Case study

Kupol Project works with Sculpteo and Leverages HP Multi Jet Fusion Technology to Reinvent Sports Headgear

How a Service Bureau and a Customer Mutually Benefit With HP's 3D Printing Technology

INDUSTRY SECTOR

Consumer product design and 3d printing service bureaus

OBJECTIVE

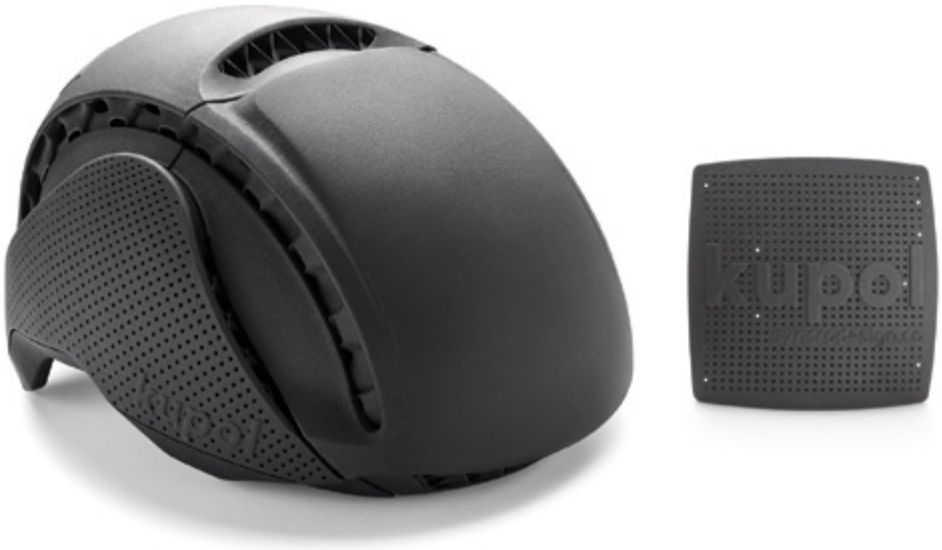
Utilize 3D printing to reinvent how bicycle helmets are designed and determine if HP's Multi Jet Fusion technology could be used for manufacturing throughout the product's lifecycle.

APPROACH

Design the product for use with 3D printing. Print prototypes using HP Jet Fusion 3D printers, test the product for impact resistance and other properties, and if successful, use the same technology to produce the final product.

TECHNOLOGY

HP Multi Jet Fusion
HP Jet Fusion 3D Printing Solution



Syncro Innovation is an industrial design firm located in Quebec, Canada. Using additive manufacturing, they work with clients to help bring innovative new products to life. The team at Synchro are problem solvers, going where innovation leads them. They focus primarily on the sporting goods industry and have developed unique types of bicycle helmets, snowshoes, and water bottles, among other products.

In the last year, Synchro's CEO, Gabriel Boutin began exploring ways that 3D printing might be used to reinvent how helmets are made. His efforts resulted in a significant breakthrough, which became the Kupol Project.

To assist him with his efforts, Gabriel contacted Sculpteo and began working with them to develop his new product. Sculpteo is a global company which is headquartered in France, but also maintains offices and facilities in the United States.

Sculpteo is a leader in digital manufacturing and provides professional online 3D printing and laser cutting services for on-demand production of prototypes, in addition to short-run manufacturing of end-use products. Sculpteo provides access to a wide range of materials, finishes, and techniques. The company also offers a web portal for quoting and order submission, as well as optimization software and a team of industrial designers who assist customers with file analysis and repair.

Challenge

"I've been designing bicycle helmets for over seven years," says Kupol Project's Director, Gabriel Boutin. "There were many limitations with mass manufacturing and especially when using traditional expanded polystyrene (EPS) foam for the helmet's interior. My role as a designer is to rethink products for the better. I wanted to create a helmet that was lighter and more functional," says Kupol Project's Director, Gabriel Boutin

Bicycle helmets are traditionally manufactured in two pieces. The exterior is made of injection molded plastic. The interior is made of EPS foam, and then the two are combined to form the final product.

