

motion world

The Magazine for CNC Automation

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SIEMENS

CNC machining in everyday life

Machine Tools Safeguard the Standard of Living

Aerospace

Retrofit with
Sinumerik
840D sl

Complete Machining

Proven
solution for
complex parts
machining:
Sinumerik
Operate



BMW AG Motorrad

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The customer in focus



Sascha Fischer
Vice President
Business Development
End Customer
Machine Tools

CNC machines give birth to most of the products that surround us in our everyday lives. Without them, there would be no cars, cutlery, glasses, mobile phones or even aircraft, to name just a few examples. Machine tools play an integral part in the manufacture of all kinds of products. That's why Siemens focuses not only on supporting the companies that make these machine tools, but also on the consumers in the various industries, as well. This focus is important for us as experts in automation because every innovation that finds its way into a consumer product influences the manufacturing of that product, and, therefore, the demands placed on the machine tools and their environment.

Our employees require extensive expertise in order to offer customers the best solutions in areas such as control systems, energy efficiency, standardization, virtual production, networking and after-sales support. But that's not all. They also need to understand the processes used by our customers, so that they can help these customers achieve the most important goal of all – increased productivity at a reduced cost.

At METAV 2012, we will present solutions and trends that cover every aspect of metal cutting for consumer products. Every industry has its own specific requirements, whether it is a highly specialized area like the automotive, aerospace, energy generation, medical, or consumer goods industries, or the broader mass market. This issue of motion world shows that Sinumerik CNCs can be used effectively in every manufacturing industry – from the major players right down to individual shopfloors.

Find out more about the challenges for the consumer market, and our solutions to those challenges – in this magazine and at Booth C44 in Hall 13 at METAV 2012 in Düsseldorf.

We look forward to seeing you there!



Urs Keller

■ CNC machining in everyday life

What if ...

What would our lives be like if we were forced to do without many of the everyday objects we have come to take for granted? Things like sunglasses, mobile phones and automobiles – none of which would exist today without machine tools.

Sunglasses, a mobile phone case or car keys – what if the machine tool had never been invented? Perhaps we would have found some other way of achieving the levels of convenience we are used to today. However, it seems more likely that, in terms of function and form, things would have remained as basic as they were in the time of our forefathers. Because it takes more than just the clever ideas of inventors to satisfy our consumer desires. Very few people are aware that tools and machine tools are used in some way or another in the manufacture of virtually all consumer products.

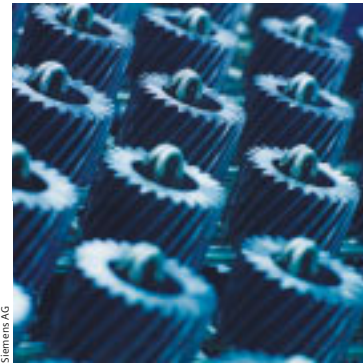
The mother of all machines delivers daily convenience

There are good reasons why the machine tool is often referred to as the “mother of all machines.” For one thing, these machines are used to make plastics molds of all different designs, including the sunglasses and mobile phone cases mentioned above, toothbrushes, the countless parts used in domestic appliances and furniture, and, of course, components for our vehicles and airplanes. They also play a significant role in the production of bodywork panels, engines, and transmissions for cars; aircraft engines; and the turbines used in energy generation. The demands placed on the machines are high: they must be capable of milling, turning, boring, grinding, and lasering to within a hundredth of a millimeter, so that we can drive around in our safe, stylish cars and travel abroad in ever more comfortable airplanes. The use of CNC machines is not restricted to the manufacture of very large components, however; these machines are also essential in the production of very tiny metal objects as well. The technology is particularly in demand when it comes to making very delicate components – medical screws, joints, dental crowns, implants, and specialized tools – items that are difficult to process and that must fit precisely when finished. With its Sinumerik CNC systems and related programs, Siemens has the perfect solution for every application already.

Automotive components require productivity and quality

Increasingly frequent model changes and global competitive pressures make it essential that the automotive industry produce cars as cost-effectively as possible.

Whether manufacturing molds for bodywork panels or the wide range of parts required for the inner workings of a car – transmission rods, engine blocks, wheel hubs, and so on – machines must be able to operate at high speeds and switch quickly



Automotive components require CNC machines with high levels of productivity and quality

from task to task. In this regard, the Sinumerik 840D sl is the first choice, with a wide range of functions to save setup time and a seamless process chain from CAD/CAM to production ensuring that productivity and quality remain high.

High levels of efficiency in aerospace engineering

It is not just the components and systems that are large in the aerospace industry – the sums involved are huge, too. Operating efficiently in these economic times requires that every process be optimized to the very last detail. The latest Sinumerik CNC systems offer a wide range of options to help: new machine tools can be set up precisely from the very first step of the planning or construction process, existing processes can achieve greater processing speeds through upgrades to the control system, and trusted old “veteran” machines with 20 years’ service or more can be returned to profitability through control retrofits.



Machine tools and control systems must be set up precisely for the large components required in the aviation and aerospace industries

► Medical implants that meet the highest quality standards

The increased longevity among the populations of industrialized nations means that medical products are rapidly gaining in importance. The manufacturing of hip and knee joints, spinal components, shoulder and elbow joints and even dental implants has become one of the most significant fields of medical technology. To make implants affordable for as many people as possible, the cost implications must be taken into consideration during the manufacturing process itself. This can be achieved using the Sinumerik 840D sl, which has been optimized for high-speed cutting (HSC) in the five-axis range, and can quickly and accurately process materials like cobalt-chrome or titanium, which are known to be difficult to machine. The Sinumerik MDynamics technology package with its Advanced Surface intelligent path control function for all Sinumerik CNCs ensures high-quality surface finishes that are as smooth as glass. The "Image to Implant" collaboration project is working towards making cost-effective series production of individual implants a reality.

