



# THE SHARP EDGE

ISSUE NINE 2012

## MEDICAL GRINDING

Case study  
Industry overview  
e-Course

**ANCA P-AXIS**  
Are you getting full value?

**EXPERT ADVICE**  
Thinking inside the box

**TAP GRINDING**  
The TXcell Revolution

**PUNCHES**  
The low-down

## NEW PRODUCTS

- MX5
- Laser Probe
- Wheel Probe
- RoboMate Collet Changer



# ANCA



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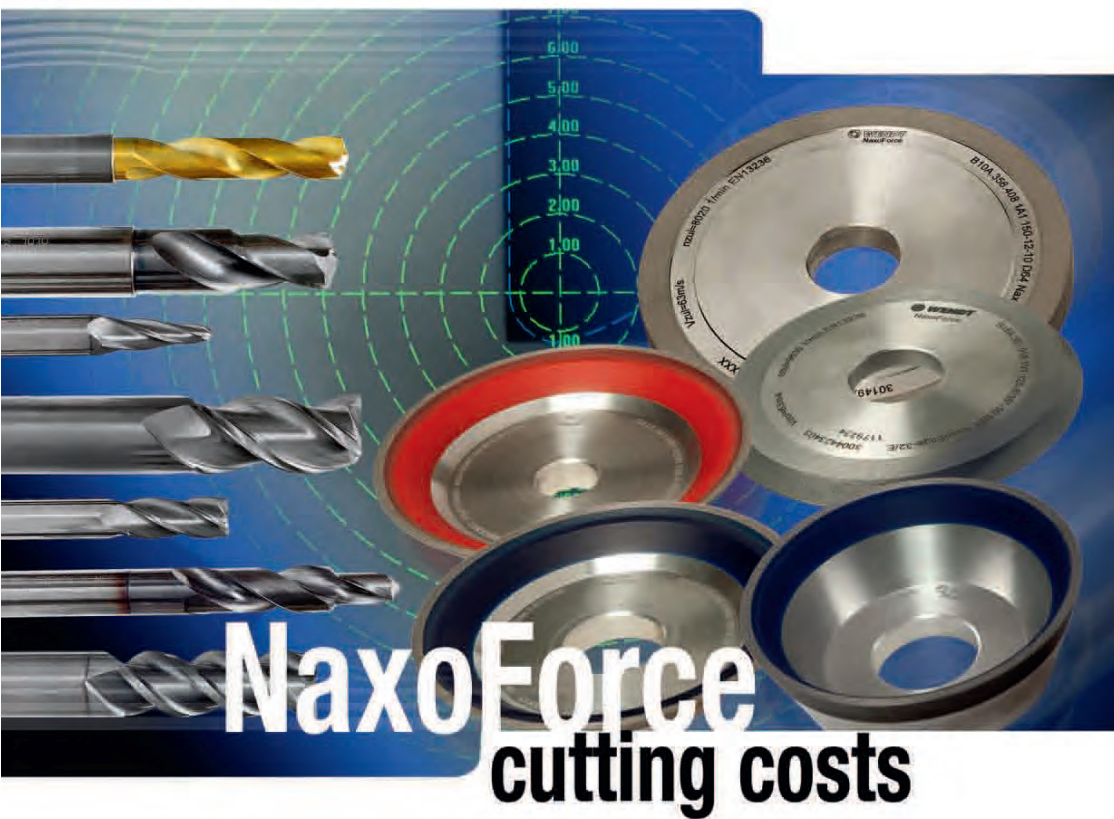


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Cover Image: Grinding components such as bone rasps and knee joints is a burgeoning industry. In our special medical edition of *The Sharp Edge*, we focus on the finer points of medical grinding and how ANCA capability is helping customers get it right.

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[www.anca.com](http://www.anca.com)

Executive Editor: Greg Perry

Contributions, Comments, Feedback: Got Some Comments? Ideas for articles? Please send your feedback and enquiries to

[info@anca.com](mailto:info@anca.com). *All contributions are welcome*

Know someone who would like their own copy of *The Sharp Edge*? Please advise us and we'll send them a copy.







## New products for a stable market

After achieving another record year in 2011, the market for tool and cutter grinders has stabilised with strong order intake in most of our markets. This is further exemplified by the strong enquiry rates at EMO last year and the more recent GrindTec exhibitions.

The launch of our new MX5 product along with RoboMate loaders has received very positive feedback. The MX5 product, which is targeted at a gap in our product portfolio in the production volume machines, will enable our customers to produce premium quality product in a more productive manner.

The release of ToolRoom 2012 software at GrindTec further enhances the flexibility of ANCA machines providing greater options in tool design software. ANCA also launched the new FastLoad compact loader for use in conjunction with our FastGrind machine which is aimed largely at the regrind market.

The release of these new products to the marketplace enables ANCA to provide greater flexibility and capability in our machines to aid our customers to improve quality and productivity.

ANCA continues to develop new products for the marketplace and it is expected that we will launch a new machine to extend our product range within the next few months. At the same time, we are continuing to develop new equipment for our machines, targeted at improving even more accurate production.

In November last year, the ANCA Group took 10% equity in Techni Waterjet, a global water jet and pump manufacturer with its headquarters located in Australia. The equity in Techni will continue to grow, and it is anticipated that Techni will become another division of the ANCA Group within the next five years.

Over the last 12 months, ANCA has continued to develop training programs aimed at improving the skill sets within the Group and throughout the world, with the ultimate aim of further improving our customer satisfaction.

I'd like to thank our global customers and suppliers for their continued support as we work together to achieve mutually beneficial outcomes.

Furthermore, I'd like to thank all employees within the ANCA Group for the significant progress in improving everything we do, everyday, as part of the ANCA way of doing business.

  
Grant Anderson  
Chief Executive Officer



ANCA has recently rebuilt the applications section of [www.anca.com](http://www.anca.com) to give you a lot more detail, pictures and videos.

For each major application group (e.g., production drill grinding, production endmill grinding, medical instruments etc.), we have significantly expanded the detail we provide, giving you insights into best practice techniques for each application.

For example, accuracy requirements on endmills are quite different to those for drills. For endmills, profile accuracy is vitally important so we detail machine features like the thermally-stable bi-symmetrical gantry of the MX and TX series; and options to help measure profile accuracy such as laser digitising.

But for long aspect ratio drills, lip to lip run-out is critical so we place special emphasis on tool support options such as the P-axis and Arobotech auto diameter compensating steady.

We show you how ANCA's solutions meet the specific needs of each application, which tool grinders in our range are best

suiting to each application and tool size, and how to tool up and operate your ANCA machine to maximize your productivity.

To visit our new applications section, go to [www.anca.com](http://www.anca.com) and press the applications menu button. Because there is so much new content, we've redesigned the navigation of this section so it's easy to digest it all in bite sized pieces without getting lost. Each application is represented by a sliding menu at the top left and right of the screen. The content for each application is divided into several major topics within each application. You'll see these as tabs across the top of the page, between the application icons.

As an example, the Production Endmill Grinding application is described in four major topics:

- Quick and Easy to Use
- Accurate
- Productive, Economical, Reliable
- ANCA's Renowned Flexibility

Within each topic, just click on the "+" sign in the detailed headings to drill down into topics that interest you. In there, you'll find lots of pictures and videos as well as plenty of detail about operating your ANCA machines and software to get the most out of them for your applications. ♦



Above: ANCA Applications Engineer Joon Lee checks out the new applications page.  
Left: The new apps page is quick and easy to use ... and accurate!





## ANCA Motion Unveils New Facility

The ANCA Group has formally opened their new ANCA Motion headquarters in Melbourne, Australia. The plaque was unveiled by Greg Combet, the Australian Minister for Industry and Innovation, and Pat Boland, the Chairman of ANCA.

ANCA Motion, a division of the ANCA Group, manufactures innovative motion control systems. Their computer-controlled systems form part of ANCA's market-leading tool and cutter grinders manufactured at a 14,000m<sup>2</sup> site located in the same industrial park as ANCA Machine Tools.

The ANCA Group CEO, Grant Anderson, told the attendees how ANCA was launched in 1974 by Pat Boland and Pat McCluskey, who today remain the owners of the ANCA Group. "The ANCA Group is a truly global company employing approximately 800 people worldwide," he said. As an example of ANCA's commitment to innovation, Anderson pointed out that the ANCA Group spends around 9% of sales on research and development each year.

Pat Boland congratulated David Fisher, ANCA Motion General Manager, and his team, on the opening of their new facilities in Australia. Seventy full-time staff work in the new building designing and manufacturing CNC solutions, servo drives, motors and associated equipment.

Greg Combet proposed to the crowd that "to be competitive we've got to be genuinely a highly skilled economy." He branded ANCA "a great success story" and commented that ANCA Motion had developed "much sought-after systems for computer controlled machinery."

Combet listed the ANCA Group's key export markets as Germany, Japan, China and the US, stating that "these are not

easy markets to market machine tools into." ANCA exports virtually its entire production with exports totalling \$800 million to date.

ANCA also has offices in the UK, Germany, Italy, Japan, China, Thailand, Brazil, India and the USA and a comprehensive global network of representatives and agents.

ANCA continues to make considerable investments in state-of-the-art factory equipment and R&D. The new ANCA Motion building represents the commitment of the ANCA Group to growth and continuous improvement.

Further information about ANCA Motion can be found at [www.ancamotion.com](http://www.ancamotion.com). ♦

Above: The proud ANCA Motion team in front of their new home.  
Below: L to R, ANCA Motion GM David Fisher, Minister Greg Combet, ANCA Director Pat McCluskey and ANCA Chairman Pat Boland.



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# Grinding Experts Go Medical

Tru-Edge Grinding, Inc. has prospered designing and grinding cutting tools for metal working applications. **By David Arnesen**

Recently, however, the St Henry, OH, company has been applying its grinding expertise to surgical cutting tools. What it knows about tool grinding translates well into the medical field, delivering excellent results for its customers in shorter than typical delivery times.

The growing company is now ISO:9001 and ISO:13485 certified to perform medical grinding work, grinding the cutting tools for surgical instruments, supporting tier 2 and 3 medical suppliers with its tool grinding expertise. Applying its grinding expertise to medical instruments gives the company an edge.

Having ground over 100 different surgical tools, the company now has about 10% of its work in medical. Earning the ISO certification will serve to strengthen its reputation in the industry and earn additional work.

Tim Knapke, owner/General Manager: "We do many different drills and reamers and we have developed a lot of special fixturing for our ANCA's that allow us to do a variety of medical work. Our grinding experience helped us to come up with efficient, time-saving ways of shaping the surgical tools."

Until a couple of years ago the surgical tools were produced by milling and turning and hand work because the geometries were so complex. But increasingly, the medical device manufacturers are looking to grinding to impart the geometry and finish required to the cutting tools, qualities that turning, milling, and handwork cannot match consistently.

"At Tru-Edge, we can put the material in the grinder and machine the tool complete in one set-up, no deburring required. Cycle times may be an hour per part due to the complexity of a part such as a bone rasp and the number of teeth in the part. But previously such a part would have required hours of cycle time across six processes from milling to turning, deburring, and polishing. We've taken hours out of the time required to produce a finished bone rasp," Tim said.

In order to do some of the more complex medical grinding work, the ANCA software has been key. One of the parts Tru-Edge has been successful with is a bone rasp—the kind of medical part that, if you can do it successfully, you can do just about anything else, Tim says.



Main image: Tru-Edge's medical machining centre.  
Top right: Tim Knapke with an ANCA MX7 machine.  
Below Right: An intricate medical instrument.

"I have to say, the ANCA iGrind Medical software within the ANCA ToolRoom suite is wonderful. We were a little skeptical at first; it seemed like it would be a stretch for the machine to make the demo bone rasp, but it came out perfect on the first attempt," Tim said. "It is a very complex part to produce on a grinding machine, as are other medical tools and implants."

"At times, the solid models of new medical parts we get from the customers are not always perfect and complete," said Frank Seger, Engineering Product and Development Manager. "Nevertheless, ANCA went off those models to create a test grinding program for the rasp that worked very well. With that demonstration, we decided to invest in an ANCA to do other similar types of parts," he said.