Because they rely on mass manufacturing methods first big challenge is that both technologies require a commitment to high volumes. In addition to creating significant upfront cost, this also limits the opportunities for customization and personalization. Further, EPS foam repels moisture and traps heat on the rider's head. While modern helmets do include cooling slots to help mitigate this problem, they don't eliminate it completely.

Solution

"I've been involved with 3D printing for 15 years," says Mr Boutin. "It has always been important to our company. But until recently the technology wasn't fast enough and the materials just weren't strong enough for this particular application. When HP introduced their new Multi Jet Fusion technology, I was excited to give it a try. If it could meet our needs and keep costs in line, we had a significant opportunity to reinvent a key element in cycling," says Sculpteo CEO, Clement Moreau.

Mr Boutin began by creating a new helmet design that would eliminate the need for EPS foam. He created an open structure inside the shell of the helmet that would provide enable customization while also improving breathability.

He contacted the team at Sculpteo and asked them to create a prototype. The first generation was not designed for impact resistance, but over the next year, they continued to refine the model. Together Kupol and Sculpteo created several versions, and those were tested for impact resistance, among other factors. Given the large number of prototypes that were created, speed was also critically important.

Prior to working with HP's technology, Mr. Boutin had tried other 3D printing methods, including FDM, SLA and SLS, but they were very slow and none were able to provide the anisotropic strength he needed, especially considering the thin walls he needed to use in his design. Further, the surface finish and lower porosity of Multi Jet Fusion enabled him to create a design that was commercially appealing.

With the testing complete, the Kupol Project finally had a product that was ready to go to market.

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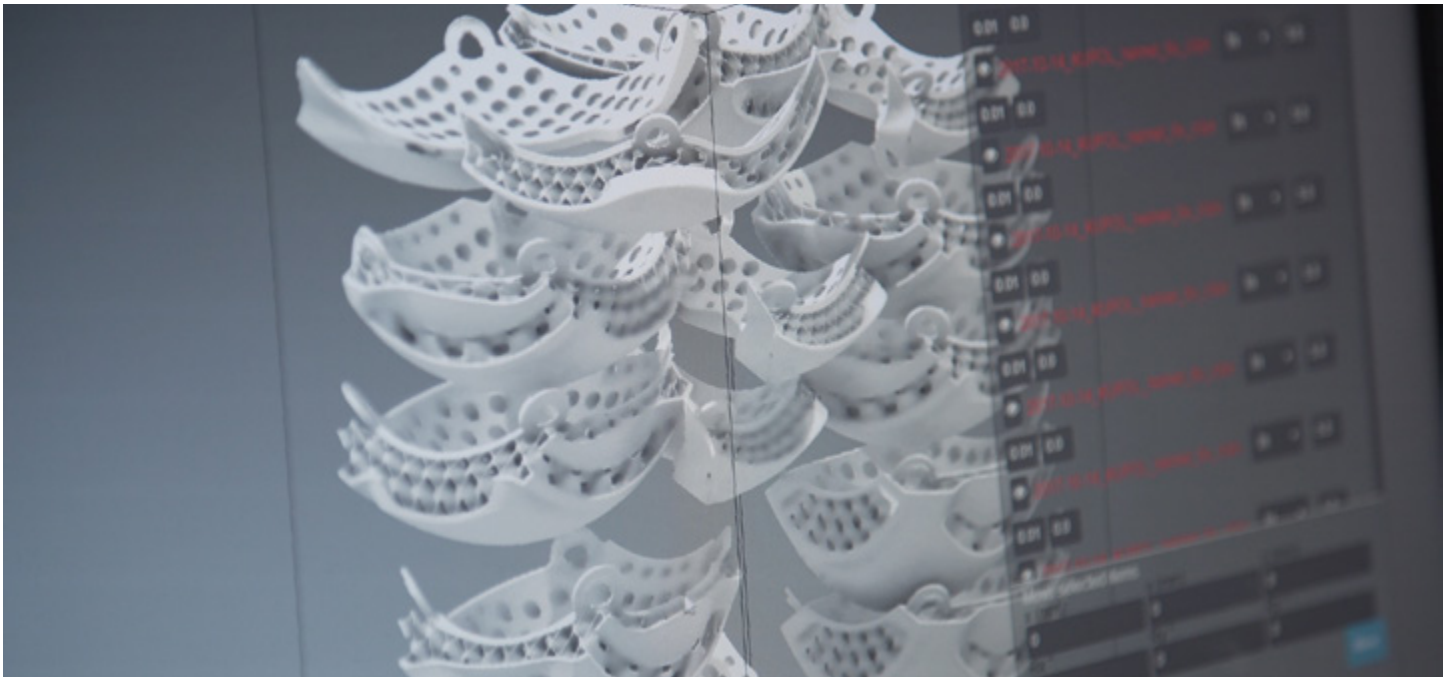
– Clement Moreau, Sculpteo CEO.



