motion

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SIEMENS

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Precision control is the key to complex robotics



Monogram Aerospace reduces downtime by speeding up tool changes



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"Innovative solutions increase productivity"



Michael Brückner Director Business Development, Sinumerik High-End

At this year's AMB trade show, the focus at the Siemens booth is on system solutions for sophisticated and productive machine tools. You can look forward to several new developments. The performance of the Sinumerik 840D sl, for example, has been increased through the use of more powerful NCUs. This enables you to increase the productivity of your machines even further and to move forward with your innovations. As a premium CNC for the high-end segment, the Sinumerik 840D sl now offers maximum milling expertise in the three- and five-axis range for mold construction and five-axis machining with a block cycle time of up to 0.4 ms – both with efficient machine operation via the Sinumerik Operate graphical user interface.

We are seeing a steady trend toward greater precision and a shortening of cycle times in the manufacturing industry. As a result, manufacturers' demand for multi-technology machines capable of complete machining is increasing. This is precisely where the Sinumerik 840D sl proves its value due to optimum technology integration – the possibility, for example, of mill-turning or turn-milling on the same machine.

Another way of increasing productivity is to perfectly integrate robot loading and unloading on the machine tool. This solution, which was presented with KUKA at EMO 2011, is now available as a ready-to-run solution. Loading and unloading with the robot is carried out quite easily via the Sinumerik's operator interface, which is familiar to virtually every machine operator. At AMB, we will show a combination of CNC and robot control for machining for the first time. This combination is especially suitable for the machining of large parts or more complex geometries.

We will also be addressing other interesting topics in Stuttgart, such as the Sinumerik's energy efficiency solutions and the advantages of an integrated CAM/CNC process chain.

Come in and find out about our innovations and see the performance of Sinumerik solutions for yourself – at our AMB booth C12 in Hall 4 and in this issue of *motion world*.

I look forward to your visit!

Kidael Bridges



Robots for CNC machining

Making the Most of Robots for CNC Tasks

Only with a combination of Sinumerik CNC control and robotic control is it possible to use robots for demanding machining tasks. With this combination, the integrated CAM/CNC process chain can be used from modeling to the finished NC program. Robot-specific kinematics and safety features are also available.



Robotic automation plain and simple

A knuckle-boom robot offers many opportunities due to its flexibility. Its kinematics reach points and achieve movements that are far superior to Cartesian robots. However, every knuckle-boom robot has its own operation, programming, and diagnostics - previously a practical obstacle to widespread use with machine tools on many occasions. Robot manufacturer KUKA has a perfect solution for this: The functional module library mxAutomation makes starting out with robot operation considerably easier because it can make the KUKA robot's movement sequence completely programmable in the Sinumerik CNC. According to Tanja Birner-Such, director product management at KUKA, "The worlds of machines and robots are drawing even closer together due to robotic control systems, programming, and diagnostics that are controlled via PLC and CNC. An annual production of 400,000 CNC machines is contrasted with the production of around 100,000 knuckle-boom robots. So our customers speak the language of PLCs and CNCs. We are therefore extending our KRL [KUKA Robot Language] programming language and speaking the customers' language."

Assisted by the openness of the Sinumerik 840D sl, user-oriented cycles are used for programming in the familiar Sinumerik programming environment. At the same time, robot-specific functions such as teaching are available, even in different coordinate systems or with different offsets. And, if on occasion something is not working, the Sinumerik diagnostics provide information via the robot's indications and alarms. So robot-specific knowledge is no longer needed to set up the program, and automation becomes extremely simple.

sing robots in production can significantly increase efficiency and productivity. Thus, machines can be equipped for fully automated around-the-clock operation. Thanks to the combination of CNC and robot control, robots are also perfect for CNC tasks. This gives machine tool builders the opportunity to easily integrate robot kinematics into their machine designs.

Siemens and Augsburg-based KUKA Roboter GmbH, a world-leading supplier of industrial robots, are jointly exhibiting the combination of a Sinumerik CNC and KUKA's robot controller for the first time at AMB 2012. The presentation focuses on the cell for machining composites – material that will gain importance in the fields of automotive construction and also power generation in the future. The robot can take over the complete root machining of the blade in a wind turbine here. This consists of face milling (trimming) as well as the placement of horizontal and vertical holes. The robot can also assist with the bonding process or lamination of the blade.

