DOOSAN

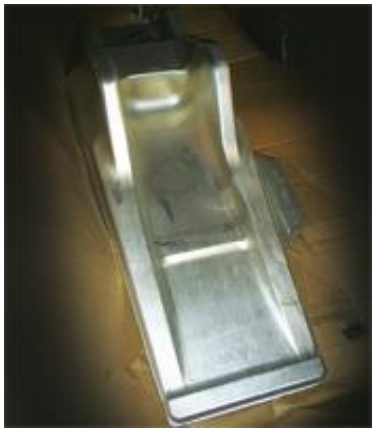
DIA Press

A Triumph in Aerospace

Extensive aluminum extrusion machining capabilities have set Triumph Structures-Kansas City, apart from the competition. About three-quarters of the aerospace shop's work involves parts made from such extrusions. It currently produces more than 1,500 separate part numbers out of its extrusion operations, and some individual part numbers can require running anywhere from 1 piece to 8,000 pieces per year.

But, while aluminum-extruded components make up a fair share of work at Triumph Structures, the shop is accomplished in additional machining capabilities, such as precision machining hard metals, to continue to meet its customers' demands in the aerospace industry and to maintain its competitiveness. The shop also is looking to expand into markets beyond the aerospace industry.

In the aerospace industry, engineers are still designing aircraft components that will be made specifically from aluminum extrusions. And the drive has been to tighten tolerances to the point where those components can be "snapped together" during assembly. It is these tighter tolerances and the inherent nature of extrusions that present the most challenges in machining.



According to Dennis Folsom, director of continuous improvement at Triumph Structures, the biggest challenge in machining aluminum-extruded parts is dealing with variations in the extruded material and thermal expansion. He said that a 12-ft or 14-ft-long piece of extruded aluminum may grow in size at a rate of 0.002 in. per 12-ft per every degree rise in temperature. So the longer the part, the faster it can "grow" out of tolerance. The shop's extruded- aluminum parts range in size from small half-inch clips to 28-ft-long combination floor beams and seat tracks for turbo-prop aircraft.

At one time, Triumph Structures machinists had to carry long aluminum-extruded components to a CMM that was in a building separate from the shop's extrusion machining area. Together, part travel and measuring time wasted about 4 hours of production, so the shop built its own shop-floor CMM that uses a laser inferometer and a traveling measuring head from Starrett, along with compensating software.

The custom-built system allows for volumetric thermal compensation and holds a tolerance of +/- 0.001 in. over a 25-ft span. Basically, it's a laser-controlled CMM with an extra-long X axis, Folsom said. He explained that the shop needed to measure extrusions accurately that were over 20-ft long and to have some type of compensation capability. The system provides that, and slashes the 4-hour operation down to 15 min.

Aluminum-extrusion machining operations at Triumph Structures include drill and trim and gage reducing. Drill and trim is milling the net shape of the extrusion, such as the three sides of a T-shaped extrusion, and putting in some holes. Gage reducing involves machining the cross section of an extrusion. Some extrusions are simply cut to length and have a few holes drilled in them.

On the precision machining side, Triumph Structures has set its sights and R&D efforts on hard metals machining, and now considers that a core competency. With that said the growing use of hard metals such as titanium, tungsten, Aermet 100, and HP9430 in the aerospace industry was a catalyst for the addition of new equipment at Triumph Structures.

For both hard metal machining R&D and some production work, the shop installed a cell of two Doosan HM 500 horizontal machining centers. With the Doosan machines, the shop develops machining techniques such as those for controlling the "springyness" of large thin titanium parts during machining operations. The shop also works closely with its machine tool providers and cutting tool suppliers to develop hard metal machining techniques. "The Doosan machines are purpose built for hard metal machining and dedicated to furthering our hard metal machining capabilities," Folsom said.

He added that, in addition to the machines, the shop's hard metal machining development benefits from a knowledge transfer that happens when pairing older experienced machinists with younger ones. These two peer groups that, in the past, didn't share ideas and information are now working together to further the shop's machining capabilities.

The shop has set up its latest machines in cells based more on part materials as opposed to part production processes. And according to Soper, these budding cells are a ramp up for new aircraft programs that are headed toward production. He also said the shop will add more automated pallet systems and robotics as the programs proceed to full rate.

For Additional Information Contact:

John Ross
Doosan Infracore
8 York Avenue
West Caldwell, NJ 07006
(973) 618-2500
john.ross@doosan.com