SIEMENS

Volume 1 | September 2015 | siemens.com/motionworld

motion world

Trends in CNC Automation

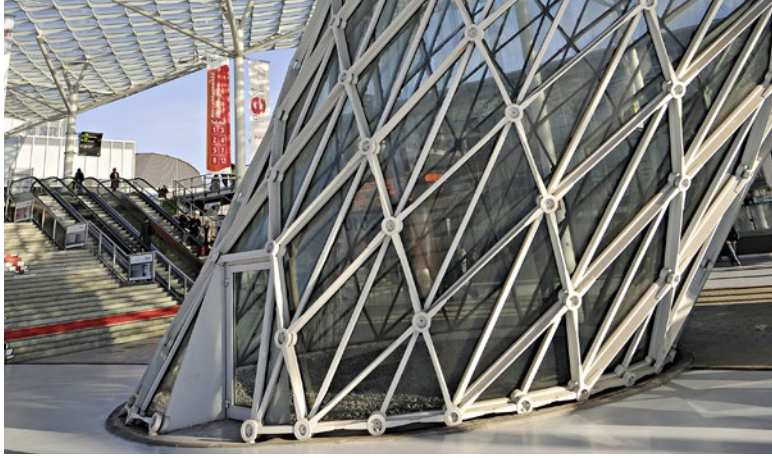
Gaining a competitive edge with digitalization

Pioneering production technologies at EMO 2015

Gaining a competitive edge with digitalization

At EMO 2015, Siemens will be showcasing innovative solutions across the entire process chain, including demanding multi-technology

Cover picture: Beppe Raso/Arcaid/Corbis



Industrie 4.0: Digitalization in Machine Tool Manufacturing

Siemens AG

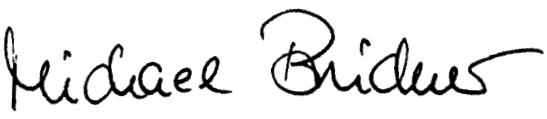
Industrial companies are facing profound changes in the world of manufacturing. Digitalization is opening up new possibilities for making products and solutions smarter and thus also more efficient. Siemens recognized this potential early on and developed coordinated solutions for all stages of the integration of automation technology throughout the entire value chain. Siemens has been focusing on simulation, virtual machines and integration of factory technology for years now, particularly in the context of CNC production with Sinumerik. The aim is to continue promoting this integration and thus pave the way for Industrie 4.0 in the machine tool industry and for CNC production. This is why the Siemens booth at EMO 2015 in Milan is centered entirely on digitalization. The focus here is on comprehensive solutions that allow small and medium-sized companies to enter Industrie 4.0 as well as on the networking of large production sites based on the Digital Enterprise software suite. But our booth in Hall 3 is not the only place where we will be showing you how efficient the use of consistent CAD/CAM solutions is in production; you can also find practical examples of how effectively the solutions work in this issue of *motion world*.

Optimized machining technology is still very much a key element of machine tool applications. Whether for turning, milling, grinding, drilling or multi-tasking, we have solutions that not only help create the perfect workpiece in the shortest time but also are easy to operate. Siemens will be showcasing its innovations at EMO, particularly those designed for the increasingly growing field of multi-tasking. Complete workpiece machining is now even easier and more effective with the new Version 4.7 of the Sinumerik Operate software for Sinumerik 840D sl and Sinumerik 828D.

See for yourself at EMO the opportunities opened up by our innovations, and be inspired by the applications featured in the magazine.

Enjoy reading!

Yours,

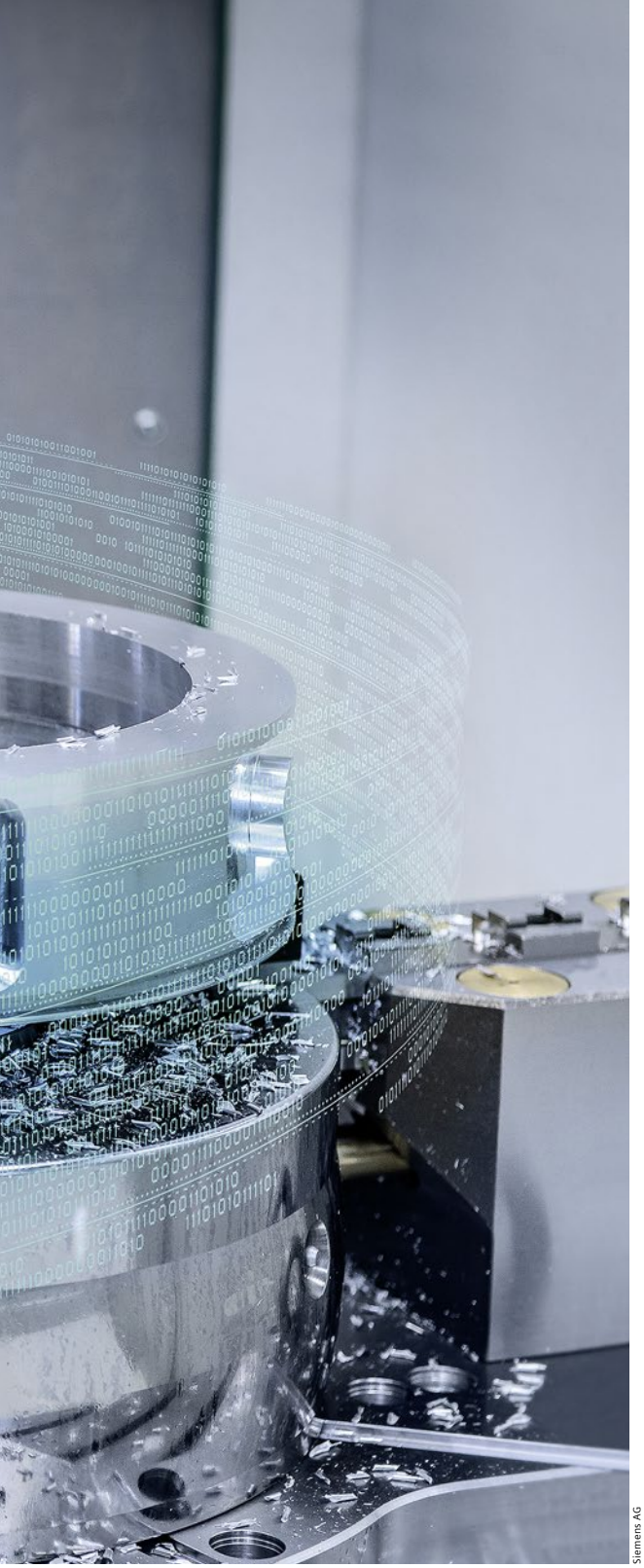


Michael Brückner
Head of Business Development
Sinumerik High-End

Solutions for pioneering production technologies at EMO 2015

Gaining a competitive edge with digitalization

Siemens will be showcasing an integrated portfolio of industrial software and automation technology at EMO in Milan under the slogan "On the Way to Industrie 4.0 — Digitalization in Machine Tool Manufacturing." We spoke to the head of the Machine Tools Business Segment, Joachim Zoll, about the advantages for the machine tool industry.



Siemens AG

At EMO 2015, Siemens will be showcasing innovative solutions across the entire process chain, including demanding multi-technology

> "We are pioneers when it comes to innovative technology. And with Sinumerik 840D sl, we also have the appropriate CNC system."
>
> **Joachim Zoll, Head of Machine Tools Business Segment, Siemens**

Mr. Zoll, just what exactly does the digitalization of the machine tool world involve?

Joachim Zoll: What we are currently experiencing is an ever-increasing integration of product development and production processes through the use of innovative software systems and powerful hardware. At the same time, the virtual and real aspects of production are merging. This represents a key step on the path toward a new industrial era. Machine tool manufacturers and manufacturing companies are already benefiting from the possibilities presented by digitalization, and they are significantly increasing their competitive edge thanks to the use of integrated products and solutions. After all, these companies now face the challenge of introducing ever-more-complex products to the market in increasingly short innovation cycles. The volume of data to be managed is also constantly growing as a result. In addition, productivity demands have risen immensely due to the fact that customers in volatile markets are relying increasingly on individualized series production rather than mass-produced goods. And, of course, another factor that plays a major role in global competition is how efficiently energy and other resources are used.

With this in mind, the ultimate aim of digitalization in production is to reduce the overall time to market for products as well as to increase the flexibility and efficiency of the processes involved. To achieve this, Siemens has developed its Digital Enterprise software suite. This addresses all the requirements of the industrial value chain, from product design and product engineering to production and service.

What does this mean in concrete terms?

Joachim Zoll: Machine operators can learn about the advantages of an integrated CAD/CAM CNC process chain at our EMO booth. Siemens offers a complete

solution here, from the NX product lifecycle software for CAD/CAM planning (i.e., product design); to the Tecnomatix software suite for drafting, planning and simulation of the digital factory to the Sinumerik CNC control system for manufacturing the respective product. The backbone of the software suite is Teamcenter, the most widely used digital lifecycle management solution in the world. It enables every step to be simulated during the design phase and production planning, even allowing for production based on the model of a virtual machine. The model allows users to check whether NC programs will run collision free, whether the syntax of the program is fault-free and how long machining will take — enabling optimization potential to be identified before real production has even started. This makes the virtual machine perfect for work preparation. All in all, machine tool manufacturers benefit from integrated engineering because it leads to faster and more flexible development processes, which enable manufacturing companies to reduce their set-up and running-in times and allow investments in new machine tools to pay off sooner.

What is the role of digitalization in production?

Joachim Zoll: As a result of digitalization, processes and applications in the virtual world and the real world are becoming increasingly interwoven — in both the horizontal and vertical dimensions. Large, process-oriented manufacturing companies need networking along the entire production line. With Sinumerik Integrate for production, we offer these companies solutions for networking machines and connecting them to higher-level IT systems. For horizontal integration across several machine tools in a manufacturing environment, Sinumerik Integrate allows resources to be linked and production data to be managed centrally. The software runs directly on the CNC, where it collects all the data on the programs and tools used, including the overall equipment effectiveness values, and makes this information available for further use. New functions can be easily installed via a server.

In addition to interlinking the individual machine tools, vertical integration — that is, networking into higher-level systems — also plays a key role. Sinumerik Integrate can be quickly and easily integrated into higher-level systems such as Teamcenter. This makes order data accessible throughout the company and allows users to easily determine which orders should be produced in which of the company's factories. It also enables users to quickly survey and effectively coordinate material stocks, logistics processes and the availability of tools.

So is digitalization worthwhile only for big companies?