Perfect interaction

With this CNC and robot controller combination, the program required for the CNC is created directly from the NX CAM system by Siemens PLM. Connection of the Sinumerik 840D sl to KUKA's KR C4 controller is effected via a motion control interface that enables the controllers to be integrated consistently into the process chain from CAM to path movement. The tried and tested interface of the mxAutomation handling solution is used for diagnostics, including drive diagnostics, of course. Birner-Such, is very pleased **Cover** Combined CNC and Robotic Controller



» With the integrated solution of CNC and robot controller, we can offer machine builders a perfect solution. «

Tanja Birner-Such, Director Product Management, KUKA Roboter GmbH

CNC Machining with Sinumerik Live at AMB

Siemens will demonstrate trends in CNC machining with Sinumerik – live at AMB 2012: five-axis machining, machining of new materials such as composites, as well as the use of robots for machining. Machine builders and users can look forward to seeing new developments for the Sinumerik 840D sl CNC as well as the OP 019 operator panel. Visit the Siemens booth C12 in Hall 4 for live demonstrations.

Other booths featuring interesting information about Sinumerik solutions are the CNC arena in booth B12 in Hall 4, booth E0-100 from VDW Jugend, and booth D32 in Hall 5 hosted by the Technical University of Darmstadt, Institute for Production Management, Technology, and Machine Tools. with the integrated solution of the Sinumerik 840D sl CNC and the KR C4 robot controller: "We are convinced that we can now offer machine builders a perfect solution." Michael Brückner, Director Business Development, Sinumerik High-End at Siemens, adds, "And this, while they continue to rely on Sinumerik for operation and Simatic for cell control."

A robot as a flexible six-axis machine

It is possible to perform six-axis machining with the six degrees of freedom afforded by a robot. This provides the user with a high level of flexibility and excellent workpiece accessibility at comparatively low costs. Manufacturers of industrial robots offer their products in modular form matched to the intended use. As a result, there are robots for palleting, welding, assembly and also milling. These robots are specifically strengthened in terms of mechanics and gears so that they can absorb greater machining forces. In addition, robot manufacturers offer special packages for robots to optimize both accuracy and the robot's dynamics.

Last, but not least, the robot controller also delivers robot-specific safety features such as Cartesian space monitoring or a safe speed of the machine tool. Thus, KUKA's KR C4 controller combines motion and safety control and replaces passive responses with extremely fast, active interaction. By connecting to the Sinumerik motion control, it is optimally suited for use in demanding machining tasks, paving the way for launching into new markets such as the machining of composites.

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Cover Mill-Turning/Robotic Machining

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.

igh-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."



» 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 millturning 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 robotassisted 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 millturning 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



The Sinumerik Operate operator interface is very similar to that of a PC; during set-up, the operator is supported by graphical displays and animated images

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 guality. In addition, there is an intelligent jerkcontrol 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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Bertrandt AG, Germany

Expertise in Design Modeling

A five-axis machining center delivers high levels of productivity for an engineering service provider specializing in the manufacture of complex 3-D geometries. Crucial to the performance of the machine – alongside its mechanical design – is its use of a high-end CNC with optimized motion control capabilities.

Bertrandt AG, based in Ehningen, Germany, is a global engineering service provider that supports automotive and aircraft manufacturers and suppliers in the development of their nextgeneration models. A major part of the company's business involves regularly checking the extent to which the ideas of designers and engineers can actually be implemented in practice. Despite the availability of sophisticated simulation technologies, nothing can take the place of a tangible model of the design in question. Accordingly, the Bertrandt Technikum GmbH site boasts a superbly equipped design modeling facility.

The main responsibility of CAM/milling coordinator Richard Richter lies in optimizing the processing time required to develop realistic models from design data. The important thing here is to select the best milling machine for the workpiece in question from all the available machinery at the site. The factors governing this decision include the size and complexity of the model. The models are manufactured primarily from plastics such as Ureol. The Gamma T Linear portal milling machine from the Frickenhausenbased supplier EiMa GmbH is a popular choice for manufacturing medium-sized components.

Twenty percent faster than the previous model

As part of an operator model agreement, Bertrandt's modeling department commissions this machine from HS-Kunststofftechnik, a specialist milling service provider. In terms of size, design, and performance, the five-axis machining center, which is equipped with the Sinumerik 840D sl control system, meets all of the requirements of company owner Stefan Schilling. Although throughput time varies considerably depending on the shape and size of the models, Schilling and Richter believe production is around 20 percent faster with the new machining center than with the previous three-plus-two-axis solution.

