

ActivArmor fashions customized orthotic devices with HP 3D Printing



Data courtesy of ActivArmor



The customization capabilities of HP Multi Jet Fusion technology lay out a new landscape for tailor-made rehabilitative care



Data courtesy of ActivArmor

Introduction

ActivArmor's mission to revolutionize the medical casting and splinting market through digital customization is evidenced by the company's ability to design, test, and fit unique, individualized orthotic devices based on customers' specific needs. Based in Pueblo, Colorado, ActivArmor serves hospitals and clinics across the United States with digital casting and splinting by offering waterproof, breathable, and hygienic alternatives to traditional casting.

ActivArmor uses 3D mapping to scan patients' injured limbs and create an orthotic device tailor-made to the patient's anatomy. This process removes the need to use temporary plaster casts to stabilize the injury until swelling subsides, and then have to continually re-cast when X-rays or other exams are warranted. With ActivArmor's digital process, patients can pick up their customized, lightweight orthotic device without a doctor's appointment, and they rarely need to return to have the device adjusted throughout the healing process.

• Industry

Healthcare

• Sector

Prosthetics and orthotics

• Objective

To shorten the time it takes to develop and manufacture breathable, customized, and 3D printed orthotic devices as an alternative to traditional casts and splints.

• Approach

Through a partnership with Avid Product Development—a 3D printing provider—and use of HP Multi Jet Fusion technology, ActivArmor can more quickly produce larger batches of customizable orthoses, compared with previously used 3D printing technologies.

• Technology / Solution

HP Multi Jet Fusion technology, HP Jet Fusion 5200 Series 3D Printing Solution, HP Jet Fusion 4200 3D Printing Solution

• Material

HP 3D High Reusability (HR)¹ PA 12

1. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 provide up to 80% powder reusability ratio, producing functional parts batch after batch. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.

Challenge

Since 2015, ActivArmor has been 3D printing in-house with fused deposition modeling (FDM) technology, which results in orthotic devices that require finishings like dips and sprays. But upon learning through a college alumni connection about HP Multi Jet Fusion technology with Avid Product Development, ActivArmor saw an opportunity to expand production beyond their in-house FDM printers, cut production time, and possibly eliminate the need for post-printing finishings.

To better serve patients who need devices tailored to the intricate details of their injuries, ActivArmor considers mass customization to be crucial in the future of healthcare.

“Mass customization is the future of medicine,” said Diana Hall, President and Owner of ActivArmor. **“With medical devices, there is no one-size-fits-all design. Patients want custom medical devices so they can improve their healing outcomes and experience.”**

Solution

In 2018, ActivArmor started to use HP Multi Jet Fusion technology through Avid Product Development to help scale production. Hall's first impressions of the technology centered on part precision.

“There was no finishing work required and I didn't need a lot of supports, which was a huge benefit to me with some of the [organic] shapes of our devices,” Hall said.

Another major advantage is the capability to print multiple devices in as little as 2 days. The process begins when one of ActivArmor's partner clinics captures a scanned image of a patient's injured limb and then creates a set of design instructions. ActivArmor sends these instructions to Avid where the device is 3D printed and returned to ActivArmor the next day for final coatings and shipment to the clinic to be delivered to the patient. The entire process takes about 2 full days.



Data courtesy of ActivArmor

Result

With FDM printers, ActivArmor printed approximately one to four devices at a time, per printer, but with HP Multi Jet Fusion, they can print more than 20 at a time, per printer. This higher output allows them to save about 15 minutes of production time per device.

“[HP MJF] will help us scale our business, allowing us to print many products overnight, minimizing labor, cutting costs on finishing work and wasted support material and clean-up,” Hall said.

Aesthetically, ActivArmor noticed improvements in the surface finish of their final parts and didn't need to apply post-processing techniques other than coatings.

Hall adds that without the need for supports for gravity issues, touch-ups are not necessary and no detail work is required before the device can be coated and used.

“With FDM, we have to use a lot of supports because of gravity,” Hall said. **“This isn't required with HP [Multi Jet Fusion] which is really nice, especially when you have organic shapes like feet, legs, hands, arms—every shape is different.”**

ActivArmor's 3D printed casts and splints have been worn by patients all over the country, including celebrities, and are contracted with Major League Baseball and National Football League (NFL) teams. ActivArmor was featured at NFL Combine in Indianapolis, and were worn on the field last season by players from the Los Angeles Chargers and the Jacksonville Jaguars.

“I see [HP Multi Jet Fusion technology] as being useful for the fabrication of medical devices on a mass customization scale,” Hall said. **“As demand and production capacity grow, we will need manufacturing processes that accommodate our on-demand, quick-turnaround product needs.”**



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