stratasys

CASE STUDY
FDM

Uniquely Streamlining Manufacturing Efficiencies

How Subaru used 3D printing to cut tooling development time by 50%.

"Speed is life" is a mantra embraced across multiple industries. Whether you're piloting a jet, launching a startup company, or making products, there's a tangible benefit in going fast and finding efficiencies. In manufacturing, speed (when paired with accuracy) is critical because it fosters a competitive advantage, allowing a company to react more nimbly to market demands.

That reality wasn't lost on Matt Daroff, Project Engineering Manager at Subaru of America, Inc. (Subaru). Daroff and his colleagues in the Subaru Accessories Product Development (APD) team are responsible for developing the extensive catalog of Genuine Subaru Accessories available for all Subaru vehicles sold in the United States. The tooling and fixturing required to install these accessories with precision were traditionally developed and fabricated through conventional means – machining metal and plastic parts and bolting them together – a slow and often expensive process, particularly during prototype validation and iteration. Subaru saw the potential for additive manufacturing (AM) to streamline the toolmaking process, and from that idea, the team's 3D printing journey began.

An Easy Business Case

As with any major equipment investment, the automaker's 3D printer purchase had to clear a strong business case. That wasn't too difficult to achieve, however, based on the high cost of traditionally fabricated, outsourced tooling. By switching to 3D printing, the Subaru APD team was able to endorse the purchase of a large-format Stratasys F770™ 3D printer, effectively insourcing tool fabrication with minimal capital investment aside from the cost of the printer. "We develop specialized tooling and jigs for precise installation of many of our products. The fabrication cost for just one of those developments was so incredibly high, that when we put pen to paper, it was easy to justify a business case for an F770 purchase. Utilizing the F770 for prototyping and production of tooling for that program alone was projected to reduce cost by about 70%, and yield a roughly two-year ROI," says Daroff, also noting that the F770 has since been used for prototyping and tooling for multiple product lines, including a variety of vehicles in development.

More significant was the impact AM had on the tool development process. According to Subaru, the switch to AM completely transformed the team's workflow, with particular benefit on tool-design prototyping and development. "Iteration cadence on tool prototypes was on the order of weeks between each new prototype with conventional manufacturing. Additive reduced this cadence to days. This enabled us to cut our development time on tools for this product line by well over 50%," says Daroff. It also enabled a switch from outsourced batch tool production to insourced single-piece, just-in-time manufacturing, a strategy that offers the benefits associated with lean, flexible, and responsive manufacturing.

The positioning fixtures were printed with high-visibility yellow ASA material. The handles are standard off-the-shelf stock.

This view shows how the FDM tooling is used to correctly position the attachment of body side moldings.

While the workflow gains were significant, they were still bound by the realities of printing large parts with existing AM capabilities. The F770 printer uses FDM® filament technology and features a generously sized build chamber, able to accommodate the large fixtures needed for installing the vehicle's accessories. If some fixtures exceed the printer's 100 cm (39.4 in.) print bed length, Subaru's tool designers will section the tool, print it in several pieces, and join them. But when you combine large parts with the speeds typical of extrusion-based printers, print times can be long.

According to the Subaru APD team, that wasn't unexpected. But even with that understanding, production timelines still had to be adapted to the pace at which the tools could be printed. And while AM achieved a cost reduction compared to conventional manufacturing, their next question was how to reach the next level of benefits AM might provide – saving time through expedited print operations.

Accelerated 3D Printing

The answer came in the form of a beta test for a new print head designed to increase the F770 printer's speed by at least 1.5X. The new T25 print head enables a faster material extrusion rate and employs a larger tip orifice, accelerating time-to-print. The T25 head also prints with the same 33 mm/0.013 in. layer height as the standard T14 print head, producing a similar surface finish for most geometries.

Stratasys in-house testing on a variety of parts demonstrated a print time increase of 1.86 to 2.27 times the speed of the standard F770 T14 print head. Results from a 36-inch-long tool printed by the Subaru team resulted in a 1.96X speed increase – or a print time roughly half of what it would take using the T14 head.

