right angle, which eliminated the potential of friction with other parts. They first attempted to 3D print it using a fused deposition modeling (FDM) printer. Unfortunately the part did not meet the company’s quality requirements. It was too porous and lacked strength.

Later, they printed the part using their new HP Jet Fusion 3D 4200 Printer. From a quality standpoint it was vastly superior. The part didn’t leak and was strong enough for a production environment.

While the part was being qualified for production the team at SIGMADESIGN compared the economics. With the HP Jet Fusion 3D Printing Solution, they had the opportunity to reduce costs and improve a key component in the fruit labeling machine.

With the successful production of the vacuum fitting, the engineers at the company identified a total of 877 other parts which could be 3D printed.

One of the key principles at SIGMADESIGN is to “prototype early and prototype often.” Because there is so little set-up with HP’s Multi Jet Fusion technology, prototypes could be produced quickly and economically, without sacrifices in part quality. That allowed them to create a version of the part in CAD software and then quickly test and iterate their design in the physical environment.

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– Bill Huseby, President and CEO, SIGMADESIGN.
Many of the machine's parts benefited from quicker iteration. One was a tapered pulley. This particular part rotates around a shoulder screw. It doesn't use any bushings, so the pulley's interior diameter must bear all of the load and friction during operation. The nylon material used in HP's Jet Fusion 3D Printers offered the necessary strength, abrasion resistance, and bearing surface needed for this application. Multiple iterations were needed. Designing and 3D printing the part was more efficient and less expensive.

With this new manufacturing technology, the engineering team had new freedom in how they could design each part. The HP Multi Jet Fusion technology allows building parts additively, layer-by-layer. Machining and other subtractive technologies, which remove material to manufacture, are more limited in what they can produce.

For example, another one of the parts that was identified was a rotary sensor flapper arm. For it, the team created a new design that featured a cage-like structure that could be press fit with a ball bearing. It serves as a counter weight when the part is mounted to a rotary sensor.

During the installation of the ball bearing, the material used in producing the rotary sensor flapper arm would need to flex out of the way without cracking or deforming. The nylon used in HP's Jet Fusion 3D Printers easily withstood the rigors of installing the ball bearing. This eliminated the need for tools and fasteners for installation, saving time and money.

But, the efforts to improve key components while lowering cost would only be successful if the fruit labeling machines were able to stand up to the rigors of daily use.

Result

“With the HP Jet Fusion 3D Printing Solution we were able to optimize parts that improved the overall design of the fruit labeling machine, while at the same time reducing cost,” says Bill Huseby, President and CEO, SIGMADESIGN. “Further, HP's Multi Jet Fusion technology allowed us to create those parts faster. Finally, it simplified production. Once the new parts were approved we went immediately into production, using the same design and the exact same parts as we used in prototyping.”

Leveraging the benefits of additive manufacturing, the engineers at SIGMADESIGN were able to design the best parts for their machine. With the design constraints removed, they were able to create parts that fit the available space, instead of having to design the machine to fit around certain parts.
Customer at a glance

Application
- 3D Printing for Final Part Production

Hardware
- HP Jet Fusion 3D 4200 Printer

Accessories
- HP Jet Fusion 3D 4200 Processing Station with Fast Cooling
- HP Jet Fusion 3D Build Unit
- HP Jet Fusion 3D External Tank

Software
- HP SmartStream 3D Build Manager
- HP SmartStream 3D Command Center
- Autodesk® Netfabb® Engine for HP
- Materialise Build Processor for HP Multi Jet Fusion
- 3MF

HP services
- Next-business-day onsite support
- Next-business-day spare parts availability, thanks to HP’s global reach
- 3D printing productivity and professional services

The resulting parts were also significantly less expensive to produce, especially in low quantities. SIGMA DESIGN’s client wanted to only order 63 units! When conducting their cost analysis, the team found that producing the vacuum applicator fitting using HP’s Multi Jet Fusion technology would save $32,000 alone versus the cost of manufacturing the part using the traditional machining method.

The final fit and finish was also important. The consistent quality from HP’s Jet Fusion 3D Printers ensured that production parts were exactly the same as the approved prototype. The dependability of the HP Multi Jet Fusion technology also meant that parts reordered later would perform as well as those made for the original order.

This allowed the company’s team to qualify each 3D printed part for “just-in-time” manufacturing. No physical inventory would be needed, either for additional orders or field repairs. New and replacement parts could be made, “on demand.” Manufacturing on demand helps reduce the cost of building and servicing the fruit labeling machines. Parts that can be manufactured digitally don’t have to be stored in inventory. As future design changes are made, there’s also less obsolescence.

For SIGMA DESIGN and its client, the impact was profound. The freedom provided by additive manufacturing allowed engineers to build better performing, less expensive parts. The productivity and reliability of HP’s Jet Fusion 3D Printers enabled them to design, prototype and manufacture the parts more effectively.

It was a key learning experience for the team at the company. Their engineers are now looking for ways that other clients can benefit from a faster, digital workflow powered by HP’s Multi Jet Fusion technology.

1. Available in most countries, subject to Terms & Conditions of HP Limited Warranty and/or Service Agreement. Please consult your local sales representatives for further details.