Joachim Zoll: No, and this preconception is something we would like to clear up at this year's EMO. By presenting smart operation at EMO, Siemens will also be showcasing improved hardware and software solutions that make machining even more efficient for small and medium-sized companies in particular, helping them enter the world of digitalization more easily. The use of networked machines and innovative operating concepts with multi-touch displays and mobile devices allows companies to optimize their production workflows. It has never been so easy to integrate a machine tool into the production process. smart operation encompasses applications for computer-based work preparation as well as options for programming and process simulation during operation. Furthermore, innovative operating concepts such as touch and gesture technology make machine operation even simpler. Staff can also monitor the current status of the machine on their smartphone or tablet via a secure web server, so that they are always aware of what is happening in the production. In addition, programs and file attachments can be exchanged and displayed directly on the control system. This allows users to view data such as PDF and DXF files directly on the machine as well as to access data within the company network. Paperless manufacturing saves time and increases quality through a more efficient data exchange process.

"Machine tool manufacturers benefit from integrated engineering because it leads to faster and more flexible development processes, which enable manufacturing companies to reduce their set-up and running-in times and allow investments in new machine tools to pay off sooner."

Joachim Zoll, Head of Machine Tools Business Segment, Siemens

Siemens AG

At the beginning, you mentioned achieving greater flexibility and efficiency as one of the goals of digitalization. What else does Siemens offer its customers to help them achieve these aims?

Joachim Zoll: By connecting individual machines with robotic handling systems, companies can enormously increase their flexibility in production. More and more manufacturing companies are now using robots for material handling tasks because doing so means that workpieces can be loaded and unloaded quickly and easily. We will be showcasing such automated cells at EMO 2015. The robots not only perform the handling tasks but also are engaged for machining processes. Connecting robots from different manufacturers to the Sinumerik 828D CNC is now also extremely easy using the Run MyRobot/EasyConnect interface. We will be showcasing solutions for connecting robotic handling and machining systems in collaboration with Kuka in Milan.

Have there been any outstanding new developments in the hardware and software sector?

Joachim Zoll: With the latest software version, Version 4.7 from Sinumerik Operate, Siemens is presenting important new technology functions for Sinumerik 840D sl and Sinumerik 828D that lead to even better machining results. I'd just like to mention the extended contour machining cycle as an example here. It makes programming four-axis turning easy: two turning tools opposite one another machine the workpiece simultaneously, which considerably reduces the machining time. In addition, the two turning tools opposite one another prevent workpiece distortion, significantly improving dimensional accuracy, particularly on long, thin workpieces.

The unique advantage of Siemens PLCs is that the new machining process can be programmed directly on the Sinumerik CNC without the need for a CAD/CAM system — the user only has to add two additional parameters for "balance cutting." The CNC sequences are then automatically created by the Sinumerik contour machining cycle. Siemens will also be showcasing Top Surface, a new development for surface quality in mold making. This function optimizes the data from the CAM system in order to achieve the optimum geometry and ensure that the surface of the workpiece is near perfect.

And how is Siemens positioned with regard to pioneering technologies?

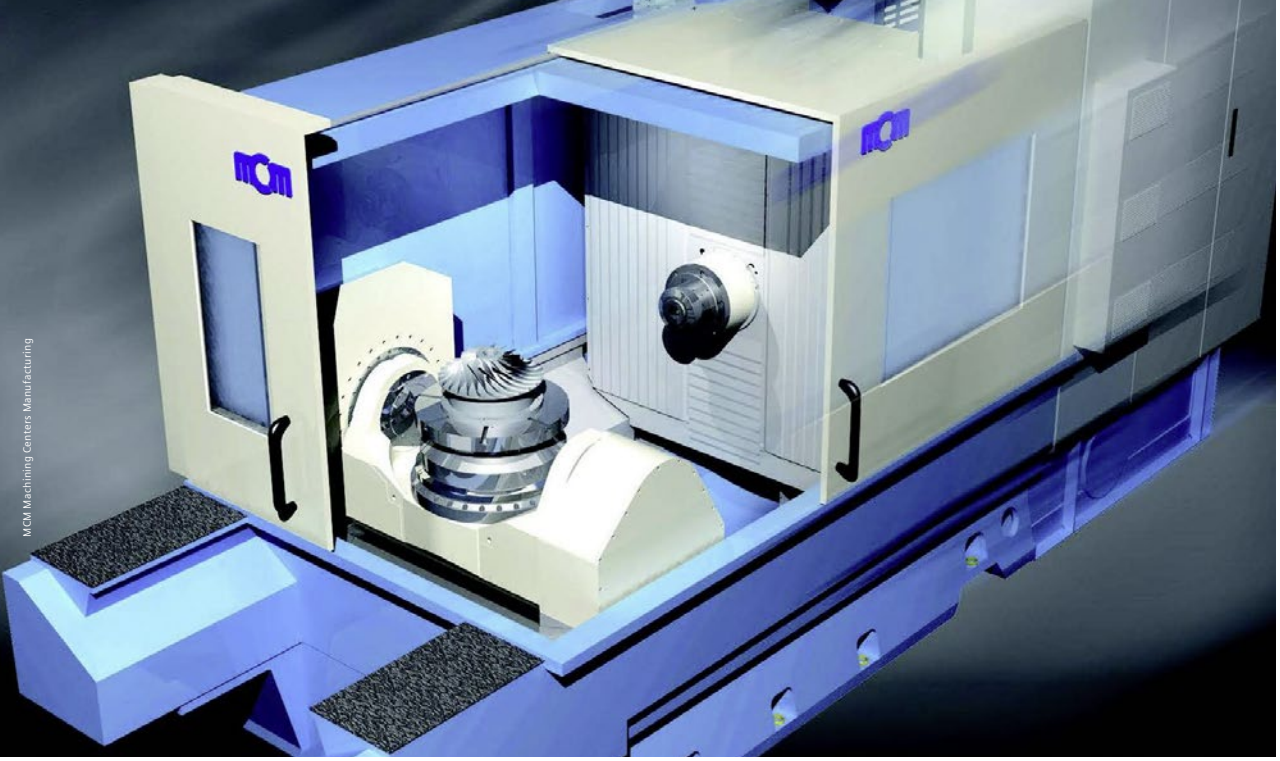
Joachim Zoll: We are pioneers when it comes to innovative technology. And with Sinumerik 840D sl, we also have the appropriate CNC system. Additive technology is set to be a hot topic at the Siemens booth, as this technology is becoming increasingly important. Sinumerik 840D sl gives mechanical manufacturers access to a powerful control system that can be used to implement machine tools for additive manufacturing processes, while the NX Hybrid Additive Manufacturing system provides users with an application for programming the production steps, including simulation of material application and removal. In this respect, Siemens is the only supplier worldwide to offer an integrated hardware- and software-based solution that paves the way for successful parts production in combined additive and subtractive processes.

As you can see, we offer integrated solutions for the digital production world, from machine tools right up to the corporate management level. We are looking forward to presenting these to machine manufacturers and operators at EMO 2015 in Milan.

Thank you for speaking with us, Mr. Zoll. ■

INFO AND CONTACT

siemens.com/emo



MCM Machining Centers Manufacturing

Many functions combined in a small space: the Clock Dynamic 2g–5 Axes

MCM Machining Centers Manufacturing S.p.A., Italy

Dynamic all-rounders

The Italian machine manufacturer MCM has developed a flexible machining center with state-of-the-art drive and control technology from Siemens that can mill, turn, grind and even produce threads and tooth systems with maximum flexibility, stability and accuracy as well as extremely short cycle times. This universal machining center can be seen live at the Siemens booth at EMO 2015.

With an axis acceleration of 2 g, a compact design and unrestricted access to the workpiece, the Clock Dynamic 2g–5 Axes takes the top spot in MCM's product line. The machining center is the latest in a series of very successful and versatile machines from MCM, as explained by engineer Pietro Contini, head of computer-aided manufacturing at MCM: "In the Clock Dynamic 2g–5 Axes, we wanted to integrate the latest Siemens technology in a multi-tasking machine that can do just about anything. For us, it was not a case of using a lot of technology for technology's sake but rather responding to the actual challenges our customers are facing today."

One machine for many machining operations

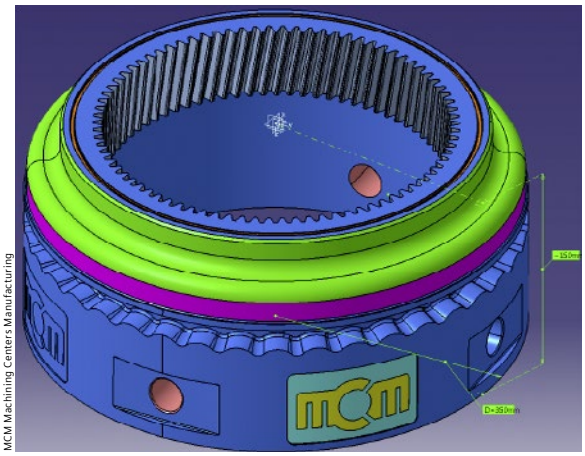
The Clock Dynamic 2g–5 Axes is a five-axis machining center that offers a great degree of compactness and stability in an operating range of 610 × 650 × 700 mm (xyz-axis) and a swivel range of –105° to +35° (a-axis). At EMO 2015, the dynamic properties and flexibility of this machine tool will be demonstrated: A sample workpiece will be produced every day on the Clock Dynamic's 500-mm rotating turret, on which various technologically demanding machining processes will be performed. (These processes resulted from a collaboration with the company Sandvik, a

developer of special tools.) Two innovative technologies will primarily be used here: first, power skiving, currently the most productive and flexible technology for producing internal and external teeth (instead of hobbing), and second, groove spiral milling, a process that is frequently used instead of large boring bars in large valves.

During turning, the Clock Dynamic will demonstrate its performance capabilities both with the high speed of the rotating turret (2,000 rpm, with a torque of 667 Nm for S1 and 1,200 Nm for S6) when machining tempered steel, and with x-y-z thread turning, with the swivel range ensuring that the tool is always held optimally inclined toward the workpiece.

During milling, a spindle with a speed of 20,000 rpm (30 kW and 72 Nm for S1, 50 kW and 127 Nm for S3) will be used for continuous five-axis machining. A contour will be produced that is typical of an aircraft engine housing. To show the machine's high dynamics, fine processing will be performed with simultaneous interpolation of the linear x-, y- and z-axes, as is often necessary when machining molds. To demonstrate the Clock Dynamic's high precision, coaxial boreholes will be made on a plate tilted 180°, with the accuracy checked by a measuring probe directly on the machine.

With a measuring probe and a dresser installed directly on the machine, the user has all the necessary means to grind parts with maximum precision on the Clock Dynamic 2g–5 Axes. Thanks to the scanning measuring probe from Blum, the surface finish of the machined parts can be checked, and the produced contours can be scanned, as with a measuring machine.



MCM Machining Centers Manufacturing

The machining capabilities of the Italian all-rounder will be demonstrated at EMO using a sample workpiece

Innovative technology and human expertise ensure market success

The electronic core of the Clock Dynamic 2g–5 Axes machining center is the Sinumerik 840D sl numeric control system and the Sinamics S120 drive system for controlling the axis motors, which also come from Siemens' product portfolio. The latest Sinumerik OP 015 multi-touch panel from the new black-line series is installed as a user interface. In addition, the innovative Sinumerik Operate operating and programming interface offers an intelligent anticollision function, among other features.

