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# cnc4you

The Shopfloor Magazine

## The beacon for your desk

New CNC4you lighthouse workpiece

### Why not just start?

Semmelrogge: from white goods retailer to highly flexible contract manufacturer

# Hands-o<mark>n C</mark>NC training at the Kiel Fjord

Kiel University of Applied Sciences uses state-of-the-art machine tools



Horst Witte Gerätebau KG is a market leader in high-precision fixturing systems

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RBZ Kiel uses Sinumerik 840D sl and the simulation software SinuTrain to provide up-to-date and practical training

The lighthouse sample

workpiece makes it easy to get started with CNC turning at BNW Lüneburg

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# Isternet Advectories Advectories

The north is shining bright – this more or less sums up the research for this issue of *CNC4you*. The people of northern Germany are used to wind and weather and are generally considered to be calm, easygoing, and even-tempered. Take a closer look, however, and you will see a very lively high-tech region with aerospace companies in the metropolitan area of Hamburg, state-of-the-art medical technology in Kiel, a powerful automotive industry in the region of Wolfsburg/Hannover, and innovative energy technology companies and small contract manufacturers for metal machining across the region.

The current issue of *CNC4you* provides insight into this extremely vibrant area of Germany. We report about innovative education and training at RBZ Kiel, one of 13 Siemens training partners in the northern area. Kiel University of Applied Sciences also trains future engineers using **Sinumerik 840D sl**. The university exploits all the possibilities of modern five-axis machines, from **ShopMill/ShopTurn** to DIN programming in **programGuide**, using simulation to protect its valuable machines. We also highlight a hidden champion from the northern mid tier: Horst Witte Gerätebau, located in the idyllic town of Elbauen, produces highly precise aluminum parts with **Sinumerik 828D** on a custom-tailored machine tool, for the company's much sought-after clamping systems. Witte is not the only example showing how important capable tool machine dealers are for the industry. With Knuth, the north can boast one of the most successful and innovative machine tool dealers in Germany. We tell the story of a small family-owned machine shop expanding its portfolio with a Knuth machine and **Sinumerik 808D**.

Are you interested in new developments in Sinumerik controls? Don't miss the opportunity – come visit us on one of the upcoming trade fairs. It will be worth your time. I look forward to seeing you there!

Ingo Bartsch

Dear readers,

Ingo Bartsch Sales Manager CNC / Application Technology

Small series with high-voltage connectors for current transformers

Semmelrogge: from white goods retailer to highly flexible contract manufacturer

# Why not just start?

As a successful small business owner over the age of 60, is it wise to enter new markets? Horst Semmelrogge from Malberg, Germany, will probably never understand such skeptical questions. He prefers to just do it. So in early 2013 he invested in a Knuth Numturn 420 with Sinumerik 808D – a combination that could easily catch on.

> f course, we don't find Horst Semmelrogge at his desk in the office. He's standing in the small production facility that he built next to his house, keeping a fatherly eye on his 14 employees and lending a hand himself to get a machine for windings running again.

> Semmelrogge set up his business in 1980, shortly after passing his exams to become a master trades-

man in electrical engineering. He started out as a retailer and repairman of white goods.

"My father made windings. We designed and built our own winding machine so that we could make a bit of extra income. Then I went around to all the villages and presented our service to local companies, where I stumbled upon more interest than expected," says Semmelrogge.



"Particularly as a small business, you want good technical support from the manufacturer. When I'm making investment decisions, service is an important factor."

Horst Semmelrogge, CEO

### Coincidence? Real entrepreneurs grab opportunities like these

In 1989 he started a conversation at a football club with someone working for the Ritz company. Ritz produced current and voltage transformers for the rail industry. Semmelrogge arranged an interview at the company, obtained his first order, and proved himself. A few years later, when the company was looking for a partner for the outsourcing of coil production, Semmelrogge resolutely seized the chance. He offered Ritz reliable production to specification, with delivery at very short notice.

"At the beginning there were perhaps 10-12 different coils. Now we manufacture more than 100 varying versions; we also produce other intermediate products and preassembled cables. We do that almost to order, at a few hours' notice. Flexibility and reliability are our strengths. We know that production at the customer's premises runs smoothly only if we deliver on time and as needed," Semmelrogge explains. The economic advantage for Ritz is that orders for prefabricated coils and other components are synchronized at Semmelrogge with the company's own production, so there is hardly any need to keep these intermediate products in stock. As a result, Semmelrogge and his team are valued partners with whom the company has been working for many years.