Of its 14 ANCA machines, Tru-Edge concentrates its medical production on the MX7 and TX7+. There are four machines dedicated to medical production with room on the floor for more as production increases at Tru-Edge.

The MX7 is optimised to grind tools up to 25 mm (1") diameter. "With a wheel pack changer storing six HSK wheel packs, we have the flexibility to handle the different batches of stainless steel material and to produce a number of different complex tools in a single set-up, saving a good deal of cycle time," Frank said.

The TX7+s are production-oriented machines with a 37 kW (49 HP) spindle for precision grinding tough material. All machines in the Tru-Edge shop operate with the same software and any

can run the medical part programs. The TX7+ can also hold a Big Plus milling toolholder, so Tru-Edge could add that capability.

The medical tools are usually of 17-4 stainless, and "we have learned a lot about stainless steel in the last few years," Frank said. "It was a steep learning curve. Depending on the stainless material we are working with, vitrified CBN or standard CBN may be the best wheel. So it's a bit of a process to get the right wheels for a particular batch of stainless steel."

## ANCA options make a difference

Certain options for the ANCA machines make them ideal for medical applications, assuring highly consistent grinding results. First, ANCA's in-process wheel dressing.

"We will never buy another machine without in-process dressing," Tim said, "due to the accuracy it affords our process. Part programs are based on a data point in the work area. In-process dressing allows the machine to know where the wheel surfaces are in relation to the data point and thus to the part at all times. The wheel imparts the form to the tool, and automatic dressing cycles maintain its form consistently."

Grinding cycle times are also improved. By automating the stick dressing, downtime during production is reduced, permitting unattended production runs as wheel condition is maintained during the batch. Dressed wheels also permit high consistent feed rates.

And importantly for stainless steel grinding, regular dressing of grinding wheels reduces tool burn and material damage, as well as ensuring open cutting wheels that reduce grinding forces and minimise spindle load.

ANCA's software, known for its flexibility and user-friendliness, fully supports the white stick dressing process, ensuring the least amount of wheel material is removed.

Another option for medical tools, which can be very long and narrow, is the ANCA P-axis.

"With ANCA's P-axis working with the grinding wheel and steady rest, which holds the part straight, we are able to grind these long reamer-type parts successfully," Tim said. "We will not buy a machine without it. It was out of the box perfect. Many of the medical cutting tools are complex and therefore difficult to hold in some cases, but the P-axis eliminates that concern."

The ANCA travelling steady provides the machine with an additional axis (P-axis) which, under CNC control, keeps the tool support directly underneath the point of grinding at all times. Keeping support under the wheel means complex operations on long slender tools is reliable and consistent.

"A conventional stationary support steady provides adequate support on a short tool, but when you are manufacturing tools such as drills up to lengths of 400 mm long, a stationary support will not provide the continual support along the entire length of the tool," Frank said.

The predictable, high quality of the medical grinding process at Tru-Edge is its overall key advantage. Tim Knapke: "One of the first comments we got from our first medical tool customer when they saw the first part was 'This thing dimensionally is flawless.' That's where the ANCA's have simply shined." ♦

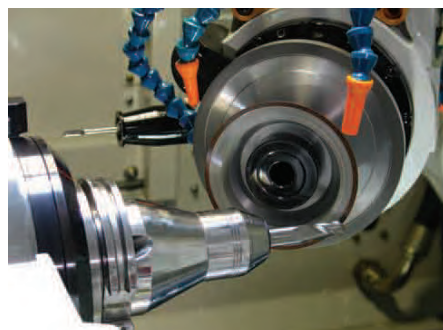
# Pegler's Pride

UK company Pegler Yorkshire recently acquired an ANCA FastGrind machine and has found it a perfect fit for what they needed.

Pegler Yorkshire is one of the world's leading manufacturers of plumbing, heating and engineering products. Originally trading as Pegler Ltd and Yorkshire Fittings Ltd, the well-known company was established in the 1890s and has grown to become a leader within its field. Now exporting to more than 110 countries worldwide, Pegler Yorkshire's success has been achieved through a steadfast commitment to high quality standards and continuous investment in product innovation. These guiding principles have established Pegler Yorkshire's global reputation, and resulted in an extensive product portfolio that continues to achieve outstanding global sales.

The growing demand for Pegler Yorkshire's valves, taps, mixers, showers, fittings and heating products, recently underlined the need to source an efficient tool and cutter grinder to replace an older, less proficient machine at the company's Doncaster headquarters. Having considered several alternative machines, a decision was made to purchase the recently launched FastGrind tool and cutter grinder from ANCA UK.

Richard Grimes, Production Engineering Manager Pegler Yorkshire, explains. "As we manufacture thousands of high-quality brass fittings, taps and valves each week, we have a requirement to produce and re-sharpen our own hardened steel tooling in-house; these tools are fitted with Widia carbide inserts."



"Our previously used tool and cutter grinder had given us sterling service, and remained capable of delivering adequate levels of accuracy and surface finish. In line with the company's policy of continuous improvement and in order to keep pace with the growing demand for our products, we recently investigated the available tool and cutter grinders that were relevant to our needs."

"Having explained our demanding list of criteria to ANCA UK, it was suggested that the company's recently launched, highly-productive FastGrind machine best met our exacting requirements."

"Although I was aware of the excellent reputation of ANCA's renowned RX7 tool and cutter grinder, I felt that this machine exceeded our needs and would not be the most prudent use of our budget. I was delighted when I was told that the keenly priced FastGrind was built on the proven platform of the RX7, and would deliver the same levels of repeatable precision for which the larger machine is well-known." In fact, the only

"The FastGrind's software has proven so logical and intuitive that our operators began writing their own programs within days of the machine's installation."



significant difference between the two machines is their available spindle power and visual appearance.

"Following an impressive demonstration, ANCA proved-off a set of tools according to our required accuracy and quality specifications. After placing the machine order, we have received excellent levels of service, support and training from ANCA UK. The FastGrind's software has proven so logical and intuitive that our operators began writing their own programs within days of the machine's installation."

"Now in constant use, the speedy nature of our new ANCA is enabling it to keep pace with our high workload and is delivering the kind of accuracy and surface finish that we require. Given the cost-effective price of the FastGrind, we are anticipating a rapid return on our investment."

Illustrating the comprehensive nature of the ANCA FastGrind package, the new grinder includes all of ANCA's innovations such as direct-drive technology, polymer concrete base, MPG



feed and Cim3D. Most importantly, ANCA's ToolRoom® suite allows users unlimited access to a full range of user-friendly yet powerful tool and cutter grinding software applications.

By removing unnecessary high-production orientated options, such as auto loading and automated clamping, ANCA has been able to substantially reduce build costs and deliver the most affordable, high-quality ANCA CNC tool and cutter grinder to date. The elimination of superfluous accessories has allowed the new FastGrind machine to meet the specific requirements of resharpening or small-batch manufacturing, and to deliver a sector-leading price/performance ratio.

ANCA's FastGrind's appeal is not only limited to first time or small-scale CNC users. As interrupting high-volume machines' production runs for small batch work or for one-off tasks can prove costly, many large tool producers have already invested in ANCA's new FastGrind and see it as an additional resource for producing special tooling or for small quantity jobs. Larger machine shops and manufacturing companies who experience high tool consumption have also been able to realise significant cost saving by using ANCA's FastGrind to provide a practical, in-house resharpening resource. ♦

Main image: ANCA's FastGrind tool and cutter grinder, which has Pegler anticipating a rapid return on their investment.

Far left: The FastGrind in action.

Above: Being based on the RX7 machine, the FastGrind takes advantage of ANCA's double-ended spindle design.





## Loading Faster

The innovative new FastLoad loader is bringing low-cost automation to the FastGrind economic tool and cutter grinder.

ANCA has released a low-cost automation solution to further enhance the immensely popular FastGrind machine. The FastLoad loader has been optimised for the highest volume diameters and lengths, which is ideal for both manufacture and regrind applications. Following very successful demonstrations at several trade shows, the FastLoad is now available as a very affordable option for all new FastGrind and RX7/GX7 machines and can even be retrofitted to existing machines.

The loader is completely contained within the machine canopy and uses the existing machine axes for pallet movement and tool loading, which means there is no increase in the machine footprint and no extra axes required.



Main image: FastLoad is completely contained within the machine so there is no increase in overall machine footprint.

Above: Operators load and unload pallets via an access door in the machine canopy.

It has a diameter range of 2-20 mm, tool length range from 30-150 mm, capacity of up to 245 tools and a load cycle time less than 20 seconds. Gripper fingers do not need to be changed between batches, further maximising productivity levels.

The pallet is attached to the side of the Z-axis saddle and a retracting arm is installed on the machine column. The arm swings down into place to load and unload the blanks and tools, then retracts to an upright position during the grinding process. The operator is able to access the loader through a door in the side of the machine canopy. In addition, the first tools of a batch are accessible through the machine operator door.

In today's demanding production environment fast tooling turnaround is essential. The FastLoad is both quick and easy to set up, further assisting in the streamlining of processes. The pallet layout is simple and is divided into just two sections. One section for blanks (pick-up) and the other for finished tools (store).

The pick-up and store sequence operates from the outside to the inside of the pallet. The first tools ground in the batch are stored within reach of the machine operator's door, enabling the operator to easily remove and check them for accuracy without having to use the loader access door.

ANCA has created an outstanding software package to accompany the loader. LoaderMate easily controls parameters such as tool pick-up height or collet insertion length and is flexible enough to accommodate multiple tool types within a pallet.

Separate iGrind grinding files (tool groups) can be associated with every different tool type within a pallet, facilitating the inclusion of different tool types and operations within the one pallet. An added feature is collet loading which accommodates variable diameter tools by loading the collet sleeve and tool together into the collet adaptor.

Contact your local ANCA agent to find out more about the latest developments in automation or to see the FastLoad in action. ♦

## All Good Measures



ANCA's new Auto Qualification Wheel Probe is increasing productivity levels by removing the need to qualify wheel packs off the machine.

For any operator who wants to grind a precision cutting tool there are many elements to consider during the set-up process, but one of the most critical is to accurately measure the grinding wheel. If the grinding wheel is not measured precisely then any errors will inevitably transpose onto the tool resulting in a loss of accuracy, productivity and potentially scrapped tools.

The Auto Qualification Wheel Probe (AQWP) offers enormous benefits to the user by removing the need to manually qualify the wheel pack outside the machine. It also eliminates the need to purchase external presetters or wheel measurement equipment. The AQWP will increase productivity by reducing first tool rejections and enhance the grinding machine to provide its customers with the capability for "the right tool first time".

ANCA understands the importance of grinding wheel accuracy and took all these considerations into account when designing the AQWP for measuring wheels inside the machine.

The AQWP is available on the TX and MX machine platforms for machines installed with ToolRoom® 2012. The software enables the operator to choose what aspects of the wheel pack to qualify. The AQWP uses a Renishaw probe unit, which ensures accurate measurements.

The AQWP is re-qualified before each wheel measurement cycle using the qualification block to maintain repeatability.

Main image: The AQWP saves time and money by qualifying the wheel on the grinding machine.

Right: The TX7+ probe retracts to a vertical position during grinding.



One of the main advantages of the AQWP is the repeatability and consistency of the qualification process as it removes human intervention. Also, the operator is free to conduct other operations as the grinding wheels are automatically measured thus reducing set-up time.

AQWP is accurate to 10 microns and repeatable to 5 microns and will qualify front and back surface locations, wheel diameter and toroid radius. By digitising several points around the wheel, the system is able to calculate and display the magnitude of any run-out. The operator can then decide if wheel dressing is required.

The AQWP will measure wheels from 50 mm (2") up to 300 mm (12") diameter and supports measurement of wheel types shapes 1A1, 1V1, 11V9 and 1F1. A standard wheel pack of three wheels can be measured in approximately 90 seconds (including probe qualification) prior to batch grinding.

