

Parts that require both milling and turning are produced 30 percent more quickly on the new hybrid machining center

■ Alzmetall Werkzeugmaschinenfabrik GmbH & Co., Germany

Higher Productivity with Robots

Robots using Sinumerik 840D sl to load blanks and to perform pallet management have enabled the machine tool builder Alzmetall to achieve extremely high levels of productivity with its complex five-axis mill-turning centers.

High-performance machine tools are particularly efficient when they are able to operate around the clock. With this in mind, Alzmetall Werkzeugmaschinenfabrik GmbH & Co., a manufacturer of high-quality machining centers, has equipped its production facility with two five-axis GS 1000/5-FDT machines linked to a robot that automatically loads the blanks into the machines. The entire system is controlled by a Sinumerik CNC system. Wolfgang Losert,

production manager at Alzmetall, appreciates the performance of this modern mill-turning center. "It brings significant reductions in production time, labor-intensive reclamping tasks, and improves accuracy," he explains. "We manufacture complex components that require both milling and turning using the hybrid GS 1000/5-FDT machining centers, which perform milling and turning in a single clamping, on average 30 percent faster than using two machines." ▶



Photos: Siemens AG

» **We developed the electronic pallet management system for the robot together with Siemens. From initial prototypes to final integration, everything was done with the highest levels of professionalism and reliability.** «

Wolfgang Losert, Production Manager, Alzmetall

► Best for small batches

The efficiency of the synchronous five-axis mill-turning centers is further increased by using a robot to load the machines. This has brought significant productivity gains for Losert and his production team, which has helped him increase the proportion of external job orders. "We first started accepting outside orders three years ago. Now we use approximately 40 percent of our production capacity for external customers from a range of highly demanding industries, such as mold and die production, the automotive industry, and turbo machinery," he says. Alzmetall expects that the cost of deploying robots in the company will pay for itself within a year.

The use of robots is especially beneficial for contract manufacturers who need to produce a wide range of different workpieces in small batches, because the machining time is a major factor in profitability. According to Losert, the ideal workpiece is one that takes between 8 and 40 minutes to produce. Alzmetall manufactures a wide range of parts. The robot-assisted GS 1000/5-FDT five-axis mill-turning centers are used in the production of around 100 different workpieces, in batch sizes of anywhere between 5 and 150 units. The Alzmetall PowerCell TWIN system is not only used in the company's own tool pro-

duction for machining centers and drilling machines, but is also used to process gray and ductile iron from the company foundry for external customers who are happy to benefit from Alzmetall's expertise. This is where robot assistance really comes into its own, making it possible to operate connected machines unstaffed for many hours. The only limitation is the intake capacity of the pallet stand system, the processing time of the individual workpieces, and tool wear. The automated system can operate on its own for several shifts without an assigned employee, which among other benefits makes it easier to introduce weekend shifts. Alzmetall has designed its pallet stand system with 16 pallet slots so that it lasts for at least one complete shift without needing to be refilled.

Perfect interaction

The robot's electronically-controlled pallet management system was developed jointly by Alzmetall and Siemens and stored in the Sinumerik CNC system. Losert, who worked on the project as a production specialist, is delighted at the level of collaboration: "From initial prototypes to final integration, everything was done with the highest levels of professionalism and reliability." In practice, the Sinumerik CNC takes on the master role, while the robot is used only during system commissioning and when there are any changes to the pallet management system,

because it is required to set-up the pallet slots. When the production program for a new workpiece has been written, the machine operator links it to the pre-determined pallet slot on the machine's operator panel. The system is now ready to run completely automatically. Before the program starts, the operator fits the first machine with the pre-defined tools. Then, protected by the Safety Integrated software package, he or she moves the workpiece into the machine to be processed. During this process, the speed and feed rate of the machine are limited and the robot is safely disconnected. However, the system is not idle at this point because the robot is simultaneously loading the second machine. If the set-up phase confirms that the program is running safely, then it can be mirrored on the second mill-turning center without any further checks, immediately doubling production capacity.

Intuitive operator interface

Losert sees many benefits in the new Sinumerik Operate user interface: "We don't program directly on the machine, which means the operator panel is required only for set-up and initiating the production run. However, I was quickly convinced of the benefits of the new user interface." The Sinumerik Operate graphical user interface is very similar to that of a PC. During set-up, the operator is supported by graphical displays and animated images. So, for example, every level features self-explanatory icons that can be configured as Favorites. There are also many intelligent functions that are helpful for tool and workpiece measurement, among other tasks. The Sinumerik Operate user interface also features integrated swivel commands that make machine set-up easier.

Other users of the Alzmetall mill-turning center program directly on the machine itself. In this case, Sinumerik Operate offers even more advantages: Because all the processing technologies are hosted in the same NC kernel, the user is always presented with a consistently structured operator interface. This means that milling and turning processes can be easily programmed and set-up on the same machine.

There are three basic programming methods to choose from: ShopMill or ShopTurn as a graphical workstation-oriented workflow programming system, programGuide for cycle support, and DIN/ISO-compliant G-code programming and Sinumerik high-level programming language. If the user decides to use ShopMill, he or she gets an animated graphical interface for simple work-step programming. If turning is required, as well as milling, that is no problem for the modern GS range of hybrid machining centers. Andreas Pfisterer, Siemens product manager for Sinumerik, explains: "At any time, the operator can access a wide range of turning



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cycles, known from ShopTurn. To do so, the transverse turning axis can even be set so that it is vertical, in order to match the actual orientation."

Another control-specific highlight is the ability to equip the GS 1000/5-FDT with the Sinumerik MDynamics technology package. At the heart of this development is the new Advanced Surface intelligent path control. Siemens experts have further improved the look-ahead functions so that the velocity profiles of adjacent milling paths are automatically harmonized. This helps achieve the required high level of surface finish in an extremely short period of time and with the highest possible quality. In addition, there is an intelligent jerk-control system that ensures smooth acceleration and deceleration of the axes despite the extreme dynamics of the equipment. This helps preserve the mechanical components of the machine and increases their longevity. ■

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