### Introduction to machining

From coil windings to machining – but why? "My nephew is joining the company. I'd like to hand him a future-proof, state-of-the-art company and to get it onto a broader footing. Apart from that, I've always remained curious and I can see opportunities in machining for new business with new and existing customers. In addition to the Knuth Numturn 420 with the Sinumerik control, I've also invested in a new hydrogen welding robot and a milling machine," Semmelrogge explains.

His youngest employee is standing beside the Knuth machine with him, optimizing programs for the current workpiece: a high-voltage connector for voltage transformers in railroad engineering across which 40,000 V will eventually run.

"This is a perfect solution for us. He is being trained on Sinumerik 840D sl at school. These youngsters see their future in working with highly efficient CNC controls. They are committed to their work, and I have the security of always being able to find employees who have mastered the control system of my machine. It even applies to multiple technologies, as the Sinumerik CNCs for turning and milling are very similar in their operation – a huge plus point," says Semmelrogge.

And because the boss wants to operate his machines himself when necessary, there has been something of a role reversal going on since spring 2013. The youngsters are educating the boss on the intricacies of the Sinumerik CNC.

### **Technical support desired**

Ingo Bartsch, Siemens sales manager for northern Germany, reports that this division of roles and the new training methods are becoming increasingly widespread in small businesses: "The workload in these companies continues to increase, and young employees in small businesses are being sent less often to comprehensive face-to-face training courses at the manufacturer's premises due to time and cost pressures." Siemens' answer to this is modular Sinumerik training courses with shorter face-toface times; video tutorials on the Internet; webbased training courses; and the SinuTrain software, which mirrors the Sinumerik CNC exactly on a PC.

### **TECHNOLOGY IN DETAIL**

## Sinumerik 808D for standard turning and milling machines

- > User-friendly technology versions
- > DIN/ISO high-level language programming compatible with Sinumerik 828D and Sinumerik 840D sl
- > Wide variety of technology cycles
- > Convenient tool management
- > Advanced Surface for perfect milling results
- > Task-oriented onboard tutorials for fast implementation
- Manual Machine Plus for CNC operation similar to a conventional turning machine

### Valuable add-ons

- > Free "808D on PC" software for training and offlineprogramming
- > Free videos and tutorials
- Standard 36-month warranty on materials and on-site support
  - Help for self-help employees from the Internet and mobile phone generation are familiar with these systems from their training and from their private lives and thus find them easy to use.

Semmelrogge has remained curious and openminded, even though he's a little over 60, and he also finds these new ways of learning both good and practical. Nevertheless, he wouldn't like to go without visits like this one today from Bartsch: "Particularly as a small business, you want good technical support from the manufacturer. When I'm making investment decisions, service is an important factor. Visits always help me and my employees get a bit further: tips about programming, tools, and maintenance; explanations about new functions and technologies; industry buzz; and lots more."

"And for me there's coffee and rolls," Bartsch says with a grin, and then adds more seriously: "As the manufacturer's employees, we also get a lot out of these visits. The closer we get to the workpieces and actual work with the machine, the better."

#### New opportunities with Sinumerik 808D

When choosing his machine, Semmelrogge went to the Knuth headquarters in Wasbek, Germany, and he is still enthusiastic about the machines on display



The first of its kind in Germany: Knuth Numturn 420 with Sinumerik 808D

and the advice he was given. "Of course a five-axis machine would be great, but based on my experience as an entrepreneur, I always invest according to needs. A machine like that must first earn a lot of money on my shopfloor before I move up to the next stage. The solution recommended by Knuth was perfect for me," the businessman explains.

This solution, however, was anything but standard, as Bartsch from Siemens explains: "Sinumerik 808D was not designed for the Central European market. Agents like Knuth drew our attention to the fact that they also experience strong demand from small companies for simple, sometimes semimanual shopfloor machines. These customers are looking for a cost-effective solution but with a future-proof control system. It should adapt flexibly to investments at a later date and offer a consistent CNC platform from turning and milling to multitasking, from the semimanual machine to the five-axis machining center. And we can offer all this with the Sinumerik family."

Of course, Semmelrogge with his direct manner and hands-on attitude had some input here. The first Sinumerik 808D used in Germany is running on his machine on his shopfloor. Now Siemens and its partner Knuth intend to tailor other packages in response to the wishes of contract manufacturers and machine shops.

Semmelrogge is glad to hear this: "It's good and it helps us. I can see that from my machine. It's nice to see the big players start off simply too."