Further information can be found on the ANCA website [www.anca.com/AutomaticWheelMeasurement](http://www.anca.com/AutomaticWheelMeasurement). ♦



# The Collet Revolution

A new system of loading and unloading Schunk collets has been developed for ANCA's innovative RoboMate loader, reducing the need for operators to intervene in the grinding process when grinding mixed-diameter batches. By **Andrew Ritchie**.

RoboMate is ANCA's most significant loader automation system released to date. Uniquely, the robot loader is standardised and can be used on the GX7, MX7 and TX7+ CNC tool grinders. RoboMate will increase output with full robot automation and will also reduce operator training requirements with its commonality across the ANCA range. An operator will only need to be trained just once to use the loader on any number of machines.

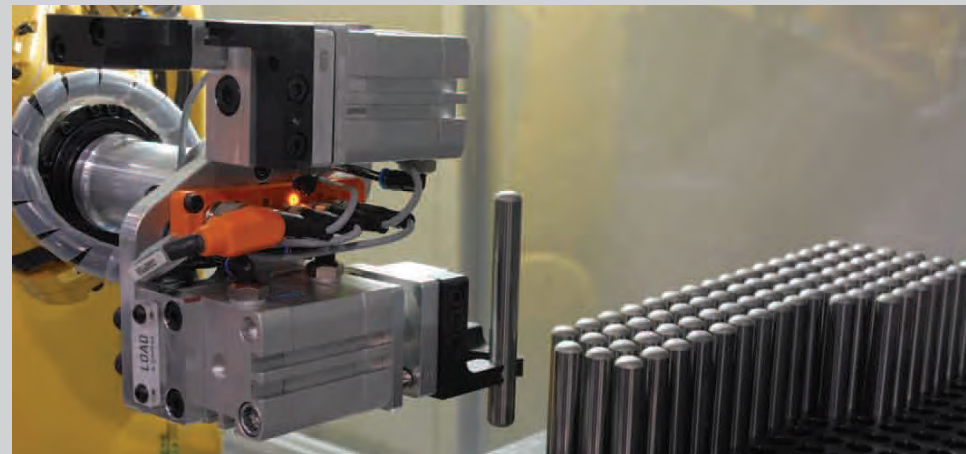
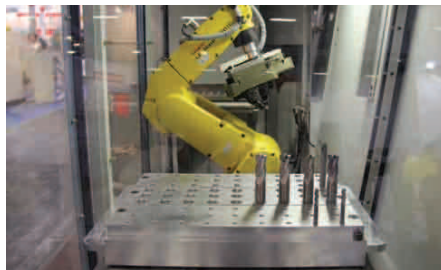
RoboMate is available as a two or four pallet option with exactly the same footprint size. Most importantly, the pallets provide many hours of unattended machine operation. In addition, the pallets and tooling are interchangeable so further savings can be made in the number of parts required if multiple ANCA machines are owned. Commonality also ensures that spares are readily available when required.

The RoboMate Loader uses a Fanuc LR Mate 200iC robot. These robots are used for their proven reliability and flexibility. They are fully integrated into the CNC machine and are programmable by the ANCA RoboMate software. The software controls loading parameters such as tool pick-up height or collet insertion depth. The RoboMate software is flexible enough to allow multiple tool types within the one pallet, facilitated via a separate iGrind grinding file for each tool type within a pallet.

An option on the RoboMate Loader is the new ANCA collet

changer. This changer is ideal for tool resharpener and assists impressively in matching the productivity levels enjoyed by tool manufacturers via automation. The system has been designed to improve the efficiency of those businesses that produce smaller batch runs and mixed diameters.

The collet changer system is available with either a single-head or double-head gripper for increased production. Tools from Ø4 mm to Ø26 mm (Ø3/16" to Ø1") with a head diameter of up to 50 mm, or Schunk collets of either Ø20 mm or Ø32 mm, can be loaded with a cycle time of just 20 seconds. Tools of up to 1 kg mass can be loaded with the single-head gripper and up to 0.5 kg on the double-head gripper.



When a change in shank diameter for the next tool is due, the robot will automatically remove the current collet from the collet adaptor and replace it with the appropriate diameter collet. This dramatically reduces the need for operator intervention, resulting in increased productivity and a reduction in operation costs.

The Schunk collets are stored in strips located near the pallet bases, with storage for up to 12 collets (six Ø20 mm and six Ø32 mm), which makes for quick collet changeover into the collet adaptor to enable tool loading. Alternatively, you can load the tool straight into a variable-diameter tool holder.

The versatile multi-function gripper enables the RoboMate to switch easily between collet loading and tool loading without the gripper fingers being changed. Both are handled with the one gripper set without protruding below the tool gripper fingers and sacrificing pick-up height above the pallet.

Also, rather than using the traditional solid pallet top, the RoboMate system consists of three independent strips, which can be set up for different diameters. Up to 81 tools can be loaded from a single pallet. As the pitch between the tool centres is the same, you won't need to re-teach the robot for each mixed batch run; it will already know where the tools will be. ♦

“The system has been designed to improve the efficiency of those businesses that produce smaller batch runs and mixed diameters.”

Main image: The pallet tops consists of three strips that cater for three different diameters of tool.

Below left: The collet changing system slots into a standard RoboMate loader.

Above: A standard RoboMate showing the difference in gripper arrangements from the collet changing system.

Below: The Fanuc LR Mate 200iC robot that is the heart of RoboMate.





# Tap into the TXcell advantage

ANCA TX7+ Product Line Manager **Duncan Thompson** examines the attributes of the new TXcell tap grinding set-up and how it is changing the industry.



Single set-up tap grinding was a seemingly distant aspiration for tap manufacturers that became a reality when ANCA introduced its TapX in 2004. ANCA is now taking this capability to the next level with tap grinding on its new TXcell machine that offers greater versatility, accuracy and perhaps most importantly reduces factory waste.

The challenges of tap grinding are well known to those already in the industry. Traditionally, different features on taps have been ground on separate machines in a sequential production line. First flute, then gun point gash, chamfer, thread and finally OD crest; these separate operations could require two, three or even more separate machines, each of which requires its own:

- capital outlay
- factory floor space
- utilities and services
- maintenance
- skilled operators

Each of these machines will inevitably require material stock to be kept in waiting before it actually progresses to the next operation – this increases your material and stock holding, tying up more of your valuable cash. Then at the end, you will accept keeping stock of finished taps to minimise the pain of changing machine set-ups from one tap to the next.

Grinding taps in a single set-up tackles each of these issues. Combined capital outlay and floor space requirements

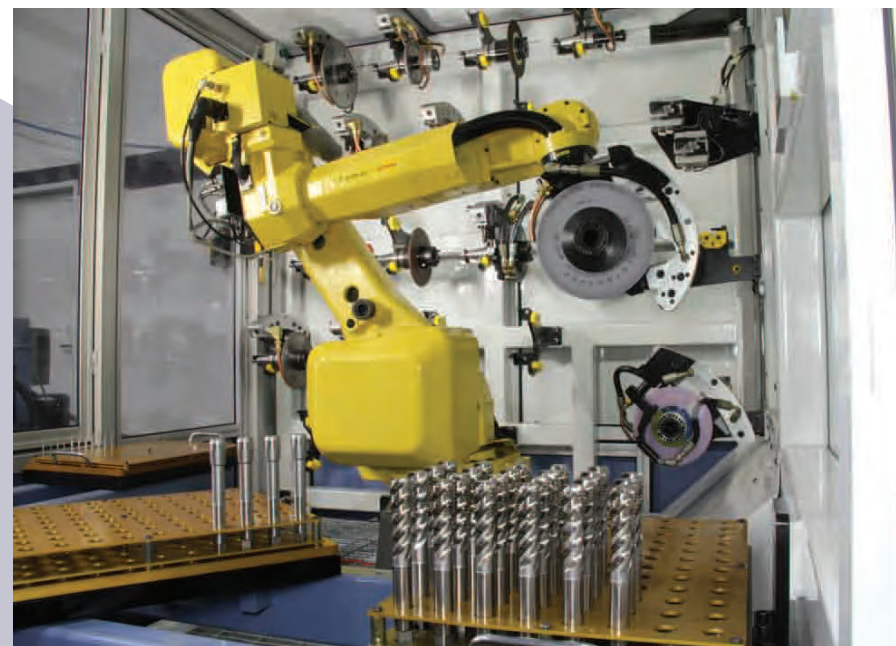
are reduced, so too are utilities and services (electricity, compressed air, grinding oil). Maintenance and operator requirements are simplified as only one machine from one supplier needs to be catered for.

This contrasts with operators and maintenance staff having to learn multiple different machines, each with their own special needs and requirements. Finally, single set-up grinding means batch sizes can be reduced and turned around more quickly, allowing you to reduce your finished tool stock levels, while still meeting the demands of your most impatient customers!

While TapX was quickly recognised by those in industry as a unique solution to a number of long standing problems, ANCA has not been resting on its laurels. The TXcell presented itself as the perfect machine configuration to further extend its single set-up tap grinding solution.

In particular, TXcell for tap grinding targets the pet hate of every factory plant manager: waste. Machine set-up and non-productive time is as a key area of waste that saps your factories productivity and flexibility. TXcell addresses this by having anywhere from nine to 24 wheel packs instantly on hand that are automatically changed by the integrated Fanuc Mi20A robot. This delivers a number of key improvements.

- Wheel packs can be set up with just one wheel per arbor. This dramatically simplifies and shortens the machine set-up time by virtually eliminating interference between work piece and secondary grinding wheels that might otherwise be mounted on the same wheel arbor.
- With one grinding wheel per arbor, wheels need be dressed only as and when required. This eliminates cycle time and wheel waste that comes with unnecessary dressing cycles that might have been necessary if two wheels were mounted on a single arbor.
- For each different tool type or size that requires different fluting or threading wheels, multiple wheel sets can be kept at the ready. This opens up the possibility of not only zero downtime between batches of tools, but also you can now grind mixed batches of different tools without stopping the machine in-between.



“... single set-up grinding means batch sizes can be reduced and turned around more quickly ...”

For the ever important thread grinding cycle, wheel changing capability now means you can truly optimise your grinding operation with rough and finish grinding wheels. Traditional thread grinders would be limited to one grinding wheel that was not optimally suited to either rough or finish grinding. Consequently, compromises either had to be made on tool quality or cycle time.

With grinding wheels up to 300 mm (12”) diameter and specially designed auto adjusting coolant nozzles that follow the wheel diameter as it is dressed, the TXcell can be set with individual rough and finish grinding wheels that are truly optimised to the required thread grinding conditions.

With various options and accessories available, ANCA TXcell offers the complete package of tools and accessories you would expect of a self-contained tap grinding cell. Not only are these necessary for practical day-to-day use of the machine, but also specifically help maximise machine operating time.

Automatic tool loading for tools up to 32 mm (1-1/4”) shank diameter comes standard with the TXcell, with the option for two or four pallets. Clever design incorporates tool grippers into the same robot head that is used to change wheel packs.

ANCA also offers the industry's most comprehensive tap grinding software package. iTap offers complete flexibility

Above: With the ability to change both the wheel packs and the tools, the ANCA TXcell offers new levels of productivity and economy to tap-grinding businesses.

Far left: The compact TXcell has a reduced footprint, which means less space is taken up on the factory floor.

to create standard or unique tap geometries. iFlute is used to ensure wheel form delivers exactly the correct flute form; and finally, CIMulator3D combines the two to confirm final geometry is completely tested and verified off line, before you even grind the first tool, dramatically reducing machine down time during set-up.

ANCA can also offer the iProbe TRM - on machine thread measurement and OD relief profile. This means the finer details of tool geometry are confirmed before you press the 'go' button on a whole batch of tools, minimising potential scrap. For this task, you would normally be using an expensive, dedicated measurement machine that might well be located in a location away from the grinder itself.

iProbe TRM is a simple yet elegant solution that fits directly on the grinder, and while it measures with the same accuracy as a dedicated measurement machine, is offered at a fraction of the cost.