Result

"With HP's Multi Jet Fusion technology, we were able to produce a product that was truly innovative," says Sculpteo CEO, Clement Moreau. "The mechanical properties were ideal for an application like this. Further, the productivity from our HP Jet Fusion 4200 3D printers is high enough and the costs are low enough to manufacture the helmets at scale. Finishing played a big role. The post processing station greatly reduced our labor cost, and allowed us to recycle considerably more material." Says Sculpteo CEO, Clement Moreau.

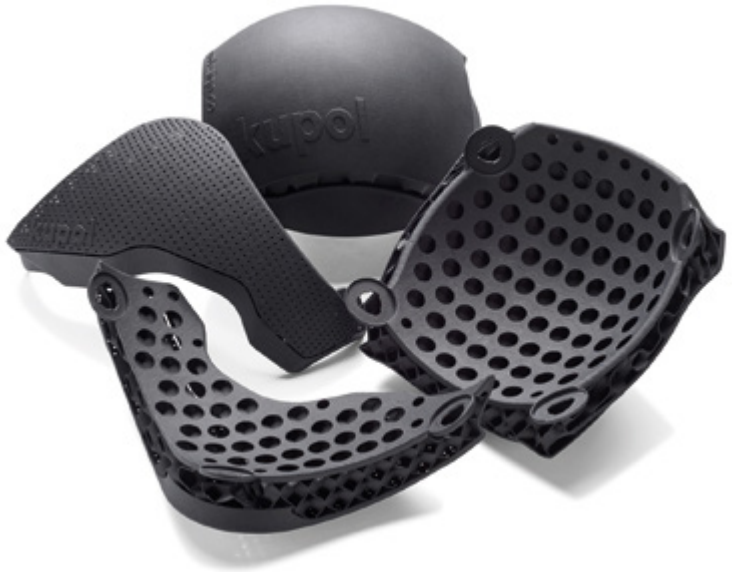
Sculpteo was able to produce a product that worked exactly as Mr. Boutin had conceived. The weight of the helmet was reduced by 20%, it was three times faster to produce than with SLS, and the consistency of output ensured that each helmet would perform as intended.

