

cnc4you

Practical knowledge for the shopfloor

2/2020

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- CNC knowledge: the spindle operating modes
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Typical aerospace and other parts produced by Honeycutt Manufacturing.

A fresh start

1960 ushered in a new era. Machines could be programmed and controlled. A few years later, the technology found its way into small- and medium-sized enterprises and millions of skilled workers were trained in the new technologies. An entire industry evolved, grew, invested extensively and created many new jobs directly and indirectly.

In 2020, we are on the cusp of a new start. Digitalization is revolutionizing the way products are created and manufactured. With Sinumerik One, we have introduced the first native digital control system for the new age. Now it is time to start into the new era together with you. Yürki Erik Voss, Sales Manager at Siemens Machine Tool Systems, sums this up in his CNC4you video interview to mark "Sinumerik – 60th anniversary of CNC".

We in the CNC4you team want to support this fresh start with practical reports, tips and tricks, and information on new technologies – also digitally in the e-magazine and the CNC4you portal.

Have fun reading, clicking and looking - it's worth it.

Your CNC4you team

CNC4you e-Magazine



→ Scan the QR code: More information, graphics and videos are waiting for you in our CNC4you e-magazine

↗ sie.ag/3dzXE6c

CNC4you portal



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We are celebrating 60 years of CNC – a new era



↗ sie.ag/39e1MZPi

Whether launching continuous path control or in graphic programming, Sinumerik has always been a trendsetter. This is also true in its anniversary year 2020 in which Sinumerik One is setting the pace for digitalization.

The first CNC on the market was launched by Siemens in 1960 and given the name Sinumerik four years later. Sinumerik has come a long way since then – from relaycontrolled control systems for applications in large-scale industry to smart, fully digital CNCs for machine tools throughout the sector and suitable for companies of all sizes. A technology that was initially regarded by many as a "job killer" has created a global industry with thousands of manufacturing companies, hundreds of thousands of skilled workers, and enormous advances in production and products. Technological developments in the field of CNC have always been very dynamic, with networking and digitalization accelerating the trend even more. To coincide with the anniversary, another new milestone has been reached with Sinumerik One.

Once again, Siemens is marking the dawn of a new era, just like the introduction of the first CNC 60 years ago.

→ For the interview: Scan the QR code



↗ sie.ag/31e3llx

60 years of contemporary witnesses

A spontaneous visit to a customer developed into a long-term partnership: Andreas Pfeiffer, Managing Director of Zirndorfbased W. Andreas Pfeiffer – Maschinen- und Apparatebau and Siemens engineer Karsten Schwarz recall the various phases of their close cooperation. It's a remarkable interview. Read how a frank conversation between the two CNC experts influenced the development of Sinumerik.



»We want to remain agile and curious in the future.«

Yürki Erik Voss, Head of Sales Machine Tool Systems, Siemens

→ For the video interview: Scan the QR code



↗ sie.ag/3lT9wDm

The future of CNCs

You sense how digitalization presents your CNC production with enormous challenges. As a technology partner, how does Siemens intend to support in the future? How does the Sinumerik team stay in touch with you even in a digital world? In a video interview, Yürki Erik Voss, Head of Sales Machine Tool Systems at Siemens, answers these and other important questions.



→ Complete article: Scan the QR code

Run MyVirtual Machine

The digital twin of the machine application

When is a machine tool at its most productive? – When it's producing chips!



↗ sie.ag/3dvhzTU

Learn how to move everything that stops your machines from making chips to the job planning phase. Run MyVirtual Machine puts your machine tool on screen as a digital twin: determine runtimes, tune programs, monitor collisions – everything's done before the first chip falls. Read this now and boost your productivity.

Questions and answers on digitalization

We answer your questions on digitalization in the CNC4you portal. Today:

"Everyone's talking about 5G. What really makes this technology so important for digitalizing manufacturing?"

Do you have any questions on digitalization?

Maybe we can help. Simply send your questions to contact.cnc4you.i.@siemens.com and we'll look for some answers.

 \rightarrow Scan the QR code and read the response



↗ sie.ag/2Hf6lkQ

CNC4you 2/2020



The spindle operating modes – cutting power and more

Buyers of CNC machine tools usually only select the main or working spindle according to the work required under their machining orders. Thanks to modern motor and drive control technology, however, spindles now offer many more application options than just the power parameters.