### INFO AND CONTACT

Horst Witte Gerätebau: high-tech fixturing systems from the north of Germany

# A head start through precision

"Hidden champion" is the perfect description for Horst Witte Gerätebau Barskamp KG. Even the company building in the small community of Barskamp on the river Elbe has an unassuming presence, almost hidden in the countryside. But from a technical point of view, this restraint stops as soon as you walk through the door. High-tech and precision engineering have made the company a leading supplier of modular fixturing systems and a leader in vacuum fixturing technology for the automotive and aerospace industries. A machine with a Sinumerik 828D CNC plays a key role in this success.



stablished in 1969 in the idyllic village of Barskamp, Horst Witte Gerätebau Barskamp KG has rapidly developed into a market leader in fixturing systems and vacuum clamping technology. Looking back to the company's beginnings, production manager Wilhelm Klinge says: "The breakthrough came with the development of our modular Alufix system. Lightweight but stable, extremely flexible and reusable as a profile kit - and built, of course, with absolute precision - our Alufix systems were an immediate hit with customers in the automotive and aerospace industries and soon became established in the global marketplace too."

### Challenging: extruded aluminum profiles

•

Today, many other fixturing systems complement the original product offering. Starting from its headquarters with various production plants in Barskamp, the company expanded with branches in Singapore, Mexico, the United States, and Brazil. Klinge explains: "The branch offices are closer to the customers, and our employees advise, design, and assemble locally. Production of our systems and fixturings, however, is concentrated entirely at our Barskamp site." Why is that? "The bars for the modular Alufix system are produced from extruded aluminum profiles, which forms the base for their highstrength construction. At the same time, the stresses arising in the material place extreme demands on the process chain on the metalworking shopfloor. The expertise required to machine aluminum is our company's key competence and competitive advantage."

### One of a kind: the key machine for face machining

As we walk through the production facility with Klinge, he gives us insight into the various process steps for the Alufix modular system. First, the surfaces of the blank profiles are milled to their standard lengths, which also resolves the stresses in the extruded section. Then the profile lengths are cut to order. The profiles, which can be combined in a versatile manner via quick connector and fixed to base plates later, are available in profile dimensions of 16 × 16 mm, 25 × 25 mm, 40 × 40 mm, and 50 × 50 mm.

The machining of the profile head has a crucial effect on the accuracy that can be achieved with the subsequent fixture. "The milling machine for face machining is the key player in this process – it has a significant impact on quality and efficiency in the production section. So we were very cautious when investing in the new machine at the end of 2012. We had very specific ideas about the capabilities and configuration required," Klinge explains. "We were increasingly experiencing downtimes with our previous machine, and it was proving difficult to carry out

### **TECHNOLOGY IN DETAIL**

### Deep hole drilling in Sinumerik Operate

Sinumerik Operate provides the user with convenient cycles for deep hole drilling. It offers options for chip breaking and chip removal. You can find an overview of all definable parameters at **siemens.com/cnc4you**. The drilling cycles are available both in ShopMill and programGuide.



planned process optimizations. Both factors were having a negative impact on efficiency."

Eventually, machine tool dealer Helmut Diekmann found the solution: "Witte's process-specific requirements are very specialized, and it was impos-



The horizontal machining of the profile heads takes place on a milling machine (left) with custom-tailored adaptations

This also includes the hydraulic clamping for various profile sizes (right)



sible to achieve them cost-effectively with a standard machine. In the end, we opted for a machine fitted throughout with Sinumerik – from the operator panel and software to the motors and wiring harness. With the approval of and in cooperation with the Asian machine manufacturer, we then planned and carried out the required adjustments to the machine."

#### Adjustments optimize the process

The rigid machine table was fitted with a clamping fixture adapted to Witte's various aluminum profiles so as to achieve the necessary precision in clamping and machining. The clever part of this solution is that the doors to the machine's machining space were provided with a "hatch" – two small additional sliding doors – to permit horizontal machining of longer profiles as well. So when necessary, it is also possible to machine faces or heads of profiles that protrude well beyond the machining space.

The capacity of the machine's tool changer was also doubled to accommodate 60 tools. This means that the types and sizes of tools required for all the profile sizes are always ready for use. "Finally, we installed an extra chip guard because the chips were thrown really high during dry horizontal machining of the aluminum with rapid traverses, and they could be found all over the machine, inside and out," Diekmann remembers.

The programs for face machining were easily imported into the Sinumerik 828D CNC and optimized. "We are in the business of precision engineering, and we have to work with machining tolerances that are often already used up during clamping. This is why we use only high-end CNCs in all our machines. In face machining in particular, the Sinumerik CNC pays off because here we are machining with tolerances of ±10 µm. The machine operators also really like the convenience because they can guickly and reliably select the frequent program changes that crop up in order-specific machining," Klinge explains.