The demonstration at EMO 2015 will also show how the workpiece machining is simulated using NX CAD/CAM and product lifecycle management software. During the simulation, the progress of the actual machining can be tracked both on the control panel on the machine and on a connected smartphone. "It is no coincidence that Siemens has secured a virtual monopoly in several market segments, such as the aerospace industry," Contini concludes. "Thanks to the extremely flexible Sinumerik control system, we can implement our designers' most innovative ideas without any problems. But it is the expertise and helpfulness of the service technicians that make the real difference — something that is indispensable for us machine designers and one of the most significant reasons for our market success." ■

> "Thanks to the extremely flexible Sinumerik control system, we can implement our designers' most innovative ideas without any problems."
>
> **Pietro Contini, Head of Computer-Aided Manufacturing, MCM**

INFO AND CONTACT

siemens.com/sinumerik
lorenzo.capodiferro@siemens.com

Huron Graffenstaden

Huron Graffenstaden, France

Premiere for new software

Huron Graffenstaden has developed a multi-tasking instrument based around a five-axis vertical center so that it can machine complex milled and turned parts on one machine. The turning functions on the milling interface are provided by a preview version of the new MillTurn software.

The good reputation of Alsace-based machine manufacturer Huron Graffenstaden is founded on three criteria: precision, speed and the contour machining of complex parts. The flagship of Huron's range is the five-axis MX10 M vertical milling center, several dozen of which have already been sold. In its standard version, the machine includes a 65-rpm turntable on the c-axis and a wobble head on the b-axis. The MX10 M is controlled by a Sinumerik 840D sl CNC. "A customer inquiry recently gave us the idea of developing a real milling center based on the MX10 M, which could also be used to perform turning operations, thus making it possible to manufacture parts that are primarily milled but also require turning," says Dominique Lutz, commercial director at Huron.

Optimized modification to a mill-turn center

No sooner said than done. The experienced machine manufacturer modified a number of mechanical elements on its five-axis machining center. The turntable now reaches a rotational speed of 500 rpm. A Hirth joint clamp was added to the table so that a fixed tool can be used in turn mode. There was only one drawback: the operators were unable to seamlessly connect the milling and turning operations directly on the machine using the current ShopMill software version. "For this project, Siemens therefore released Version 4.7 of Sinumerik Operate as a preview, which allows turning operations to be performed with ShopMill, too," reports Lutz. The five-axis MX10 MT milling center is therefore one of the first machines worldwide to benefit from the latest developments from Siemens in this sector — the integration of turning cycles directly into the ShopMill programming interface.

Huron Graffenstaden

> "In the simulation in Sinumerik Operate, which was parameterized with the help of Siemens, the turning and milling operations are reliably represented in one single program."
>
> **Julien Violet, engineer at Huron**

One operator interface for all machining operations

"We can now enjoy the benefits of a completely open software, which allows us to integrate turning operations into a milling process. And we can even do this with one single interface, without having to change from milling software to turning software," says Lutz. "The development represents a real market opening for Huron," adds Georges Jung, regional sales manager at Siemens. "The machine is still a milling center with five continuous axes, which requires a CNC chain for certain machining operations. The new interface now additionally allows for turning operations in the same clamping position, which are programmed on the operator interface, without compromising the existing CNC chain." Machining complex parts in one clamping position means time savings for the user.

According to Lutz, the machine can truly realize its full potential with MillTurn from Sinumerik Operate 4.7: "The software previously only recognized the 0° and 90° positions on the switched wobble head. Now, all switching positions can be utilized. As a result, shorter and more rigid tools can be used to achieve greater cutting depths, or long tools to implement milling or turning operations in recesses."

Tested and approved

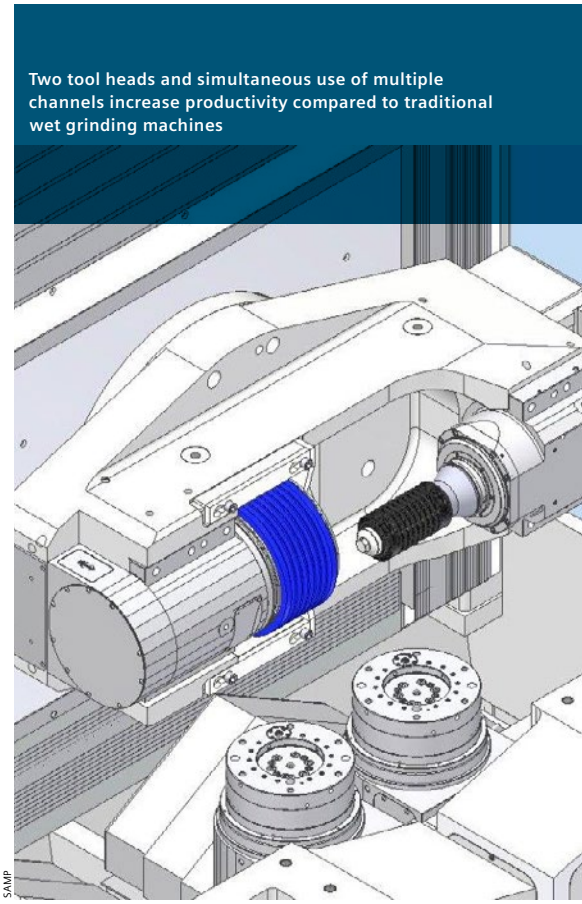
Julien Violet, engineer at Huron, tested and implemented the new functionalities of the CNC control system for a month in close collaboration with Siemens. He was very satisfied with the result: "With this new version of ShopMill, milling machine operators who are familiar with the software will quickly find points of reference for turning operations. In the simulation in Sinumerik Operate, which was parameterized with the help of Siemens, the turning and milling operations are reliably represented in one single program: the tools are correctly aligned, and the position of the tool and its alignment during turning are displayed. During machining, the information displayed on the screen is automatically adapted depending on the machining operation currently in progress (milling or turning); the operator does not need to think about it. What's more, the wobble head for the turned part is controlled completely by the software."

Rapid implementation

Jung is convinced: "This project has been characterized by a high level of commitment by all those involved as well as by technical expertise. Even though Huron and Siemens always work in parallel, this time you could almost call it a technical tour de force, since the deadlines leading up to the premiere were relatively tight." The machine was requested in September 2014 and was already fully operational by January 2015. The result has paid off for Huron, as Lutz confirms: "The MX10 MT is now a turnkey standard derivate that gives us a presence in the niche market of milling centers that can be used for turning operations. This advance should enable us to respond to the expectations of the aerospace industry, the general mechanical engineering sector, the rail industry, and the energy sector. What's more, milling companies wishing to branch out into turning operations will find a development path here. Over the next two years, we intend to further develop our MX series into large, five-axis machining centers." ■

INFO AND CONTACT

siemens.com/sinumerik-operate
francois.chevalier@siemens.com


Two tool heads and simultaneous use of multiple channels increase productivity compared to traditional wet grinding machines

SAMP

SAMP S.p.A., Samputensili Division, Italy

Dry grinding for toothed gears

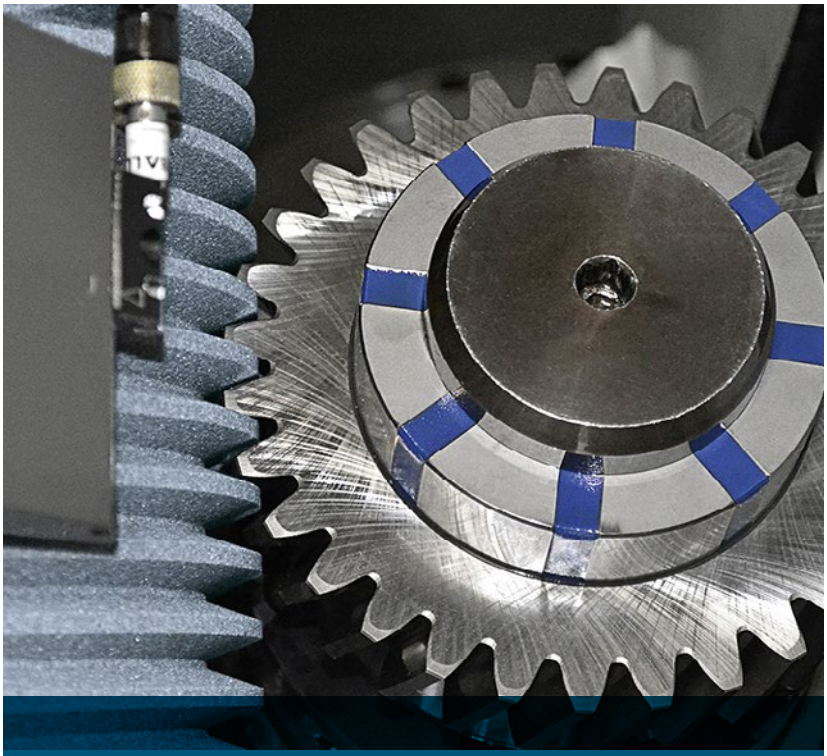
The innovative Samputensili machine for dry grinding the tooth flanks of toothed gears uses the entire spectrum of options offered by the Sinumerik 840D sl CNC. The result: a machine with exceptional performance that surpasses the productivity of classic wet grinding machines with two tables.

It's a dream come true: finally, all the steps involved in machining toothed gears can be performed using only the dry method. At EMO 2015 Samputensili will be presenting the first dry grinding machine for toothed gears that eliminates cooling lubricants and the associated equipment. The high-performance system was designed especially for toothed gears that are used in vehicle transmissions of the latest generation.

No more oil

Samputensili, a division of the SAMP Group, is one of the most important manufacturers of machines for producing toothed gears and has now developed an innovative method for the final sanding of toothed gears following case hardening. The innovative feature is that the highly critical process that determines the final quality of the product uses no oil as a cooling lubricant.

SAMP has developed a machine equipped with Siemens CNC technology with a completely new design. It combines roughing with a tool with geometrically defined cutting edges (hob) with a machining operation in which a tool with nongeometrically defined cutting edges (grinding wheel) is used. "When machining with tools with nongeometrically defined cutting edges, as with grinding, a great deal of heat is transferred to the workpiece. To prevent the workpiece from overheating in such a case and to remove the chips, we previously always worked with a coolant. However, the equipment for handling the lubricating coolant takes up a lot of space and uses a lot of energy and therefore increases both the acquisition costs and the operating costs of a machine," explains Enrico Landi, machine tools manager at Samputensili. "In the alternative solution, which we first implemented in our new G160 grinding machine, we use a hob to remove around 90 percent of the grinding allowance in the first pass. As a result, the workpiece does not get too hot. In the second finishing pass, a grinding wheel then removes the remainder of the already reduced grinding allowance. This not only prevents the workpiece from overheating but also avoids the risk of losing the hardness achieved in the previous case hardening. Furthermore, the innovative design with two tool-holder heads driven by linear motors and the simultaneous use of multiple channels allow us to guarantee a chip-to-chip time of less than two seconds in the machining cycle — a performance that surpasses the productivity of traditional wet grinding machines with two tables. For all this, the G160 takes up only half as much space and requires less investment for additional devices. This reduces operating costs and increases



Samputensili produces toothed gears for vehicle transmissions of the latest generation using an innovative high-precision method

SAMP

The innovative new machine from Samputensili for grinding toothed wheels — without oil or coolant

SAMP

the environmental sustainability of the machining," continues Landi.