The main task of a spindle drive is to provide the cutting power that is required for machining. From the point of view of the CNC and the drive technology, the spindle motor is in speed control mode. The task of the spindle drive is to keep the spindle speed, which is defined by the CNC programmer as the S value in the CNC program, at a constant level, and consequently the cutting speed.



Peripheral surface transformation TRACYL



Front-face transformation TRANSMIT

Our CNC expert Andreas Grözinger says: "The ability to move spindles in position control as well as in speed control mode, i.e. in continuous-path mode, opens up additional fields of application which extend as far as the machining of freeform surfaces on turning machines. In this "supreme discipline", the position-controlled main spindle assumes the task of a highly dynamic orientation axis for 5-axis transformation."

You can find the complete article with programming examples on www.siemens.com/cnc4you-magazine.

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CNC Robotics: Cross-over of CNC and Robotic



¹ sie.ag/2T1rJm2

Huge potential for innovation: path-accurate robots acting as a machine tool

In cooperation with Siemens, Maucher CNC-Robotic GmbH is about to revolutionize many areas of CNC production. Sinumerik controlled standard robots handle tasks such as bonding, hook-and-loop fastening, water jet cutting, deburring, riveting, and other activities in machining cells. The innovative robot cells have been performing well in practical applications at the automotive supplier Maucher Formenbau for many months now.



Revolution in robotics: direct programming via Sinumerik 840D sl and G-Code

The employee at Maucher Formenbau GmbH takes the blank for the vehicle roof liner out of the press. For the purposes of precutting, he places the roof liner on a mold which is clamped onto a workpiece table in an otherwise empty cell. The door of the cell closes and the operator starts the NC program on the CNC using a mobile operator panel. The robot arm then moves into the cell from above. Accompanied by seemingly effortless movements of the robot arm and workpiece table, the robot moves precisely over the complex curves of the mold and over all cutouts with a nozzle for water jet cutting. No

sooner is this task finished than the robot arm moves up out of the cell and lowers itself into an adjacent cell where another employee has placed a different molded component for precutting.

What looks so unspectacular and commonplace in the production facility at Maucher Formenbau is actually a minor revolution in robotics and CNC production. "Robots were previously limited to handling tasks as they were controlled by point-to-point systems. Using them to perform more complex or more precise machining operations was impossible", Dirk Brissé, Managing **Director of Maucher CNC-Robotic** GmbH, tells us. Then a former colleague Patrick Bartsch called him up and told him that he wanted to develop robots which could be used for machining.

SINUMERIK Run MyRobot: an electrifying idea

The two innovation-hungry partners then went knocking on the doors of many robot manufacturers with their idea. However hardly anyone really shared their enthusiasm - probably because the robotics business was booming and huge revenue from simple handling operations was already on the cards for manufacturers. "Then we heard about Comau and its integration in Sinumerik Run MyRobot. Here too, the primary application field was handling, but the Comau robot was controlled by the CNC and was synchronized with the machine tool in this way. And here's what really electrified us: the Siemens developers had integrated the kinematics of the Comau robot in the CNC, thus establishing a continuous-path control for robots. The robot could

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Dirk Brissé, Oliver Freisler (Siemens) and Ralph Schäfer in front of a standard cell for waterjet cutting at the automotive supplier Maucher

benefit from all the advantages of the Sinumerik 840D sl: digital twin, machining simulation, integrated safety, programming via CAD/CAM software, etc." This means that a robot specialist is no longer necessary for programming machining tasks.

In-house production as a test bay

The two developers then also got Peter Strittmatter, Managing Director of the automotive supplier Maucher Formenbau GmbH, interested in their idea: "Our sphere of activity involves supplying roof liners, mats, wheel arch liners and hybrid materials for small production runs, luxury brands and special vehicles, such as armored limousines. Flexibility is required here – coupled with high quality. The crux of the issue is as follows: special-purpose machine manufacturing is hardly worthwhile with these quantities and we come up against our limits with respect to output, quality, efficiency and ergonomics if our processes are purely manual. I found the idea of using precise and flexible robots for machining and being able to program them like a CNC extremely exciting".

