

THE SHARP EDGE

ISSUE 10. 2013

ERODE & GRIND
with new ANCA EDGe



AEROSPACE

INDUSTRY OVERVIEW TURBINE BLADES

ANCA's new workholding
& tool support system



The benefits of
**SOFTWARE
SCRIPTING**

Feature Companies

Sheffield Precision Medical
& Benchmark Carbide

ANCA



LESS THAN **3 MICRON** TOOL RUNOUT

Workholding + Tool support system

With ANCA's MicroPlus workholding and tool support system you can consistently achieve less than 3µm tool runout.

The MicroPlus system consists of the Flexi-Chuck assembly for workholding and the Overhead Top Clamp assembly (OTC) for tool support.

The patented new Flexi-Chuck design allows the tool and internal components to move independently of each other, minimising any misalignment. The tool is firmly secured in place by the OTC. Together, as the MicroPlus system, they can reduce runout to less than 3µm.

***The Runout Revolution
is Here!***



www.anca.com

Email: info@anca.com

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ANCA®

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Cover Image: Changes in design and materials used in the aerospace industry has opened up whole new markets for tool grinding companies. In this special aerospace edition of *The Sharp Edge*, we explore how ANCA is at the cutting edge.

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Executive Editor: Greg Perry

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



From the desk of the CEO

The uncertain global market has softened in the past year and ANCA has taken this opportunity to continue to invest in new product development, improving our systems, processes and skills within the ANCA Group.

ANCA's ongoing product development program has resulted in the launch of the EDGe machine, focussing on erosion and grinding of polycrystalline diamond (PCD). This product extends our range and will assist our customers in producing higher-end tools with longer life to satisfy the ever-increasing demands on productivity.

At the same time, we have been focussing on developing new accessories to further enhance the accuracy and productivity of our machines. In particular, we have launched the new MicroPlus chuck, which significantly improves runout accuracy. We have also launched the Laser Probe for in-process measurement and the auto white-stick wheel dresser.

ANCA's ToolRoom 2012 packages are being sold with new CNC upgrades and are selling extremely well in the marketplace, particularly for those customers who have older machines.

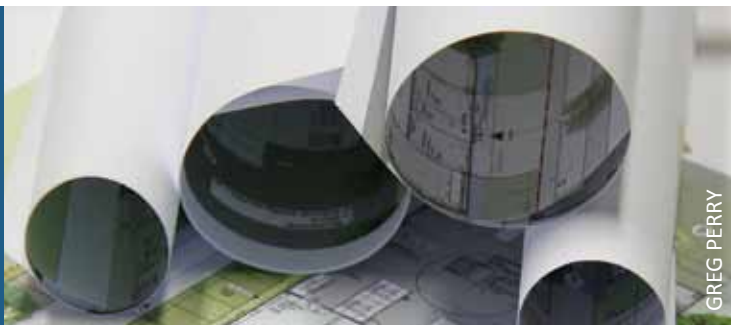
The design of our new European headquarters has been finalised and we have purchased land in Weinheim, Germany. Selection of the final builder is in process. We are looking forward to being able to provide improved facilities for machine demonstrations, training, commissioning, automation assembly and after sales and service. Additionally we have added engineering resources to our European office to work more closely with the technical requirements of our customers.

We continue to focus on delivering customer value in everything we do, every day. As an example, our After Sales and Service division continues to sell contract maintenance plans for our machines and this has been successful in many markets. This division has also developed skills and training development programs covering many aspects of our global organisation.

On a final note, I'd like to thank our global customers, suppliers and all employees for their continued support.

Grant Anderson
Chief Executive Officer

ANCA GmbH building to open in 2014



In 2012, ANCA announced the plans to build a new state-of-the-art facility in Weinheim, Germany. Work has begun on this new facility and is on track for its grand opening in early 2014. ANCA has had a facility in Germany for over 20 years, initially in Dusseldorf and then in its current location in Mannheim.

There are close to 50 ANCA employees in Europe. Half of them are based in Germany, consisting of sales and support staff.

Expansion is necessary as they have out-grown the current ANCA Europe facility. The new facility will be erected on a 3500 m² block of land located in Weinheim, not far from its current location in Mannheim. It will house a machine demonstration and technology centre, configuration and rebuild area, and comprehensive spare parts store.