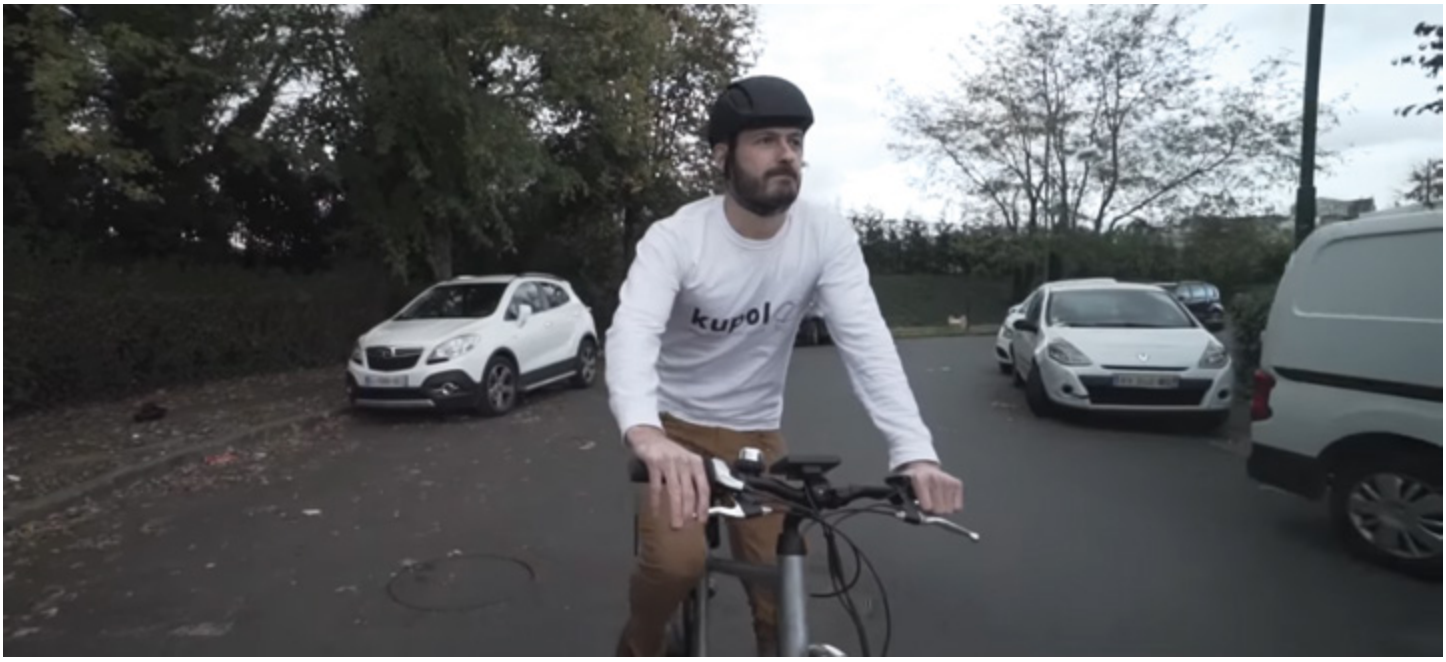
The cost per part was also in line with expectations, which was important because Kupol's impact absorption system can only be manufactured using an additive technology.

The ecological characteristics of Multi Jet Fusion provided an additional advantage. Recycling up to 80% of the PA powder meant that Kupol could also tout the green aspects of their product, in addition to the performance and economics.

Having Sculpteo produce the helmets was also a big benefit for Kupol project. As a small team, resources were limited. Purchasing their own machine would have been expensive and difficult to justify. Further, they gained considerable insight from the relationship.

"The team at Sculpteo has been an invaluable resource. Their understanding





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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

of the printing process, in addition to the challenges that come with producing and distributing a product like this, helped us accelerate our development cycle," says Mr. Boutin. "Our intention is to crowdfund the launch of this product, and it's comforting to know that the team at Sculpteo will be at our side when we go into delivery mode."
Beyond the initial production of Kupol Project's new cycling helmet, there is significant excitement around the future capabilities of Multi Jet Fusion. As HP begins to do more with voxel level control of its technology, even more new features can be built into Kupol's product. Once full color becomes available, graphic design can be integrated into the product, and as multi material properties are unleashed, additional cushioning can be integrated into the helmet's design.

Starting with higher end products, the team at Kupol Project believes that the technology used in its helmets will eventually replace polystyrene completely. They envision a factory floor filled with HP 3D printing technology, manufacturing high quality end-use parts.

"With HP's technology, we're just starting to cross the chasm," says Mr. Boutin. "One of the big problems with additive manufacturing is that when it comes to consumer products, there's no flagship product. Nothing that really demonstrates what can be done. Footwear is interesting, but other opportunities abound. 3D printing can be used to add value to almost any product. In fact, I believe that slowly but surely, 3D printing will eventually replace injection molding. The potential for innovation is just too great."

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