In addition to productivity, customer solutions from Bertrandt require a high-quality surface finish and production tolerances in the tenths of a millimeter

Benefits of Sinumerik Operate at a glance

- Windows-style user interface for intuitive operation
- Graphical display with animated images
- Many integrated intelligent functions
- Three programming methods to choose from: ShopMill/ShopTurn, programGuide, DIN/ISO and Sinumerik high-level language

range. The new machining center guarantees positioning accuracy of 0.025 mm and repeat accuracy of 0.012 mm, which means it is always within the required values. Crucial to this accuracy are the robustness of the mechanical design and the quality of the Sinumerik 840D sl with its new Sinumerik Operate user interface and MDynamics technology package. Cutting experts Schilling and Richter both agree: "In terms of performance in simultaneous five-axis machining, Sinumerik control systems have been the industry leader for years."

Intuitive operation, high-quality interfaces

The machine supplier is also convinced that Schilling has made the right decision in choosing the Sinumerik 840D sl. As EiMa managing director Helmut Gras



In addition to the mechanical design of the machine, Sinumerik 840D sl with Sinumerik Operate and Sinumerik MDynamics is essential for the high productivity and production quality of plastic models

explains: "Approximately 70 percent of our customers rely on control systems from Siemens. And with the most recent improvements to Sinumerik Operate and MDynamics in particular, I see a great deal of further potential." Gras knows exactly what he is talking about because his company was involved as pilot partner during the implementation phase of the latest developments.

Sinumerik Operate offers three different methods for programming and setting the workpieces: the ShopMill and ShopTurn as graphical user interface, programGuide for G-code with cycle support, and traditional DIN/ISO programming. Stefan Schmidt, a Bertrandt employee at the site, enjoys working with the software: "I've been working with Sinumerik CNCs for a long time now, but the new Sinumerik Operate user interface makes my job even easier." The Sinumerik MDynamics technology package really comes into its own in complex five-axis machining. Precision workpieces with high-quality surface finishes can now be produced even more quickly. Sinumerik MDynamics has also seen the further development of various functions for high-speed cutting, which are made available on the EiMa machining center and used

by cutting expert Schilling: "The Cycle832 highspeed setting lets us adapt our processing strategy very quickly, and the new Cycle800 swivel cycles allow even complex workpieces to be prepared and processed quickly and easily from a single setting." The new JOG-mode measurement functions are also interesting, further simplifying the machine set-up even for three-plus-two-axis centers.

Downtime costs money

When a machine drops out of production, immediate action is required. That's why an efficient service offering is a key requirement of Bertrandt. Even 24-hour service isn't adequate, according to modeling manager Richter. In this case, the proximity to company sites and a service agreement with Siemens bring considerable benefits, with response times coming in at well under eight hours.

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Waldemar Link GmbH & Co. KG, Germany

Implants with Polish

The production of bone and joint implants requires equipment with cutting-edge technology. The latest software tools allow optimal interaction between CAM and CNC systems and guarantee a perfect finish and the highest levels of product quality.

he world's first artificial hip, which was implanted in Germany in 1963, was produced by the German company Waldemar Link GmbH & Co. KG. Since then, the specialist manufacturer has repeatedly set standards in the development of artificial implants. "We have a wide range of special one-off designs, starting from slightly modified standard knee joints and extending up to and beyond complete femur replacements, that is, implants that completely rebuild the thighbone. Our day-to-day work primarily involves the series production of bone and joint implants," explains Kai Lemke, production manager at Link.

Link uses highly sophisticated CNC grinding machines to produce knee implants such as the femur components of the Gemini SL bone surface replacement, which is available in eight variants to suit the most diverse medical indications. Grinding is now a validated method in the overall CNC process and helps create products that are identical. With up to 600 grinding paths side-by-side on the surface of a knee joint, a great deal of computing power is required from the CAM workstations and the machine tool used. Grinding helps combine an extremely high-quality surface finish with a high degree of repeat accuracy, especially on the extremely hard materials used for these implants, such as cobalt-chromium-molybdenum alloys.