Precision workmanship of turbine components

The turbines used in steam, gas, and hydroelectric power plants must be able to withstand enormous forces in their daily use. For the manufacture of turbine components, the various machining technologies require precise and high-performance automation, drive and monitoring technologies. As such, the production of heavily-stressed workpieces is

The production of turbine components requires reliable automation



characterized by high cutting volume. First and foremost, five-axis machining requires a maximum cutting capacity that can only be achieved with highly efficient HSC machines. The objectives are: Maximum precision, surface quality and machining speed. In this respect, in addition to five-axis milling, the Sinumerik 840D sl also supports complete machining on one machine.



Sinumerik MDynamics is perfect for achieving perfectly smooth surface finishes on implants

Highly flexible in the manufacturing of consumer products

Parts intended for the consumer market must be manufactured to the highest standards of accuracy – regardless of whether they are small parts like watches, jewelry and electronic components, or molds for items such as sunglasses, mobile phones and other everyday objects. The machines must also be extremely flexible, so that they can be adapted quickly to meet different requirements. Here is where turn-mill machines equipped with Sinumerik CNC really come into play, and leaving a lasting impression with their excellent surface finishes and true running characteristics, not to mention their ability to switch quickly between small batch and volume production.

Overcoming current challenges

As illustrated by these examples, the main challenges for the effective use of machine tools lie in meeting industry and material-specific requirements and supporting process optimization – for example, by reducing changeover times through simultaneous processing of both turning and milling. This also presents a highly complex challenge to the control system, which cannot allow accuracy to be compromised even when operating at top speed. As long-time market leaders, Sinumerik CNC systems have played a significant role in shaping recent developments in machine tool design. Time and time again, innovations have made it possible to further optimize construction and application processes. Sinumerik engineers, with years of industry experience behind them, are now working to ensure that this remains the case in the future, collaborating with machine builders and end-users so that consumers can continue to enjoy familiar products for years to come. ■

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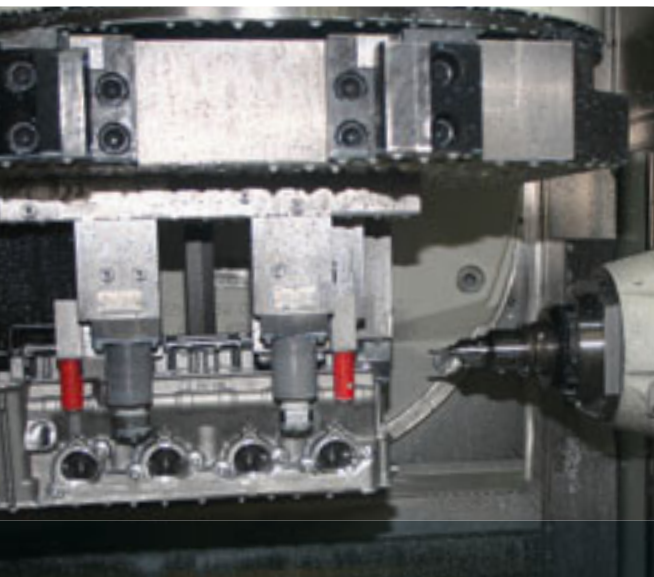
■ BMW AG Motorrad, Germany

Precision Processing for Fast Bikes

To guarantee perfect workmanship and the highest possible product quality, BMW uses five-axis machining centers equipped with Sinumerik 840D sl and a range of new user interfaces for machining operations in its Berlin motorcycle plant.

BMW motorcycles enjoy an outstanding reputation around the world for their reliability, quality, performance and safety. This is not achieved by chance, however. BMW's motorcycle plant in Berlin uses around 50 machine tools to create numerous key components on-site, from frames and valve shafts to connecting rods and cylinder heads. Among these tools are Grob's horizontal five-axis G550 machining centers equipped with

Sinumerik 840D controllers, which are used in the manufacture of cylinder heads for flat and 4-cylinder engines. Prices are obtained from suppliers at regular intervals, especially when the company is investing in new machining centers. The aim is to ensure that BMW can manufacture its components more cost-effectively than external contractors, while at the same time comparing the prices offered by the various machine suppliers. ►



Grob

The horizontal design of the Grob five-axis G550 guarantees the highest levels of rigidity, which keeps axial deviations below 10 µm



BMW AG Motorrad

Highly trained employees and specialist suppliers help BMW motorcycles maintain their excellent reputation for reliability, quality, and safety

- One of the major reasons for choosing the G550 was because it was equipped with a Siemens CNC. Thanks to previous positive experience with Siemens, the BMW manufacturing specialists in Berlin already employ technology from Europe's market leader for 90 percent of their controllers. This allows both operators and tool setters the flexibility to work on almost all the machines in the plant. Other key requirements noted in the specification were adequate space for manufacturing all relevant components, the highest levels of precision and surface finish, compliance with pre-defined cycle times, and the ability to reuse all current tools and equipment.

