HITTING THE RIGHT NOTE

Fender Cuts Prototyping Costs in Half with Objet 3D Printer

"Getting our product out first, and making sure it's the right product, is really important at Fender. The ability to perform rapid prototyping in-house with the Objet Eden350V has had a huge impact on both fronts."

— Shawn Greene, Fender

Fender dropped its time-to-market and cost of new products now that the company produces detailed prototypes in-house with an Objet 3D Printer.

Fender Musical Instruments Corporation designs and manufactures stringed instruments and amplifiers, such as solid-body electric guitars, including the Stratocaster and the Telecaster. The company makes acoustic guitars, electric basses, mandolins, banjos and violins, as well as guitar amplifiers, bass amplifiers, and public address equipment. Avril Lavigne, Elvis Costello, Eric Clapton, Pete Townsend and Sting are among the artists known for using Fender equipment.

While engineers focus on how instruments should sound, a group of industrial designers at Fender work on how they will look. Design is an extremely important element of Fender's business. The company maintains its own in-house design center, complete with a model shop to explore new concepts, create designs, prototype and test. Shawn Greene, senior industrial designer for Fender, plays a key role in that effort.

"We're dealing with artists and often professional musicians, so all of our instruments and equipment need to look great as well as sound great," says Greene. "Our design group works closely with marketing to explore different colors, graphics and the types of metal and plastic parts used. Before we spend anything on a product, we do a lot of concept work and research to make sure it's the right fit and product."

Rising Volume, Costs Cause Fender to Bring Rapid Prototyping In-house

3D rapid prototyping has been a part of Fender's design process for years, and until recently the company outsourced this work to service bureaus. However, Greene and his team were frustrated by the time and expense of outsourcing. It often took one to two weeks to get a "rapid" prototype back, a time lapse that really slowed down projects. By late 2007, Fender's volume had grown to a point where Greene recommended that the company bring rapid prototyping technology in house.

At a Glance

Challenges
- Speed prototype creation, accelerate product introductions and reduce cost of outsourcing prototypes

Solution
- Objet Eden350V™ 3D Printer

Results
- Prototypes now can be created in a few hours, product development cycles accelerated by as much as 6 to 12 months, and rapid prototyping costs cut in half

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“I calculated the cost of outsourcing prototypes for one year and compared it with the cost of bringing the function in - house. Even after factoring in the cost of the equipment and materials as well as staff time, I still concluded that we could significantly reduce our costs by doing it ourselves,” explains Greene.

His manager agreed, and Greene was tasked with evaluating 3D printing system vendors. “Detail was the most important criteria for us,” recalls Greene. “The nature of our work requires very tight detail. Ease of use was #2, and cost was #3. We also needed to make sure the system could handle a variety of part sizes and materials, because our parts range from the size of a dime up to a full guitar body.”

Outsourcing rapid prototyping on parts like this to a service bureau was expensive and time-consuming.

Service Bureaus Recommend Objet as the Best Choice for 3D Printers

Greene consulted with the service bureaus Fender had used for suggestions on 3D printer vendors. The most common recommendation by far was Objet.

“We were familiar with the equipment our service bureaus were using and had learned to distinguish parts made on certain printers,” he says. “There was one brand of printer that produced what we called ‘fuzzy parts’ because the finish was so raw – so we dismissed that vendor right off the bat. On the other hand, we’d always been happiest with parts from Objet printers.”

Greene ultimately chose Objet’s Eden350V 3D Printer. Built on Objet’s advanced Eden platform, this machine delivers the market’s most productive, flexible and high quality way to compress the product design-to-manufacturing cycle. PolyJet Photopolymer jetting technology found in the Eden350V enables horizontal layers of just 16-microns (0.0006»), producing prototypes with exceptionally fine details and ultra-thin walls down to 0.1 to 0.3mm thick.

Fender chose the Objet Eden350V because of its ability to produce fine details and thin walls.

The Objet Eden350V is designed to provide high quality 3D models quickly and conveniently throughout the CAD/CAM process. With a full 350 x 350 x 200mm build size, it offers the flexibility to produce a single large model or multiple smaller models in one build.

Now, the Fender design team can prototype a part within hours versus weeks – so they are doing a lot more of it. “We print anything from small guitar parts and amp knobs up to amp chassis and new guitar body designs,” he explains. “We do a lot of overnight printing. We set the printer before we leave, and when we get back in the morning, the parts are ready. When we’re cranking on a project, getting those prototypes back quickly really, keeps the momentum going. When we outsource and have to wait a week or two for a prototype, it can cause us to lose our steam.”

Greene and his team are extremely happy with the finish and detail of parts printed on their Objet Eden350V. “We can even put text on very small parts and it shows,” he says. “We get very sharp radi, and it’s very easy to switch out materials. We’ve used every one that Objet offers.”