Integration of all available product data

From the original idea to the sterile packing of the product, almost all tasks are performed within the company's internal production network. In addition to manufacturing the blanks in the company's own foundry, there is also an internal research and development (R&D) division called Deru. As part of its R&D process, Deru uses the NX CAM and Team-

Link manufactures thighbone implants using sophisticated CNC machines from Haas



Grinding achieves an extremely high-quality surface finish with a high degree of repeat accuracy, especially on the exceptionally hard materials used in medical technology

center software tools for its product lifecycle management (PLM), which supports a consistent process chain across the company, from construction to the finished workpiece. "The optimal interaction between CAM and CNC that we get by combining NX CAM and the Sinumerik control system is essential for creating excellent products," stresses Lemke.

Production plans, created by the NX CAM system from the individual parts, contain not only the CNC programs for the implants themselves, but also complete information on the required production resources, such as machines, tool lists, clamping devices, and so on. The accessibility of all these data in the Teamcenter software facilitates the seamless transfer of information to the production department. The data are linked in the PLM system, ensuring that all processes are completely transparent, and the CNC programs are sent directly to the machine over the network.

Strict safety requirements fulfilled

"Because we place a lot of emphasis on an integrated overall process, our employees need to have a general understanding of that whole process, as well as solid and specific expertise in their own particular area of responsibility," explains Lemke. "We also place correspondingly high demands on our equipment partners." When it comes to grinding, the company works closely with Haas Schleifmaschinen GmbH based in the German town of Trossingen. The extensive implementation of Siemens products at the implant specialist is also based on the same requirement. Both companies understand the strict regulations and restrictions governing the medical technology sector and are therefore able to provide optimal support for customers. Link polishes its knee implants on Multi» The optimal interaction between CAM and CNC that we get by combining NX CAM and

the Sinumerik control system is essential for creating excellent products. «

Kai Lemke, Production Manager, Waldemar Link GmbH & Co. KG

grind CB machines. These work with directly driven grinding spindles and are equipped with the highperformance Sinumerik 840D sI CNC and automatic handling systems. "Our machines use only components that are innovative and that we know really work," explains Philip Burkard, project manager at Haas. These include the Sinumerik Safety Integrated safety functions that are integrated into control system and drive technology. The safety package monitors the machine tool in all its operating states, with safety indicators linked to process steps so that both machine and operator are protected from possible hazards.

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Monogram Aerospace Fasteners, USA

More Uptime and Higher Productivity

Monogram Aerospace Fasteners uses remote access and condition monitoring from Siemens to troubleshoot and reduce machine tool service calls by over 25 percent.

onogram Aerospace Fasteners (MAF) is a leading producer of high-strength blind bolts for aircraft assembly, temporary fasteners for fixturing and alignment, as well as installation, finishing and removal tools. With manufacturing expertise spanning more than 120 years, the company has pioneered a number of fastener innovations, like its Visu-Lok®, Composi-Lok®, Radial-Lok[®], or OSI-Bolt[®] brands. Likewise, the company's fastener designs have evolved with the times and technology to incorporate various features required for semi- or totally automated assembly operations, as well as to meet the unique fastening requirements of today's composite aero structures. The company boasts numerous industry certifications (AS9100, ISO9001 and NADCAP), plus supplier awards for quality, delivery and its achievements in driving the technology forward.

Definite solution

Recently, MAF purchased four new Eubama S6 CNC turning machines. This German machine tool builder, with its local office in Elkhart, Indiana, provided the

S6 line to MAF, specifically for the high volume of fastener families produced at the company. A key to the S6 design is the centerline clamping, two-jaw chucking system that allows fast diameter change-overs for the rapid production of workpiece families. The powerful Sinumerik 840D CNC on the S6 permits nearly immediate restart of the cutting cycle with the proper feed speed and rapid traverse, after a fast tool and clamp jaw change, made possible by the configuration of the machine design. The CNC was considered by MAF as a critical step up from the conventional hydraulic or hydromechanical control typically found on such machines. It was a definite solution to the small and medium batch production needs at the fastener manufacturer.

There was also some consideration being given to a further enhancement, namely, an ongoing condition monitoring system offered by Siemens that would substantially improve the predictive maintenance capabilities at MAF. While many companies do preventive maintenance in a regular pattern and set time period, predictive maintenance would key the



Eubama designed the S6 with centerline quickchange jaws and rapid tool change capability to further reduce downtime



activities of the MAF personnel to the actual performance and onsite utilization of the machine tools.