The highest levels of precision on even the hardest materials

Before committing to the new investment, the responsible BMW production engineer worked with a colleague from process engineering to investigate the effectiveness of the Grob machines in cylinder head production. Initially, it was the G550's near-identical sibling, the G350, that was under consideration. As a first traditional single-workplace machine

» **Previously, it might have taken several hours to set up the machine and the workpiece, now it can be done in just a few minutes. «**

Christian Hei, Applications Engineer, Grob

tool, it already met almost all the main criteria, but the space available inside was deemed too small to accommodate all the required processing tasks. However, the G550 satisfied this requirement as well. Among other factors, the horizontal design of this five-axis machine, which has both rotary axes in the work area, contributes sig-

nificantly to its outstanding rigidity. As a result, axial deviation remains process-compliant at values under 10 µm. The level of precision that can be achieved is correspondingly high, even when processing extremely hard materials, as with valve seat inserts, for example.

The machine also produces a high-quality surface finish, with roughness (Rz) of up to 2 µm. Christian Hei, applications engineer at Grob, explains a further benefit of the horizontal design: "Tool life can be increased by approximately 30 percent compared with that of vertical machining centers. And the problem of jammed slivers is almost completely eliminated because they are not able to fall onto the workpiece in the first place, but instead fall right through to the ground."

One of the G550's strengths is its compact size, at only 3800 mm x 6300 mm. However, despite its size, it still features an extremely long z-axis stroke of 1020 mm, meaning that tools up to 500 mm long can be retracted completely out of the work area and into the so-called spindle tunnel. The swivel-mounted shuttle table is another feature that helps deliver high levels of productivity. While one workpiece is being processed, the next can be clamped and set, thus minimizing costly downtime.

Programmed and set in no time at all

Employees find the new Sinumerik 840D sl CNC especially easy to operate because, in the production of BMW cylinder heads, only Siemens controllers are used. Despite this, the user interface presented on the Grob machines looks completely different from the others. Until now, operators and setters have been used to the DIN-based HMI Advanced user interface, but the new CNC on the G550 features the Sinumerik Operate animated graphical display. Siemens has integrated a new operation and programming structure, with practical functions such as copy and paste that are well known to users from their daily use of PCs. This allowed BMW employees to quickly adapt and master the new Sinumerik user interface in no time at all.

Thanks to its excellent usability and intuitive operation through various technology cycles, measurement cycles, and setting functionality, the new G550 machines can be set up for new batches much more quickly than before. As Heiß explains: "This means our customers are much faster than before. Previously, it might have taken several hours to set up the machine and the workpiece, now it can be done in just a few minutes."

Quick and reliable with remote maintenance

Along with the tools and equipment from the current machines, the German motorcycle manufacturer was able to reuse all its existing programs as well. It took a single employee only two days to upgrade these programs to be compatible with the latest software, which can be loaded onto the relevant machine as required either over the network or from a USB stick. The modern Windows Explorer-style program manager means that complex programs can be managed either on the CF (Compact Flash) card or directly on the CNC.

If problems arise while the machine is operational, BMW production engineer Taner Ögretmen and his colleagues use the network-based remote maintenance functionality provided by Grob. This has rarely

been required so far – but when it has, it proved to be extremely smooth and efficient, stresses Ögretmen. Grob can also perform minor optimizations together with Siemens using the teleservice. This is usually done automatically and without any disruption to ongoing production.

The Sinumerik-controlled Grob machines have met every expectation in full, which is why BMW has already ordered an additional four G550s. ■

Programming and operation using Sinumerik Operate

Sinumerik Operate provides several different programming methods to let users program and set the workpieces: ShopMill graphical user interface, programGUIDE for G-code with cycle support, and pure DIN/ISO programming. If the user decides to use ShopMill, he or she receives an animated graphical work-step programming environment for simple dialog programming. The interface is designed to be clear and self-explanatory, so that even operators with no programming experience can learn the basics in no time at all. To write programs in programGUIDE, the operator will need some knowledge of G-code. The highlights here include new cycle support functionality and animated elements that can be used to represent the cycle graphically. Tooltip support is also provided.



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■ Medizin- und Dentaltechnik, Germany

Highly Precise and Cost-Effective

The decision to invest in high-performance machinery equipped with Sinumerik CNCs has enabled Medizin- und Dentaltechnik to become a highly flexible company capable of responding quickly to customer requirements.

Medizin- und Dentaltechnik, based in Villingen-Schwenningen, Germany, manufactures screws and other turned parts from high-quality materials such as titanium, molybdenum and tantalum. The range of parts produced by the company's 25 employees can be divided into three categories: bone screws with diameters anywhere between 1 and 10 mm, standard screws made mainly of titanium with thread sizes of between M1 and M8 and dental implants. In the case of dental implants, the company develops complete implant systems, including tools and accessories, and manufactures these on a per customer basis. A single group of products might contain up to 66 different implants of differing shapes and sizes. Overall, the company produces around 150,000 implants each year for approximately a dozen different manufacturers. The company's specialty is its flexibility. The manageable size of the team and close collaboration within the company mean that special requests from dentists can be implemented quickly and easily, with no unnecessary bureaucracy. Its newest product is a tiny dental implant, just 3 mm x 6 mm, based on an idea from a dentist.