Perfect synchronicity for perfect teeth

All machining of toothed gears requires perfectly synchronized tools, axes and workpieces. Even the slightest error has an effect on the involute shape of the teeth, which then determines the quality of the finished workpiece. The precision requirements for the tooth profile and hence the precision of the synchronicity are extremely high in the final sanding.

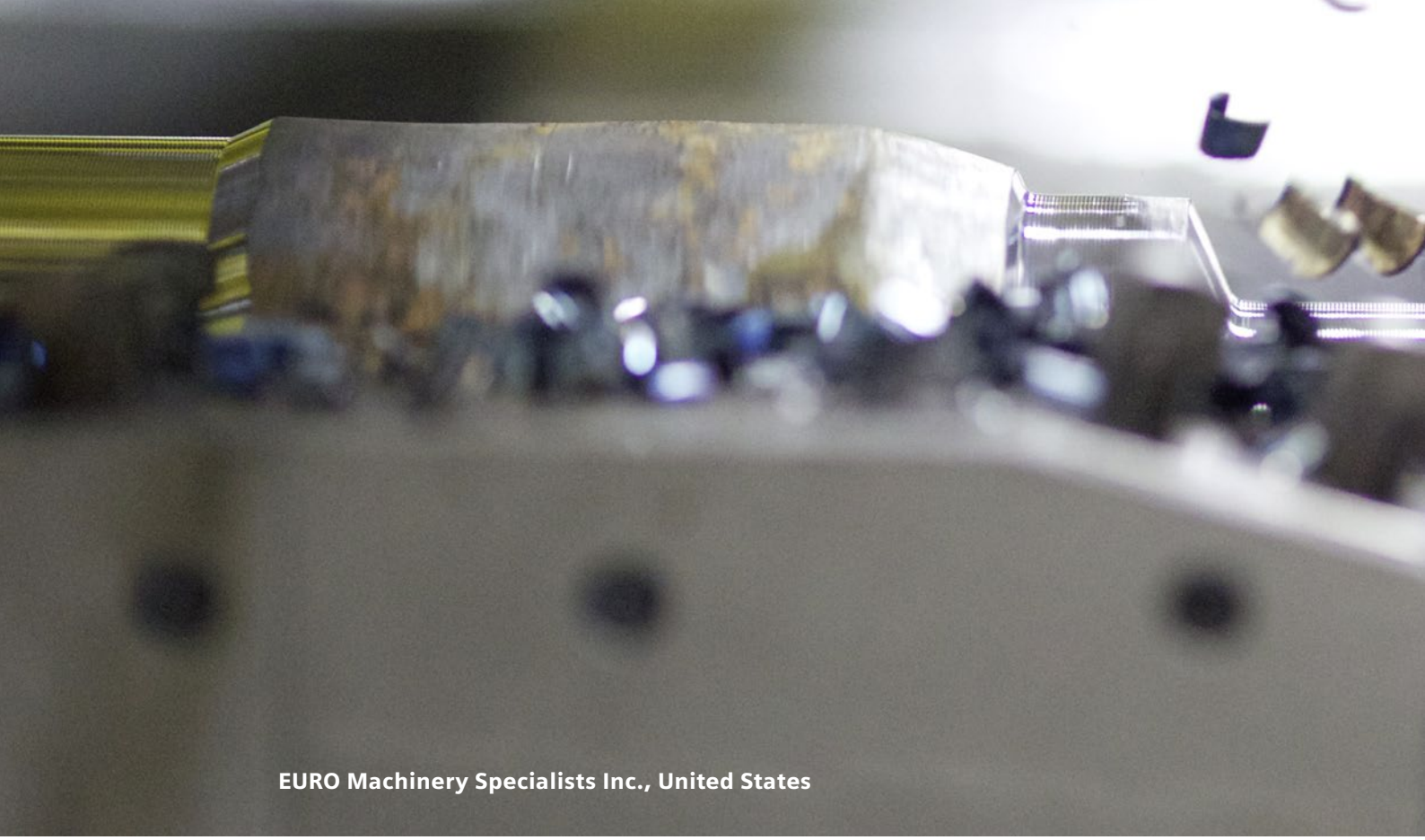
This is where the specific functions of the CNC chosen for the machining of toothed gears are needed, as Landi confirms: "We set the highest standards for the CNC: it has to have multiple channels so that processes can be controlled simultaneously. It must pass on the axes from one channel to another on the fly, so to speak, and it needs to be able to control various virtual axes. And last but not least, it needs to offer excellent dynamics with highly rigid workpiece tables and a wide speed range." For these reasons, Samputensili has always used the Sinumerik 840D sl CNC. The high performance of the NCU730.3 PN is supplemented with the intuitive design of the user interface Sinumerik Operate, which not only makes life easier for the operator but also allows the designer to implement his or her own expertise using the customizable pages.

Added value through innovation

As will be demonstrated at EMO 2015, the new G160 grinding machine from Samputensili guarantees cycle times comparable to those of traditional solutions for machining a typical toothed gear for a vehicle transmission — but at a lower projected cost. Landi's conclusion: "We are convinced that our customers will appreciate this revolutionary solution — a solution that shows how investing in innovation generates added value. This also applies to Sinumerik CNCs. Thanks to the practicality of the Siemens technology, we can exploit the intelligence and performance of these CNCs to develop leading global applications." ■

INFO AND CONTACT

siemens.com/sinumerik
giovanni.ferrari@siemens.com



EURO Machinery Specialists Inc., United States

Full speed ahead

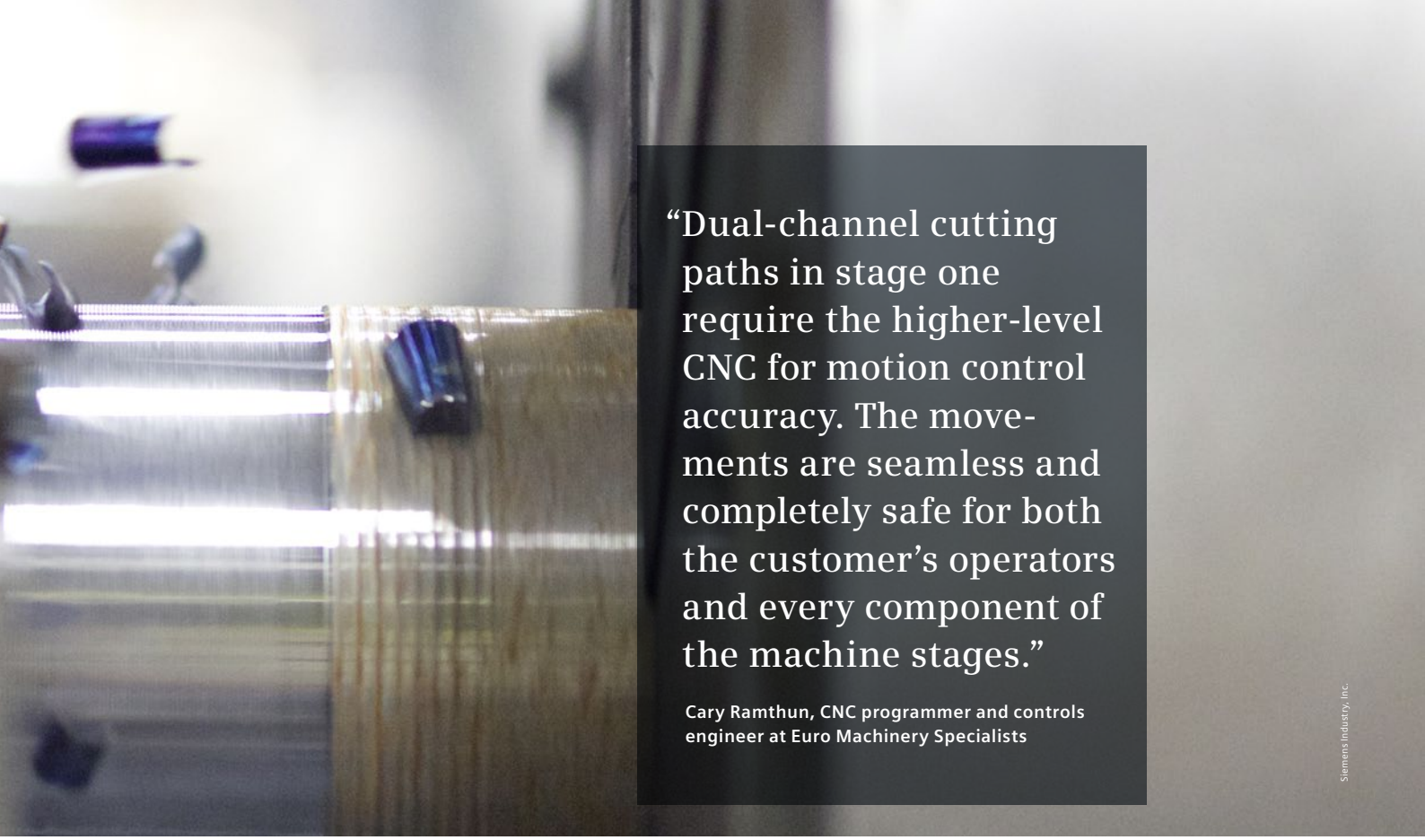
This machine tool rebuilder is faced with vintage train axle lathes that no longer work up to speed. Sinumerik 840D sl CNC helps convert the old units into an automated lathe line that works better than ever.

Euro Machinery Specialists of Menomonee Falls, Wisconsin, recently remanufactured a 1960s vintage Snyder "three-stage" lathe machining line for its customer, Standard Forged Products of McKees Rocks, Pennsylvania, for use in the production of rail and locomotive axles. Thanks to the change from hydraulic tracer to advanced CNC control and other improvements, the production of steel billets into hammer-forged finished axles was substantially improved.

Starting from the ground up

"Standard Forged Products needed to bring its 'three-stage' system back to OEM-level cycle times, after punishment from many years of heavy-duty machining around the clock," said Karl Engelke, Vice president at Euro Machining Specialists. "Peak operating performance was originally about a four-minute cycle time for a completely machined axle, start to finish. Over the years, cycle times dwindled, and when we received the project, cycle time was more than seven minutes per axle, due to numerous mechanical and electrical issues. Our overall three-year contract with Standard Forged Products for this project required complete rebuilding from the ground up. "Since the old iron was extremely sound, it was an ideal candidate for remanufacture," he said. "This included the key motion control package, consisting of three Sinumerik CNCs, Simotics motors and Sinamics drives at each lathe, plus Simatic PLC and HMI as the master of the entire line."

