

CGX leverages innovative design, a more simplified supply chain, and fast time to market with HP Multi Jet Fusion technology



Data courtesy of CGX
Printed by Avid Product Development, a Lubrizol company



From ideation to production, **CGX** achieves a leaner supply chain and the ability to adapt to market demand



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Introduction

CGX designs and manufactures innovative wireless physiological monitoring systems, most notably its electroencephalogram (EEG) headsets, devices that provide images of electrical activity in the brain. CGX's headsets range from low-density 8-channel systems to high-density 128-channel systems, all of which are supported with accessories to help monitor other physiological inputs such as electrocardiograms (ECGs) for the heart.

Since its founding in 2011, CGX's achievements have included building a range of research-grade wireless, dry-EEG headsets; a precision wireless EEG/ERP marker system; and most recently, the Mobile-128, the first high-speed wireless 128-channel mobile EEG system.

CGX has two forms of distribution: research (universities, government, and the research arms of companies) and clinical (practitioners and healthcare providers).

• Industry

Healthcare

• Sector

Medical equipment

• Objective

To produce better-fitting, easier-to-manufacture EEG headsets at faster speeds and improve the subject's experience.

• Approach

Using the capabilities of HP Multi Jet Fusion technology, CGX was able to produce more headsets and deliver a more comfortable experience for subjects in EEG studies.

• Technology | Solution

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

• Material

HP 3D High Reusability¹ (HR) PA 11
HP 3D High Reusability² (HR) PA 12

1. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 11 provide up to 70% 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 accuracies.
2. 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

As part of their portfolio of products for research and clinical use, CGX designs and produces a wireless, dry-electrode electroencephalography (EEG) headset that clinicians place on a subject's head to monitor brain activity. In order to optimize this device—which is made of dozens of unique parts requiring precise assembly—CGX sought a more efficient production method as well as materials that are comfortable, biocompatible, robust, and easy to manufacture.

CGX had been using ABS filament 3D printing to produce some headset parts, but experienced QC breakages and disappointment from customers who were displeased with the cosmetics of the final product.

“What was holding us back in manufacturing was that we spent so many hours on gravity casts that we couldn't keep up with orders,” said Spencer Linton, Vice President at CGX. **“We were constantly getting behind, so we needed a better method. We build low-volume, highly specialized systems, and we can't justify the cost and lead times associated with injection molding. So we were trying to find a new 3D printing technology.”**

“We had tried casting and polyurethane,” said Alan Fang, Engineer at CGX. **“But it was too labor-intensive, and production was close to impossible...then we found HP Multi Jet Fusion.”**

Solution

In order to achieve their production goals, CGX reached out to a 3D printing service provider to use HP Multi Jet Fusion (MJF) technology to start making part prototypes.

CGX started small with the first few functional prototyping projects, which resulted in well-assembled, well-functioning models of their headset design. CGX experimented with design iterations and benefited from the service provider's feedback regarding design recommendations, as well as suggestions for saving on costs and lead time.

“We took all of our gravity cast parts and switched them to HP Multi Jet Fusion because there were a lot more possibilities with it,” Linton said. **“We even started making**

some of our molds out of HP MJF because it was consistent and it lasted longer than what we were using previously. We really tried to focus on using HP Multi Jet Fusion for all parts of our manufacturing.”

Now 95% of the parts that make up the headset are HP Multi Jet Fusion parts.

“Our latest product is called the ‘Quick-20r’,” said Fang. **“It has 20 channels to monitor brain waves. Because of HP MJF, our headset is lighter weight, better conforms to the head, and is better looking than previous versions.”**



Result

CGX produces 41 individual components for their Quick-20r headset using HP Multi Jet Fusion. Achieving this number of parts with other technologies, such as tooling or machining, would have been prohibitively expensive, without affording additional benefits, according to CGX.

“We can also rapidly design because we’re not putting time and dollars into molds or tooling, so we’re able to modify our headset designs for continual improvement,” said Linton.

In terms of materials, CGX found HP 3D HR PA 11 and HP 3D HR PA 12 to be excellent options in order to obtain durable-yet-flexible parts.

“Since this is a wearable device, some parts take a lot of bending and mechanical stress. There are a lot of moving joints,” Fang said. **“As you can imagine, if you use an ABS printer, the filament isn’t exactly the best. Excessive pulling on a structural part would cause failures. That’s a customer frustration we won’t tolerate.**

“HP MJF has really helped. When you design correctly, it’s basically indestructible. That really helps us improve our overall design. Our first-generation EEG was heavier, less

elegant, and could become uncomfortable for sensitive subjects. Our new designs are significantly more user-friendly.”

Speed and efficiency are two other benefits CGX noticed with HP Multi Jet Fusion technology. With previous technologies, it took them 30 labor hours to build a headset. HP MJF allowed CGX’s engineers to design more sophisticated parts with higher feature counts. As a result, current headsets require less than 15 hours of labor, saving significantly on labor costs.

For the future, Fang sees bright opportunities for HP Multi Jet Fusion and 3D printing in general:

“HP MJF changed our business. We are able to design and produce far more sophisticated devices while reducing design and manufacturing time by almost 50%.

“Over the past 2 years using HP MJF, we’ve noticed significant improvements in material stability, finishing techniques, and turnaround time. This explains why [HP] MJF is the focal point of our design process. We have several ground-breaking products in the R&D stage today that were simply unbuildable just 3 years ago.”

Connect with an HP 3D Printing expert or sign up for the latest news about HP Jet Fusion 3D Printing hp.com/go/3Dcontactus

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Learn more about CGX at www.cgxsystems.com/