For the production of these parts, the company's machine shop already features a total of 25 sliding head turning machines fitted with driven tools. More than a third of these – the newer Hanwha XD20H type machines – have already been equipped with modern Sinumerik controllers. Volker Schulz, managing director of Medizin- und Dentaltechnik, was initially skeptical about the switch: "Our staff was

Medizin- und
Dentaltechnik
specializes in custom-
made dental implants

The company has its own clean room where implants are sterilized, packed and labeled



used to the previous controllers, which is why I was worried that it would require a lot of extra work to get to know the new devices." However, thanks to the Sinumerik CNC's intuitive user interface, the switchover went extremely smoothly. "We were surprised at how easy the new controllers are to use. The entire staff was able to quickly get up to speed," says Schulz.

Simultaneous processing of several tools on both spindles

The implant specialists have set up their machines to enable just-in-time production. In doing so, the collaboration with machine supplier EB Turn-Key from Tübingen has proven its worth. They also provided the automatic turning machines made by the Korean machine builder Hanwha. The main spindle on these machines turns at 10,000 rpm, while the counter spindle reaches 8,000 rpm. The Sinumerik CNC allows simultaneous processing of multiple tools on both spindles, with two channels used to control up to seven axes. "The Sinumerik control provides a very convenient set of standard features, which meant there was really no alternative for the applications running here," explains Markus Efinger, man-

aging director of EB Turn-Key GmbH. "We didn't need to activate or add any individual cycles," continues Peter Schütz, a production foreman at Medizin- und Dentaltechnik. All of the required information was directly available using the Sinumerik's standard cycles. Users were also impressed by the high level of computing power offered by the CNC: "We are now around a third faster in the production of many dental implants," explains Schütz. During the first quarter of 2012, the company plans to expand its manufacturing environment to include an additional machine equipped with Sinumerik 840D sl.

Programming directly on the machine

Modern shopfloor equipment offers significant benefits when it comes to new product development. Initial programming and any subsequent program changes that are required can be implemented quickly and efficiently. At Medizin- und Dentaltechnik, programming is carried out on the Sinumerik-controlled sliding head lathe itself. Simple program management functions and easy access to standard cycles mean that even complex contours can be programmed without problems. Schütz was particularly impressed by the Sinumerik CNC's performance in the production of chain threads (several different threads following on from each other on a single part): "This thread takes a really long time to program on other controllers. Using the thread cycle on the Sinumerik CNC, we were able to complete the programming in five minutes, and the final result was exactly what we wanted." After all, even the most complex parts used in medical applications have to meet the highest possible standards. ■

Image to Implant

Siemens will introduce its new "Image to Implant" concept for the very first time at METAV 2012 in Düsseldorf. "Image to Implant" takes a CT scan of a knee joint and uses a highly automated process to develop and manufacture a patient-specific knee replacement prosthetic. The process makes it so easy to manufacture customized implants that these are now seen as a real alternative to standard prosthetics.

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■ Gisma Steckverbinder GmbH, Germany

Well-Connected

Gisma specializes in the production of underwater connectors typically used in offshore energy generation. Sinumerik-controlled Spinner CNC machine tools contribute significantly to the success of the company.

Special connectors are required to safely and reliably connect electrical and fiber-optic cables deep underwater. With maintenance more difficult, all of the parts must meet the most rigorous technical requirements in terms of reliability and service life. Products from Neumünster, Germany-based Gisma Steckverbinder GmbH are designed to be fail-safe and to withstand maximum pressure loads while still operating on the basic "push and pull" principle. In addition to shipyards, the offshore oil and gas industry, and the military, Gisma is now receiving an increasing number of orders from offshore energy companies. Gisma

works closely with its customers on all of its developments – most recently on a single-pole, wet-mateable power connector for use in offshore underwater turbines, which was designed to handle operating voltages of 12 kV at 400 A and is guaranteed to be fail-safe for 25 years.

Manufacturing repeatability to the nearest micron

To meet the high standards required in underwater technology, manufacturing accuracy to the nearest micron is required, especially for fiber-optic connectors. In addition, the materials must all be corrosion-



A variety of complex connector casings are manufactured using the Sinumerik-controlled Spinner TC77 lathe

resistant. The highest levels of functional safety are also required to enable the machining of sea-water-resistant bronze and stainless steels, along with more sophisticated materials such as duplex and super-duplex steels, titanium and high-performance plastics. The demands placed on the cutting machines and controllers used in the production of these parts are correspondingly high. For many years, Gisma has relied on Spinner milling and turning centers equipped with Sinumerik CNCs. "The machines rarely fail, not least because of the high-quality drive and control technology," says production manager Michael Königsmann. He is particularly impressed by the TC77 universal turning machine from the 800 series, which will be used, among

has become a thing of the past," explains Tobias Frerck, Gisma's managing director. "We have always had great results with Sinumerik controllers and knew we could rely on our competent regional service partners on those rare occasions when something went wrong." For newly-developed products, production manager Königsmann and his staff usually create the CNC programs on external PCs in DIN ISO and then send them over the network to the most suitable machine. If there is a need to manufacture new connectors based upon an existing family of parts, the required CNC programs can usually be adjusted directly on the machine itself. And, just as during initial setup, the Sinumerik 840D sl's fully integrated and user-friendly ShopTurn software



» We have always had good experiences with Sinumerik controllers and knew we could rely on our competent regional service partners on those rare occasions when something went wrong. «

Tobias Frerck, Managing Director, Gisma

other things, to turn the casings for a new high-performance connector measuring up to 3000 mm long. The TC 77 is built on a rigid Meehanite cast iron base with large tempered steel guide rails, allowing a high cutting capacity, along with good damping and rigidity characteristics. It is equipped with a water-cooled motor spindle, which allows precision turning to within a few hundredths of a millimeter shortly after switching on. The machine also has a counter spindle and features 12 tool stations with driven tools. "This lets us manufacture some workpieces in a single run, whereas previously it would have taken several," explains the production manager. In accordance with VDI/DGQ 3441, the machine achieves repeat accuracy of 2 µm in the x- and z-axes.