As Daniel Martinez from the Siemens Aerospace Center of Competence describes it, "Monogram was seeking a total service solution, where the service contract would be extended in functionality by giving our service department the ability to look into their Eubama machines on very short notice. We convinced Monogram's management that the enhanced service and remote access capabilities of our Electronic Production Services [ePS] were a less-costly investment, compared to the increase in service and inside maintenance needed."

The condition monitoring system would track five key conditions (called triggers) with SMS/e-mail notification. Additionally, production part count would be plotted graphically, for easy access by the production team. The five triggers included a maintenance task involving backups on each machine, part counts per shift, spindle temperature, alarm log and current status of each machine, plus a notification if the machine was in e-stop condition for more than 30 minutes.

From the Siemens technical support side, engineer Brad Cornell commented, "By accessing the Eubama machines at MAF with our ePS, we eliminated additional calls to identify part numbers and software versions. I could look into the error log, versions display and machine data instantly to get actual values. By utilizing ePS remote viewing, we minimized time spent on the diagnosis of a failure."

Better support in less time

As an example of the functionality of the system, MAF recently contacted the Siemens Technical Center in Elk

Grove Village, Illinois, regarding a fault on one of the Eubama S6 turning centers. The remote access session was initiated by the MAF operator directly on the machine's CNC and the technical support was able to see the alarm log directly onscreen to diagnose the issue. It was immediately determined that an onsite field service call was needed. However, prior to the use of ePS, this incident would likely have required 3–4 additional calls and as much as 300 percent more time to resolve. The obvious savings to the MAF production scenario were substantial.

Through ePS, all HMI action logs, machine data and CNC status data are captured in real time. A PLC trace enables the prior actions to be taken as a snapshot for instant analysis of alarms. Alerts generated by the system can take the form of text or e-mail messages, both internally, to the MAF personnel and externally to the Siemens Technical Support.

Flexible system

The trigger determinations of ePS can vary substantially with the customer. It is not a one-size-fits-all proposition, because the production variables monitored are driven by customer and machine needs. Condition monitoring services are not designed only for large production departments. A shop of any size can benefit almost immediately from this service, especially where "lights-out machining" takes place. In a smaller shop, where there is often no distinct maintenance personnel, the operator and shop owner alike can use condition monitoring to their advantage.

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ePS condition monitoring allows Siemens Tech Support instant access to the error log, machine tool data, CNC status and PLC trace to quickly determine cause and resolve a problem

Industry Tooling and Mold-making

amag GmbH is a manufacturer of machine tools and individual components. Based in the Thuringia region of Germany, the company employs around 500 people, 366 of whom are involved in the manufacture of machine tools. The main focus is on manufacturing parts for the automotive sector, but the company also produces hydraulic and pneumatic components, along with tools and dies. Its machine range includes multispindle horizontal machining centers along with special-purpose machines and deep drilling machines. The machining centers can be used to process small to medium workpieces efficiently, accurately, and safely with four or, optionally, five axes. "Our machine strategy allows for preparation and processing to be carried out simultaneously. While one workpiece is being processed, the next ones are already being manually or automatically clamped in place. We then use a pivot to move the pieces into the loading area or the processing chamber," explains Samag designer Ronny Witt. This strategy dramatically reduces nonproductive time and allows machines to be easily integrated into the company's automation systems. The results of this basic concept are the MFZ4 and MFZ6 lines, which

Effective protection with Sinumerik Safety Integrated

At the heart of the automation concept is the Sinumerik 840D sl. "We've been using this modern CNC control system since 2010, but even before that we had positive experiences with a pilot machine," says Harald Wagner, group leader of electrical design at Samag. The Sinumerik 840D sl is a universal and flexible CNC system that works equally well with dif-

can each be fitted with two, three, or four spindles.

Samag Saalfelder Werkzeugmaschinen GmbH, Germany

Safety in Series Production

In addition to highly sophisticated mechanical components, Samag GmbH relies on the latest Sinumerik 840D sl and Sinamics S120 control and drive technologies with integrated safety features when manufacturing multispindle machining centers.