After the first face machining, the profiles are given the holes characteristic of the Alufix modular system in a further machining step. Then they go back to the machine again for face machining. This is when the second profile head is milled – completely and precisely according to the holes made previously. This guarantees the precision of the systems constructed later at the customers' premises. Every minute inaccuracy in the profile head would ultimately build up over the length of the profiles or as they are interlinked and would lead to unacceptable deviations.

#### A clear advantage for throughput

For production manager Klinge, the special machine for face machining is paying dividends. An inexpensive standard machine that already included the necessary high-end Sinumerik 828D was used as the platform. The collaboration with Diekmann provided the basis to construct a process- and customer-specific solution within a few weeks.

The results are impressive and speak for themselves: the combination of the faster tool changer, new tools, and precise Sinumerik CNC with its additional rapid traverses has almost halved the average machining time per profile head. Now, the heads for the entire production of Alufix profiles are machined on the new machine in two shifts.

Despite its key role in the quality and global supply of modular Alufix fixturing systems, this special machine is barely noticeable within the production plant's extensive machining facilities – a hidden champion that fits in very well with Horst Witte Gerätebau in Barskamp.

### INFO AND CONTACT

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"In face machining in particular, the Sinumerik CNC pays off because here we are machining with tolerances of ±10 µm."

Wilhelm Klinge, Production Manager Horst Witte Gerätebau Barskamp KG





The base plate for a moisture analyzer is produced precisely and in a highly efficient manner with one clamping on the Sinumerik-controlled DMU 65

At the Mürwiker Werkstätten, people with physical and mental disabilities can show what they are capable of – and this with great business success: the company has held its own in the market. On the metalworking shopfloor, the employees use a five-axis machine tool equipped with a Sinumerik CNC.

Mürwiker Werkstätten: socially responsible and profitable

# "Nearby instead of Far East"



he Mürwiker Werkstätten GmbH were founded 1966 in the German town of Flensburg. Today, 830 people with handicaps work in several workshops. They are trained, supervised, and looked after by master craftsmen and skilled workers. The "Mürwiker," as they call themselves, work in farming, maintain automobiles, embroider thousands of logos, assemble cables, test circuit boards - and machine metal. The objective is for the disabled employees to work and live with the greatest possible autonomy. To achieve this, the enterprise must perform a balancing act between its social mission and profitability. General manager Günter Fenner stresses: "We have stiff competition. In the field of metal machining we are experiencing more competitive pressure from suppliers in Eastern Europe and Asia. This is why we keep drawing attention to our strengths: reliability, top quality, good prices, and our slogan 'Nearby instead of Far East.'"

It is not only disabled persons who are realizing their dreams here, as can be seen in the person of Jörg Köster. He started at the Mürwiker Werkstätten in 1992 as an engineering mechanic and soon felt that he was needed here. "Of course I could make more money elsewhere," he says, "but the combination of technical, commercial, and social tasks is something special that I have come to appreciate dearly." Köster has since completed various further training courses. As a master precision mechanic with additional qualifications in special needs education, he became production manager in 2004.

Köster and four skilled workers supervise the work of 25 mentally or physically disabled persons. Every-

The user-friendly and clearly arranged operation with Sinumerik Operate supports the employees at the Mürwiker Werkstätten

one is appointed to tasks according to his or her abilities. All the workers complete a two-year training program during which personal skills are identified and the required expertise is imparted.

### In competition – just like any other business

"We need to reel in orders and fulfill the technical and commercial market requirements just like any other business," explains Köster.

About a third of total revenues are generated in metal machining. Batch sizes between 20 and 3,000 pieces, made from various materials (construction steel, stainless steel, aluminum, brass, etc.) shape the daily routine. To ensure that the company can continue to satisfy its customers from the automotive, mechanical engineering, and food technology industries, it makes regular investments – most recently, in the spring of 2012, the purchase of a DMG MORI DMU 65 Monoblock five-axis machining center equipped with a Sinumerik 840D sl premium CNC. Köster says: "The Siemens control caught our eye at the NORTEC trade fair in 2012. Its Sinumerik Operate user interface is so clearly arranged and easy to use that we quickly agreed – this would be the CNC."

### Five-axis machining is gaining importance

According to Köster, the trend is moving toward complex orders and five axes: "Apart from the fact that some of our customers' parts will not be producible any other way in the future, we can manufacture many workpieces in a single clamping, and this makes us much more productive." With five axes, the DMU 65 milling center can manage many tasks, ranging from traditional three-axis to 3+2-axis and even up to simultaneous five-axis machining. Taking up only 7.5 m<sup>2</sup> of space, the new machine excels through high stability – the foundation for precise machining and the finest surface quality of up to Ra = 0.4 µm. The 1.43-m-wide doorway offers the disabled persons good access for workpiece changes.