The facility will accommodate a wide range of the ANCA CNC machine tools giving customers the opportunity to see and demonstrate the ANCA product first hand.

Training will be a big focus with the new facility, as dedicated training rooms and equipment will ensure that we can further support our customers with training programs from basic operation and maintenance to specialised applications and software features.

ANCA has its main manufacturing facility in Melbourne, Australia but has built a business model around being local. ANCA is a global company and has established regional offices around the world ensuring that our customers have local staff to deal with.

ANCA GmbH is on the doorstep of our major competitors and we have to make sure that our customers continue to benefit from local support.

Building a company-owned premises in Germany is a further sign of our ongoing commitment to our European customers.

ANCA GmbH is one of the company's most important facilities, servicing a broad customer base right across the continent. Jan Langfelder, Managing Director ANCA GmbH, has been there from the beginning and is very excited about the new facility.

"ANCA manufactures a world class product and the new facility is further demonstration of our commitment to our customers," says Langfelder.

"We have been a key player in Europe for over 20 years and the new facility demonstrates that we plan to be here for another 20 and beyond." ♦ - Greg Perry

ANCA wins export award

ANCA won the Large Advanced Manufacturer award at the 2012 50th Australian Export Awards. The Australian Export Awards is one of the longest-running and most prestigious business award programs in the country.

The Awards recognise Australian companies engaged in international business who have achieved sustainable growth. They assess innovation, international growth, and export marketing and financial strategies.

This is ANCA's second win in this category, having won this award and the overall Australian Exporter of the Year Award in 1995. The awards are presented by the Australian Trade Commission (Austrade), and the Australian Chamber of Commerce and Industry (ACCI).

Margaret Bounader from Austrade said, "ANCA is an outstanding example of successful, export-focused manufacturing. ANCA exports 98% of its products and has built its reputation through innovation and a commitment to research and development."



ANCA Director Pat Boland (left) receives the award for Large Advanced Manufacturer.

Pat Boland, ANCA Director, said after he accepted the award: "We were pleased to receive the award as it is recognition for the dedication of our employees. ANCA staff are passionate about our products and helping our customers."

ANCA's win represents a positive story of an Australian manufacturer succeeding on a global scale. ♦ - Greg Perry

Protect your investment with an **ANCA** Service Agreement

Save 10% on parts

Modern CNC tool grinders are a significant company investment. It therefore makes sense to ensure they not only operate at their peak condition to provide the highest quality tools possible, but also continue to help you meet your deadlines for many years. An ANCA maintenance and service agreement will help you achieve these goals and extend the life of your machine.

An ANCA service agreement means one less thing to worry about. ANCA will contact you when your service is due, allowing you to organise a convenient time for our service engineer to visit. This helps prevent having to fix problems as they arise and potentially having an unscheduled shut-down that could damage your reputation for being able to deliver on time.

A service agreement will help you to identify potential problems before they occur. For example, a cover over a moving part may have a small hole in it which cannot be seen by the operator. Paying a low amount to fix it before it develops into a significant problem that costs a lot more and causes a shutdown is how regular maintenance with a service agreement can help.

Another major benefit of ANCA service agreements is the 10% discount for parts for machines under agreement. This can provide significant savings. It also ensures that high quality OEM parts are used to fix your machine. When cheaper substitutes are used they do not always have the same long-life as the ANCA parts designed specifically for the machine. ANCA parts, such as spindles, include bearings manufactured to tolerances of 1-2 microns and use specified lubrication



compatible with the entire system. They are subjected to very stringent testing which use ANCA CNC test rigs that test to specific parameters, at set temperatures and RPMs. Substitute parts are not subjected to this quality control.

An ANCA service agreement will help you extend the life of your machine which will reduce the total cost of ownership and delay the time when you need to think about replacement. Tips on daily, weekly and monthly maintenance can be found in your machine manual and your ANCA service technician can assist you with information about this.

At ANCA we maintain one of the most experienced machine tool field service teams in the world. Our service technicians are OEM factory trained and provide the highest quality level of service.