Multispindle machining centers can be used to process workpieces effectively, accurately, and safely

Sinumerik Safety Integrated at a glance

- Safe and easy operation of machines in all types of operating conditions – for example, in set-up and test mode with an open safety door
- Compliance with DIN EN 61508 for use up to and including SIL (Safety Integrity Level) 2, and category 3 and PL (Performance Level) d in accordance with DIN EN ISO 13849
- Functions for safe monitoring both at speed and when idling
- Functions for the safe isolation of processing and safety chambers, and for area identification
- Direct connection and internal logical combination of all safety-relevant signals



A Sinumerik 840D sl mounted on a C-frame is a characteristic feature on all Samag machining centers

ferent processing technologies. It also includes PLC functionality, meaning that companies like Samag do not need to add an additional special system to their machining centers. The high-end control system is characterized by its openness and scalability, so that in terms of the user interface and underlying software, there are very few barriers to the implementation of specific customizations. The control concept also provides effective personal and equipment protection in the form of Sinumerik Safety Integrated, which integrates safety functions into the control and drive technologies. "Safety Integrated is used on all the machines at Samag," explains Wagner. "The reason for this is that we always have a large number of NC axes in operation at any given time. The four-spindle MFZ6 alone has 23 NC axes."

Positive collaboration between partners

The Sinamics S120 is the servodrive of choice at Samag. Its key benefits are the integrated system modules for all the production areas, along with its compactness, modularity, and flexibility. For efficient communication, the designers use Profibus to connect distributed I/O devices via a Simatic ET-200S. "As for motors, we use three models: the Simotics S-1FK7, S-1FT7, and M-1PH7," continues Wagner. The machining centers are also equipped with a master communication system – for performing remote diagnostics via modem or Internet, for example.

"We deploy the whole spectrum of Siemens NC technology for all the different tasks we perform, including additional panels, handheld devices, and even a second control system," explains Wagner. The closeness of the partnership between the companies is demonstrated by the fact that every new machine concept is first discussed in detail, and the modular control concept is then designed in collaboration. Wagner sees this level of cooperation as extremely positive: "Regardless of whether we are dealing with hardware or software, the communication is excellent. And whenever we need help, we get it – which isn't always the case when you have two companies that are so different in size."

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Sinumerik 840D sl Type 1B

Top-Class Performance in the High-End Segment

The new version of the Sinumerik 840D sl permits the flexible networking of machine tools, while extended functionality enables efficient, high-performance operation.

he Sinumerik 840D sl type 1B features scalability up to the highest performance level together with maximum accuracy and extreme efficiency. Up to 93 axes and spindles ensure maximum quality and productivity, and the Profinet functions make engineering, maintenance, and diagnostics easier than ever.

Tried-and-tested Sinumerik concept

The Sinumerik 840D sl line offers a tried-and-tested concept featuring CNCs in a variety of performance versions, from the Sinumerik 840D sl Basic, the economical solution for machine tools with up to six axes, to the high-performance high-end model for complex machining tasks. All the functions for the various CNC, HMI, PLC, control, and communication tasks are combined in one NC unit. Hardware and software can be scaled separately, which allows flexible set-up for any machine and production environment, thus enabling individual machines to be tailored to the customer's requirements.

additional axes are implemented with the CU 320-2 control unit. The functions in Sinumerik Operate are also innovative. As a result, the Manual Machine function in ShopMill/ShopTurn is available now for milling, and features of this function have been enhanced for turning. In Manual Machine it is possible to use the same options as in the Editor. This results in consistent and efficient machine operation.

Profinet simplifies wiring, engineering, and diagnostics

Productivity is not least a question of the speed and reliability of communication. The Sinumerik 840D sl type 1B offers Profinet functionality as standard for

Maximum productivity

The latest version of the Sinumerik 840D sl offers a performance category with increased performance thanks to multi-kernel technology, with low block cycle times of up to 0.4 ms, and more powerful PLCs. Based upon the optimized Sinamics S120 drive platform, it offers an even higher level of accuracy and maximum control dynamics for the best surface quality while machining. It can be extended by up to 93 NC axes via an NCU link. This ensures maximum quality and productivity. Further

Perfect team for machine tools: the new Sinumerik ...