Engelke said that on all three machines, 4-inch-diameter ballscrews and bearing blocks capable of more than 44,000 pounds of thrust were designed to replace the original hydraulic cylinders. The line required complete rebuilding of all headstocks and hydraulic chucks and replacement of most gears as



> "Dual-channel cutting paths in stage one require the higher-level CNC for motion control accuracy. The movements are seamless and completely safe for both the customer's operators and every component of the machine stages."
>
> **Cary Ramthun, CNC programmer and controls engineer at Euro Machinery Specialists**

Siemens Industry, Inc.

well as shafts and Timken bearings. All new hydraulic and lubrication systems were designed and integrated. Other improvements were double-way wiper systems and special enhanced sheet-metal guarding to protect the operators and machine components from the heavy chips. In total, the entire project required more than 11,000 hours of labor.

Automation innovation

In addition to remanufacturing the three lathes, Euro provided an entirely new overhead gantry workpiece shuttle system. This massive automated system, converted from hydraulic to servo with rack-and-pinion operation, performs bar code scanning and moves the newly forged axles into the "stage one" roughing lathe for journal-section machining. It then transfers the workpieces to the next machining stage for "stage two" center-section roughing and "stage three" finish cut, finally transferring and offloading the completed workpieces to the holding area.

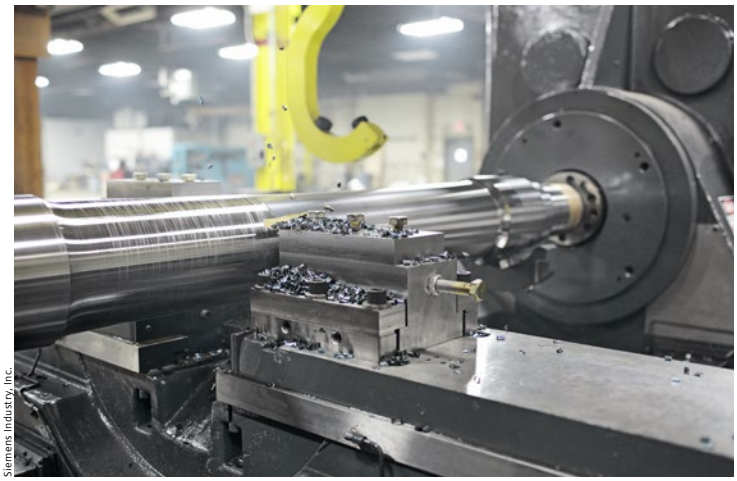
The turning line synchronizes left-head and right-head 150-hp Simotics M-1PH8 motors for both stage one and stage two roughing lathes. Engelke said the rough cut is "perhaps the most aggressive and impressive cutting operation in the machining industry today." On each tool block, large high-carbide cutting tools remove about 0.2 inches, with approximately 0.5 inches cut depth per revolution. The high-carbide tool allows for extremely high tool pressure and resists high temperature, which puts the heat into the chip, not into the workspace.

Three Sinumerik CNCs, plus a PLC, run the entire system

Siemens Industry, Inc.

Siemens Industry, Inc.

Raw forged axles before the turning operation



Siemens Industry, Inc.

Semifinished axles are sent to the centerless grinding application before wheels are mounted

Siemens Industry, Inc.

Raw hammer forged axles weigh approximately 2,200 lbs

Power and stability

Standard Forged Products has the cutting formula down to a science. However, the process was optimized even further thanks to the incredible power and torque from the headstock motors and the newly designed large ballscrews, gear reduction and servomotors. Since the axle is hammer forged, the surface is extremely difficult to break and machine with consistency; therefore, tool stability and extremely rigid machine components are critical to the integrity of the process.

In stage two, the center section of the axle is rough-machined with an overall first finish pass. Stage three provides the final finish pass with a single-headstock 75-hp Simotics M-1PH8 motor driving the workpiece. In operation, while the customer spec for the axle surface finish is 250 RMS, the line is currently holding 124 RMS consistently, Engelke said. Every workpiece in the process is measured by form gauges and profilometer readers for accuracy. As an interesting sidebar, this line produces two semitrailers full of chips every day.

Each stage's motion control is run by a Sinumerik 840D sl CNC, the Siemens flagship controller. An HT2 handheld unit is provided at each station for easy setup and commissioning.

Operating at a higher level

"Dual-channel (X, Z and U, W) cutting paths in stage one require the higher-level CNC for motion control accuracy," said Cary Ramthun, CNC programmer and controls engineer at Euro. "We were challenged by the large amounts of power and torque required to perform this machining operation in each of the three stages. Plus, the overhead gantry system and other materials handling devices all required precise integration. We worked with Tom Threinen and his team at Siemens to achieve the entire motion control and automation package. The movements are seamless and completely safe for both the customer's operators and every component of the machine stages."

Ramthun added, "Siemens programmers worked with us and Standard Forged Products programmers to accomplish the final solution on this project." He said the unique adaptive control feature on the Siemens CNC accommodates the out-of-roundness condition often found on hammer forgings. The Profinet coupler provided with the Sinumerik 840D sl syncs the gantry and the machine stages in a series of "handshakes" with no hardwiring. Only subnetwork connections are required, plus full isolation of the networks.

Siemens Industry, Inc.

Raw hammer forgings, finish-machined on the rebuilt Snyder line, are subsequently manufactured into railroad axles

Turning a bane into a boon

Engelke noted the engineering required for the project presented considerable challenges. "We were working with 1960s machinery built by a Snyder company that's no longer in business. We literally started by reverse engineering each individual machine component with our CAD system. Doing so allowed us to design, engineer and adapt new, modern mechanical and servo-driven solutions as well as provide the customer with complete, highly detailed machine documentation such as manuals with assembly drawings, spare parts lists and hydraulic, lubrication and electrical system schematics. Our customers find such documentation invaluable to the long-term operation and investment of their machine tools."

In addition to the Sinumerik CNC, Simatic HMI and Simotics motors on the line, the 46-foot-long control cabinet features Sinamics booksize and chassis drives, active line modules, Sitop 24 V DC power supplies and all auxiliary hardware for the machine and gantry control.

Team effort and top results

Euro Machinery Specialists was founded in 1969 by Engelke's two grandfathers. Today, it represents a number of quality horizontal and vertical boring mill lines, machining centers and grinding equipment in addition to its rebuilding and retrofitting business. Customers range from major machine tool and construction equipment builders to the military and related contractors. The company employs more than 20 people, including two CNC engineers.

Engelke said, "This was a total team effort between Siemens, Standard Forged Products and our company. The result was a better-than-new production line for our customer, which came about through the use of new modern motion control and CNC technologies, diverse talents cooperating together and a good deal of old-fashioned American ingenuity." ■

INFO AND CONTACT

usa.siemens.com/cnc
john.meyer@siemens.com

Bien-Air Surgery S.A., Switzerland

Taking on the competition with maximum performance

Performance and productivity are important differentiators on the global market. This is especially true in the field of medical technology, where numerous standards must be met and complete documentation provided. The medical technology company Bien-Air has equipped its production facilities with Sinumerik-controlled turn-milling centers, thus laying the foundation for competitive production.

European suppliers of medical devices are under enormous pressure from global competition. Their chances of success are good, however. Doctors and hospitals require more than just high-quality products, which they can also obtain from Asian manufacturers. The high performance of the devices, short delivery times and flexibility to respond quickly to customer requests also play a major role. For this reason, Bien-Air Surgery, which has locations in the Swiss towns of Biel and Le Noirmont, has upgraded its development and production facilities with three turn-milling centers from the TNI PreciLine series from Carl Benzinger GmbH, controlled with Sinumerik 840D sl CNCs, so that it can produce complex parts.

Essential expertise

Milling, cutting, drilling — Bien-Air is a specialist in medical devices, which work in a similar way to machine tools. The products for the laboratory sector are used to mill dental prostheses, for example, and in the surgical sector a wide variety of treatments are performed on patients, from milling bony structures in the ear and jaw area and smaller bones in the hand and foot to drilling holes in the spinal cord and skull. The development and manufacture of products with such a high level of innovation requires extensive expertise. Bien-Air produces almost 80 percent of its products on its own premises, primarily the most complex parts.

The Benzinger TNI machine tools are developed especially for high-precision complete machining, for example, in the medical technology industry or the watch industry

Perfecbore AG

The requirements for the three new turn-milling centers were therefore correspondingly high.

Perfect for complete machining

In a preliminary test using a sample workpiece with a required accuracy of 3 µm for the outer diameter, a surface roughness of R = 0.4/0.8 (without polishing) and a radius of 0.1 mm for the smallest drill hole, the precision machines from Pforzheim-based Carl Benzinger GmbH clearly came out on top. Equally complex parts are machined from solid metal and emerge from the turn-milling center in a finished state every five minutes. Eric Gasser, head of technology and service at Perfecbore AG, Bien-Air's machine partner, confirms: "These machines combine many outstanding features in one complete package, and their Sinumerik control system is not only easy to operate but also contributes to the necessary performance for this series." This is especially true of the models with multiple channels. The Sinumerik control system is capable of managing the individual tool carriers in different channels, the editor can be adapted to the machine's channel structure and multi-channel operations can be simulated directly on the control interface.

Another advantage of the machines is that they can be retooled quickly and easily. "Producing smaller series of 20 to 500 units is our day-to-day business. If retooling runs smoothly, we have taken the first step toward short delivery times," says Roland Hasler, CEO of Bien-Air. Added to that was the knowledge that the service from Perfecbore is competent and reliable: "A certain degree of physical proximity is important to us when it comes to service — both so that there are no delays and because we require French-speaking service," explains Hasler. In terms of the machine operation itself, language barriers are a thing of the past, as the Sinumerik CNC comes straight from the factory with multiple languages available — including French.

Complete documentation made easy

Alongside the machining methods, complete, continuous documentation is a major consideration in the choice of machine. When manufacturing medical devices, the entire process, right down to the individual product, needs to be reliably documented. Bien-Air has already been working paper free for around 10 years. The new machines' CNCs now provide suitable functions for documentation via the user interface Sinumerik Operate. Users can easily create screenshots or view files in PDF or JPG format directly on the control system.

Working together toward innovation

The Bien-Air sales representatives visit hospitals not quite on a daily basis but certainly very frequently. In search of ideas for improvement, they watch doctors at work in operating theaters. This is how the idea came about for a saw driven by a micromotor, which is used in rhinoplasty (plastic surgery procedures on the nose). Constantly remaining one step ahead in terms of performance allows the medical technology company to survive in this highly competitive market. An essential prerequisite for this is the right production machinery, and the CNC systems on Bien-Air's most recent precision machines form the basis for a significant competitive advantage.