ANCA have a comprehensive global maintenance and service network. The new maintenance and service agreement program is available in most regions and is being progressively released globally. Please contact your local ANCA branch to discuss your requirements and to check the availability in your region at this time. ♦ - Lisa Paterson



Overview of the benefits of an ANCA Service Agreement

- Protect the investment you have made in your ANCA CNC tool grinder
- 10% discount on parts for machines under agreement
- Extended machine life through regular maintenance and checks
- Maximise machine uptime
- Experienced ANCA technicians to perform maintenance
- OEM quality parts for repairs
- Annual inspection and report on machine condition

New Vision recognition system saves time and eliminates scrap

There is increased demand for deep-hole drilling applications and reducing the overall cost of making holes. Hole costs can only be reduced by having shorter cycle times. This means running a drill at higher RPM and feedrates. However this generates higher temperatures, which reduces the life of the drill.

Many high performance drills have internal “through” coolant holes which deliver coolant directly to the cutting edge of the drill. Coolant reduces the temperature when drilling and improves chip evacuation.

Cutting tool manufacturers are producing more drills with through coolant holes to meet the strong demand. Drills with coolant holes are manufactured from raw material that has the coolant holes pre-formed into the drill blank.

The coolant hole positions must be known in relation to the flute and helix. This is typically measured inside the machine with a touch probe, but this adds to the grinding cycle time. ANCA has developed an automated inspection process to locate the coolant holes using a Vision system on the RoboMate loader.

RoboMate is a loading system common across the range of ANCA machines. ANCA has integrated a Vision recognition system using a Cognex camera inside RoboMate for coolant hole detection. By integrating the vision system onto RoboMate, inspection and coolant-hole location is determined outside of the grinding process. This reduces overall manufacturing time.

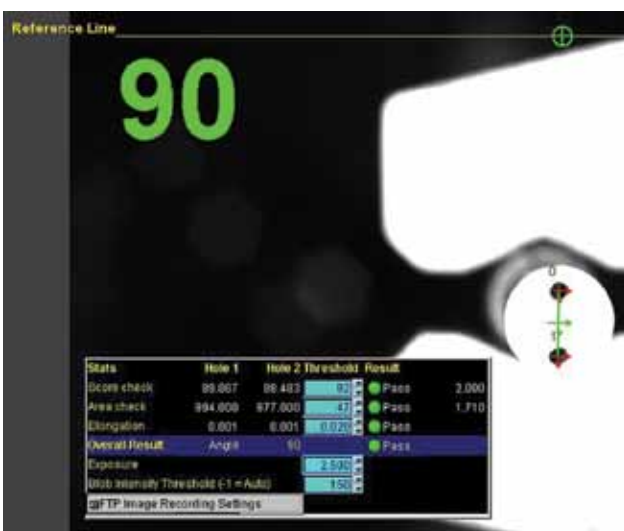


ANCA's Vision system is installed on the RoboMate loader so the verification process is done outside of the grinding cycle.

The Vision system can recognise and locate coolant holes as small as 0.1 mm (0.003”) diameter. With an overall drill diameter range between 3 to 20 mm (1/8”– 3/4”). The camera used with the Vision system can capture an image and locate two coolant holes in less than 10 seconds and caters for different drill point angles. The camera can be easily adjusted for focus and brightness based on the drill type and geometry.

Other benefits of the Vision system include an air blast to clean the tool and a reject station to store tools that do not meet specification, or if the systems cannot detect the coolant hole position. Both these features ensure the correct coolant hole position is known prior to entering the machine. It also eliminates scrap tools and the need for operator intervention.

In addition to measuring coolant holes, other types of tools can be detected and measured using the Vision system. The possibilities seem endless for other applications; all that is needed is an idea and a little “vision”. ♦- *Simon Richardson*



Screen capture of the vision system detecting coolant holes on a drill.



At the Cutting Edge of Aerospace

New composite aircraft are creating opportunities for ANCA customers. Lisa Paterson explains how.

Tool grinders are an important part of the aerospace industry. The latest aircraft continue to include a higher percentage of composites in their design, which has meant change and opportunity for the tool manufacturers that help make them. Typical tools or components the tool grinders are used to manufacture for the aerospace industry include drills, endmills, countersinks, turbine blades and aerospace bearings. For example, ANCA tool grinders make tools that are involved in manufacturing components and assemblies for aircraft manufacturers such as Airbus and Boeing, aerospace engine manufacturers such as Rolls Royce and General Electric and a number of defence manufacturers such as Magellan.