TXcell machine and its dedicated tap grinding accessories, mean flexible tap manufacture in small or large batches is now a reality. All this without the anticipated traditional downtime and waste that comes with machine set-up in between batches. ANCA offers you a truly flexible and complete tap manufacturing cell. ♦



# Filtering the Good Oil

On the eve of IMTS, filtration system manufacturer Ebbco introduces us to their new Evolution Series systems.



Since 1983 Ebbco Inc. has been a full design/build manufacturer of filtration system and vessels with a focus on the metalworking industries.

Ebbco offers a complete line of filtration equipment for precision machining, grinding, waterjet and EDM applications. Ebbco systems are custom designed to meet OEM manufacturers' specifications.

The Ebbco precision machining filtration systems are designed to eliminate particulate build up in the machine tool, increase fluid life, maintain a consistent part finish and reduce part rejections. The internal filter cartridges are designed for the removal of carbide, stainless, HSS, ceramics, PCD, diamond and other materials down to 0.5 micron.

Ebbco's precision machining filtration systems are custom designed for each application, with flow rates ranging up to 120 gpm (460 lpm).

Standard systems consist of a bag pre-filter system with an optional magnetic roll pre-filter for high-speed steel and other magnetic material applications, heavy-duty filter cartridge housings containing up to eight micron-rated filter cartridges each, an inline or cabinet-mount chiller to maintain a consistent fluid temperature and optional machine feed pumps.

The Ebbco Evolution Series filtration systems can be designed to handle one or multiple machines, always providing the best filtration possible.

At IMTS 2012 Ebbco is pleased to release the Evomatic, a new backwash filtration system. The Ebbco Evomatic Automatic Backwashing Filtration System is designed for coolant or oil applications, cutting materials such as high-speed steel, carbide, ceramics, PCD and much more.

The Evomatic Filtration System conditions coolants down to 5 micron or oils down to 0.5 micron while maintaining a constant set temperature to avoid thermal distortion.

This system is designed to keep particulate from building up in the machine tool, increase fluid life, maintain a consistent part finish and reduce part rejection. The Evomatic Series filtration system is capable of providing flow rates up to 120 gpm.

For more information please contact:

Ebbco direct at 586-716-5151, email: [info@ebbcinc.com](mailto:info@ebbcinc.com)

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- 25 to 120 GPM Flow Rates of Clean Chilled Fluid
- Chillers Available from 24,000 to 180,000 BTU Ratings
- Filtration Down to 1/2 Micron
- Optional Magnetic Separator Prefilter for Steel Applications

Defense
PCD

Power Generation
Stainless Steel

Industrial Machining
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High Volume Production
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**Ebbco Inc. manufactures complete line of filtration systems which range in flow from servicing one machine to multiple machines. These systems can be integrated with new machine orders or retrofitted in the field to an existing machine.**

*Let us make it perfectly clear .*

For More Information please contact:

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Tele: (586) 716-5151 Fax: (586) 716-4949  
web: [www.ebbcoinc.com](http://www.ebbcoinc.com)  
email: [info@ebbcinc.com](mailto:info@ebbcinc.com)



# MX5

## A Machine with Performance

After identifying a need for a mid-range tool and cutter grinder that delivered an excellent ratio between economy and capability, ANCA developed the MX5. MX Product Manager **Simon Richardson** explains how it was done.

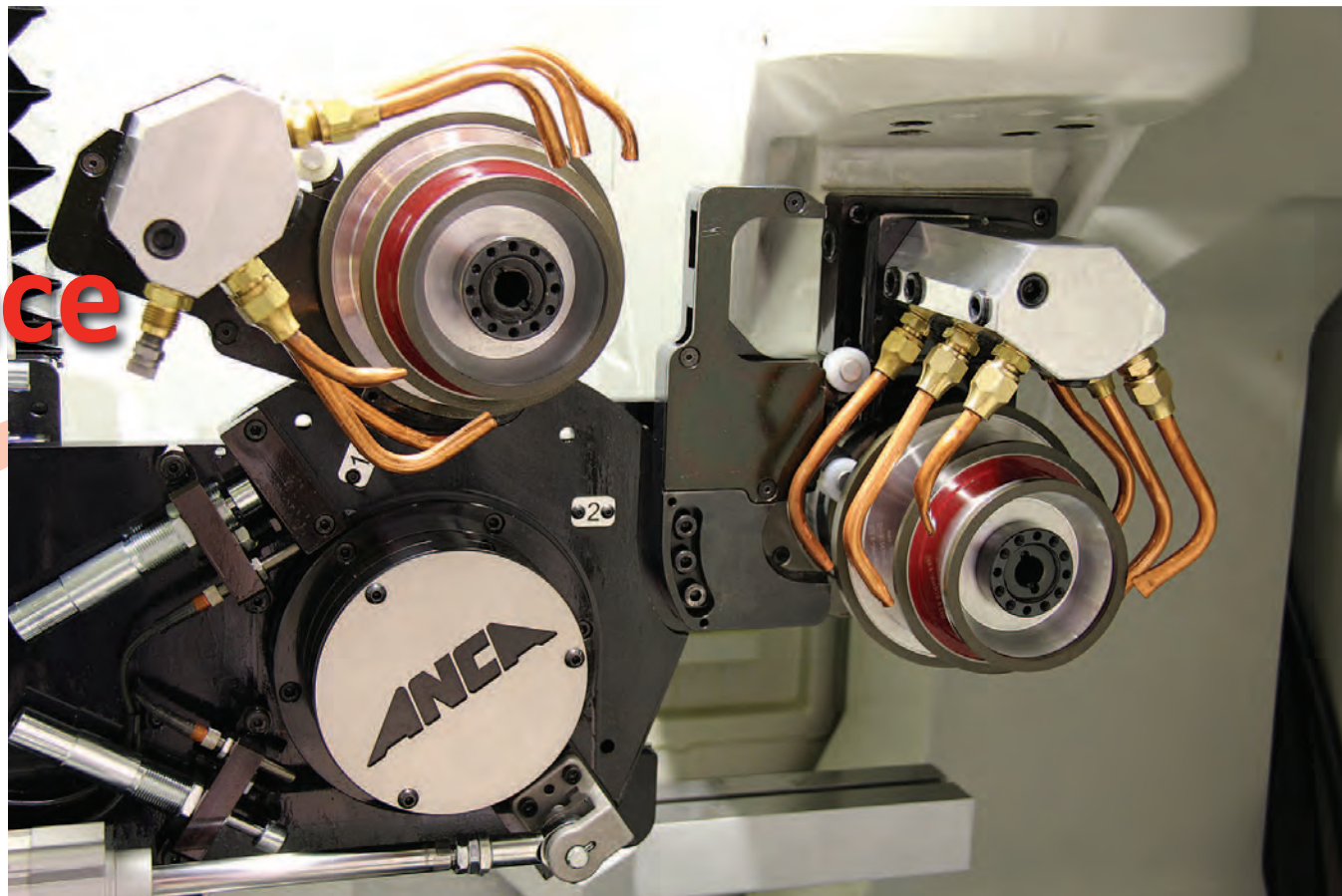
After the successful launch of the MX7 CNC tool grinding machine into the marketplace, ANCA started to review the replacement for the RX7 machine. It was decided any new machine was to be targeted towards grinding carbide tools in large volumes whilst retaining a compact footprint.

The machine would have to be able to grind tools up to 20 mm ( $\frac{3}{4}$ " diameter and be competitively priced. From this set of criteria the MX5 was born. Once the concept was created the ANCA MX Product Manager gathered the necessary industry information to ensure the MX5 would reach its target customers.

In today's marketplace, price and performance are two of the key requirements from customers producing carbide cutting tools and this was at the forefront of ANCA's thoughts when designing the MX5.

The MX5 CNC tool and cutter grinder was developed after customer and market feedback identified a need for a more economical machine that also had an increased level of stability and accuracy.

The MX5 is targeted at volume endmill producers, but also has the flexibility to easily manufacture mixed batches. The starting point and consideration of any CNC grinding machine is the rigidity of the base. ANCA decided to use the same base for the MX5 as is used on the MX7. This base is a precision construction made from polymer concrete, which offers greater vibration-resistance and thermal dampening properties, resulting in the highly-accurate finish desired in carbide cutting tools.



A major contributor to accurate tool grinding is the precise positioning and repeatability of the grinding wheel. In the MX series the grinding wheel and spindle are supported in the machine by a huge casting ANCA calls the bi-symmetrical gantry. Evenly straddling the tool centre line, the gantry minimises the effects of thermal growth and provides the rigidity required for producing accurate tools consistently.

The design also enables the grinding wheel to remain very close to the C-axis pivot point. This configuration produces the highest levels of profile accuracy for tools requiring substantial 5-axis movements, such as corner radius or ballnose endmills.

ANCA used this proven system in both the MX and TX series, which are traditionally priced at the premium end of our range. ANCA's challenge was to find a way to reduce cost to enable this particular design of tool grinder to be available to a wider market.

This needed to be done in a way that did not impact on stability and that maintained the features that were seen as required by customers.

Main image: ANCA's research showed there was a significant market that required only two wheel stations on the changer instead of the six on the MX7.

Left: The MX5 was built on the same base as the successful MX7.

Far left: A top clamp is one of several options available on the MX5.

### Wheel changer

ANCA achieved this by conducting research that determined a certain target market only required a two-station wheel changer, for loading wheel packs into the machine instead of the six-station type on the MX7.

The two-station wheel changer can accept wheels up to 200 mm (8") diameter and works with the same HSK50F wheel arbors that are used on the MX7. The loading time has been kept to a minimum of 10 seconds, ensuring productivity is maintained. The simplified design of the two-station wheel changer also gives the operator a better view inside the machine and the tool-grinding area.







“ANCA’s challenge was to find a way to reduce cost to enable this particular design of tool grinder to be available to a wider market.”

### Spindle

The MX5 has a permanent magnet spindle with a peak power of 26 kW (34.8 HP). This spindle has enormous power and is ideal for carbide grinding as it delivers higher torque at lower RPM.

The MX5 also retains the Q-axis on the spindle, where wheel packs are changed using orientation synchronisation, a clever technique requiring precise control of the spindle position. This ensures the wheel pack’s arbor mates with the spindle taper at exactly the same orientation every time.

This minimises potential run-out variations that can result from mating the surfaces at arbitrary angles with each load, therefore reducing the need for you to re-qualify after wheel pack loads.

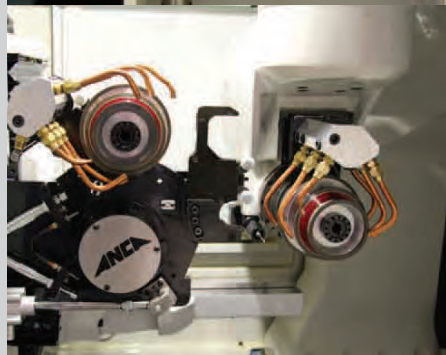
The MX5 machine has had several modifications and improvements to the canopy which include a wider opening for the operator door. This offers the user better ergonomics, space and easier access inside the machine for the operator during the set-up process.

Accurate tool support is critical when producing endmills to maintain low run-out. The MX5 comes with a wide variety of options and accessories including a pop-up steady and over the top clamp to ensure the tool is held accurately when grinding. To cater for customers who want to produce large batches of carbide cutting tools, the MX5 can also be fitted with RoboMate robot loader for automated production.

With the MX5 machine ANCA has found a way to manufacture a more economical machine that will meet the needs of a large segment of the tool grinding market, including volume end mill producers.