Consistent CNC strategy since 2000

The sophisticated Sinumerik 840D sl CNC plays an equally important role in reducing manufacturing time. Since the year 2000, Gisma has used only Siemens controllers in its production facility. "By standardizing the controller, we have created an environment where we can deploy our employees flexibly all over the shopfloor and operator error

comes into its own here. The animated graphical user interface is completely intuitive, meaning that it can be easily picked up even by temporary staff. The Sinumerik Safety Integrated software package provides additional safety when working in setup mode, allowing operators to monitor the production process with the machine door open. Safety mode allows speeds of up to 2 m/min, and the software ensures that the drives stop quickly after a maximum of 1 to 2 mm should any problems arise. If anything is unclear when an operator is entering data, he or she can push a single button on the operator console to bring up a help menu. Switching to a text-based DIN interface is just as straightforward (for example, when an experienced programmer feels that he or she can more quickly and easily describe a complex contour using a DIN statement). As always, the main focus remains on achieving the highest possible standards in terms of both the manufacturing and the finished product. ■

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■ Lufthansa Technik AG, Germany

Better than New

Retrofitting a machine used to repair engine housings and combustion chambers with a Sinumerik 840D sl CNC helped significantly improve its day-to-day performance.

For many people, the name “Lufthansa” is a byword for safe, comfortable air travel. The Lufthansa Technik group of companies (LHT Group), which carries out aircraft servicing and maintenance, plays a significant role in maintaining that reputation. Lufthansa Technik is one of the few service companies allowed to overhaul aircraft and engines from a wide variety of manufacturers. Indeed, for certain procedures and manufacturers, the Lufthansa Technik site in Hamburg, Germany, is the only qualified repair location in the world.

Sophisticated engine repairs

Repairs to engine housings represent a particularly difficult challenge. Engine housings are complex, heavily stressed components made of materials that are expensive to buy and process. In scheduled maintenance, it is sometimes possible to replace only those sections that show signs of mechanical and thermal stress – an alternative that is technically challenging, but financially, extremely interesting compared with using new parts. To do this, the component to be overhauled is first precisely measured and a CAD model of its actual shape is created. Next, the worn sections from the engine components are replaced with new material, which is then reworked so that it exactly matches the previous structure in terms of shape, size, and accuracy of fit. The repair technology requires machining centers of a particular size and quality, as Andreas Tölle, project engineer at Lufthansa Technik in Hamburg, explains: “Our large vertical turning and grinding machines from Jungenthal, with their solid and reliable mechanics, are completely indispensable for this type of work.” They are regularly overhauled to reflect the state-of-the-art in terms of both electrical engineering and CNC technology.

Engine components exposed to high thermal and mechanical loads must be overhauled after a predefined number of takeoffs and landings or a set number of flying hours

Photos: W. Marschner



New technology simplifies programming

Lufthansa Technik in Hamburg recently turned to Siemens to retrofit the drive technology and control system on its Jungenthal vertical turning and grinding machine center. "Everything we produce is a one-off and needs to be individually programmed and processed," says Tölle. "Our staff also needs to be able to operate all of the machines easily. That's why we are gradually converting all our machining centers to use CNCs with shopfloor software from Siemens."

The electrical engineering part of the retrofit included all of the axle drives and the CNC system. The Sinumerik 840D sl, with its Sinumerik Operate graphical user interface and integrated ShopTurn shopfloor software, made it possible to combine the turning and grinding processes that previously required two CNCs into a single control system, thus saving one control panel. This means that there is now more space around the machine and users can move around freely as they operate the grinding functions from an MP8 mobile panel. With the turning and grinding processes now combined in a single control system, programming and program management have been considerably simplified. The old CL800 cycles have been translated one-to-one into ISO cycles for the new control system. On the OP 015 control panel, more information can be visualized in a clear and transparent manner than ever before. For example, it is now already obvious during the simulation phase whether a tool can be used at a particular angle of attack. In ShopTurn, which is also integrated into Sinumerik Operate, contour sections can be easily cut out and inserted using the copy-and-paste function. The panel is also extremely useful when operating in manual mode.

Retrofitting saves time and money

To fully exploit the capabilities of the Sinumerik tool management system, Lufthansa Technik retrofitted the tool turret with Capto toolholders. This allows the Jungenthal machine to be specifically fitted with ready-made tools, simplifying in-process tool changes, eliminating the need for time-consuming scratching, and allowing entire production sequences to be

» When repairing an engine, we have only one opportunity – and there can't be any waste. The Sinumerik solution developed together with Siemens guarantees the required process reliability. «

Andreas Tölle, Project Engineer, Lufthansa Technik, Hamburg

combined into cycles and programmed processes. "More efficient tool and program management has increased our processing speeds on average by between 10 and 20 percent," explains Tölle. Equipped with the new Sinumerik CNC, Simotics S-1FK7 servomotors and the Sinamics S120 drive system, including actively regulated infeed, the Jungenthal machine now has the flexibility to deliver the efficient production processes required for aircraft maintenance. The retrofit proved particularly economical when compared to the cost of buying a new machine, even without counting the work saved on foundations and infrastructure. This resilient machine will probably also last longer than a newer model built today, says Tölle, who is already thinking ahead to the next retrofit with Siemens as its partner. ■

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W. Geyer

Components like this can be programmed and manufactured extremely efficiently with the FZ08 MT and Sinumerik CNC

■ Chiron-Werke, Germany

Simultaneous Machining

Chiron has developed its new machining center specifically to handle the complete machining of highly complex workpieces, and the company is using Sinumerik Operate to make the most of the increased capabilities.