INFO AND CONTACT

siemens.com/sinumerik
hans-peter.kueng@siemens.com

Bien-Air Surgery S.A.

Supporting medical devices: the iChiropro implantology system from Bien-Air records and continuously documents all speed and torque curves during a procedure

MTU Aero Engines / F. Lancelot

MTU Aero Engines, Germany

Top productivity for blisk production

Precision manufacturing generally requires specific adaptation of the parts program to the actual machine. In cooperation with Siemens, MTU Aero Engines has found a way to free its blisk production from this tie to the machine, allowing for extremely flexible manufacturing.

MTU Aero Engines is Germany's leading engine manufacturer and supplies the world's most important industry OEMs with engine components. The company made a decisive contribution to the development of geared turbofan (GTF) engines, and as a result MTU had to adjust its production capacity to meet the sharply rising demand for essential components for GTF engines. At MTU's site in Munich, blisk production needs to be expanded from 500 to 3,500 blisks per year.

Precise and efficient processing – even with a batch size of one

The term "blisks" (blade integrated disks) refers to turbine blade disks manufactured in one piece, which primarily operate in the high-pressure compressors of GTF engines at extremely high speeds. To withstand the extreme structural stresses, they are made of titanium or Inconel — and with maximum precision. For 500-mm blisks, the maximum shape tolerance is in the range of just a few hundredths of a millimeter.

As a partner of the largest engine manufacturers worldwide, MTU needs to respond flexibly to current demand, which is why blisk components for different engine stages are manufactured on demand in batch sizes of one. As the machining times are between 15 and 40 hours, the parts to be manufactured must be distributed among the machines that happen to be free at the time in order to ensure efficient manufacturing at high machine capacity utilization. However, precision machining generally requires a parts program

MTU Aero Engines / A. Ridder

With the same parts program, almost identical high-quality blisks are manufactured on each of the 10 installed machines

MTU Aero Engines

MTU Aero Engines uses identical high-performance five-axis milling centers for its new blisk production plant in Munich

that is precisely optimized to a specific machine. Together with the machine manufacturer GF Machining Solutions and Siemens, MTU Aero Engines found a way to break the tie between the parts program and the machine.

Production with optimized standard milling centers

For blisk production, MTU in Munich uses standard five-axis machines that have been optimized for blisk production. The high-performance Mikron HPM 800U milling machines from GF Machining Solutions are characterized by their very low temperature drift and high vibration resistance. For standardization reasons, all machine tools at the Munich site, as well as all drives in the production facility infrastructure, including the machine-level auxiliary units, are generally equipped with control and drive technology from Siemens. This minimizes costs for spare parts inventory as well as costs for training and maintenance. For maximum performance and a long service life, the machines in the blisk production line are equipped with Sinumerik 840D sl CNCs of the latest system generation, and the rotary operating mechanisms and part-turn actuators of the bench have been converted to highly dynamic torque motors of the 1FW series.

One parts program — identical results

The Sinumerik 840D sl CNC offers everything required for highly productive five-axis machines. This includes intelligent motion control functions that can compensate for the unavoidable minimal differences in the production characteristics of the almost identical machines of the blisk production line. The rotary axis distances, for example, are automatically measured with Sinumerik Cycle996 and then corrected on the CNC side using the TRAORI function in a way that is uniform for all machines. Not only does the TRAORI function enable parts programming that is independent of the kinematic type of the machine; it can also unify the behavior of identical five-axis kinematics down to the last detail.

Thanks to the high control precision of the Sinamics S120 drives, the minimum production tolerances of the optimized Mikron HPM 800U machines and the extremely low temperature drift of the uniformly and constantly temperature-controlled machines, all 10 of the machines installed achieve uniform production characteristics with a repeat accuracy better than 1.5 µm. MTU thus achieves the same production quality on every machine with the same parts program.

To ensure that the uniform production characteristics of the machines are retained during the course of their use, the Electronic Production Services extended service functionality has been set up on all machines in Hall 77.

Paving the way for other industries

The automated production system designed by MTU Aero Engines is intended to manufacture up to 3,500 blisks per year starting in 2016, with just 24 production stations — that corresponds to 6,000 hours of cutting time per machine per year. The project proves that state-of-the-art precision manufacturing is possible with several identical machines in which the tie between the parts program and the machine has been severed. And what's more, the route taken by MTU Aero Engines to high-flexibility precision manufacturing with optimized machine utilization could become as successful as the GTF engines MTU helped develop and could become an example for quality-focused production plants in other industries. ■

INFO AND CONTACT

siemens.com/sinumerik
ws.schmidt@siemens.com

ANGER MACHINING GmbH, Austria

Cutting, drilling, milling — simultaneously and with high precision

For complex series parts that require multiple production operations, the machine tool manufacturer Anger Machining has developed a special machine design in which the workpiece is transported to the tool. This transfer center, with a Sinumerik CNC, can take the place of several traditional machining centers.

There is a lot going on in the HCX transfer centers of the Austrian manufacturer Anger Machining GmbH: the workpieces race along short traverse distances without colliding, past a multitude of individually driven tools, until they reach the right machining tool. All the tools are designed precisely according to specific requirements and have their own fixed place in the machine room. This allows for 500,000 parts a year to be produced with high precision. The machine design, developed by company founder Anton Anger, is frequently used in the automotive sector for producing drivetrain parts. It is particularly valuable in the production of parts with very specific characteristics — for example, if different types of tools are required for the machining.

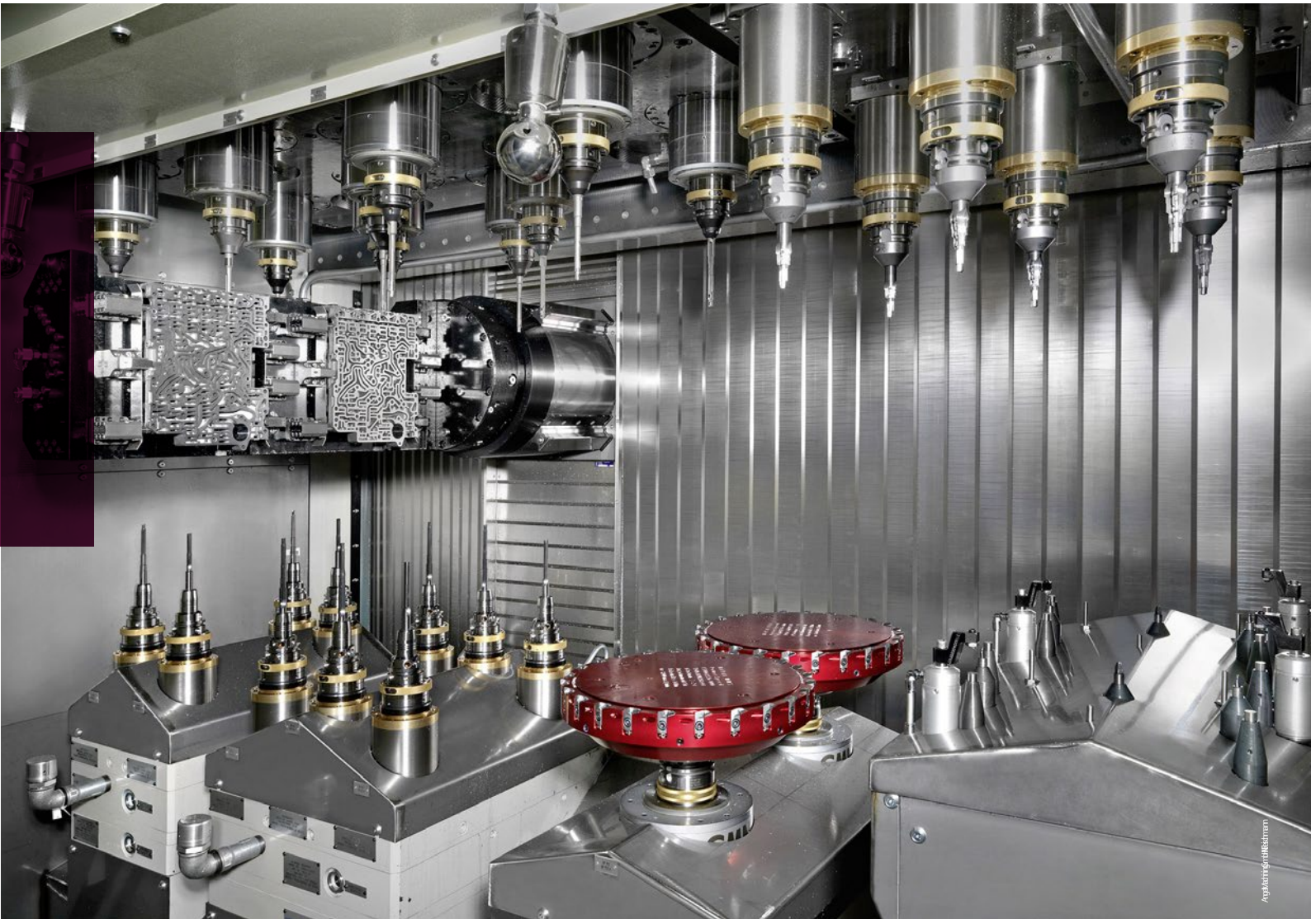
Productivity gain due to parallel machining

A prime example is a valve casing that requires precise slide holes and a particularly smooth surface. Defined surface finishes are required to ensure that it fits its counterpart tightly. An Anger HCX with a large side milling cutter creates this surface in a single step. The valve casing also has a pattern with several drill holes and threads, which a multiple-spindle head maps and machines in one operation. Several core holes can thus be drilled or several threads cut with a single pass of the workpiece. Compared with the machining effort of a conventional machining center, producing and machining in parallel results in a productivity gain with every additional hole drilled or thread cut simultaneously. What is more, parallel machining requires fewer clamping operations, which increases accuracy.

The number of machine tools that can be replaced by a part-specific HCX transfer center depends on whether a workpiece requires the features mentioned, such as multiple drill holes and threads. The number is usually between three and ten. “In series production, the part is already designed for these criteria,” explains Herbert Vrba, head of technology and research and development at Anger. The more the product design, the means of production and the life cycles of the machine and product are coordinated, the higher the productivity and cost savings.

Automation adjusted to complexity

Modern production lines in the automotive industry are very complex. Producing an engine block, for



The Anger transfer centers demonstrate their advantages in particular for workpieces that need to be machined with different tools

"We verify the systems with the NX CAM open CAM solution. Using the 3D collision camera, we can optimize the paths better and more quickly."

Herbert Vrba, Head of Technology and Research and Development, Anger Machining

example, requires up to 35 linked operations. This complexity is reduced not only by using fewer machines, as is the case when using transfer centers, but also by using a relatively limited number of components across all machines. The electrical components of the individual machine — infeed, contactors, motor technology, communication and so on — are precisely coordinated with each other. "We now exclusively use control and drive technology from Siemens," explains Hannes Hossinger of the engineering department at Anger Machining.