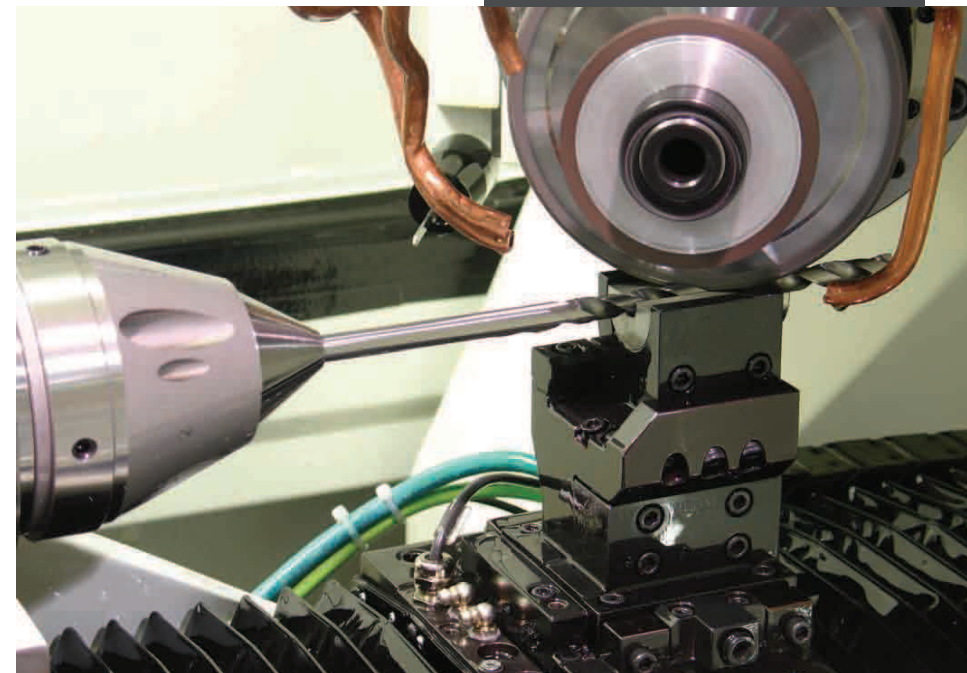
By listening to the market’s needs, ANCA has provided the features that are important to our customers and enabled them to manufacture tools that will have minimum of rejects and to work to tighter tolerances. Customers can therefore demand higher prices and increase their profit.

ANCA has also provided a machine that is powerful and flexible enough to allow our customers to manufacture a wide range of tools on a more cost effective machine, improving their price/performance ratio. ♦



Top: The MX5 is the first ANCA grinder to be fitted with the new style of operator’s console.

Above: The two-station wheel changer retracts after loading so the operator has a clear view of the grinding process.



## ANCA P-axis: the Versatile Option

Installing a P-axis on your tool and cutter grinder can open new markets for highly-accurate long-length tools. But with four options available, which one is the right one for your business? MX Product Manager **Simon Richardson** explores the possibilities.

Over the last four years there has been increasing demand for longer cutting tools with challenging tolerances. The stronger demand has particularly come from the automotive industry. ANCA responded to this demand in 2007 by introducing on to the TX7+ and MX7 machines the CNC traveling steady rest (P-axis) which is a very rigid and accurate piece of tooling.

The P-axis can be easily programmed to travel with the grind point thus providing optimal support during grinding.

For long drills with a high aspect ratio (length : diameter) conventional stationary support is insufficient. The P-axis gives plenty of support during grinding to prevent flexing and chatter. During the grinding process, vibration can cause excessive wheel wear, chatter marks and poor surface finish. The P-axis will eliminate these problems by ensuring rigid tool support. The TX7+ and MX7 machines both have the option to use a P-axis for supporting long tools.

ANCA customers are always looking for increased output from production. The rigidity of the ANCA machine and P-axis assembly allows the operator to increase fluting feed rates for greater productivity. This greater productivity is invaluable for ANCA customers.

The main function of the P-axis is to provide a CNC traveling steady rest which supports the tool at the maximum load point during fluting operations. This load point is directly below the contact point of the grinding wheel. As a result, the wheel moves along the tool during flute grinding and the steady support under (CNC control) moves in-situ maintaining optimum tool support. The P-axis can also provide support for end face grinding as the steady can be positioned at the end of the tool.

Four variations of P-axes are available on the TX7+ and MX7 machines which all use the same fundamental drive, machine mount system and hydraulic actuation. The only difference being the method of support when grinding. The P-axis variants are bush holder, Arobotech hydraulic steady, programmable force tailstock and programmable NC steady. All variants offer different methods of tool support dependent on the grinding application.

Above: The bush-type traveling steady exposes the top 55% of the tool needed for grinding.





**“This unique tool holding design maintains accuracy, rigidity and true running.”**

Left: The Arobotech traveling steady uses high precision support pads to hold the tool on three points using line contact.

Each of these options is completely interchangeable and a customer can select to purchase a P-axis with any of the four variants.

Customers need flexibility and reduced set-up time for grinding machines in production. With the P-axis the changeover time from bush to Arobotech systems is under one hour for a tool with a flute length of 400 mm (dependent on tool holding and wheel diameter). The P-axis system can accept tools between the diameters of 2 and 26 mm and has the added benefit of programming a safe park position when the operator wants to grind shorter tools (when long tool support is not required). The bushes, bush holders and Arobotech wear pads are interchangeable between the TX7+ and MX7 machines.

### Arobotech traveling steady

Most drills are ground with a back taper to ensure the diameter has clearance when drilling to reduce heat and friction while the tool is engaged in the material. Drills with back taper do not pose a problem for the P-axis with an Arobotech. The Arobotech steady has the advantage to accurately support tools with reducing diameters as it auto-adjusts to centre the support as the diameter changes.

The Arobotech uses high precision ground support pads to hold the tools on three points using line contact. These accurate carbide pads hold the tool on each side and below the drill during grinding, and can cover a large range of different size tools (1 mm-26.5 mm) (0.039"-1").

This unique tool holding design maintains accuracy, rigidity and true running. The iGrind software controls the Arobotech unit when adjusting the hydraulic clamp pressure for the pads to give the tool optimal support when grinding.

### Bush-type traveling steady

The bush support version uses a circular bush to encapsulate the tool during grinding and is ideal for fixed diameter applications and a wide range of tools. The bush is open at the top which exposes the 55% of the tool needed for grinding wheel access. The bush system will offer elongated support for long tools during fluting operations when the grinding forces are at their highest. The bush system is very easy to set up and change between different tool types.

The bush-type P-axis also has the added capability of mounting a centre and being used as a tailstock. This offers the customer the added ability to cylindrically grind tools (such as reamers) between centres to tight tolerances.

### TX7+, MX7 and TapX Tailstock

ANCA offers other different methods of P-axis tool holding for many varied applications.

The TapX machine is used for the production of a wide variety of taps. ANCA conducted detailed research and consulted with tap manufacturers when designing the TapX tailstock.

When grinding taps a tailstock is essential for accurate positioning. Alignment is required for the TapX P-axis tailstock but this does not solely rely on mechanical positioning. To ensure consistent tailstock alignment the majority of settings are controlled by the software.

The operator has several easy methods of programming the tailstock force using the iGrind user interface. Programming the force is flexible and easy for different tap sizes. The force for the tailstock can be specified using kilograms, pounds, or newtons. Using the iGrind software, the operator has complete flexibility

and can apply different forces over all operations or individually.

When grinding taps with a centre, wheel clearance is critical for operations such as threading and spiral gash. During these operations the grinding wheel is in close proximity to the centre and can be ground away.

To manage this concern, the tailstock and centres have been designed to maximise the grinding clearance. Different size male and female centres (dependent on the application) can be used to achieve the desired clearance and all centres used with the tailstock are interchangeable.

### Future development of the Programmable NC Steady

In today's production environment customers have smaller batch sizes and shorter lead times. This means customers require reduced set-up times to remain competitive. For shorter tools which require support on a small section of the tool the Arobotech may not be suitable.

Changing from one tool size to the next manually can be a time-consuming process. When using a standard pop-up steady the operator initially has to manually set the height of the steady. This setting process relies on the experience and "feel" of the operator.

To alleviate this problem ANCA is developing and will introduce in the near future the programmable NC Steady. The primary benefit of the NC steady is the height for the tool diameter can be set without operator intervention. The NC Steady is an automatic tool support system that is fixed in position along the tool axis. The height of the V-shoe and tool is accurately set in the vertical position using a hydraulic cylinder. During the setting process the top face of the tool is probed and positioned against a fixed surface (datum block). Once the tool

is positioned underneath the datum block, the steady extends upwards pushing against the tool and stops at the height that suits the tool diameter.

The steady (which includes a height setting cylinder) then locks into position at the desired height position. The height setting cylinder shaft is hydraulically clamped and acts as an end-stop for the vertical position of the steady.

The NC steady can be used with blanks and pre-fluted tools. The NC steady can be set at different height positions depending on the section of tool being supported and can be set at different P-axis positions along the tool. This capability is useful for stepped tools or if there is a variation of diameters between tool groups (tool types) in batch grinding.

The operator has complete flexibility to adjust the NC steady in the Y-axis, yaw position (around the Z-axis) and for back taper. The amount of tool deflection (height adjustment) can also be specified by the operator. The NC steady is repeatable to 0.005 mm and accurate to 0.005 mm. The diameter range of the NC steady is 1-32 mm/0.039 -1.259" (TX7+) & 1-25.4 mm/0.039-1" (MX7)

### Other Application Areas

The introduction of the P-axis enabled ANCA to develop other applications such as "blanket grinding" and "peel grinding". Using the TXcell machine and the Arobotech system, ANCA has been able to develop (for large volume tool producers) the blanket grinding process, which covers all the processes needed to go from bar stock to finished tool in a single chucking. Peel grinding is primarily used for blank preparation where surface finish, run-out and size tolerances are critical for the finished blank. The peel grinding process is similar to the turning process on a lathe, but uses a narrow grinding wheel removing material in small to large depths of cut. ♦



Right: A tailstock on a P-axis is essential for accurate tap grinding.

# Thinking *Inside* the Box

Winterthur Technology Group's **Walter Graf** tackles the issues of removal rate and aggressiveness from an expert point of view.

We are often encouraged to "think outside the box". While this saying has its place in many other circumstances, it should not apply when setting grinding processes. On the contrary, we strongly suggest to "think inside the box".

However, our thinking box should be as large a box as possible. The illustration on the right shows such a box as a mental concept with which to approach a process. Naturally, we should know the box's limits, and then fully exploit those.

A box or a cube is determined by three dimensions: its length, width and height. If we limit a grinding process to three parameters, we can graphically translate this into such a box. This box will represent how we mentally limit a given process. The three most basic grinding parameters for such a box are the wheel peripheral speed  $v_c$ , the feed-rate  $v_w$  and the depth of cut  $a_e$ .

Limits regarding these three parameters are, of course, loss of form or burning. For example, let's imagine we are pushing the feed rate  $v_w$ . Initially, if we start with too low a feed rate, the wheel may burn as the force to make it free-cutting is too low. Increasing the feed rate will open the wheel.

By further increasing the feed rate in incremental steps of 10 to 20%, we will reach a limit because of burning, or because of excessive form loss as the wheel breaks down. The same applies to the surface speed  $v_c$  of the wheel. Too low a wheel speed will reduce form holding, increasing the wheel's speed  $v_c$  will improve form holding but will lead to burning at some point.

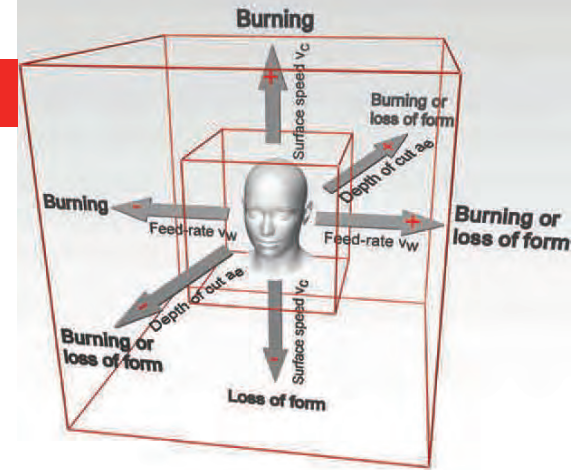
Once we have established the limits of our wheels, the machine and the processes, we can take all of this a step further and introduce two more parameters that help us to fine-tune our grinding process:

## 1. The Specific Material Removal Rate $Q'_w$ for Flute Grinding

This is also known as Q-Prime or  $Q'_w$  given as material removal in  $\text{mm}^3$  per mm wheel width per second ( $\text{mm}^3/\text{mm}/\text{sec}$ ). The Q-Prime is easily calculated by taking the depth of cut  $a_e$  and multiplying it by the feed rate  $v_w$ , and dividing the whole by 60.