### CNC programming on the PC instead of the machine

Of the programming modes available in Sinumerik Operate, ShopMill is most frequently used at the Mürwiker Werkstätten. The menu navigation is clear, and practical cycles can easily be adopted. This way, the metalworking team leaders can create error-free programs in a short time. They spend hardly any time at the machine to do so – usually, SinuTrain is used for programming at the PC with a single license, mapping the machine configuration 1:1. The pro-

### **TECHNOLOGY IN DETAIL**

### Trochoidal milling with Sinumerik Operate

Sinumerik Operate offers the operator a trochoidal milling function, thus enabling the machining of open grooves. This strategy is often used to machine grooves with a high depth of cut on weaker machines as well as in steel qualities with high tensile strength. The milling path results from combining the continuous rotation of the milling cutter with a linear feed movement, thus creating a "slab milling process." The chip cross section at the cutting edge is always the same size, resulting in a reduced machine and tool load and making it possible to run significantly higher cutting values.



grams are centrally managed and can be uploaded to the machine or executed directly via the network.

Köster demonstrates an additional function of Sinumerik 840D sl: "We file photos of the part clampings in the program folders. This electronic memory aid is very helpful." For Köstner, it is just another reason to keep relying on Sinumerik.

### INFO AND CONTACT

#### **Training at RBZ Kiel**

# Simulation establishes safety

The regional training center RBZ Kiel was facing a dilemma: practical training must take place on state-of-the-art CNC milling and turning machines, but it is impossible to insure such machines in training centers at a reasonable cost. Mapping virtual production processes with simulation software integrated into the Sinumerik 840D sl control and providing SinuTrain software for PCs proved to be the perfect solution.



Preparing apprentices, students, and trainees for their future profession in the best possible manner requires technical equipment that is state of the art," says Jürgen Ströh, headmaster at RBZ Kiel, with firm conviction. The school management is pressing for modernization in all areas. This is visible not only in the modern architecture of the building but also in the facilities that are equipped with the latest DMG MORI CNC machine tools.

Stephan Meyer, head of the department, and his deputy, Josef Pitz, proudly demonstrate the DMU 50 ecoline 3+2-axis CNC milling center along with a DMG MORI CTX 310 ecoline CNC turning machine. It is no coincidence that the two specialist teachers, Thomas Mittelstädt and Rolf Dencker, chose Sinumerik 840D sl as the control for both machines. "We have a lot of small and medium-sized machining companies working with innovative Sinumerik controls here in northern Germany. In this case, the choice of Siemens technology was an easy one". "We usually begin with programGuide. This way, our trainees learn the basics of the DIN-compliant programing languages first."

Thomas Mittelstädt, Specialist Teacher

### More vocational training opportunities with SinuTrain

Sinumerik Operate provides students with a state-of-the-art user interface – and not just at the machine terminals. The school also equipped several classrooms with 12 + 1 PC workstations each, allowing entire classes to practice with the SinuTrain programming software in a practical and realistic way, from programming to virtual machining. All soft keys are featured on the user interface and need only be clicked by the mouse, without a single chip flying through the air.

### DIN-compliant programming taught first

For CNC programming, Sinumerik Operate offers students two methods to choose from: the ShopMill/ShopTurn graphical work-step programming or the programGuide G-code version with cycle support. Mittelstädt explains: "We usually begin with programGuide. This way, our trainees learn the basics of the DIN-compliant programming languages first."

As soon as the students have grasped the principles and are able to program simple workpieces, they switch to the



The students can personally experience how their workpieces are machined on a state-of-the-art DMU 50 ecoline DMG MORI 3+2-axis CNC machining center

An error-free simulation is the prerequisite for optimal machining and thus for a perfect workpiece

next level. "From here, ShopMill and ShopTurn are easy to understand and quickly learned," Pitz adds. "The Siemens work-step programming is built up logically and can be operated intuitively."

### Simulation: locating and correcting errors

Once the students are convinced that their programs are ready, they start the integrated simulation. Possible errors soon become obvious and can often be corrected independently. Only after the simulation has run without problems does the teacher give the goahead for the program to be run on the machine via USB stick. "As soon as the program is read and the machine is set up, we could actually operate the machine at full speed right away, thanks to simulation. To avoid malfunctions and to protect the machine, however, we generally run the programs slowly first. We don't want to encourage a crash, and we really can't afford one either," says Dencker, explaining the simulation's protective function.