In the meantime, complete solutions that were developed based on the idea have been doing a reliable job at the Maucher production facility for a number of months now. Not very far away from the multi-cell plant for water jet cutting, there is a cell where a robot is being used to apply adhesive and hook-and-loop tape to the vehicle roof liners. These will later be used to fasten the roof liners to the bodywork. A dis-

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Less is more ...

Sinumerik 828D on the shopfloor: As soon as the Covid-19 restrictions were relaxed a bit, we visited Kamusin Metallbearbeitung GmbH. Read now how the small family business is coping with the crisis – and what Sinumerik has to do with it.



↗ sie.ag/340uRF0

You can find the complete articles on www.siemens.com/cnc4you-magazine

penser nozzle on the robot arm first applies adhesive. After each complete path, the robot head performs a small rotation, moves back along the lines and applies hook-andloop tape from a large roll on the head, presses this down and cuts it to size – all perfectly controlled by a Sinumerik 840D sl.

"This work requires precision and was also extremely demanding physically for our employees due to the pressure that had to be applied. We even had the basic problem of employees not being able to reach far enough when it came to roof liners for vans and minibuses. Now this task is performed auto-

»People have to rethink: robots work true to path and are programmed like any CNC machine.«

Dirk Brissé, Maucher CNC-Robotic

matically – for a large number of different roof liners and vehicle types", says Peter Strittmatter.

The importance of practical experience is evident from the fact that the robots are not positioned in the cell, but laterally above the cell. This saves space and allows one robot to operate in several cells.

Even the largest cell can fit on a truck. The cells can be set up in only a few hours. Robots and cells only have to be erected. No special anchors or foundations are required. From a process engineering standpoint, the cell constitutes a classical CNC machine tool after it has been set up. Programs can be created and simulated in the usual digital sequence using CAD/CAM programs; tools and clamping devices are automatically tested – and the "Integrated Safety" functions of Sinumerik are also operational. So far, this is all familiar territory. But the robot cells also open up new possibilities. The eight axes permit more efficient machining strategies and shorter cycle times - in some processes up to 30 percent better than classical 5-axis machines. Robots and cells can be used for different tasks. The investment protection is also impressive: "If a process or machine becomes obsolete due to changes in the order books, I can retrofit the robot for other processes", says Peter Strittmatter. And I never need a robot expert and I never have to train my people for new applications and programming languages. The whole thing is based on the G-code which we are already familiar with. Programs can easily be created or adapted in-house on a CAD/CAM workstation – by people who do that type of work anyway.

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5-axis CNC for the pole position



↗ sie.ag/2SYQwXF

High-performance dry machining of complex composite components. Read how a DMG MORI gantry machine with Sinumerik 840D sl secures a pole position for TOYOTA GAZOO Racing Europe.



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An investment that pays off



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↗ sie.ag/2H7wDeF

Honeycutt Manufacturing, a Mukilteo, Washington job shop located near Seattle, is in service to the aerospace, marine and general industrial manufacturing markets. The latest investment in a GROB G550T 5-axis machining center has proven to be a game changer.

This family-owned and -operated machine shop was running 2-axis lathes and VMCs for a number of years and doing quite well. The business came largely from aerospace-related companies in the local supply chain to that major OEM. As General Manager Nick Honeycutt explains, "We didn't feel we had the workload for a 5-axis machine at the time our local machine tool dealer, Vince Selway of Machine Tools NW, approached us about the GROB machines. We have a long and mutually beneficial relationship with Vince, so we were certainly interested in his suggestions."

Honeycutt subsequently purchased a 4-axis HMC and the results were acceptable plus a base savings had been realized, but then a particular job opportunity presented itself and the shop purchased its first GROB, a G550T 5-axis machine, with advanced machining technologies to move his shop forward. After the commissioning and training, including sessions with the Siemens user supporter, Daniel Vitullo, who gave the operators assistance with the Sinumerik 840D sl control, the first parts were produced to spec on the very first day of run-time.

Reducing machining steps drives efficiency

In two weeks, Honeycutt Manufacturing brought a variety of customers into their shop to see the GROB machine in action and the company was immediately awarded additional work. As Nick Honeycutt explains, "We reduced the machining setup operations from six to two with the GROB, cutting cycle times by 50% and reducing our tooling costs about 60 to 70%." Within 30 days, the shop was ready to buy its second GROB machine tool with Sinumerik 840D sl and plans are in the works for an addition to the building that will house 3 to 4 more machines.