Before incorporating the new T25 print head, the APD team relied on two printers, the F770 and another large extrusion printer, to meet production demands. With the introduction of the faster T25 print head, Subaru was able to increase throughput and meet demand with just the F770 printer, leaving the other system available for other urgent jobs.

Daroff relates, "When we were presented with the opportunity to explore increasing our F770's print speed, we were all for it. Until now, we were using another machine to pick up the slack. Now we can get all that throughput on a single [F770] machine. It immediately made for a more robust and flexible operation, freeing up an entire asset for other work."

Magnets allow the tools to adhere to the car. Soft-touch pads bonded to the tools after printing prevent surface marring.

Despite their size the tools are printed with sparse-fill density which keeps them light and easy to manipulate.

The Bigger Picture

While the T25 print head has made Subaru's accessory development operation more efficient from a time and cost perspective, there's a broader view on how this solution has helped. In short, it has alleviated some of the pain points that the team has faced in the normal course of business, allowing them to react faster than they've historically been able to. This swifter reaction means the operation no longer suffers the consequences and costs associated with delays, thereby reducing losses and waste.

Subaru points to urgent tooling requests as a prime example, situations where faster turnaround can prevent delays for the installation group, reduce waste, and protect business opportunities that would otherwise be lost. "Much of our waste is a function of time," says Daroff. "The costs of lost time are opportunity costs. If our team doesn't have the tools necessary to install our products with confidence and precision, we will not install them at all. So the sooner we can get our team what they need to perform that work, the sooner we can create value for our customers. Conversely, if we can't respond quickly to replace damaged or lost tools in the field, or new tool requests, this means lost opportunities to deliver our products," he adds.

Cost savings aside, this also supports the automaker's environmental commitments to reduce waste, conserve resources, and preserve natural spaces, directly tying into the fact that all Subaru products are manufactured in zero-landfill production plants.

Why Stratasys

When Subaru considered bringing additive manufacturing in-house, its focus was on the potential to include a variety of AM manufacturers. Based on discussions with internal customers, the development team narrowed the field to large-format, extrusion-based printing technologies. "I think we picked about seven or eight different machines to evaluate from manufacturers across the globe," Daroff says. "At the time, none of them were Stratasys. Based on our known available budget, I felt Stratasys was beyond what we could realistically consider. We were looking at the balance between cost, quality, and efficiency."

Subaru solicited sample parts for evaluation from the various manufacturers under consideration. However, based on previous positive experience with Stratasys technology, they requested a sample from Stratasys to use as a benchmark. After comparing the submissions, the Subaru team noted a clear distinction in terms of the output from Stratasys industrial printers. "In that evaluation, once we saw the delta, the gap of quality and the output of [the Stratasys] machines, we had a powerful enough artifact to show our leadership and say, 'We understand this may be a more significant investment, but it's worth it,'" says Daroff.

Turning Speed Into Real Benefits

It's not every day that an automaker is able to improve process efficiency by nearly 100% with a simple machine upgrade. But that's what Subaru has been able to achieve with the T25 print head on its F770 printer. As a result, it has opened the door to considerable downstream benefits, further reducing tooling development cadence from multiple days to a day, or in some cases, even hours. The combination of this efficiency and the switch to a just-in-time workflow gives the APD team the ability to serve and collaborate with their customers much sooner.

Daroff makes the point this way: "Getting parts to our customers earlier gives them an opportunity to test for things we may not have caught in development or simply identify reasonable opportunities for improvement upon an already good design. This gives us the opportunity to make corrections and improvements sooner, minimizing time and material waste on defective output before it's produced, and maximizing opportunities for continuous improvement."

For Subaru, speed isn't just about printing faster—it's about catching issues quicker, reducing waste, and getting accessories to market with greater confidence. The F770 with the T25 print head has helped make that possible.

stratasys

stratasys.com
ISO 9001:2015
Certified

Stratasys Headquarters

5995 Opus Parkway,
Minnetonka, MN 55343
+1 800 801 6491 (US Toll Free)
+1 952 937-3000 (Intl)
+1 952 937-0070 (Fax)

1 Holtzman St., Science Park,
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000
+972 74 745 5000 (Fax)