The results achieved with the DMU 50 ecoline 3+2-axis CNC machining center are impressive. Precise machining relies not only on the highperformance Siemens controls but also on the sturdy cross-slide design of the DMG MORI machines with rigid corrugated cast-iron frames. The axes, equipped with Simodrive digital drives, achieve rapid traverse rates of up to 24 m/min and accelerations of up to 5 m/s<sup>2</sup>. The variable swivel rotary table with a hydraulic table clamp complements the main axes with two additional axes. This makes it possible to produce even complex parts in a single clamping. All this, combined with traverse routes of 500/450/400 mm (x/y/z), makes the DMU 50 ecoline a compact five-axis machine that is ideally suited for training and the introduction to five-plane machining.

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### **TECHNOLOGY IN DETAIL**

## 3-D simulation with Sinumerik Operate

The 3-D simulation enables the operator to easily check whether any errors have occurred during programming. Thanks to the different-colored lines, it is easy to track the exact movements of the tool and to verify the chosen milling strategies. Green milling paths represent feed movements, and red paths rapid traverse movements. This makes it easy to monitor any contour damage that may occur.



Kiel University of Applied Sciences uses state-of-the-art machine tools

# Hands-on CNC training at the Kiel Fjord

In northern Germany, wind power plant manufacturers, shipyards, and aerial and automotive industry suppliers are desperately looking for qualified staff. The education provided by the Kiel University of Applied Sciences mechanical engineering department is known to be especially practical. Training in the machine shop takes place on state-of-the-art Siemens CNCs, because – according to shopfloor manager Detlef Möller – they are the ones most widely used.



A t Kiel University of Applied Sciences, located directly on the Kiel Fjord and close to the Baltic Sea, challenges are highly sought after. Kiel students participate in many competitions with great success. One example is the international "Racing Aeolus" competition, in which Kiel students have been competing with their wind vehicles for years. The main principle of a wind vehicle: a turbine transforms the kinetic wind energy into mechanical power and actuates the wheels of the vehicle via a drivetrain.

The Kiel Formula Student Team RACEYARDe is another example. Here, students design and build single-seated electrically driven race cars with a power of 80 kW to participate in the international Formula Student Germany competition and other international Formula SAE competitions. The models from the T-Kiel A series regularly rank among the top placements. The special challenge here is that students from different departments and semesters are responsible for the entire process chain, from design to production, to marketing and sponsorship.

The wind vehicle *Baltic Thunder*, designed by Kiel students



The students learn how to create the perfect workpiece by programming in Sinumerik Operate and with the help of integrated simulation

#### Students' ideas become reality

The interface between theory and practice runs right through the machine shop, which is why it is considered the lynchpin of education in Kiel. Hands-on training requires state-of-the-art equipment. Shopfloor manager Möller explains: "Our future engineers must know which types of parts can be produced with which machines and when the limits of feasibility are reached." On the shopfloor, the students are counseled by skilled workers and master craftsmen in the creation of CAD parts in CNC programs and then supported during the manufacture on the available machine tools.

For the wind vehicle, a modern Universal CNC turning machine with driven tools is used. Sinumerik 840D sl, equipped with the Sinumerik Operate user interface, serves as the control. "We use only Siemens controls in the machine shop. They are the most common in Germany and throughout Europe, and we aim to be as close to the job market as possible," explains Möller. "What is more, you can find the Sinumerik CNC on all different kinds of machines - on simple and highly complex milling centers as well as on turning, grinding, and fully automated hybrid machines."

Bendix-Michael Tank, production manager at the Institute for Computer-Integrated Manufacturing Technology Transfer (CIMTT), attached to Kiel University of Applied Sciences, shares the same opinion. Here the students are even granted free access to the machine tools. "In addition to the design, we also look at the implementation of ideas on the machines," explains Tank.

### **CNC programming a priority**

Accordingly, CNC programming is on top of the agenda and prominent on the students' schedules. In addition to DIN-compliant programming language, ShopMill and ShopTurn work-step programming is taught as well. This is especially interesting for younger students, says Tank, because the programming processes are easy to comprehend. "Experienced programmers will primarily use the cycle-supporting DIN language of programGuide or, in the case of more complex workpieces, an external CAM system," confidently explains the CIMTT production manager.

Tank proudly presents a Grob G350 six-axis milling center, controlled by Sinumerik 840D sl. Originally a five-axis machine, this G350 was complemented with an additional axis by a Komet mechatronic tool system. Additional

### **TECHNOLOGY IN DETAIL**

### CNC programming with NX-CAM

The NX-CAM programming software from Siemens PLM provides the programmer with a tool to create and machine complex CAD models. On these tools, NC operations are generated. Many strategies are available to enable optimal machining of the workpiece, such as roughing, semifinishing, or finishing, for example. The generated milling paths are translated into the Sinumerik language and can be processed directly on the machining center.

