From prototyping to production, HP 3D HR PP enabled by BASF results in robust parts and shorter supply chains

Data courtesy of Extol

Extol leverages the manufacturing industry's familiarity with polypropylene combined with the capabilities of HP Multi Jet Fusion technology to help customers decrease time to market through design validation efficiency

Data courtesy of Extol

Introduction

Extol Inc. specializes in plastics assembly technology, custom automation, and engineering services. With a customer-centric, values-driven approach, Extol serves its customers across their value stream to help them improve the way plastic products are made for industries such as automotive, life sciences, and consumer products.

• Industry

Mobility and transportation

• Sector

Automobiles

• Objective

To decrease time to market and shorten the development cycle by manufacturing functional prototypes using the same material and assembly process as end-use parts.

• Approach

Extol was able to shorten the development cycle from weeks to days for a fluid reservoir functional prototype by 3D printing the reservoir with HP Multi Jet Fusion technology in HP 3D High Reusability (HR)[1] PP enabled by BASF.

• Technology | Solution

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

• Material

HP 3D HR PP enabled by BASF

1. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PP enabled by BASF provide up to 90% 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

In Extol's Process Development Center, teams assemble functional prototypes of fluid reservoirs using polypropylene (PP) parts made from injection molding, which are provided by their customers. It typically takes up to 7 weeks for Extol's customers to injection mold these parts, but once the parts arrive at Extol, they can be joined using hot-plate welding in only 1 day. Using injection molding to create the prototypes of these parts delays the functional testing and overall validation processes, so Extol's customers are constantly pursuing faster design cycles and improved validation efficiency.

Extol had been using 3D printing internally for years and realized that the technology could provide value to customers in situations like this.

"We learned from our customers that many of them wanted to use 3D printing to find value in their business beyond prototyping but didn't know where to start," said Kyle Harvey, Business Unit Manager for Additive Manufacturing at Extol.

According to Harvey, using 3D printing to manufacture functional prototypes for fluid reservoirs increases design validation efficiency and allows for the completion of more design cycles in the same amount of time as traditional methods, which significantly shortens the time to final part and, thus, time to market.

"We chose HP Multi Jet Fusion…because the technology is well-positioned to allow 3D printing to make the jump from prototyping to functional, end-use parts," Harvey said.

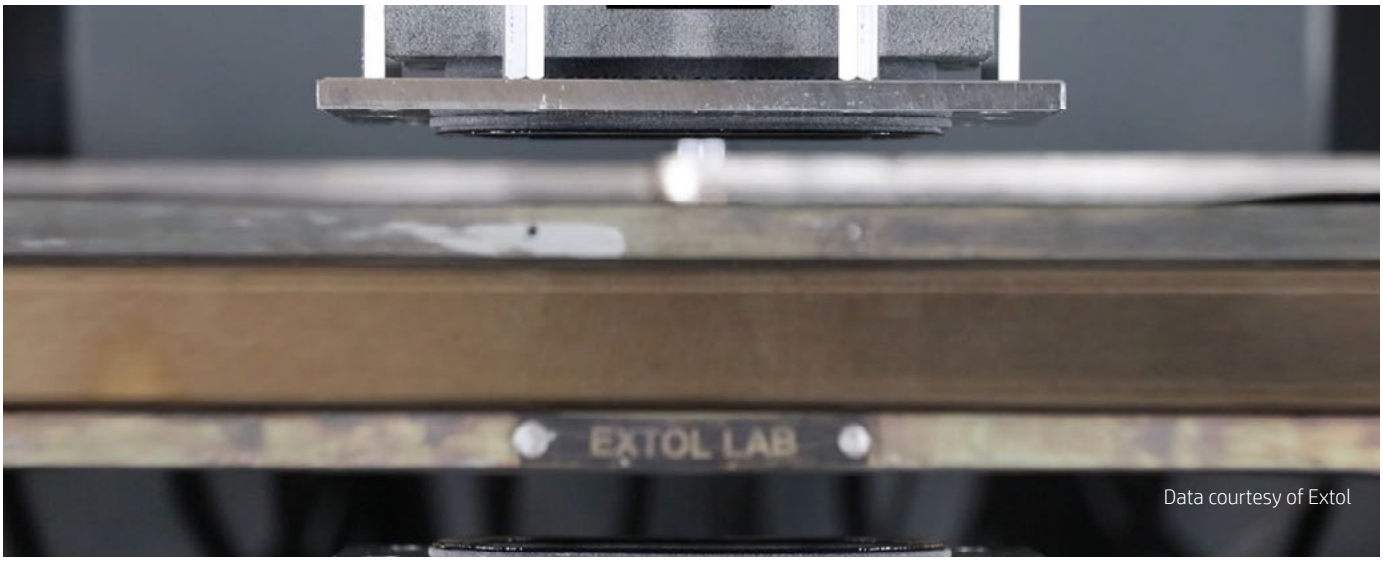
Despite the wide use of PP as a manufacturing material, especially in the automotive industry, the implementation of 3D printing has lacked a robust PP solution. Extol aimed to leverage its customers' knowledge and acceptance of PP in existing product requirements to create functional prototypes that are similar to production assemblies and to improve functional testing of these design prototypes.

Solution

In its Digital Development Center, Extol 3D printed the prototype fluid reservoirs with HP Multi Jet Fusion technology using HP 3D HR PP enabled by BASF. With HP Multi Jet Fusion, Extol can create thermoplastic parts, which can be welded with traditional plastic assembly processes such as hot-plate welding. The combined welding-and-printing process enables nonporous parts that are capable of fluid tightness.

Extol then hot-plate welded the assembly on prototype tooling to complete the functional prototype assembly, which was then validated with burst testing and leak testing using the same methods that would be used with an injection molded assembly.

As a material that manufacturers have come to rely on for weldable, chemically resistant functional parts, 3D printing with PP presents the capability to use the same material for both functional prototyping and production, and can provide a more accurate representation of performance when produced at scale.



Data courtesy of Extol

Result

Combining 3D printing using HP Multi Jet Fusion technology and HP 3D HR PP with the traditional assembly process of hot-plate welding reduced the time to the first functional assembly from 7 weeks to 6 days.

Compared with the injection molded assembly, the 3D printed assembly achieved comparable burst- and leak-performance, reaching a parent material strength weld in the burst test and forming a hermetic seal in the leak test. Depending on the strength requirements for the system validation testing, the printed design may be optimized for strength if it needs to achieve the same burst strength as the injection molded assembly.

Similar results may have been possible with other HP 3D Printing materials but using a different material in prototyping versus production can lead to additional validation measures, possible performance discrepancies, and also can create a barrier for customer adoption. The availability of and familiarity with HP 3D HR PP helps remove these potential barriers.

"[Customers] come to us asking for PP because they know the performance characteristics and assembly processes associated with PP," Harvey said. **"This reduces the barrier of entry to 3D printing because it's involving a material they already know."**

Harvey sees Extol continuing to use HP Multi Jet Fusion technology and HP 3D HR PP by incorporating the technology and material into existing 3D printing processes to help both new and existing customers create value from additive manufacturing.

"There's a lot of change management required to convince a customer to try 3D printing or to work on developing an application together, so giving them something that's familiar to them (i.e., PP) is a much smoother place to start," Harvey said.

Data courtesy of Extol

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4AA7-7607ENW, May 2020