ShopSolutions

Case Histories of Manufacturing Problem Solving

Multitasking Machine Tests Super

Magnus Precision (Phelps, NY) is one of the premier contract shops in the Northeast. Housed in a world-class 55,000 ft² (5109 m²) facility, the company is respected among customers and suppliers alike for its meticulousness in producing complex components for the aerospace, medical, optical, and micromachining markets. It embraces a philosophy of applying the latest advances in machining technology to keep the competition in its rear-view mirror.

When Don Miller, director of business development at Magnus Precision, received a call from the Hardinge Group (Elmira, NY) asking if his company would beta test its latest Super-Precision T-42 multitasking turning center, he replied, "Yes, how soon can you deliver it?" Magnus had many years of compatible experience with the machine tool builder's previous Conquest T-series generation with live tooling, and wanted to assess the impact that the new turning technology would have on the company's precision-machining work.

Don Miller (left), director of business development, and Grant Oberdorf, plant manager, at Magnus Precision (Phelps, NY) with the new Hardinge SP T-42 Super Precision multitasking center installed for beta testing.

At Magnus Precision, in addition to quantifiable time studies, productivity gains are measured in better accuracies and improved surface finishes, less scrap, and reduced part-handling time. "We knew that Don and the skilled workforce at Magnus would provide the thoughtful, practical feedback we needed before releasing the machine to the world market at IMTS 2010," explains Paula Ameigh of Hardinge.

Accordingly, the Hardinge SP T-42 turning center was installed in July 2010. Magnus immediately put it through its paces on two test parts. The first was a 440C stainless valve component for an aerospace customer. Miller felt this was an excellent choice, because the approximately 4" long × 1.5" diam (102 × 38-mm) part required a number of turning, milling, and drilling operations that would test the live tooling option on the machine and the subspindle performance.

Previously, the valve parts were turned on a CNC lathe and then transferred to a VMC for the milling and secondary drilling operations. Once the off-line programming was accomplished using PartMaker and downloaded to the machine's 0.000010" (0.0003-mm) resolution Fanuc 31i CNC control, the SP T-42 was ready for production. There was one surprise in store for Magnus personnel, however. While familiar with live tooling on other turning centers, Magnus didn't have experience with the BMT-45 top-plate system on the SP T-42.

"The BMT-45 system was new territory for us," says Miller, "and it's that aspect of the machine that provided the most surprising results. Most manufacturers aren't as familiar with BMT tooling or BMT top plates as they are

with the more common VDI system. We found that BMT top plates are significantly more rigid, with a heavier-duty interface. With the proper gear ratios in the toolholders, you can achieve unusually high speeds, up to 32,000 rpm. We took an approximate previous cycle time of 40 min down to a total of about 14.5 min—part complete, one machine, one setup. We've almost tripled the productivity, and are looking forward to working with those higher rpm on our micro-medical components."

The BMT-45 turret offers 16 live tooling stations with one half-station index between each station. Both the static and live toolholders are designed to adapt modular add-on toolholder blocks for user flexibility and allow fine tool adjustment in the *Y*-axis plane. Typically, maximum live tooling rpm are in the

The BMT-45 turret on the Hardinge SP T-42 offers 16 live-tooling stations with one half-station index between each station. Both the static and live toolholders are designed to adapt modular add-on toolholder blocks for user flexibility, and allow fine tool adjustment in the Y-axis plane. Live toolholders on the Hardinge BMT top plate start at 8000 rpm and are capable of 16,000—32,000 rpm.

Hardinge's subspindle system for machining the back end of parts and removing them is designed to handle critical parts with delicate surface finishes. The gripper includes machinable nylon inserts that are gentle on parts.

5000–6000 range. Live toolholders on the Hardinge BMT turret start at 8000 rpm, and, when high speeds are required, are capable of up to 16,000–32,000 rpm when purchased with ratios of 2:1 or 4:1. They provide run-out within 0.00012" (3 µm).

"With the positive results we've achieved in such a short time, we are looking forward to putting more of our complex parts on the machine."

The second test part, a classified titanium (Ti6Al-4V) aerospace part, featured 0.0003" (0.008-mm) tolerances on several features. "We knew that particular part would relay the precision aspect of the SP T-42 very well. We held the tolerances with no problem, part to part," says Miller.

"Thermal stability is paramount to accuracy, too, and we are skilled at chasing it here at Magnus," says Miller. "The SP T-42 has a detached stand, which houses the coolant

pumps, coolant filter, machine power case, and hydraulic system. By design, the detached stand prevents these heat and vibration-generating components to migrate through the machine, resulting in the machine's ability to achieve higher thermal stability and, thus, part accuracy. Further, the spindle is cooled using an oil jacket and chiller for even better thermal properties."

Finishes are a significant aspect of the overall accuracy and precision requirement, in particular on the company's optical and medical components. Part finishes of 0.000006" (0.15 µ) Ra are routinely achieved on the SP T-42. Hardinge's subspindle parts-removal system is designed for handling critical parts with delicate surface finishes. The gripper includes machinable nylon inserts that are gentle on parts. Users can opt for a parts conveyer where components can be off-loaded manually or integrated with a robotic device, permitting untended operation with a barfeed.

During the beta testing phase of the SP T-42, a couple of minor issues surfaced that Magnus relayed to Hardinge. The issues were related to software and implementation of the Fanuc 31i control to the new Hardinge T-series.

"This was the whole idea of beta testing with Magnus," says Jim Langa, vice president, Engineering & Global Sourcing at Hardinge, "to learn what we needed to tweak. We resolved those items quickly by working with our software and applications engineers and directly with the Fanuc software engineers."

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"As for us," says Miller, "with the positive results we've achieved in such a short time, we are looking forward to putting more of our complex parts on the machine. Continuous improvement can sound like a cliché, a buzzword, but at Magnus, we are very serious about it to not only stay in business, but to thrive in a challenging economy. We keep figuring out better ways of doing things for our customers. They bank on our philosophy. The SP T-42 plays right into those goals." **ME**

For more information on Hardinge, go to www.Hardinge.com, or phone 607-734-2281.