The Q-prime factor allows us to benchmark a process such as flute grinding. For example, in flute grinding of solid carbide milling cutters with metal hybrid bonds, we aim to have a Q-Prime ( $Q'_w$ ) of minimum of 8 to around 14. To achieve a

Right: The grinding box as a mental concept with which to approach a process.



Q-Prime of 10, the formula looks like this, given a depth of cut of 4 mm and a feed rate  $v_w$  of 150 mm/min:

$$Q'_w = \frac{a_e \times v_w}{60} = \frac{4 \times 150}{60} = 10$$

## 2. The Aggressiveness Factor $F_a$

If the intention is to increase the material removal rate, the question arises whether it would be better to increase the feed rate  $v_w$  or the depth of cut  $a_e$ . This question illustrates the limitation of using Q-prime ( $Q'_w$ ) as a benchmark as the depth of cut  $a_e$  and the feed rate  $v_w$  are equally weighted. A benchmarking concept which goes beyond the mentioned limitation was developed by Dr Jeffrey Badger ([www.TheGrindingDoc.com](http://www.TheGrindingDoc.com)).

Dr Badger called this concept the "aggressiveness" of a grinding wheel. The idea behind this concept is to find the "sweet spot" of any grinding wheel, i.e. the combination of parameters within which a given wheel works best. Instead of limiting oneself to just depth of cut  $a_e$  and feed rate  $v_w$ , the concept includes the wheel's diameter  $d_s$  and the surface speed  $v_c$ .

This concept is elaborated here and is based on the following grinding parameters:

$$F_a = 16.7 \times \frac{v_w \text{ (feedrate)}}{v_c \text{ (surface speed)}} \times \sqrt{\frac{a_e \text{ (depth of cut)}}{d_s \text{ (wheel diameter)}}}$$

- Depth of cut per pass in mm  $a_e$
- Wheel diameter in mm  $d_s$
- Surface speed of grinding wheel in m/sec.  $v_c$
- Feedrate in mm/minute  $v_w$

Let's assume we had to grind flutes into solid carbide bits. The depth of cut  $a_e$  is ideally the full depth of the flute as we want to limit this operation to one pass for economic reasons.

Let's also assume, that for a given wheel specification, at a specific wheel speed  $v_c$ , and given diameter  $d_s$ , we have established that the ideal "sweet spot", or aggressiveness factor  $F_a$  is around 22.4 as seen in line 1 of the table below. Therefore, for different depths of cut  $a_e$  or diameters  $d_s$ , we can adapt the wheel speed  $v_c$  or the feed rate  $v_w$  to arrive at the same aggressiveness factor  $F_a$  of 22.40 as per the formula.

## Conclusion

Finally, what is the benefit of this factor of aggressiveness  $F_a$ ? Answer: for equal processes such as flute grinding, this factor  $F_a$  helps to establish ideal cutting process parameters. In other words, this factor creates the box within which to think and work. The formula can be solved for the individual parameters such as differing wheel diameters  $d_s$  or cutting speeds  $v_c$  if a certain  $F_a$  factor has proven to work well. A simple spreadsheet will make light work of this. This factor helps to set up new processes with cutting parameters that yield satisfactory results very quickly and repeatedly. Therefore, the chances that wheels are used "wrongly" diminish. Subsequently, processes can be calibrated and grinding times can be calculated prior to cutting any chips. ♦

|   | Depth $a_e$ | Feedrate $v_w$ | Wheel Speed $v_c$ | Wheel dia. $d_s$ | Q-prime $Q'_w$ | Aggressiveness $F_a$ |
|---|-------------|----------------|-------------------|------------------|----------------|----------------------|
| 1 | 4 mm        | 150 mm/min     | 20 m/s            | 125 mm           | 10             | 22.40                |
| 2 | 3 mm        | 132 mm/min     | 17 m/s            | 100 mm           | 6.6            | 22.40                |
| 3 | 2.25 mm     | 220 mm/min     | 22 m/s            | 125 mm           | 8.25           | 22.40                |



# Medical Grinding

## An Industry on the Move

by ANCA medical specialist  
Nick Van Benschoten

Grinding medical tools and implants is a growing industry, and ANCA is right in the middle of it all.

It's a dynamic time at ANCA. More and more medical and dental companies are learning of ANCA's success in the cutting tool world and applying that technology to their products; just like how the auto industry discovered ANCA for pinion gears. The idea of using a CNC tool and cutter grinder doesn't seem like much of a stretch for manufacturing medical rotary instruments. However, some people are surprised to learn of ANCA machines being used to manufacture medical implants for some time.

### Industrial Tooling

We'll address the diversity of ANCA applications starting with the obvious: industrial tooling. There are a number of Original Equipment Manufacturers (OEMs) and Medical Contract Manufacturers (MCMs) using ANCA machines to manufacture industrial tooling such as T-slot cutters and drills that are used in their own CNC vertical and horizontal machining centres to produce medical components. Some point to the cost savings, but others like reducing their turnaround time.

With a typical lead time of 3-4 weeks for special tooling, removing this from a product launch is appealing. MCMs also appreciate the shorter turnaround time, but also the tangible benefit of reducing teardown and set-up time. They explain that there are occasions when they're forced to teardown a set-up due to a tool that doesn't show up on time or breaks unexpectedly without another readily available.

There is also an inventory saving, since bars of carbide are valued lower than finished ground tools. Companies typically stock three or four different bar diameters and this provides



the freedom to make endmills in custom diameters, with a specific corner radius or sharp, or a tapered/straight ballnose. Some process engineers like the ability to save cycle time by eliminating tool change time by creating their own step drills. Quality Engineers like the improved concentricity.

Companies with 10 or more swissturns that produce pedicle and other medical screws with internally hexed heads can go through quite a few hex broaches for use in their rotary broaches. Hex broaches can be easily programmed and ground using ANCA's iPunch software. These same swissturn users also make their own tiny boring bars on their ANCA machines.

Pill and tablet punches for pharmaceutical companies are also manufactured on ANCA grinders.

Most surgical stapling devices actually clamp, staple, and cut and contain components that are stamped. These stamping MCMs use their ANCA machines to produce punches for their stamping dies.





### Medical Instruments

Some of these same stamped components also require secondary operations such as running a T-slot cutter in the stapler's channel or anvil to guide the knife. Of course, the knife needs to be ground too.

As stated earlier, it isn't much of a stretch to connect the dots between an ANCA and rotary instruments like bone drills, taps, disc shavers, burs, reamers, glenoid cutters, calcar planers. They're all round and have cutting edges similar to industrial tooling. Although bone taps are typically turned on swiss machines, there are occasions when grinding has advantages, like when the difference in the thread major diameter is greater than the shaft diameter and beyond the range of an overgrip collet.

Some OEM buyers may be unaware that their bone drills are being produced complete on swissturns. Even though these may look like drills, they do not have the proper reliefs to actually make them cut. Bottom line: swissturned drills can make a hole in bone, but so can a bone awl combined with a pedicle probe.

However, a well-designed and ground drill will provide a cleaner, rounder hole that actually cuts cortical and cancellous bone. Unrelieved edges displace or rub away material. Rubbing or friction accompanies heat. This should be avoided as much as possible considering bone cells die when elevated to 122° F (50°C).

Instruments don't have to be round to be a good fit for ANCA. Self-retaining drivers used to be mainly hex shaped, but there has been an increase in the use of different configurations.

While ANCA's iPunch software is used to program the hex drivers, ANCA's Keyhole Punch software simplifies the programming of these newer profiles. Flat saw blades with straight or curved teeth are often overlooked for ANCA's 5-axis grinding ability.



Disc rasps, with their teeth on both flat sides are another application that isn't immediately apparent. ANCA really shines on humeral and femoral broaches and rasps. ANCA's C-axis layout makes repositioning to grind a cross-hatch pattern quick and easy. Endoscopic grasping and scissor forceps that are relied on to function properly down inside a cannula are also a non-round application.

### Implants

When a machine can drill, mill, grind and threadmill the inserted drill body, the wheels start to turn in the minds of creative manufacturing engineers. There is only so much that can be done to improve metal removal rates. Where inroads can be made is doing more in fewer loadings and reducing queue time. ANCA's TXcell, TX7+, and MX7 all have the ability to drill, mill, grind, and threadmill plus they have five axes of movement. Unlike a vertical machining center with a 4th/5th axis table that is typically limited to 90 or 110 degrees of tilt, ANCA's "tilt" axis, the C-Axis (the spindle is horizontal), can rotate a total of 264 degrees. ANCA's A-axis is 360 degrees. With this range of movement, ANCA can complete more in one load.

The biggest success story is knee implant manufacturing (knee trial size instruments fit too). A knee casting is loaded, ground, the periphery is milled, and the I/C slot is profile milled. With all this accomplished in one loading, there isn't any inaccuracy or scrap due to reloading error. Given the superior finish attained through grinding over machining, subsequent finishing operations such as belt sanding, tumbling, and polishing are reduced or eliminated.

Modular orthopedic implants for example, femoral and humeral stems, necks, and heads, are also excellent choices for ANCA. Given that most ankle, wrist, and elbow implant systems are fundamentally ball-and-socket designs, they all benefit from processing on ANCA multi tasking machines. Heart orifices and leaflets are additional implant applications.

The list of medical and dental components will surely grow as more OEM and MCM process engineers and manufacturing engineers discover the advantages of ANCA. Contact ANCA's medical group to discuss the specifics of your project. Since ANCA designs and builds the machine, the drives, the control, and the software, ANCA has the sole authority to modify or customise to your specific requirements. ♦

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- ➔ Apply fresh techniques from industrial cutting tool design
- ➔ Optimise your instrument geometry to match the specific nature of bone structures
- ➔ Leverage the advantages of grinding over Swissturning
- ➔ Learn to select a material and grinding wheel to suit bone drilling
- ➔ Break through into the medical components market

***Upgrade your industrial drill making skills and join a recession-resistant industry***

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- ➔ 30 years of experience
- ➔ Leaders in drill manufacturing technology
- ➔ Highly awarded for manufacturing innovation
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# Beat 'em to the Punch

Product Line Manager **Duncan Thompson** examines why grinding punches on the TX7+ and TXcell could be good for your business.

In an earlier article about TXcell for tap grinding, we talked about the dramatic change that ANCA had introduced to that market by making one machine responsible for complete tap manufacture. A similar outcome is being achieved in punch grinding applications too. Read on to learn how.

One important strategy in remaining competitive in your business today is ensuring you have the tools to adapt to your shifting markets; having the flexibility to adopt new technologies and reap the benefits that they offer. Punch manufacturers around the world that know this fact are seeing now the benefits of using ANCA TX7+ and TXcell for their production needs.

To begin with, TX7+ or TXcell needs to be kitted up with the right tools and accessories to do the job. ANCA has developed a number of accessories and options that explicitly meet the needs of the punch grinding application.

- iPunch: dedicated punch programming software gives you complete flexibility on punch geometry and grinding process parameters.
- iBalance: on-machine wheel balancing software.
- Rotary wheel dresser units fully supported by ANCA

dressing software delivers in-process dressing to keep your wheels running true and sharp.

- Auto adjusting coolant nozzles that change position as wheel diameter reduces.

These accessories are necessary for any good punch grinding machine. So, what makes punch grinding on ANCA TX7+ so different? Starting with the basics, TX7+ is a 5-axis grinding machine, compared to the 3-axis grinder more traditionally used for punch manufacture. Having these extra degrees of freedom on your grinding machine translates to greater freedom in what applications you can put through it.

In the case of punch manufacture, a traditional punch grinding machine would have been capable of grinding only the outside form of the punch with a single wheel. The TX7+ now offers you so much more.