New Aerospace materials

Materials used in aircraft have continued to evolve and have recently moved to an increased use of alloys and non-metals. The new Boeing 787 Dreamliner incorporates 50% by weight of advanced composites and is the world's first major airliner to use composite materials as the primary material in the airframe construction. It is designed to be lighter, 20% more fuel efficient, quieter and cheaper to maintain. It is also made from recyclable material designed to produce fewer emissions.

These different aircraft materials have different characteristics which has prompted United States cutting tool manufacturers such as Precorp, Inc. and Wichita Precision Tool, Inc. to develop new types of tools, geometries and materials specifically optimised for composites.

Precorp has the experience for complex applications

Precorp in the United States uses their 24 ANCA MX7, RX7 and EDGe tool grinders to grind custom polycrystalline diamond (PCD) and carbide tools for the aerospace industry. Precorp has a long history solving difficult applications in both the aerospace and automotive industries. Specialising in PCD tools, they have found them particularly suitable for their customers who use them for drilling holes through materials such as the high strength carbon fibre reinforced plastic composites (CFRP).

Rich Garrick, President of Precorp advises that "we have the resources to accommodate difficult and new applications. Our engineering team has a unique knowledge of the ever changing applications of our customers and they work to create the most effective tooling solutions. We have a wide range of tooling



The Airbus A380 contains a significant percentage of composite components.

developed specifically for new-age aerospace composites. We rely on our ANCA tool grinders to grind the high quality tools our customers demand. ANCA software provides the versatility needed to develop engineered cutting tool solutions.”

Building the A380 and Dreamliner is a global effort

While the Asian market has been estimated to be responsible for approximately one third of aircraft production during the next 20 years, many of the components for those aircraft will be manufactured in the United States. Airbus, for example, plans to double the \$US12 billion it currently spends with suppliers based in the United States.

Wichita Precision Tool knows what their Aerospace customers want

Another United States supplier that manufactures aerospace tools on ANCA machines (MX7, GX7, RX7) is Wichita Precision Tool, Inc. With 15 years of experience in the CNC drill manufacturing and sharpening, the company specialises in premium grade cutting tools. New aircraft sometimes require holes to be drilled through a sandwich of 3-4 layers of different materials including composites, honeycomb, aluminium and titanium. All with tight tolerances and no delamination (separation of composite layers caused by a weakening of the bonds holding the layers together). Companies such as Wichita have therefore had to develop new types of tools that are optimised for the different layers and materials.

Wichita's owner is Gordon Norris. “Completing parts on my machines quicker than others is our advantage,” said Gordon. “Doing a tool a third quicker allows me to sell tools at a lower price while still providing the customer the advanced tool designs they need to do their work.”

To meet his customer's needs, Gordon's tool design and grinding experience, combined with ANCA software, are used to engineer tooling from concept or sketch. “Sometimes we are asked to create and design many complex tools with difficult-to-manufacture features,” Gordon said.

Technicut leads the way in the United Kingdom

Technicut is the United Kingdom's largest tooling manufacturer. They provide optimised rotary tooling solutions to the aerospace industry for materials such as carbon fibre reinforced

plastic composites (CFRP), titanium and nickel based super alloys. Technicut manufactures a wide range of cutting-edge tooling solutions on the 22 ANCA tool grinders that they own.

Innovation is continuing for suppliers, tool manufacturers and ANCA

Certain features on ANCA machines assist the operator's ability to achieve tight tolerances. These include the polymer concrete base which reduces vibration, the MPG Feed will enable the operator to quickly and safely step through new programs on the machine, the Drill Wizard and CIMulator3D software and improved useability in ToolRoom 2012 software. These type of features are particularly important in demanding industries such as aerospace.

As demands for new aerospace materials are made so they are lighter and more durable, demands are also made on tool manufacturers who have also continued to innovate. ANCA tool grinders used by tool manufacturers have continued to provide the power, versatility and precision required to grind new tooling solutions.

ANCA has continued to invest significantly in research and development and in additional resources. This has resulted in the release of new products such as the MicroPlus work holding and tool support system which reduces runout to less than 3 micron. Also the new MX5 tool grinder and EDGe erosion machine and other new machines which are in development. This can only be positive for aerospace industry suppliers where more change is expected. ♦





Blade Running

Duncan Thompson reports on the technology behind grinding turbine blades on ANCA's TX7+ precision grinder.