Greene cites four main benefits to having the Objet Eden 350V printer in-house:

- Accelerated time-to-market for new products and product enhancements
- Lower risk for new product introductions
- Better, more creative product designs
- Prototyping costs cut in half even though Fender now does much more rapid prototyping than in the past

Time to produce prototypes has been reduced from weeks to hours

New Amplifier gets to Market 6 to 12 Months Faster

Fender now uses its Objet 3D printer to create parts, mockups and prototypes for almost every product. One recent success prototyped on the Objet Eden350V is its G-DEC® (Guitar Digital Entertainment Center) amplifier, named “Best New Instrument Amplifier” by Music and Sound Retailer.

“We were able to prototype parts and knobs on the amp long before we spent any money on tooling and finished a mockup of the first G-DEC within one month,” says Greene. “Then we worked with marketing to conduct focus groups with musicians and retailers to make sure the product was on target. After some tweaking, we were able to go right to tooling. The whole process took about six months.”

“Prior to having the Objet Eden350V, the mockup alone would have taken 6 to 12 months,” he adds. “The changes we got from marketing would have added even more time to the project, as we waited for new prototypes. The bottom line is that having the Objet 3D printer in house helped Fender get the G-DEC amplifier to market 6 to 12 months faster.”

3D printing helped bring a new amplifier to market 6 to 12 months faster

A more common project for Greene’s team is designing new features for an existing product. Recently, Fender’s marketing team asked Greene to design a new ergonomic knob for an amp. Prior to having the Objet Eden350V in house, Greene would have created alternatives using CAD software and then shown the CAD drawings to marketing for a decision. Instead, Greene was able to create 10 alternatives using CAD, print out and paint prototypes of each and put them on real amps. “The finish on the printed prototype was so good that I was able to install the knobs right on real amps in our office and let the marketing staff try each one to see which looked and felt the best,” he says. “It was a much better experience for the marketing team – our internal customer – and resulted in a much better product for consumers. It also saved us a ton of time, money and risk. We didn’t have to guess which knob would be best for this purpose.”

More Frequent Prototyping Helps Prove Product Designs

The Objet Eden350V also has helped Fender avoid rework and retooling. One notable example was a light-up front panel for an amp. Greene designed the parts and then printed a prototype of the front panel with Objet’s transparent material. After he installed the prototype on the front of an existing amp and tested it with different types of lights, he discovered that light didn’t deflect the way he thought it would. As a result, he went back and adjusted the design significantly. “In the past, we would not have done a prototype for that kind of part because it would have taken too long and cost too much money,” says Greene. “So by the time we noticed that problem. We would already have paid for tooling, and then we would have had to pay for amendments to the tool. The ability to rapid prototype in-house saved us a fortune just on that one project.”

“Getting our product out first, and making sure it’s the right product, is really important at Fender,” he adds. “The ability to perform rapid prototyping in-house with the Objet printer has had a huge impact on both fronts.”

According to Greene, sometimes Fender designers even print samples of real parts using the Objet 3D Printer for a mockup or for another product they’re testing, if they are out of stock. “Instead of ordering from the factory and then waiting, we just print the part on our printer” says Greene. “It’s fast and easy, plus we’re not taking away from customer stock.”

Objet Printer Helps Design Team Explore New Ideas Quickly

Greene says the greatest benefit to having the Objet printer in-house is that his team can explore new ideas quickly. “Having the printer

in-house means we can experiment more,” he says. “It’s given us freedom and creative latitude. If I have an idea for something new and edgy, I can design it and have a prototype in just a few hours. If it doesn’t work out, I’ve only used an afternoon instead of a week.”

“We call the Objet printer ‘our favorite toy’” he adds. “When people come to Fender for tours, we always show it off.”

Fender’s marketing staff is ecstatic about the Objet 3D printer. “We’ll leave a meeting with marketing and have a working prototype to show them the next day,” says Greene. “They are amazed at how quickly we can now go from concept to reality.”

“You can show something on paper all day long,” adds Greene,” but when you give them something real they can touch, people really get excited.” Greene also believes that the Objet Eden350V has helped Fender provide better products to its customers. “We prototype so much more now, and I feel it’s absolutely had an impact on the quality of our designs. Often the prototypes cause us to make little tweaks throughout the design process to improve the look, feel and functionality of a part.”

The Bottom Line

Even with its significant increase in rapid prototyping, Greene says Fender’s costs are half of what they were when the company outsourced the work. And despite the printer’s frequent use, its performance of Fender’s Eden350V has been rock solid. “In 18 months, it has not gone down even once,” says Greene.

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