The new FZ08 MT ("Mill Turn") machining center from Chiron integrates the most sophisticated turning and milling operations. The world's leading producer of vertical machining centers has also optimized the thermal stability of this proven machine design, increased its modularization and expanded it to include a full-fledged Sauter/Capto C4 turret. The swivel head, rotating spindle, turret (with centric clamping vise) and counter spindle or swivel table(s) offer a total of up to 12 axes when fully equipped, allowing the user complete freedom when carrying out six-sided complete machining of highly complex workpieces. The ability to use two tools simultaneously on both spindles should allow processing times to be cut by half and therefore double productivity. The automated material feed (42 mm or 65 mm diameter bars) and the automatic unloading of finished parts make this an extremely productive manufacturing system that meets the highest possible quality standards. This machine tool builder is aiming at users not only in medical part manufacturing, clock and watch-makers, and jewelry manufacturers, too, but also at those in the automotive and general mechanical engineering industries, where complete machining is becoming more and more important.

The very latest CNC and drive technology

The Sinumerik 840D sl, together with direct drives and spindles from Siemens (Weiss), forms an integral part of this new generation of machines. Chiron is also using Sinumerik Operate HMI software for the first time, in order to fully exploit the increased capabilities and enable both simple and highly complex workpieces to be programmed safely and quickly, directly on the machine itself. In addition, the Chiron PROCESSline CAD/CAM system, based upon NX-CAM from Siemens PLM, provides easy offline programming and simulation that is precisely tailored to suit the kinematics of the machine.

Two-channel display provides transparency

"For us, one of the most important differentiators of the Sinumerik Operate HMI graphical user interface was its ability to display the processing steps on the two NC channels for the main spindle and the rotating or counter-spindle side-by-side during runtime," explains Dr. Claus Eppler, head of research and development at Chiron. That means the operator is always able to monitor the machining process without the need for any manual switching, and is always able to keep track of the current processing

steps. The same applies during the creation, programming and graphical simulation of new workpieces on the machine, which eliminates input errors and helps avoid the damage these can cause. The programSYNC function allows the synchronization of the channels or program sections to be easily optimized. To fully exploit the benefits of a detailed graphical display, the FZ08 MT comes equipped with the new, large 19" OP 019 touchscreen as standard.

Direct drives for precision and dynamics

The reliable superstructure of the MT range, which is currently available in two sizes, has been extended to incorporate a full-length transverse linear axis at the bottom. The common primary component of the Simotics L-1FN3 linear motor has a secondary component mounted on it for the axial movements of the turret and another for the counter-spindle. The water-cooled, wear-free linear motors offer the best possible dynamic performance, ensuring the shortest processing times, high levels of precision and repeat accuracy, and, therefore, the highest possible processing quality. The travel paths are finely tuned that the swivel head and turret can be used on both spindles. Meanwhile, the equally compact built-in Simotics T-1FW6 torque motor, which has performed well in other Chiron machines, delivers a high degree of torque and holding torque (for milling operations) on the counter-spindle.

Comprehensive support included

In addition to the products themselves, the Tuttlingen, Germany-based company has always made good use of the support services and expertise provided by Siemens. For example, Siemens employees were



W. Geyer

Productivity in compact form: Chiron has integrated complex six-sided turning and milling operations in its new FZ08 MT machining center

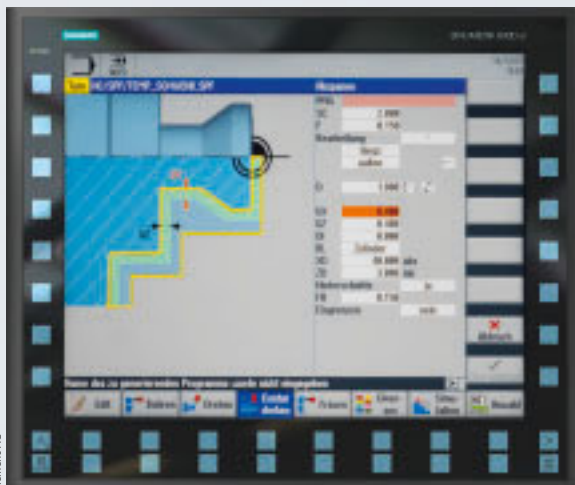
closely involved in the definition and implementation of the new functionality and also in the commissioning of the first FZ08 MT at the last EMO trade show. Chiron also leaves the switch cabinet construction to the specialists from Werk für Kombinationstechnik Chemnitz (WKC), which delivers ready-to-use, fully-certified cabinets direct to the company's production line. The range of services is completed by an intensive training program for the Chiron team on a Chiron machine at the Siemens Technology and Applications Center (TAC) in Erlangen, Germany. ■

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The benefits of Sinumerik Operate at a glance

- Integration of work-step programming and high-level language programming in a single user interface
- Windows-style display
- Clear overview provided by tool list
- Ease of use with animated elements
- Safety through simulation
- Easy setup of different kinematic characteristics



Siemens AG

■ Gewinde Ziegler AG / GSA AG, Switzerland

Standardized Interface Promotes Flexibility

Gewinde Ziegler AG / GSA AG uses a heavy-duty Leadwell LTC-60CXXL turning center equipped with Sinumerik 840D sl CNC and its standardized, easy-to-use Sinumerik Operate graphical user interface to produce flexible, high-quality spindle shafts.



