Application Story: Stama Maschinenfabrik

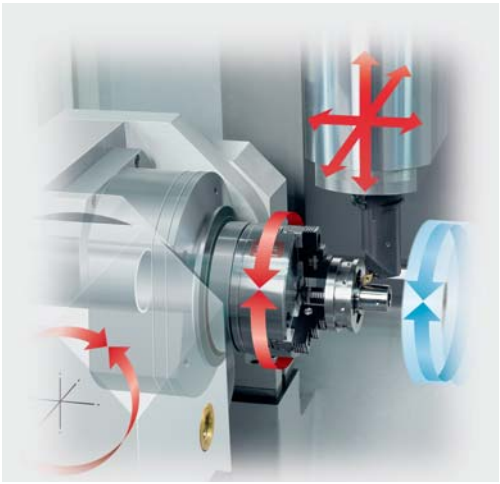
Controls are Key to Success for Stama Milling/Turning Center

In the development of the new System 7 milling/turning center from Stama, the German machine tool builder, there were some distinct challenges for the control supplier. On this innovative machining center, a single five-axis milling spindle is combined with one or two turning spindles and trunnion-mounted workpiece positioning for true six-sided, fully-automated machining for blank bar stock or from a chuck. Traditionally, when small to medium batches were required, such work was done on multiple machines, owing to economic inefficiencies involved in using a multi-tasking machining center for such work. Stama sought to produce a highly flexible machine, capable of milling, drilling, thread cutting, external/ internal turning, facing and contouring, that could offer more customers the ability to use it on shorter runs. Because short set-up and changeover times were distinct goals of the System 7 design team, the control selection process became all the more complex, according to Stama director of sales, Gerhard Ulmer.

"And, compounding our challenge," Ulmer states further, "we had a great demand for high accuracy under production conditions, because our automotive and our medical customers require it. 0.02mm true position under 1.67 Cpk conditions are typical for our twin spindle machines. With some of the extreme alloys our customers process, holding that standard would not be so easy to achieve."

The inherent advantages of twin-spindle machines have always included a smaller footprint, power savings, increased productivity (42% vs. single spindle, according to an Aachen University study) and a reduction in overall cost per part. Correspondingly, the base cost of the machine and the changeover times meant these machines were generally best suited for fewer and longer production runs. While Stama serves Tier One automotive and other customers who fit this profile exactly, this builder sought to design a machine with their Tier Two/Three automotive, as well as their high-precision, short run customers in mind, according to Ulmer.

From the beginning of the process, the Stama design team considered their customers' main concern, namely, how to devise a solution that would allow twin-spindle and single-spindle work to be processed with economy, on the same machine. Clearly, this machine would require a very high level of motion control, accuracy and multi-function capability. Customers would need the options to machine one piece simultaneously with two spindles, run separate smaller parts on each spindle independently or change tooling on one spindle while the other was machining (zero-based toolchanging). And, for true six-sided machining, one spindle would need to function as the rotary actuator for the workpiece. To pack all these features into a single machining center and not price it out of the competitive market ranges was a major concern for the Stama team.



Above Left: Siemens SINUMERIK 840D with NCU (Numerical Control Unit) 573.5, the powerful CNC that runs the System 7 machine

Above Right: System 7 (MT Series) from Stama, a milling/turning machining center for complete six-sided machining of small and medium batch runs

Left: System 7 from Stama combines five-axis machining with trunnion-mounted twin spindle technology to allow vertical or horizontal machining, bar stock feed or chucking. Customers have reported a 70% reduction in throughput and over 30% cost savings per part produced.

Left: High-precision medical implants, surgical tools and instruments are made on the System 7, often from very hard-to-machine alloys such as cobalt chromium and Nitinol (nickel titanium) and others. Other Stama customers include automotive parts suppliers, thus System 7 was also designed for economical high production runs of tool steels.

The control solution of choice was the Siemens SINUMERIK 840D with NCU (Numerical Control Unit) 573.5, a CNC of open architecture, PC-based design that is capable of handling up to 31 axes and 10 channels. Siemens motors, power supplies and drives were also chosen for the System 7 as a turnkey package, as was the TRAORI software suite from Siemens. This software is based on transformation orientation that drives the cutting motions relative to the position of the workpiece, not the NC program. With the "look ahead" function, this proprietary Siemens software also speeds the cutting time and overall finishing time on the part, especially critical for Stama's automotive customers and on the complex materials cut by Stama's medical customers. According to Gerhard Ulmer, director of sales at Stama, "We did some modifications of their software for the particular needs of our customers, but the base model and the flexibility of the Siemens CNC package made this supplier the only choice for Stama on the System 7. It's the first true control package for a mill/turn machine in the world," Ulmer observed. He further cited customers reporting a minimum 30% reduction in throughput time savings on the System 7, as compared to their previous machines or methods.

As a result, the programming of single or twin spindle use, in all configurations desired by Stama, was achieved. As Ulmer points out, "It doesn't matter if the machine is running as a five-axis mill or a lathe. Other CNCs we considered had to switch their operational mode, while the Siemens SINUMERIK 840D can run any program seamlessly." He also mentioned the control was very robust and safety-conscious, essential for the medical market especially. When cutting cobalt chromium, Nitinol (nickel titanium) and other alloys commonly used in the production of medical implants, surgical tools and instruments, tool wear is common. Up to 30,000 tool changes a day are not uncommon, according to Ulmer, who cited the rigidity of the System 7 frame and the out-of-tolerance tool detection capability of the CNC as key features for the medical customers Stama serves worldwide.

He also noted the cooperation of Siemens engineering was vital to the development process on this new milling/turning center. "They (Siemens engineering personnel) were in-house at Stama from the outset. We had worked with another CNC supplier previously and never received such service. I can say without hesitation that the Siemens CNC was key to the development of the System 7, as well as our System 8, designed for the larger workpieces and chucks. It was a true example of simultaneous engineering on our part and theirs, to devise the best result. Moreover, our customers report a true 30% reduction in part cost with the System 7 already and that's really the best result from this entire process," Ulmer concluded.

Stama Machinenfabrik GmbH is based in Schlierbach, Germany (near Stuttgart), with Stama America serving the North American market from its offices near Chicago. The company currently has over 4000 machines in use worldwide. Stama has sold the U.S. market since 1997 and already has over 100 machines in use here. ■

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