Read more at siemens.com/cnc4you

special features are that the machine is not aligned vertically, as is usually the case, but horizontally. Both rotation axes are in the workpiece, leading to high rigidity. The axis deviation reliably remains at values below 10  $\mu$ m, and high surface qualities of up to Rz = 2  $\mu$ m can be achieved.

The compact machine can be easily operated with the Sinumerik Operate user interface. The integrated simulation reveals the students' possible programming errors before costly material is machined or a crash occurs.

After the machining is finished, the future engineers proudly hold their workpieces in their hands. And once these parts have proven their worth in the intensive competition of wind vehicles or race cars, everybody can see and understand the value of a hands-on education.

### INFO AND CONTACT

New CNC4you lighthouse workpiece

# The beacon for your desk

As a maritime navigation aid, a lighthouse marks important points of orientation or hazardous areas, thus directing ships to safety. At BNW Lüneburg, however, the lighthouse makes it easy to get started with CNC programming using Sinumerik controls. In the basic CNC turning course, it serves as a sample workpiece to demonstrate efficient programming with Sinumerik Operate. The sample programs and necessary production data are also available for download from the CNC4you online portal.

A sone of the first Sinumerik training partners, BNW Lüneburg offers various courses and vocational training programs for turning and milling with Sinumerik. The training rooms are equipped with SinuTrain programming stations as well as CNC turning and milling machines with the current Sinumerik Operate user interface. The proximity to the river Elbe and to the seaside motivated CNC trainer Martin-Thomas Ostrowsky to create the sample lighthouse workpiece for the basic CNC turning course with Sinumerik Operate.

The sample programs for the lighthouse were created on an NEF 400 CNC turning machine with a c-axis designed and produced by DMG MORI. The CNC turning machine is equipped with Sinumerik 840D sl with Sinumerik Operate.

### **CNC lighthouse workpiece**

The lighthouse is made up of five individual parts. The base and the attached hollow middle part made of aluminum provide the foundation. For both parts, the outside contour is created in the contour editor and then scrubbed and smoothed with the area clearance cycles.

The gallery serves as the middle part, which is preproduced with standard turning cycles first. To drill the balustrade, the cycle for full-circle drilling positions is used. In this cycle, the user chooses the option to drill in the lateral surface. This makes it possible to program the drilling positions without time-consuming conversion. Additionally, a circular pocket contour is milled on the face. This is also accomplished by using a cycle.

The participants created the lighthouse in the basic CNC turning course with Sinumerik 840D sl and Sinumerik Operate



The dome, made from acrylic glass, is the centerpiece of the lighthouse; its production requires two clampings. Again, the outside contour is created first via contour editor. The cycle for plunge turning and plunge turning residual material is used for stock removal. Plunge turning is a very effective means for producing contours with steep slopes and deep grooves. Finally, the aluminum tower roof is turned. In the first clamping, the circular pocket is milled on the inside, and the dome is turned and cut off. In the second clamping, the roof is precision turned once more.

### Assembly and illumination

The individual parts of the lighthouse are easily put together. The press-fit base and middle part as well as the gallery, dome, and roof are simple to assemble. The loose fit between the gallery and the middle part provides for easy separation of the parts. A small flashlight can be used inside to illuminate the dome.

Find detailed instructions, including programs and drawings, at siemens. com/cnc4you under the CNC Workpieces heading.

### INFO AND CONTACT

# Milling with Sinumerik

he CNC's software determines the productivity, performance, and ease of use of a machine tool considerably. Siemens offers the Sinumerik MDynamics milling technology package for three-axis, 3+2-axis, and fiveaxis milling and mill-/turning machines. It is built on the Sinumerik Operate system software, bringing the best features of this product family's user interfaces together with familiar procedures from the Windows PC and integrating the ShopMill and ShopTurn programming software. This provides

for intuitive operation and flexible programming for easy and direct access to the productive potential of the machine.

Below we show selected functions. Find more online in the **CNC4you Portal**.



### Sinumerik Operate: Block search

Block search on the break point is possible even after a sudden power failure or emergency stop. This is necessary in combination with the retract function.

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### Sinumerik Operate: Retract

This feature supports manual retraction from the workpiece following interruption due to power failure or MCP reset. This supports tool retraction in the tool direction in JOG mode and provides the possibility to resume machining at the point of interruption. The particularities involved with interrupted tapping (G33, G331/G332) or active swivel cycle CYCLE800 are taken into account. The "retraction" function is also active when tapping is aborted. In JOG, the spindle interpolates with the Z axis when being retracted from the thread.