... the new Sinamics S120 Combi drive system

> ... and highperformance Simotics motors

reduced wiring requirements, simpler engineering, and more flexible diagnostics and maintenance. With the I-Device function extension, the Sinumerik CNC becomes both an intelligent controller and an I/O device. It can therefore communicate not only with subordinate devices as an I/O controller, but also with higher-level or central controllers as an I/O device. This enables very simple and fast controllercontroller communication on the same bus, with full system access throughout the entire network. At the same time, it is possible to access addresses of the I-Device with the Profinet IO protocol with-

Highlights at a glance

- Scalable up to the highest performance level due to multi-kernel technology
- Up to 93 axes and spindles for optimum quality and accuracy
- Optimized Sinamics S120 drive platform for greater accuracy and maximum control dynamics
- Profinet on-board as standard for simpler engineering, wiring, diagnostics, and maintenance

out the use of additional PN-PN couplers. Shared Device, which enables two controllers to access the same Profinet I/O device (for example, distributed peripherals or drives), offers simplifications for engineering. This reduces the number of hardware components and interfaces necessary, which simplifies the system configuration and wiring. Shared Device also optimizes the implementation of machine tools in which a Sinumerik controller with an integrated standard PLC is used for machining tasks and a failsafe Simatic PLC is used for safety tasks. The new NC unit integrates a PLC web server, which, in addition to pre-defined status and diagnostic information, also provides user-definable process information. It is possible with an Internet browser to access the web server via the machine or company network without an engineering system. This makes commissioning and diagnostics, in particular, considerably easier. Fast access to this information reduces downtimes, since machines can easily be diagnosed remotely and service calls can be planned to perfection. Even the documentation of a machine can be stored as HTML on the web server.

Perfect for the most demanding requirements

Thanks to its innovations in scalability, performance, accuracy, control dynamics, and communication, the Sinumerik 840D sl type 1B is particularly suitable for demanding applications in the high-end segment – for example, complete machining in a single work-step.

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FAT Haco, Belgium

Partnership in Poland

Since the Belgium Haco group took over the Polish lathe manufacturer FAT, Sinumerik CNC accomplished the evolution of the company. Ever since, FAT Haco can look back on 15 years of using Sinumerik.

bout 15 years ago, the Belgian Haco group of machine builders, who originally became famous for their sheet and woodworking machines, took over the Polish state-owned company FAT (Fabryka Automatow Tokarskich), a manufacturer of automatic lathes. Originally, FAT focussed on manufacturing lathes, teach-in lathes and slant bed lathes. By now, they have about 200 employees and are evolving towards larger and more complex machines – like turning centers. Turning centers can be used for milling, drilling, tapping, grinding and so on – all in addition to turning. "In other words, one can produce completely finished items, all one the same machine," Gabriel Joye, managing director of FAT Haco, explains.

"Initially, the management saw opportunities in simply mechanically upgrading the existing range of machining possibilities of the company – but in the end, we decided to expand the production of lathes," says Joye. Under the former Polish regime, economic activity was regulated strictly - which means that only a limited number of manufacturers was allowed to manufacture lathes. And if so, then only in a specific basic segment. FAT, for example, was only allowed to manufacture lathes with a swing of 560 and 630. After the fall of the former regime, guite a number of Polish companies – including FAT – have been privatized step-by-step. "And after this privatization, we finally have been able to expand the production of conventional lathes to teach-in lathes and bigger sizes and ranges," Joye states.

All machines have been fitted with Sinumerik controls

FAT possessed the expertise and the technology, at least as far as conventional machines were con-



cerned. What they needed, however, was to establish computerized numerical control machines. "Since we took the step to CNC, we decided to use Sinumerik – and this is how the cooperation with Siemens Belgium came about," Joye continues. "Besides, there aren't so many other manufacturers of control systems. And since Siemens is wellestablished in Western Europe, where our intended market was mainly located, the decision was soon made." Other reasons for the cooperation with Siemens have been the good service infrastructure in Western Europe as well as their general expertise of CNC systems. And once the decision was made. all of their machines have been fitted with Sinumerik controls. Recently, the integration of the 1,000th Sinumerik CNC in the 1,000th FAT machine was celebrated

Last, but not least, Siemens Belgium was recently approved by the Siemens head office as "Competence Center for Retrofit for Central Europe," which also qualified them for the FAT project. "All of these points played a prominent role with regard to our decision," says Joye.