Same as was described with taps, punches will typically have a series of separate machine operations that

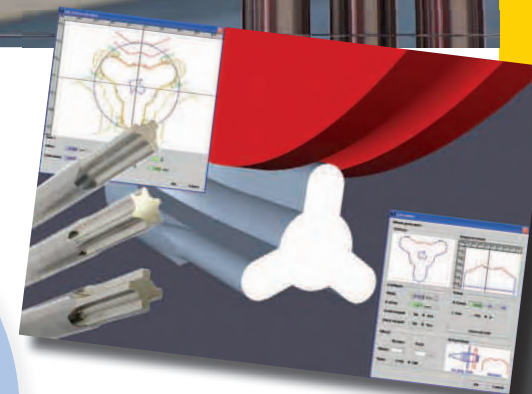


Main image: TX7+ and TXcell flexibility means grinding punches and endmills on the same machine, in the same set-up, is now possible.

Below: Using ANCA's punch software has the flexibility to produce a myriad of punch shapes.

Right: The high surface finish quality on punches produced on a TX7+.

Below right: The ability to grind key hole punches is the TX7+ and TXcell's trump card.



need to be performed to complete the tool. The same issues arise too. Increased capital investment, factory floor space and utility consumption, as well as labour for separate needs of machine operations and maintenance. Then to add to the pain, machines and WIP must sit idle while you change over tooling and grinding wheels when grinding one tool to the next.

So, what operations on the tool require all the additional investment and effort? After OD grinding a punch may require a roof-top or whisper shear on the punch. Additionally, a tool index mark or feature may also need to be included near the shank of the tool. Typical punches include a single radius dressed into the grinding wheel to create a gentle transition between punch section of the tool and its shank, but in some cases, additional reinforcement radii are added. Finally there is the inclusion of ejector holes in the end face of the punch that requires not grinding, but drilling operations.

With two wheel packs available on the 5-axis TX7+, undertaking several of these operations in a single set-up is now possible. But take the next step to a TXcell, with its offering of nine up to 24 wheel packs, and all these operations can now be

done in a single set-up, something that was never possible on a standard punch grinding machine. The TXcell robot used for changing wheel packs is also used for automated loading of tools, which means you can keep it running for those unattended shifts.

Having more than one wheel pack on the machine brings other benefits too. By using different roughing and finishing wheels, grinding operations can now be optimised for stock removal or fine surface finish. The TX7+ and TXcell are also ideally suited to the use of CBN grinding wheels.

Using a much smaller wheel diameter (up to 200 mm (8") on TX7+ and 300 mm (12") on TXcell), CBN not only delivers superior grinding feed rates compared to conventional abrasives, but also requires less frequent wheel dressing. Both of these properties ultimately save you time and money.

The TX7+ and TXcell have one final trump card to offer the punch grinding application: key hole punches. These punches typically feature much more complicated OD profiles including concave forms, and require a fundamentally different approach to grinding them. Small diameter wheels with form profiles and run at high RPM; the TX7 and TXcell handle this with ease. Dedicated key hole punch software allows you to control every detail of the key hole punch geometry and grinding process. This means the possible punch applications on the TX7+ and TXcell have been opened up to an entirely new segment of the punch-grinding market, giving you more opportunities to be making money from your investment.

In fact, if business in the punch-grinding industry turns down to such a point that the machine has spare time available, then re-tooling your machine to ANCA's bread and butter application of drill or endmill manufacture is a simple exercise.

ANCA's TX7+ and TXcell offer you a complete step forward in enhanced punch production flexibility and automation. Diversity like this not only opens up new markets and business opportunities, but also delivers security. ♦

# ToolRoom® 2012

## Does the Job



The long anticipated release of ANCA's latest instalment of the industry-leading tool design software suite, ToolRoom® 2012, will see ANCA customers benefit from a wide variety of enhancements. Paul Bocchi, Software Product Manager explores the main features ToolRoom® 2012 has to offer.

Endmills was one of the main focus areas for ToolRoom® 2012. New features vary from major developments to minor enhancements all culminating to deliver a new ToolRoom® software package that will greatly simplify the way endmills are programmed and ground on ANCA machines. The goal was to expand on the flexibility that our customers expect from ANCA software, yet simplify the process of programming production ready tools directly on the machine.

### Simple but Flexible Programming with the new Endmill Wizard (EMW)

The new Endmill Wizard (EMW) is one such feature that was developed to achieve this goal. The EMW guides the operator

through a simple step-by-step process asking for simple tool specifications along the way. The wizard uses this input to automatically produce the grinding program using a set of predefined rules and calculations. Geometry, feed rates, and all other parameters are automatically calculated. The wizard will also automatically select appropriate grinding wheels from those already mounted in the machine or simulator. Where it does not find an appropriate wheel, it will provide a recommendation. At the end of the process the operator can be confident that a good tool will be ground after pressing the GRIND button.

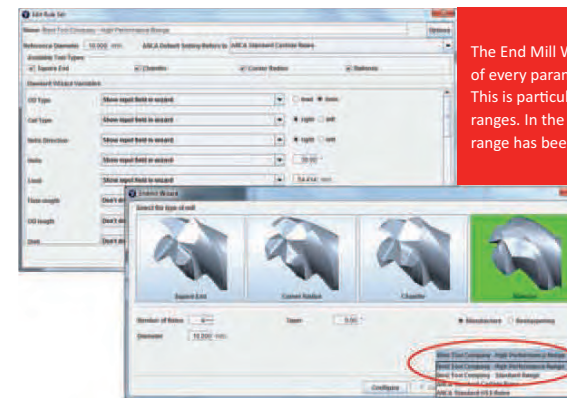
The new Endmill Wizard simplifies programming, reduces set-up times, and eases the requirements for operator training. Although simple to use, the wizard is a powerful tool that is able to generate a vast range of endmill types typically produced within the industry.

What sets the wizard apart is a unique customisation option. Rather than be locked into the default wizard behaviour, the option exists to completely customise the wizard. An example of a common benefit of this flexibility is where tools are produced under different product ranges. For example, a manufacturer may produce a high-performance range of endmills as well as a standard range. The geometry and process used to produce these tools may be different and therefore customisation of the wizard is required.

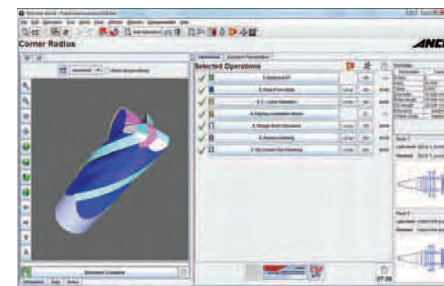
The way a parameter is assigned or calculated from the wizard can be customised. This can be done for every single parameter in the software providing total flexibility. For example, a relief angle can be given a fixed value, calculated from a formula involving other dimensions such as tool diameter, or can be derived from a table of known values. Once customised, it is a simple matter of selecting the customised range from the first page of the wizard. Additionally, the customisation information is easily transferred to other machines or simulators.

### Immediate Feedback with Integrated 3D Graphics

Once a tool is generated from the wizard, the operator can then take advantage of the integrated 3D graphics, another



The End Mill Wizard is completely customisable. The behaviour of every parameter within the software can be customised. This is particularly useful for catering for different tool product ranges. In the left image a high-performance and standard range has been customised within the wizard.



iGrind software in ToolRoom® 2012 now features a dynamic and fully integrated 3D model. As the design parameters change, the model updates automatically. Touch-screen friendly controls make viewing the 3D model easy when working on the machine. Cycle time estimation is also updated dynamically.

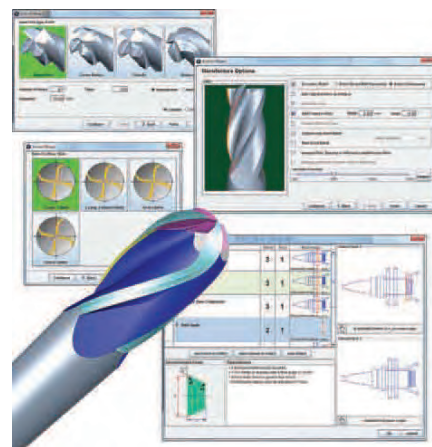
operation is shown. This instant feedback is particularly useful to reduce cycle times by optimising process parameters.

The 3D model can also be sliced at any position to inspect the 2D cross-section. As per the 3D model, the 2D cross-section may be colour coded by operation, wheel selection, or other options available. Simple measurements are possible to verify the programmed geometry.

This type of measurement is typically best performed in the 2D view rather than the 3D view and therefore can greatly aid in verifying the programmed geometry.

### Dramatically Faster Simulation

The mechanism used to generate the integrated 3D model is fast and efficient and is now also used with ANCA's Simulator3D software. As a result, users of ToolRoom® 2012 may find significant simulation time benefits regardless of the Simulator3D version currently used. Depending on the complexity of the tool, speed increases of up to 10 times could be realised. Common tools such as taps and ballnose endmills also significantly benefit from this feature.



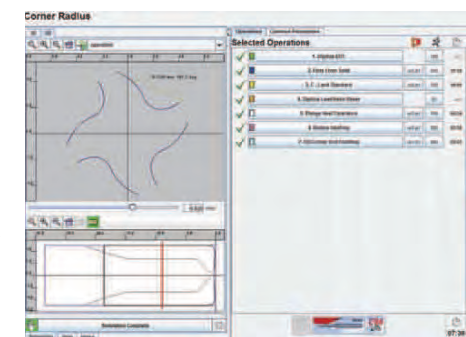
The new Endmill Wizard supports creation of new square end, corner radius, chamfer, and ballnose tools. The wizard greatly simplifies the programming of production-ready endmill tools directly on the machine.

major enhancement within ToolRoom® 2012. A 3D model of the tool appears in the iGrind tool design software and is updated dynamically as parameters are changed. The 3D model takes only seconds to update, providing instant feedback for any geometry changes made.

Apart from reducing programming time on simulators, the 3D model is an important aid when programming tools directly on the machine. The operator is now able to inspect the 3D model on the machine before commencing the grinding operation. This increases confidence that the tool will be ground correctly and eliminates (in many cases) the need to verify geometry on a simulator PC. To help cater for this, the interface includes touch-screen friendly controls to allow manipulation of the 3D model on the machine.

The 3D model is available for all tool types within iGrind, not just endmills. The benefits of having the integrated 3D model extend well beyond just inspection. For example, the cycle time estimation is also dynamically updated as geometry and/or process parameters change.

The cycle time for the entire tool as well as the time per



Apart from a 3D view, the model can be sliced at any position to inspect the cross section and perform basic measurements directly within iGrind.



Users of all versions of Simulator3D software will notice significant improvements in simulation times using ToolRoom® 2012.

|                |  |  |   |
|----------------|--|--|---|
|                |  |  |  |
|                | RN31.1-1   | 7.9 sec  | 18.2 sec  |
| ToolRoom® 2012 | 4.5 sec  | 3.5 sec  | 19.4 sec  |
|                |  |  | 3.6 sec   |

### Accurate Edge Preparation (K-Land) without Digitising

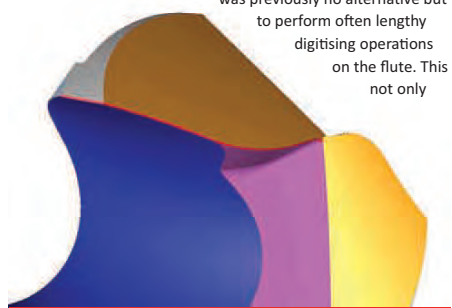
A significant leap forward is the ability for iGrind to interrogate the 3D model within the design environment. This ability has greatly simplified tasks that were either not possible or often difficult to achieve. One such example is K-Land grinding on drill points.

