Aerospace Tough

UTC AEROSPACE SYSTEMS IMPROVES PRODUCTION WITH 3D PRINTING

"The rugged factory environment often puts high demands on 3D printing materials and based on our experience, ULTEM 1010 is fully capable of meeting the challenge."

— Larry Crano, automation specialist, UTC Aerospace Systems

CASE STUDY

This new Y-shaped design in strong ULTEM 1010 resin has been in production use for eight months without cracking.

The Aerostructures business of UTC Aerospace Systems builds a number of large and critical assemblies for many global leaders in commercial and military aircraft including the world's two newest commercial twinjets, the Boeing 787 Dreamliner and the Airbus A350 XWB. These assemblies include nacelles, thrust reversers and pylons.

Manufacturing aerospace structural components requires a wide range of complex machinery. Aerostructures operates a well-equipped machine shop and is responsible for producing parts needed to keep this machinery running at full efficiency and build tooling, jigs and fixtures to optimize productivity.

Aerostructures originally purchased a Fortus 900mc™ 3D Production System to reduce time to market by building prototypes of components for many of the company's end products much more quickly than previously possible. Over the last few years, UTC Aerospace has also used the 3D printer to substantially reduce the cost and lead time required to build machinery replacement parts as well as tooling, jigs and fixtures.

Searching for Strength

However, there were still many components that had to be made by conventional manufacturing methods, because 3D printing materials were not yet strong or heat-resistant enough. One example involves the nozzle of a fume collection system supplied with a machine tool. Production workers suggested converting the simple cylindrical nozzle to a Y shape to better collect fumes created in two different areas.

UTC Aerospace technicians redesigned the nozzle and 3D printed it with ABS material. Metal toggle clamps were used to attach it to the remainder of the fume collection system. Unfortunately, the 3D printed nozzle cracked at the point where the loads from the toggle clamps were applied. Technicians estimated that producing a metal nozzle using CNC machining would cost about $2,000 and take about 21 days.

Enter ULTEM 1010 Resin

Around this time, UTC Aerospace was introduced to ULTEM 1010® resin, which offers the highest tensile strength, heat resistance and chemical resistance of any FDM® thermoplastic. "We tested the new material and the results were very promising so we decided to produce the new nozzle in ULTEM 1010," said Larry Crano, automation specialist for UTC Aerospace.

The cost, including material cost and burden rate, was $750 and the part was produced in one day. "ULTEM 1010 provided the qualities needed for the nozzle," Crano said. "The new part has been in use for eight months without cracking or any other issues and has solved the fume control problem. We also expect that it will have longer life than the previous printed part."

"Beyond this specific application, we believe that ULTEM 1010 has tremendous potential for printing of tooling, jigs and fixtures because of its exceptionally high strength and heat resistance," Crano concluded. "The rugged factory environment often puts high demands on 3D printing materials and based on our experience ULTEM 1010 is fully capable of meeting the challenge."

Machining another of the original design for the nozzle would have cost about $2,000 and taken 21 days.

The new Y-shaped design in ABS material wasn't tough enough and cracked during use.

The new design 3D printed in ULTEM 1010 resin cost only $750 and was produced in one day.

METHOD	TIME	COST
CNC machining	21 days	$2,000
3D printing	1 day	$750
Savings	20 days **95%**	$1,250 **63%**

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