Intention of building larger and more complex machines

"By now, the cooperation between Siemens and FAT has grown from a pure customer/supplier relationship into a full-fledged industrial partnership," Thierry Van Eeckhout, Siemens Belgium, confirms. Six machines in the company's machine park have already been retrofitted so far. "During these initial retrofits we still took full responsibility for the project, but experts from FAT, however, are now able to carry out the complete electrical retrofit by themselves – which means that we can limit our involvement to supporting specific functions," Van Eeckhout continues.

During the FAT relaunch, the machine stock was upgraded with finishing machines and with exisiting machines from other plants of the Haco group. A high-precision spindle grinder was also acquired. "Currently we are building 14 to 15 machines per month on average. The sales markets for our standard machines include the automotive, aviation, hydraulics and agricultural machines sectors. We are, however, fully committed to building larger and more complex machines," Joye reveals. "Larger machines because there is less competition, complex machines because they offer more possibilities and have a larger capacity."

Long-term use of Sinumerik pleases management of FAT

At FAT Haco, everyone is pleased with the longterm use of Sinumerik: "For our original intention – migrating from conventional lathes to teach-in lathes – the ManualTurn version was the best



In Wroclaw Siemens and FAT celebrated the 1,000th Sinumerik control in the 1,000th FAT machine

» Since we took the step to CNC, we decided to use Sinumerik, because Siemens is wellestablished in Western Europe, where our intended market was mainly located. «

Gabriel Joye, managing director of FAT Haco

solution for us. But when we subsequently switched to CNC machines, we integrated ShopTurn – which is, in my point of view and with regard to its performance, the best version of Sinumerik. As part of the further expansion of our turning centers, we are planning to integrate ShopMill as well," Joye explains.

Michael Brückner, Director Business Development, Sinumerik High-End at Siemens, is also positive about the company's development: "End-users demand machines which are more accurate and incur lower logistical costs – a trend which FAT follows closely."

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Sinumerik Ctrl-Energy

Environmental Benefits

Sinumerik Ctrl-Energy provides both machine tool builders and end-users with a wide range of solutions for improving the energy efficiency of their equipment. This service has now been recognized with an award in the Environment category at a leading industry trade fair in Paris.

or the past 10 years, the Trophées de l'Innovation have been awarded to particularly creative solutions that lead to improvements in industrial production. This year's innovation prize was awarded at the Industrie Paris trade fair for endusers in the mechanical engineering sector, where Siemens France received the coveted prize in the Environment category for its Sinumerik Ctrl-Energy function. The decisive factor for the jury was the function's ability to reduce the energy consumption of machine tools and thus contribute to a healthier environment. The judges were also impressed by the end-user focus of the development, the function's ease of use, and the wide range of offerings for almost all control systems.

A basis for economical operation

Sinumerik Ctrl-Energy can be used at any point in the machine lifecycle, from machine construction to work preparation and machine operation to partial or complete refitting. Supporting the energy-efficient operation of machine tools are a wide range of drive and motor components, CNC and drive functions, PC software solutions, and Sinumerik Manufacturing Excellence services. Because Sinumerik Ctrl-Energy is compatible with the complete port-



Winners of the innovation prize (from left to right): François Chevalier, Fabrice Vandenbrouck, Luc Losson, and Bernard Mauclere

folio of Sinumerik CNC systems and Sinamics drives and Simotics motors, the function is available on almost all equipment, from standard machines to premium-level machining centers. Using the simple and easy-to-remember Ctrl+E key combination on the operating panel of the Sinumerik CNC control system, users can carry out a quick assessment of the energy consumption of the machine and manage energy consumption during downtimes.

Conclusion

With its ability to maximize energy efficiency for all types of machine tools, ensure efficient solutions from machine construction to retrofitting, and optimize manufacturing procedures from an energy perspective, Sinumerik Ctrl-Energy is already providing solutions to the energy efficiency challenges of tomorrow.

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Dialogue

Mowo app

motion world for iPad

Just in time for AMB 2012, the third issue of motion world for the iPad will be ready for download soon. The iPad magazine combines the print editions of motion world IMTS and motion world AMB with multimedia and interactive features. Videos, animated graphics, photo slideshows and other content provide you with an even richer environment to learn even more enjoyably about the latest trends and technologies in the world of Sinumerik CNC.

Launch the *motion world* app you have already installed and download the latest issue. Don't have *motion world* on your iPad yet? No problem! Simply scan the QR-code and install the *motion world* app from the App Store – free of charge, of course.

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