Enabling the workpieces to accurately move past each other at top speed without colliding, with an accuracy of tenths of a millimeter, requires precise simulation. "We verify the systems with the NX CAM open CAM solution. Using the 3D collision camera,

A prime example of a workpiece that can be machined easily on an HCX transfer center is a valve casing that requires precise slide holes and a particularly smooth surface

Anger Machining GmbH

we can optimize the paths better and more quickly," says Vrba. The Anger team not only simulates the workpiece movement on five axes on this system but also uses it to create the postprocessors. All production-related data are managed in the Teamcenter product lifecycle management system, which integrates all master data and resources generically in a common database.

To control and regulate the multitude of spindles and machine components in the transfer centers and to monitor the many motors, the Anger machines are equipped with the Sinumerik 840D sl CNC. "For a 2.5D machining operation with four to five machine axes moving simultaneously toward one point — and with masses between 2.5 and 3.5 tons that need to be positioned with micrometer precision and with a high degree of repeat accuracy — we require a suitable control system," says Vrba. Hossinger confirms: "With the Sinumerik CNC, we have the long axis in the gantry system and the interpolation of the individual axes under control. We use original Siemens machine cycles for certain gantry functions or if we are using two channels." When using this technology, the high degree of repeat accuracy — regardless of interference from temperature differences or heat expansion — is of enormous importance. The compensation possibilities of the Sinumerik CNC ensure consistent process quality.

The many spindles were implemented as a Sinamics drive system. Because every tool sits on its own spindle in the transfer center, the drive motor, bearing design and so on are optimized for the relevant application. The side milling cutters require a spindle with high torque and a moderate speed, for example, while the reamers require one with low torque and high speed.

"Maintenance staff in the automotive sector in particular are familiar with Siemens technology and are therefore able to quickly fix any errors that occur. And the machine operators appreciate it when the number of spare parts that need to be kept is reduced," says Hossinger. For the machine builders, it is important that the suppliers can stock the spare parts. They need to guarantee location-independent support services for systems with service lives of more than 20 years as well as for customers around the world. Therefore, all Anger machines are protected with their own service plan in addition to a Siemens maintenance contract.

Productivity or flexibility — or both?

In the workpiece-specific HCX transfer centers, every millimeter, every movement, every spindle arrangement is tailored for the efficient production of a very specific part. For this reason, it is only worth purchasing these machines if it is clear in the long term that the relevant part will not change at all or will undergo only minor changes. Vrba notes, "It is usually only OEMs that have such certainty in the automotive industry, as they have full control of the planning."

This is why Anger Machining has developed the new Anger FLXBL, a standardized transfer center whose name reveals its advantage: increased flexibility. The machine supports automotive suppliers

Anger Machining GmbH

"Maintenance staff in the automotive sector in particular are familiar with Siemens technology and are therefore able to quickly fix any errors that occur."

Hannes Hossinger, Engineering, Anger Machining

that typically need to decide within a short offer period how they can efficiently produce a component. If production is to start just a few months after contract acceptance, they need to be sure that the infrastructure will be available in time. Because such orders are often limited to between two and three years, flexible production machines are required. The Anger FLXBL, which boasts an impressive modular design, bridges the gap between the HCX transfer center and conventional machine tools. Anger has put together consistently recurring spindle arrangement systems and units to form a series of standard modules that can be installed and removed flexibly via an interface with the base frame. The modules allow for lower manufacturing costs and facilitate machine simulation and CNC sequence programming thanks to their familiar parameters. Because the standard modules are available preassembled from the supplier, the machine can be put into operation relatively quickly and can be retooled easily. It is, therefore, perfect for producing medium-sized quantities, and it even allows for alternating machining of several workpieces. More space in the machining area makes it easier for the workpieces to find collision-free paths.

Completely new possibilities

With the Anger FLXBL, the Austrian machine builders also serve users who were previously reluctant to purchase transfer centers because they could not commit themselves to the long-term production of one particular component. These convertible and thus flexible machines open up completely new possibilities for them.

INFO AND CONTACT

siemens.com/sinumerik
hofmann.walter@siemens.com
rudolf.wallner@siemens.com

Moules Mirplex Inc.

Sinumerik 840D controller and Huron KX30 machine tool

Moules Mirplex Inc., Canada

Last-minute molds

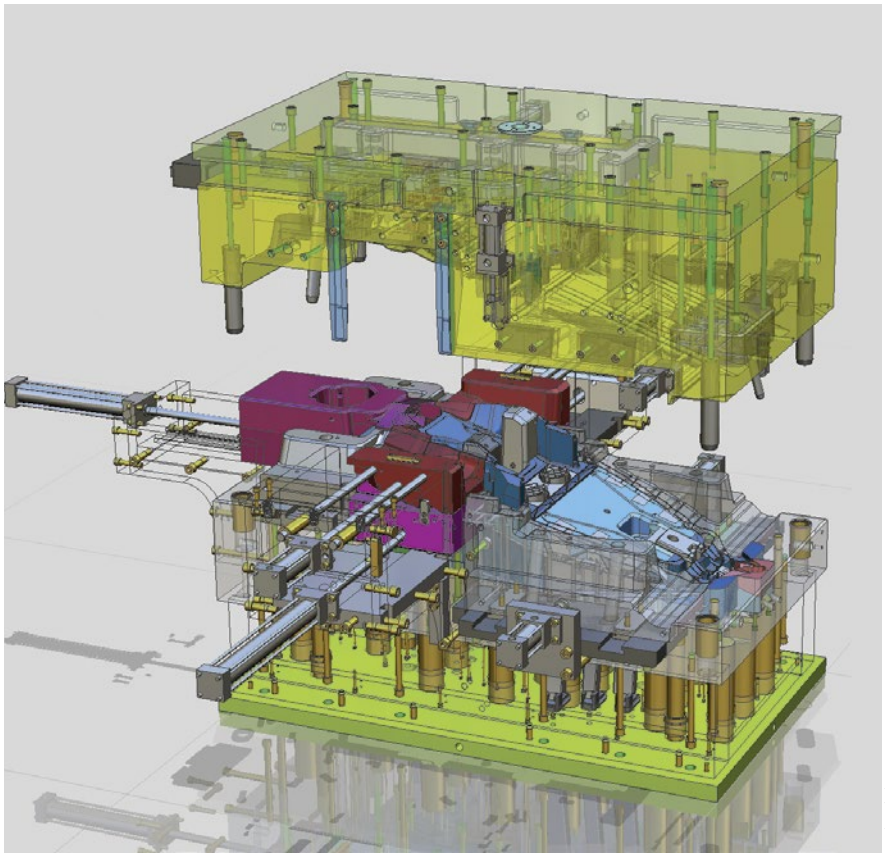
For the production of a great variety of molds, the Canadian company Moules Mirplex chose PLM software from Siemens. The software shrinks mold development time by 35 percent while allowing quick changes through its NX CAD, NX CAM and Sinumerik 840D controller.

Moules Mirplex Inc. (Mirplex Molds Inc.) has offered mold manufacturing and precision machining for more than 25 years. Mirplex serves a range of industries including sports and recreation, pharmaceuticals and consumer goods. Its mold sizes vary greatly, from tiny ones for pill bottle caps to giant ones for recreational equipment — up to 15 tons per side. Mirplex produces multi-cavity molds, molds with hot runner systems, molds with multiple slides and cams, gas-assisted molds, compression molds and molds for aluminum die casting.

From its first CNC machining center, purchased in 1987, to the Huron high-speed machining (HSM) center, added since 2002, Mirplex has continually expanded its capabilities to better serve its customers. The company has become known for its expertise, and its customers now involve Mirplex in their design processes. But this does not protect the company from time pressures posed by global competition. "We must always find ways to deliver molds faster to stay ahead of foreign competition," said Pascal Lachance, a mechanical engineer and mold designer at Mirplex.

Perfect software choice

Mirplex relies on the NX digital product development system and Sinumerik CNC technology from Siemens for a fast mold development process that ensures the high quality its customers expect. The company evaluated a number



Virtual mold assembly for BRP Piranha project. Mold size: 62 × 37.5 × 42.5 inches; number of components: 900; press size: 1,600 tons

Moules Mirplex Inc.

of other solutions before upgrading from its previous I-deas software. It chose NX because of the seamless integration of the NX CAD and CAM systems, the availability of NX Mold Design and the ability to get technical support in the local language. Other selling points were NX's ability to create the large digital assemblies that some molds require and NX CAM's support for the Sinumerik 840D controller, which Mirplex uses to run its Huron HSM center.

With NX, the mold is designed and the tool path created concurrently. While Lachance is designing the mold, his colleague, CNC programmer Eric Boucher, starts the programming work in NX CAM. This workflow is possible despite the fact that many design changes may still be coming from the customer because of how easily the NX geometry can be changed. "The challenge we have is that the parts we get from customers are never completely designed," said Lachance. "We are doing some development on the part before doing the mold. NX gives us the flexibility to change a model through powerful tools such as the surface modeling function."

> "NX Mold Design has standardized our processes."
>
> **Pascal Lachance, Mechanical Engineer and Mold Designer at Mirplex**

Time savings on all fronts

Lachance estimates that mold design takes 25 percent less time with NX than before. That's partly due to the faster incorporation of customers' design changes, which now takes about 40 percent less time. NX Mold Design also accounts for some of the time savings. "NX Mold Design has standardized our processes," says Lachance. "Also we now have a library of parts, such as mold bases, that we can reuse. A mold is already half designed when we start." Typically the customer provides CAD geometry in Step or Parasolid format. "Here, too, NX is better," Lachance said. "The translators are embedded in NX, and they are faster and more accurate, so we don't spend time stitching surfaces."

The association between NX CAD and NX CAM makes it easier to update the CAM model after a design change. Boucher estimates that he can incorporate design changes 50 percent faster with NX because he doesn't have to reassign all the surfaces. He finds NX CAM easier to use overall because of features such as drag-and-drop operations to create a machining sequence. Templates allow him to reuse existing information. This ability to use existing data, start programming work sooner and incorporate changes faster has made tool path generation 20 percent faster.

The overall result of NX is a 35 percent reduction in the time it takes Mirplex to deliver molds to its customers. This faster cycle time, combined with the company's expertise, positions it well in the globally competitive market for molds. "We are selling expertise," says Lachance. "But we are always looking for ways to work faster. The upgrade to NX has definitely streamlined our CAD and CAM work. By continuing to work closely with Siemens, we look to enhance our part manufacturing and machining capabilities even further." ■

INFO AND CONTACT

siemens.com/plm
matthias.leinberger@siemens.com

ANDRITZ Ritz GmbH, Germany

Vision for pumps

A leading pump manufacturer's integration of product lifecycle management (PLM) and CNC operations using NX and Teamcenter guarantees a seamless flow of information from CAD/CAM to the machine tool controls. It not only automates production but also reduces costs and throughput times.