### **INFO AND CONTACT**

siemens.com/cnc4you wolfgang.reichart@siemens.com New training center for Sinumerik

# The machine whisperer

In the German town of Flieden, a new partner for Sinumerik training is establishing itself. AIXOTEC goes beyond standard training and even offers individual coaching. In the spinning showroom next door, the new skills are put into practice on machines and workpieces. A network of partners makes it possible to provide training on the entire machining process.



The specialty of the training team – (top, from left to right) Alexander Freund (Conmatix), Thorsten Bothe (Voha Tosec), Guido Heinze (AIXOTEC), Arnd Görtz (AIXOTEC), Martin Deipenwisch (Voha Tosec), and Karsten Schwarz (Siemens) – is complex workpieces (below)

F or many years, Arnd Görtz, 48, worked as a freelance consultant, coming to the rescue when complex workpieces didn't come out of the five-axis milling center right or if a workpiece just took too long to machine. His business partner, Guido Heinze, 46, learned the job as a self-employed toll manufacturer and experienced the stress of competition that weighs on businesses, programmers, and operators. In this interview, the AIX-OTEC partners explain why they decided to go on the offensive with these new ideas and open a training center.

#### Why establish a training center after so many years of successful work in the field?

Arnd Görtz: Because it really only makes sense after many years in the field. I gained a great deal of experience working on my own, and now I want to pass on my valuable expertise and experience and get to the root of the problems.

**Guido Heinze:** The complexity of workpieces in mechanical engineering is increasing. After all, it's not enough to purchase a costly machine. The programmers and operators must be able to use it quickly and reliably too. Whether or not a machine provides a return on the investment depends largely on the personnel and their level of training.

### But aren't there a lot of training centers already today?

**Guido Heinze:** Many training courses are not practically relevant. We don't just provide dry training on Sinumerik; we move on to the spinning demonstration center, run the programs, and optimize them for the machine.

Arnd Görtz: In addition, we approach proficient users with individualized training. Why not take up the exact complex workpiece in the training that is currently to be implemented in production? This is what we call "fast coaching" but it is extremely useful. As soon as the employee returns to work with a solution, the training turns into productive working time. This way, the manager is more likely prepared to spend money for training. It really has to be a person with hands-on experience doing the training to achieve this. **Guido Heinze:** The Sinumerik control is the main instrument. But to manufacture efficiently, employees need to understand the entire process. We collaborate with partners such as Conmatix for PLM and NX, and with the Voha Tosec tool specialists, for example, to cover this expert knowledge.

### You have worked with many controls and now – as trainers – have decided to be certified for Sinumerik. Why?

Arnd Görtz: The development of Sinumerik is impressive. In the past, it was more suited for highly efficient, optimized serial production, whereas now, innovations such as Sinumerik Operate make it possible to realize small batch sizes, even down to the individual part. You move from the design to the readymade part in absolutely no time.

### INFO AND CONTACT

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## New language packs for SinuTrain for Sinumerik Operate V4.5

There are new language packs available for SinuTrain for Sinumerik Operate V4.5. The SinuTrain language packs are extensions and can be installed in an already existing SinuTrain version. The language packs are available for download free of charge from the CNC4you Portal on the Web. You can also download the free 60-day trial version of SinuTrain for Sinumerik Operate V4.5.

Trial version: sie.ag/1kztFg8 Language pack: sie.ag/1hlPsDp



### Sinumerik 808D on PC V4.6 with German language pack



The free 60-day Sinumerik 808D on PC trial version can also be used with a German language user interface from V4.6 on. The software bundle is based on Sinumerik Operate BASIC V4.6. Besides the German version, you can also change into English and Chinese. The German user interface is installed via a separate language pack. The trial version can be activated by using a code available free of charge.

Trial version: sie.ag/1m4EMcl Language pack: sie.ag/1kztMZ6

### Events

Below you will find an overview of upcoming fairs related to turning and milling with Sinumerik. Find out more about these and further events at **siemens.com/cnc4you** —> Events.

Event	Location	Date
Metav	Düsseldorf, Germany	March 11–15, 2014
АМВ	Stuttgart, Germany	September 16–20, 2014



NC/UKS/CUBE/CUBE

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# SinuTrain

Geared to the real world

### siemens.com/sinutrain

SinuTrain<sup>®</sup> is a control-identical training software for the PC. It facilitates user-friendly operation and CNC programming close to that in reality — based upon the new SINUMERIK<sup>®</sup> Operate user interface. SinuTrain is suitable for all of the usual programming methods, is available in

several languages and can be optimally adapted to the axis configurations of various machines. Therefore, ensuring a maximum degree of compatibility between CNC programs generated offline and machines in the production environment.

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