

FDM End of Arm Tools Deliver Quick, Cost-Effective Results

“Normally it would take weeks to get traditional grippers made. With the FDM gripper, you can have a new end of arm tool complete and bolted up to the robot within a day or so.”

— Doug Huston, Technical Advisor, Genesis Systems Group

SITUATION

Genesis Systems Group, headquartered in Davenport, Iowa, designs, builds and implements robotic automation systems. Its expertise enables the production of a wide array of products in the automotive, construction, aviation and recreational vehicle industries, to name a few.

One of Genesis’ specialties is building robotic, waterjet cutting systems used to trim composite parts. Because many of its parts have complex geometries, the normal approach for trimming was to mount the waterjet cutter on a robotic arm and move the cutter around the part. This approach lost favor however because one wrong move of the robot’s arm could cause the high pressure waterjet to become dangerous for employees.

In response, Genesis pioneered a safer process which utilized an end of arm tool (EOAT). The EOAT gripped the part and moved it around the cutter to safely trim the part. The greatest challenge to this approach was that the company had to design and build a custom gripper for each unique part to be trimmed. Genesis depended on CNC machining to create the grippers, but the lead time and cost were very expensive.

SOLUTION

Genesis engineers examined the feasibility of using 3D printing to reduce the time and cost of making EOAT grippers. They determined that while most 3D printed parts were not rugged enough to withstand the rigors of the water jet cutting process, grippers created with FDM[®] technology were more than equal to the task.

In addition, engineers were able to leverage FDM’s ability to create intricate and complex shapes by creating an internal channel for a pneumatic airline. This allowed the grippers to hold parts with a vacuum. It also reduced the need for cumbersome, external pneumatic lines that could be damaged in the waterjet environment.

RESULTS

Genesis engineers soon discovered that FDM technology also created a number of other benefits, including vast reductions in production cost and cycle time. Previously it would have taken 20 days and substantial cost to make a pneumatic gripper with CNC machining. By using 3D printing, Genesis reduced the time to three days and significantly reduced the cost — an 85% reduction in production time and an even greater 94% reduction in cost.

How does FDM compare with traditional methods for Genesis Systems Group?

Method	Time	Weight
CNC Machining	20 days	15.9 kg (35 lbs)
FDM	3 days	1.4 kg (3 lbs)
SAVINGS	17 days (85%)	14.5 kg (91%)



Figure 1: Traditional EOAT with bulky, machined components.



Figure 2: Replacement FDM, single-piece EOAT (ULTEM[®] 9085 resin).

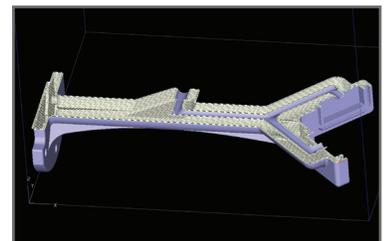


Figure 3: CAD model of FDM EOAT showing internal vacuum channel.

The redesigned EOAT, made with lightweight FDM plastic, also reduced the weight from 35 pounds to just 3 pounds. This made it possible to use smaller, less expensive robots. These factors alone give Genesis numerous opportunities to reduce costs and streamline production throughout the company.

Doug Huston, technical advisor for Genesis Systems Group, expressed his appreciation of the system by saying, "Switching to FDM dramatically reduced the cost of building grippers. Delivery time was substantially reduced too, which is important because if a tool is destroyed in production, we have to shut down until a replacement is built."

Huston added, "Normally, it would take weeks to get traditional grippers made. With the FDM gripper, you can have a new end of arm tool complete and bolted up to the robot within a day or so."



Figure 4: FDM EOAT gripper used in a waterjet operation.

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ACS-FDM-GenesisSystems-12-14-EN

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