Andritz Ritz GmbH

One of Andritz Ritz's most spectacular projects: the largest underwater pump in the world

Founded in 1877, Andritz Ritz GmbH supplies pumps and underwater motors for municipal and industrial water and sewage engineering, mining and offshore raw material extraction applications. With over a million pump systems installed worldwide, the company, based in Schwäbisch Gmünd in Germany, is now one of the leading manufacturers in this market segment. Using state-of-the-art development and manufacturing methods, Andritz Ritz produces pump systems and spare parts and also boasts some spectacular development projects. The largest underwater pump in the world (with a height of 13 meters and a diameter of over a meter), which supplies Las Vegas with water from the largest reservoir in the United States, and the world's largest underwater drive (with an output of 3,000 kW), which is used at a depth of 3,000 meters to extract a gas and oil mixture, both come from Schwäbisch Gmünd.

Maximum efficiency within the smallest margin of error is required for development and production at Andritz Ritz. "This requires streamlined and continuous processes," says Hans-Jürgen Steeb, manager of IT and organization at Andritz Ritz. "A medium-sized company such as ours, with limited resources, can achieve the necessary IT infrastructure only with a long-term strategy in which every step builds on the one before." Under Steeb's leadership, Andritz Ritz's existing IT infrastructure has been continuously restructured and improved. For example, the transition from 2D CAD to a 3D process with Solid Edge from Siemens PLM Software has increased the efficiency and accuracy of design.

Improvements all the way to production

The next corporate objective was to optimize NC programming and tool management. "We have organized all our technical and commercial systems in such a way that employees benefit from the work of others throughout the process chain," explains Steeb. "Our CAM selection criteria were therefore heavily focused on establishing an integrated process." The company evaluated many CAM systems from various providers based on criteria such as reducing throughput times, improving product quality and ease of use and reaching a higher degree of automation in the processes between design, NC programming and production.

The order finally went to the Adanos network, led by A+B Solutions. The Siemens PLM Software partner offers software solutions such as NX and Teamcenter as well as comprehensive product lifecycle management services, including system implementation. The CAM functionality of NX and the PLM capabilities of Teamcenter perfectly corresponded to Andritz Ritz's vision. And the implementation proposal, which included far-reaching process optimizations supported by the integration of Teamcenter and Shop Floor Connect — a new web-based Teamcenter client for the shopfloor that can be used to manage CNC controls — also impressed the pump manufacturer.

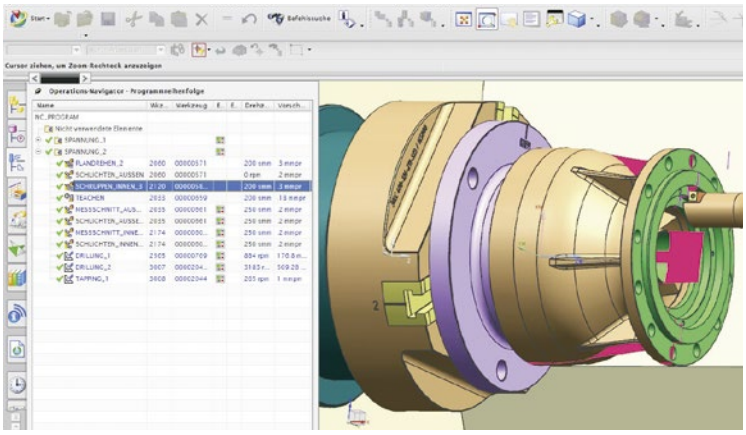
Integrated PLM environment

Now, each time Solid Edge is called up, Teamcenter is launched at the same time. Every new component is immediately recorded and managed by the PLM system. All the change, update and approval processes are triggered in the program and performed largely automatically. Changes in design and production are also monitored and managed throughout the entire process — from the initial design, to the derivation of variants, to production. Standard parts are classified within the library to enable simplified reuse, and their use is recorded within the individual designs. Finite element method simulations are also filed in Teamcenter. The NC programs are created on the NX CAM workstations, which are connected to Teamcenter. Even the compilation and release of the NC data to production are controlled by the production approval process in Teamcenter. In Teamcenter, the NC programmers select the required tools and clamping devices for the appropriate CNC machine. NX CAM postprocessors for the Sinumerik and Eltropilot control systems ensure that all machine parameters of the various machines from Mandelli, Edel, Voestalpine and Monforts are precisely taken into account.

Before the NC programs run the actual machine, they are first run through a virtual machining simulation within NX CAM to allow NC programmers to check the tool paths in the context of the complete machine interior, providing comprehensive collision protection. Any damage to the individual gray or spheroidal graphite iron parts would delay the completion date by weeks. After the simulation, tool lists and set-up sheets are created and stored together with the work plan, shopfloor drawings, NC data and simulation videos.

Advantages of Siemens PLM software

- Seamless flow of information to CNC controls
- Secure, automated production with fewer errors
- Faster set-ups and less downtime
- Documented and certified quality
- Significant cost savings



Andritz Ritz GmbH

Before machining, the NC programs are first simulated in NX CAM in order to prevent tool collisions

Closed data cycle

Andritz Ritz attached great importance to ensuring a continuous cycle of project information — from manufacturing planning to production. The PCs on the shopfloor are connected to one or several machine control systems via a serial interface or Industrial Ethernet. There, machine operators log in to Shop Floor Connect to gain role-specific access to released data. For each job, the user is shown only the information that is actually needed. Depending on the complexity of the project, simulation data, CAM parts, CAD models, photos, videos and work plans may supplement the standard NC programs, shopfloor drawings and set-up sheets. With one click, the data can then be displayed on the screen.

Andritz Ritz GmbH

Powerful high-voltage motors are also used for the water supply in Las Vegas

NC programs can be transferred directly to the control system with the simple press of a touchpanel. Sometimes programs need minor adjustments and optimization on the control system. When this occurs, the machine operator can record the changes and transfer the modified programs back to the NC programmer via Teamcenter. Sometimes simple parts are also programmed on the control system. Via retransmission, these NC sets are then recorded in Teamcenter and automatically create the part with all associated information. "Thanks to the extensive access to PLM information on the shopfloor, the machines' idle times have been significantly reduced," concludes Steeb. "Also, our employees have been able to very effectively minimize variations in quality and manufacturing errors." Arthur Maier, administrator of manufacturing systems at Andritz Ritz, adds, "Shop Floor Connect has been quickly accepted. Today, no machine operator wants to work without such a practical solution. The streamlined program performs very well, with minimal support required."

> "Thanks to the extensive access to PLM information on the shopfloor, the machines' idle times have been significantly reduced. Also, our employees have been able to very effectively minimize variations in quality and manufacturing errors."
>
> **Hans-Jürgen Steeb, Manager of IT and Organization, Andritz Ritz**

More effective and faster process runs

Not all service providers have the manufacturing knowledge and implementation experience of A+B Solutions, which is critical to helping their customers succeed. Steeb appreciates this too: "The collaboration with A+B Solutions is great because our partner understands the processes of midsize companies and is immediately available when a problem occurs." Andritz Ritz has established a new process culture based on secure workflows and approvals, from design to production. Project runs have become more efficient and faster, while continuing to remain lean and without compromising the fundamental principles of process reliability and continuous improvement. "We are able to identify and fix potential errors much earlier in the process now," says Steeb. "Because the costs of errors later in the process rise to exorbitant levels, this saves us a lot of money." ■

INFO AND CONTACT

siemens.com/plm
matthias.leinberger@siemens.com

eBooklet for EMO 2015

Reliable trade fair companion

Visitors to EMO 2015 in Milan can download an eBooklet onto their smartphones, tablets or PCs to serve as a useful companion before, during and after the trade fair.

Perhaps you have thought about viewing a machine for gear cutting or recommending a visit to a certain machine in the run-up to the trade fair.

The EMO 2015 eBooklet from Siemens — an electronic reference guide available via a standard browser — gives you access to more than 150 machine tools with Sinumerik that will be showcased at this year's EMO.

Are you thinking of planning your trade fair visit ahead of time? A simple machine search function allows you to filter the results by manufacturer and hall using a text search tool and quickly guides you to the right machine.

You are already at the trade fair and would like to know which machines are located in the hall you are currently in — for instance, only machines equipped with Sinumerik 828D? The results filter can help in this situation, allowing you to select the relevant components, industries and machine types in addition to the manufacturer and hall.

Perhaps you want to create a favorites list of machines for a colleague that is available offline for you at the fair. The offline favorites list enables you to save up to 10 selected machines with descriptions and images. You can also share and recommend individual entries from a favorites list by e-mail, Twitter, WhatsApp and so on, directly from the trade fair.

siemens.com/emo-ebooklet

First scan the QR-Code, and then download the eBooklet

EMO trade fair show — smart operation

Siemens is highlighting the motto "On the Way to Industrie 4.0 — Digitalization in Machine Tool Manufacturing" with an interesting and exciting show at the company's EMO booth. The show reveals how digitalization can specifically benefit shopfloor applications with smart operation. Two actors invite visitors to delve into the digital world of smart operation and represent the individual smartPrepare, smartOperate, smartMobile and smartIT solution packages. A large touchscreen acts as a membrane between the digital world and reality, which then merge to become a single entity.

Visit Siemens in Hall 3, and see for yourself the solutions available for digitalization in the machine tool industry.

siemens.com/emo

motion world 1/2015

Published by:
Siemens AG
Division Digital Factory
Werner-von-Siemens-Str. 50
D-91052 Erlangen
siemens.com/digital-factory

Division Digital Factory:
CEO Anton S. Huber

Editorial Responsibility in Accordance with the German Press Law:
Bernd Heuchemer

Responsible for Technical Content:
Hans Pischulti

Editorial Committee:
Hans Pischulti

Publishing House: Publicis Pixelpark, P.O.Box 32 40, 91050 Erlangen

Editor in Chief: Gabriele Stadlbauer

Layout/Copy Editor:
Sabine Zingelmann, Julia Robinson

DTP: Mario Willms; TV Satzstudio GmbH Vogler

Printing: Wünsch, Neumarkt
Circulation: 8.000

motion world is published once a year
ISSN 1611 1028 (Print)
IWI: TMOD

Article No.: E20001-MC115-B100-X-7600

This edition was printed on environmentally friendly chlorine-free paper.

Printed in Germany

SIEMENS

Show and presentations at the Siemens booth

EMO Milan
October 5-10, 2015
Hall 3, E06 / F03

Digitalization in Machine Tool Manufacturing

siemens.com/emo

Increased efficiency, enhanced flexibility and shorter time to market – all this is promised by digitalization. Whether integrated engineering in machine development or networking machine tools in a production landscape:

We support machine builders as well as machine tool users with our solutions! The basis is always our SINUMERIK® CNC with its openness and technological bandwidth.