Up until ToolRoom® 2012 it was necessary to digitise the cutting edge on the drill in order to determine the lip geometry. The K-Land is typically 50 microns in thickness, half the width of a human hair. Accurately digitising the drill geometry and grinding the K-Land to tolerance can consume the majority of the set-up time for such drills.

iGrind can now intelligently interrogate the 3D model and determine the drill cutting edge, thus eliminating the need to digitise during manufacturing. Assuming good machine setup, only minor adjustments may be required to achieve the K-Land tolerance and therefore set-up times for such tools are significantly reduced as well as reducing the possibility of scrap tools.

### Complex Profiles Now Perfectly Calculated

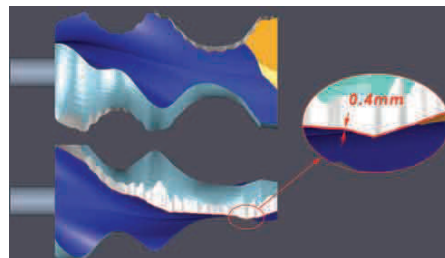
The ability to interrogate the 3D model has also been extended to profile tools to solve the long standing issue of flute hook face compensation. To grind an accurate profile onto a tool the software needs to calculate how to compensate for the curved surface of the flute face. When the flute shape is complex there was previously no alternative but to perform often lengthy digitising operations on the flute. This not only



By interrogating the 3D model, iGrind can now accurately determine the drill lip edge and simulate and grind the K-Land without the need to digitise.

consumed set-up and cycle time but also meant that the geometry could not be easily simulated or verified prior to grinding.

With ToolRoom® 2012, the profile software is now able to calculate the compensation required to accurately produce a cutting edge on the tool regardless of the complexity of the flute shape or the profile. The grinding process and geometry can be verified directly within Simulator3D without requiring any digitising data. It is common for profile tools to be ground in very small batches and therefore the minimal set-up times and zero scrap rates offered by ToolRoom® 2012 will boost your profitability and competitiveness in profile tool grinding.



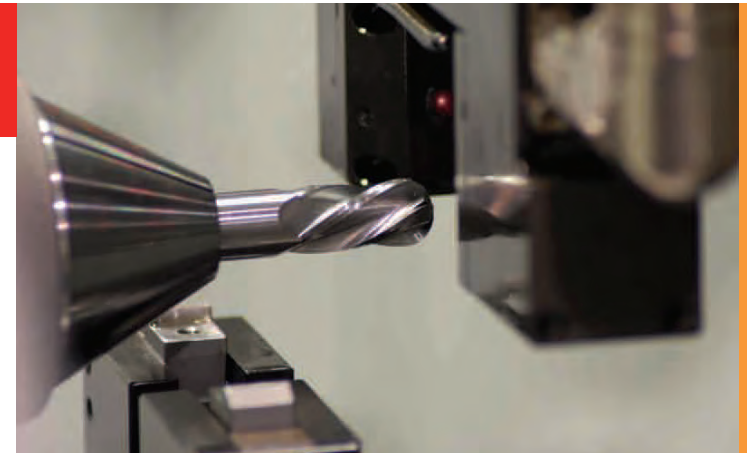
The profile software in ToolRoom® 2012 can now accurately determine the required flute hook face compensation using the 3D model of the tool, eliminating the need to digitise. This also allows geometry and grinding verification within Simulator3D.

### Laser Digitised Profiles

ToolRoom® 2012 also includes support for laser digitising and compensation of ballnose, corner radius, and profile tools. Laser digitising is an optional accessory on ANCA machines. Tool geometry can be automatically and accurately measured and compensated in-process without the need to remove the tool from the machine.

Laser digitising, along with the automatic hook compensation feature in ToolRoom® 2012, means that profile tools can be easily programmed within iGrind, verified in Simulator3D, ground on the machine, and automatically compensated with minimal effort and complication. As the tool does not need to be removed from the machine, the requirement for

ToolRoom® 2012 includes support for laser probing and compensation of ballnose, corner radius, and profile tools.



“A significant leap forward is the ability for iGrind to interrogate the 3D model within the design environment.”

special work-holding or orientation software is eliminated. The machine remains productive throughout the entire process without the need for operator intervention and eliminates the issue of the machine cooling down while a lengthy external measurement process takes place. Laser probing can also eliminate the need for expensive measurement machines. The advantages are numerous and significant.

### Wheel Qualification for Further Set-up Time Reduction

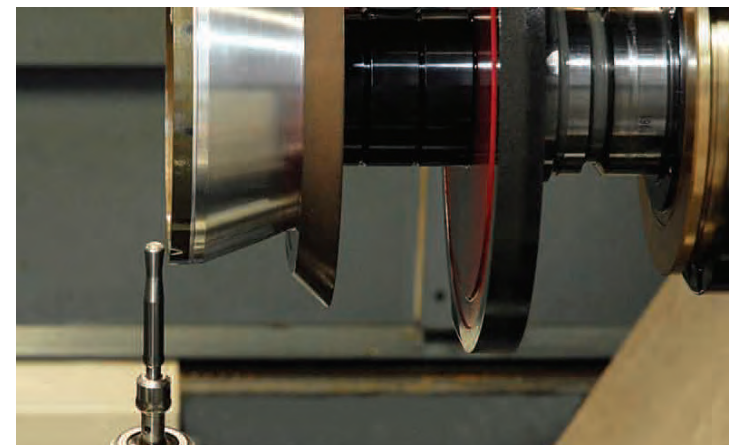
To further enhance automation and repeatability, the Wheel Probe feature can be fitted to free the operator of the task of qualifying wheels. The accuracy and repeatability of the probe has proven superior to the manual method of internally qualifying wheel packs where large differences in qualified values are experienced from one operator to the next. Refer

to [www.anca.com](http://www.anca.com) to further read how the wheel probe can benefit your production line.

ToolRoom® 2012 includes many other enhancements aimed at reducing setup times, simplifying programming, increasing accuracy and repeatability, improving automation, as well as being able to produce new geometries not before achievable. This article has touched upon some of the main enhancements our customers will benefit from when upgrading to ToolRoom® 2012 or when they purchase a new machine.

For a complete overview of ToolRoom® 2012 enhancements, please refer to the flyer located on the ANCA website [www.anca.com](http://www.anca.com).

For further information on ANCA products, please contact your local ANCA branch. ♦



The optional Wheel Probe supported in ToolRoom® 2012 introduces a new level of accuracy and repeatability into your grinding process.



# MX5 technical specifications

## ANCA global

### Asia Pacific

ANCA Pty Ltd,  
ANCA Machine Tool (Shanghai) Co. Ltd  
ANCA India  
ANCA Japan  
ANCA Thailand Ltd  
ANCA Motion  
Sahamit Machinery  
CKB

Allied Chase  
Leeport (Holdings) Limited  
SH International

### Europe

ANCA GmbH  
ANCA Italia  
ANCA (UK) Ltd  
Karel Redig – ANCA  
Christophe Chaumet – ANCA  
Slawek Antoszczyk – ANCA  
Springmann Austria GmbH  
ALBA Precision sro  
KR Trading  
ARTOC Suez  
Tek Team Ltd  
Ravema AS  
MAVIS VS Impex srl  
ZAO Rosmark Steel  
ALBA Precision sro  
Cohersa Industrias SA  
Ravema AB  
Springmann SA/AG

CNC İleri Teknoloji ve Tic. Ltd. Şti

### North America

ANCA Inc.  
Earth Falcon  
Focus Technology  
Grinding Solutions  
Innovative Machine Solutions Inc.  
Machine Tool Marketing Inc.  
Machines & Methods Inc.

Metalworking Technologies Limited  
Modern Tools Inc.  
Productivity Inc.

Smith Industrial Machine Sales  
Smith Machinery  
SMS Machine Tools  
Tornquist Machinery

Triad Machine Tool Co.

### South America

ANCA do Brasil

Melbourne  
Shanghai  
Bangalore  
Nagoya  
Rayong  
Taichung  
Bangkok  
Hiroshima  
Nagoya  
Osaka  
Tokyo  
Shanghai  
Hong Kong  
Seoul

Mannheim  
Vicenza  
Coventry  
Edegem  
Meximeux  
Wielkie Drogi  
Feldkirch  
Brno  
Juelsminde  
Giza  
Yehud  
Oslo  
Bucaresti  
St. Petersburg  
Banska Bystrica  
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Varnamo  
Neuchatel  
Niederburen  
Istanbul

Wixom, MI  
Lauderdale-by-the-sea, FL  
Mooreville, NC  
San Pedro Garza  
Watertown, WI  
Bixby, OK  
Bellevue, WA  
Beaverton, OR  
Arlington Heights, IL  
Stoneham, MA  
Minneapolis, MN  
Cedar Rapids, IA  
Omaha, NE  
Rochester, NY  
Salt Lake City, UT  
Rexdale, Ontario  
Brea, CA  
Phoenix, AZ  
Wheat Ridge, CO

Australia  
China  
India  
Japan  
Thailand  
Taiwan  
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Japan  
Japan  
Japan  
Japan  
China  
China  
South Korea

Germany  
Italy  
United Kingdom  
Belgium  
France  
Poland  
Austria  
Czech Republic  
Denmark  
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#### CNC Data

ANCA CNC control, Core 2 duo, min. 3GB RAM, 15" touch screen, Ethernet port, 56 kbps modem, two USB ports, UPS

#### Mechanical Axes

|                              | X-axis     | Y-axis     | Z-axis     | A-axis     | C-axis     | P-axis     |
|------------------------------|------------|------------|------------|------------|------------|------------|
| Position Feedback Resolution | 0.0001 mm  | 0.0001 mm  | 0.0001 mm  | 0.0001 mm  | 0.0001 deg | 0.0001 deg |
|                              | 0.0000039" | 0.0000039" | 0.0000039" | 0.0000039" |            |            |
| Programming Resolution       | 0.001 mm   | 0.001 mm   | 0.001 mm   | 0.001 mm   | 0.001 deg  | 0.001 deg  |
|                              | 0.000039"  | 0.000039"  | 0.000039"  | 0.000039"  |            |            |

**Software Axes:** (patented) B, V, U, W

**Workpiece:** Diameter 100 mm (4") max., tool grind length 250 mm (10"), max. weight 20 kg (44 lb)

**Drive System:** ANCA Digital (EtherCAT standard). Linear axes direct-drive ballscrew, rotary axes direct drive

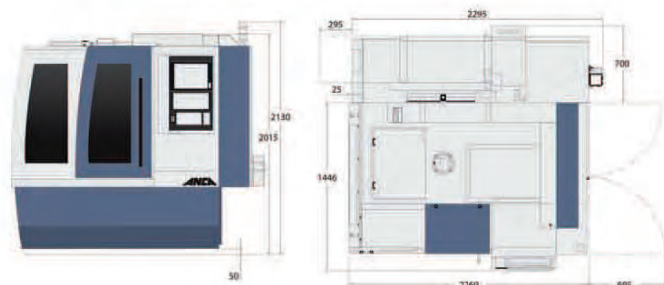
#### Machine Data

Grinding spindle: ANCA bi-directional direct drive, 26 kW (34.8 HP) spindle power (peak), position-controlled Q-axis, HSK50F taper  
Grinding wheel: max. diameter 203 mm (8")  
Wheel bore: 31.75 mm (1 ¼"), 32 mm, 20 mm  
Wheel packs: two, max. four wheels per pack

#### Other Data

Electical power: 25 KVA (including coolant system)  
Probe system: Renishaw  
Coolant system: External  
Machine base: ANCAcrete (polymer concrete)  
Colour: RAL 7035 / RAL 5014  
Weight: Approximately 5500 kg (12,125 lb)  
Floor plan: Width: 2269 mm (89"), Depth: 1446 mm (57"), Height: 2015 mm (79") without loader

\*Depending upon tool set-up  
ANCA reserves the right to alter or amend specifications without prior notice





# MX5

*Time to celebrate!*

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HAS JUST  
BECOME MORE  
AFFORDABLE**

Meet the new MX5  
tool grinder  
- the latest member  
of the popular  
MX family.

We've included  
the most important  
features from the  
MX series – whilst still designing  
a more affordable machine!



*From endmills to profile tools, the **MX5** has the power and stability to grind high quality tools every time.*

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