Photos: Gewinde Ziegler AG/GSA AG

Tempered roller screw actuators make environmentally friendly, energy-efficient, and highly accurate feed drives a reality

Any manufacturing company relying on the small-series production of customized components for up to 90 percent of its output must be highly flexible if it is to operate economically and meet tight delivery schedules. For Christoph Meier, CNC technology manager at Gewinde Ziegler AG / GSA AG in the Swiss town of Horriwil, flexibility was the main reason he chose the Leadwell LTC-60CXXL turning center, which can process metal bars up to 400 mm in diameter and 6 m in length (or up to 9 m in length if the additional support chuck behind the spindle drive is used). "Instead of waiting five to eight months for an outside sub-contractor, we are now able to pre-turn even large threaded spindles within a week or two, after which we can temper and grind them. This reduces delivery times to two or three months and is one of our main competitive advantages allowing us to survive even in a high-cost area like Switzerland," explains Meier.

Easy programming – thanks to the graphical user interface

When it came to the CNC controller, the CNC technology manager chose the Sinumerik 840D sl based upon positive previous experience with the device. With its multi-channel technology, the control is able to manage the VDI 60 turret with its 12 tool slots, the tailstock with rotating center, the main spindle and the feed drives. As Meier explains, he was impressed by the specific benefits of this control concept after seeing it used on smaller turning and milling machines. As far as he is concerned, its best feature is the Sinumerik Operate graphical user interface: "The interface displays animated graphics for every work step, meaning that even inexperienced staff are able to create sizable NC programs within a very short time." As Meier notes, it can no longer be taken for granted that the ability to pro-



» **Thanks to the NC programs created directly on the machine using Sinumerik, our staff is able to work reliably from the very first piece. «**

Christoph Meier, CNC Technology Manager, Gewinde Ziegler AG/GSA AG

gram in standard DIN ISO language (G-code) will be part of the day-to-day skill set of a metal processing specialist. The concept of graphical, parameterized work steps offers an innovative alternative in this regard, allowing even complex NC programs to be created much quicker and easier right on the machine itself. The Sinumerik Operate user interface even lets users create, edit, and manage detailed tool lists, with all the included tools also represented by icons. "Thanks to the NC programs created directly on the machine using Sinumerik, our staff is able to work reliably from the very first piece," says Meier.

Economical single-part production

The animated 3-D simulation of programmed processing steps, including the tools and clamping devices, also ensures a high degree of process reliability. With the costly procurement of high-quality chrome-nickel alloy blanks often taking several months, process reliability plays a crucial role in ensuring continued economic viability. The benefits of 3-D simulation are particularly apparent in the manufacture of single part and small-series items, including the heavy-duty long roller screw actuators used in electric injection molding machines and sluice gates, for example. This drive technology is increasingly replacing conventional hydraulic drive technology, with its associated risks to the environment and difficult commissioning and adjustment procedures. The roller screw actuators produced by Ziegler are mostly made-to-order and are also used as drive components in machining centers and other specialized machines, in automation, and also in automobiles.

A single user interface for all machines

The benefits of the Sinumerik 840D sl have persuaded Ziegler to acquire a smaller Leadwell LTC-25ALM turning center, which is equipped with

a Sinumerik 828D and will be used for training purposes. Like its larger, high-end sibling, this entry-level CNC offers all the required functions for easy and efficient programming through the same Sinumerik Operate programming and user interface. This allows trainees to immediately apply the knowledge they have gained here in the company's production environment. "That represents another highly practical benefit of the Sinumerik control system concept: all of the PLCs on our turning and milling centers have exactly the same programming and operator interface. This means our employees are able to switch between different machines within a



Colored graphics showing the work area and work-piece and animated simulation of the programmed processes ensure optimal process reliability in the manufacture of customized threaded spindles

very short period of time, increasing the flexibility with which we can deploy our staff," says Reto Ziegler, managing director in Horriwil, summing up the benefits of Siemens CNC control systems. ■

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■ Life Cycle Services

Optimizing Plant Availability

Life Cycle Services is a comprehensive offering from Sinumerik Manufacturing Excellence that allows users to increase both plant availability and the productivity of their systems, while simultaneously reducing costs over the longer term.

Whether in production or during maintenance, Life Cycle Services from Siemens helps increase the manufacturing quality delivered by all types of machinery. The range of services covers the development and retrofitting of machine tools, machine simulation and the delivery of solutions for manufacturing IT and virtual production. Users benefit not only from improved machinery performance and manufacturing quality, but also from the reduced operating costs required for staff and tools. The innovative service concepts also offer significant potential in terms of optimizing the life cycle costs of a machine. Two examples involving the Dutch company Case New Holland (CNH) and S.A.B.C.A. of Belgium help illustrate how the savings potential offered by Life Cycle Services can be achieved.