»The Siemens CNC was a relatively easy learn for our operators.«

Nick Honeycutt, Honeycutt Manufacturing

The GROB G550T is controlled by a Sinumerik 840D sl at Honeycutt Manufacturing.

While much of the aerospace work here is aluminum with very high removal rate, a further advantage emerged with the GROB-Siemens combination. On jobs involving Inconel and Titanium, the power of the machine plus the 0.0006" typical accuracies and 32Ra finishes they were able to achieve, won the machine shop even more work, according to Honeycutt. These levels of accuracy and finish are critical on parts produced, which range from aluminum leading edge to titanium elevator control, lab devices for precision measurement, and commercial as well as pleasure boat components.

Vince Selway of Machine Tools NW, the machine tool dealer for GROB in the area, is a long-time partner to Honeycutt. "My father sold machines to Honeycutt, so we have a long history with the shop." He detailed the sale of the first 5-axis machine, noting that, "... it worked so well that they were so excited by what they witnessed on their shopfloor, as it performed aluminum hog outs at such an incredible rate, they could barely keep up with the chips flying. Even better were the accuracy, finish and speed being achieved on the really tough-to-machine materials."

Andy Krupp, a universal machine applications engineer at GROB, explains: "The GROB horizontal 5-axis design is unique and offers many advantages over conventional 5-axis vertical machines on the market. On this Honeycutt project, the addition of our 5-axis machines helped to significantly improve their aerospace part production, while maintaining the highest quality standards."

Advanced Siemens CNC is the clear choice

Andy Krupp further notes, "Siemens is one of several controls we use on our machines, but is the only control for special complex machining options we've developed on our machines, including multi-tasking mill-turn, skiving (used for gear production), high-end hobbing, cross-feed spindle configurations and more. One of the great things about using the Sinumerik 840D sl control is its ease of use. Training people who have used other brands of CNC and bringing them to a comfort level using Siemens has actually been quite simple."

On the 5-axis machines at Honeycutt, the Sinumerik 840D sl is outfitted with the GROB-4 Pilot control panel, allowing the machine builder to incorporate additional applications onto the 24" operator interface (HMI). Nick Honeycutt further observes, "The Siemens CNC was a relatively easy learn for our operators, due to the training we received from GROB and Daniel from Siemens. We had a lot of experience with other control brands, but the speed and power of the GROB 5-axis machines with Sinumerik made the higher-level CNC very necessary to execute our complex operations on a single machining center." In addition, the Siemens control easily interfaces with the Honeycutt CAD and CAM platforms they use here.

The shop operates multiple shifts, seven days a week, and is continuing to expand to meet the additional business being generated by the GROB 5-axis machines and other services they provide.

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SinuTrain for Sinumerik Operate 4.93



With many new functions – now for download

For basic and advanced training or as a PC-based programming workstation: SinuTrain is THE Sinumerik tool in manufacturing and training. Control identical programming – without requiring any machine time, more cutting time, fewer risks and a perfect training platform for NC programming. The new version of SinuTrain for Sinumerik Operate 4.93 is now available.

⊅ sie.ag/2H7eBsT



NEW: Video tutorial 11

If you want precise results, you need to measure. Our new Sinumerik live video tutorial No. 11 shows how it works.

Here's a link to the video: **↗ sie.ag/379nk8M**

Here's the link to all previous tutorials:

↗ sie.ag/3mpvtuv
 ☑ armin.baernklau@siemens.com



Education and training

Tips and tricks

→ Watch the video: Scan the QR code



Improved structure and better overview of your NC programs

Our video tutorial shows you how to divide NC programs into "descriptive" blocks that can be hidden and displayed. Here's a link to the video:

↗ sie.ag/3nVQQ7M



Programming component variants flexibly and quickly

Using R variables (R/user parameters), you can set values manually when the program is called and thus deal with different component variants within one NC program. Here's a link to the video:

↗ sie.ag/3IMWO96



New version of the Easy CNC app

The mobile companion for all Sinumerik users. In the new version with X-Y-Z cube for determining the rotation in a 3D environment.

↗ sie.ag/33ZLbWu

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