Retrofitting a turning machine

CNH is a leading manufacturer of agricultural and construction machinery, with over 40 production sites around the world. The company's plant in Zedelgem, Belgium had a Boehringer inclined bed turning machine from the 1990s that was respon-

sible for 25 individual work steps and was in urgent need of a retrofit due to dwindling productivity after years of continuous use. When implementing this modernization project, specialists had to consider a number of requirements:

- ▶ Some replacement parts for the machine were extremely difficult and expensive to obtain.
- ▶ The reliability of the machine needed to be improved, which meant fitting components that would ensure the highest levels of plant availability.
- ▶ Suitable software needed to be installed to monitor the data produced by the machine and establish its efficiency.
- ▶ The error-prone control cabinet was to be simplified.
- ▶ The CNC machine had to provide a high degree of safety.

The solution was to replace the existing CNC system with Sinumerik 840D and Safety Integrated, which has all the required safety features already fully

Overall equipment effectiveness (OEE)

integrated. This control system uses machine data acquisition (MDA) software to monitor production data, allowing the production department to easily determine the overall equipment effectiveness (OEE). Additionally, new Simodrive 611 drives allow the control cabinet to be simplified, and the Simotics S-1FK7 servomotors are more robust and run more efficiently.

In summary, after retrofitting with Sinumerik 840D, the machine is now far easier to maintain, obtaining replacement parts is no longer a problem and machine downtime has been almost completely eliminated.

Optimizing production flow

Belgian aerospace company S.A.B.C.A. has many years' experience in processing highly complex components. To continually deliver the high levels of quality demanded by customers in this high-tech sector, S.A.B.C.A. places great emphasis on adapting its machinery to meet the very latest technological requirements. When an audit revealed that the company's production flow could be further improved, along with its productivity and profits, the company turned to Siemens to find out how.

To S.A.B.C.A., it was important to use software to monitor production data and, therefore, the efficiency of the machine. The production flow was then to be improved by carrying out a structural analysis of the collected data. S.A.B.C.A. also wanted detailed insight into the problems that might occur during the production process, in particular during periods of downtime. In the event of a system change, data were to be measured directly and accurately.

Two measures were crucial in satisfying these requirements: Siemens first installed its MCIS (motion control information system) software, which automatically extracts data, error messages, etc., from the machine. This allows the performance of the entire production system to be measured based on objective data. MDA software was then installed on all the machinery in the production flow, allowing operators to record OEE data at a glance. Messages concerning critical machine statuses are now generated automatically and no longer need to be recorded by hand.

S.A.B.C.A. was extremely pleased with the results, as the machine's OEE values for availability, performance and quality all showed significant improvement after the solution was implemented. In addition, the basic data used in the calculations were more precise and the evaluation of objective data much simpler. The company now has a continuous and complete overview of its production flow that is always up-to-date. The machine is also easier to maintain thanks to the early identification of structural problems based upon analysis of the data. ■

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■ Sinumerik Solution Partner

Process Monitoring for the Sinumerik 828D

In collaboration with Emco and Siemens, MCU has developed the first tool-monitoring system suitable for use on a compact machine fitted with the Sinumerik 828D.

Increased automation has led to corresponding increases in both process and product diversity, which in turn place even higher demands on those responsible for managing and operating the machines in question. That is why self-optimizing, self-adjusting process monitoring systems, designed to actively support the user in his or her tasks, are becoming ever more important. Sinumerik Solution Partner MCU GmbH & Co. KG has developed its Toolinspect module specifically to monitor tools fitted on CNC machines. The device, which uses integrated software to help select the most appropriate monitoring strategy, records the required data via a Sinumerik Profinet or Profibus DP interface. After the tool manufacturer has set the required parameters once, no further adjustments are necessary.

Test passed with flying colors

Toolinspect was installed on an Emco VT250 vertical lathe fitted with a compact Sinumerik 828D CNC. The device turned in an impressive performance, characterized by high levels of productivity and repeatability and excellent usability. Together with its partners, Emco and Siemens, MCU succeeded in implementing a cost-effective and fully functional integrated process monitoring system on a compact control system. After Toolinspect had been installed, the VT250 was used to process steel workpieces. Using the standard setup, the system was able to safely monitor turning, milling, boring and threading processes via the tools in the turret. Because the system is designed to be operated using only three function keys, a short training session was sufficient to bring the operator up to speed. None of the parameters or thresholds needed to be changed, because the system carries out its own optimization while producing the first workpieces after a trial run.

Many advantages

Toolinspect is characterized by its ability to recognize process anomalies and its user-friendly design. The module is extremely easy to operate and requires only very small changes in the CNC program. It automatically adapts to different operating conditions, such as wear and tear or changes in temperature, and, on top of it all, it is also extremely easy to install. ■

Toolinspect
monitors tools on
CNC machines



MCU GmbH & Co. KG

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New app

G-Code Compatibility app



Siemens AG

This handy CNC G-Code Compatibility app helps you quickly find compatible codes for Siemens and ISO G-codes. In addition, formatting examples are provided, making easy-to-use Sinumerik CNCs even easier. A Glossary of Terms function is your easy reference guide to CNC abbreviations. Looking for service or support is right at your fingertips with a web-link tool, and CNC social media feeds open the doors to a vast online user community.

Download the G-Code Compatibility app for iPhone and iPad for free.

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The Siemens logo is displayed in a white box in the top left corner of the page. The background of the entire advertisement is a blurred industrial scene featuring a large CNC machine and two workers in the distance. In the foreground, a close-up of a precision-machined metal part with two circular holes is visible.

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