Whether propelling aircraft or ships around the world, or generating electricity for industry, gas turbines keep our world moving by taking advantage of the latest in manufacturing and materials technology. Extremes in heat and stress are the norm for modern gas turbines, which is no surprise, considering power output of a marine turbine could be up to 50,000 kW, while micro-turbines may be running at up to 100,000 RPM.

Fundamentally, gas turbines feature an air compressor that is coupled to the power-generating turbine. In between the two is a combustion chamber. In the compressor section, hundreds of turbine blades act to compress incoming air. When fuel is injected, this compressed air is ignited to create a high-temperature, high-pressure flow of gas that drives the turbine.

Performance of the turbine compressor blades directly affects the turbine's efficiency and power output. As a result, turbine manufacturers must not only manufacture turbine blades to extremely high tolerances, but also use processes that can economically produce them in their thousands. In addition, blades must pass strict quality control processes to ensure the turbine will ultimately perform safely and reliably.

ANCA has been working closely with the industry to deliver a process for grinding all geometric features of the finished compressor blade root forms. The compressor blade root form

is responsible for ensuring the blade itself will be correctly seated in the turbine rotor during operation. ANCA's TXcell proved ideally suited to this application, by combining the flexibility of a robot cell with the rigidity and precision of the TX7+.

ANCA Grinding Process

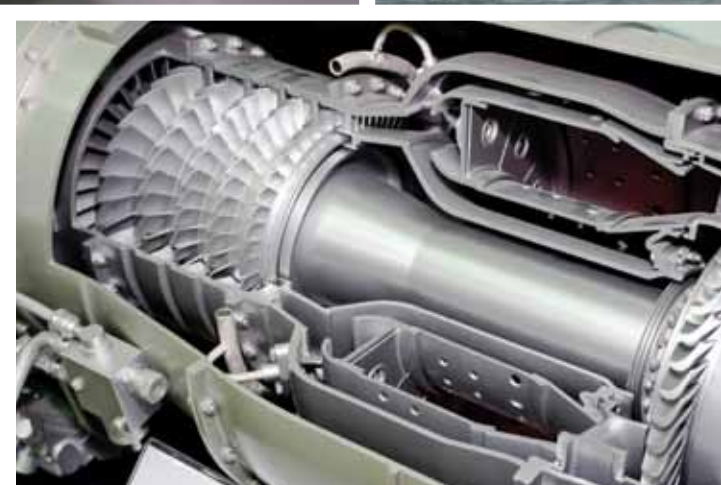
The unground, forged blade is presented in a rough form that will require various chamfers and flat surfaces to be ground on the root and platform face.

A 3D model of the finished root form is imported into UG-NX where the grinding path is prepared in the NX-CAM software.

Using ANCA's own ANCam post processor software, all programmed machine moves are now exported from NX-CAM to the ANCA ToolRoom software. This allows simulation of the grinding cycle in CIMulator3D and finally, grinding of the actual part.

TXcell for Blade Grinding – Special Features

ANCA's TXcell proved to be the perfect foundation for complex applications like turbine blade grinding. The proven rigidity and accuracy of the TX7+ ensures highly productive and accurate grinding. Complex blade geometry requires use of



MAIN IMAGE: Grinding turbine blades on a TXcell.

ABOVE: Turbofan engines have been fitted to most modern jet aircraft.

LEFT: A cut away of a gas turbine showing the blades.

BELOW: A gas turbine blade close-up.



multiple wheel packs that are more than covered by the TXcell, which has capacity of up to 24 wheel packs. In addition, the same robot loader that is used for wheel pack changing is also applied to automate part loading.

Several enhancements, specific to the needs of blade root form grinding, were developed to ensure the TXcell delivered all the capabilities required for a high volume blade manufacturing environment.

Dresser

Generating the required blade root form requires multiple wheel packs, each with their own unique wheel profile. Each wheel profile has its own dedicated dresser roll that allows quick and highly efficient plunge dressing. In considering the weight of the arbour and mounted dressers, the dresser unit itself is situated on the operator side of the TXcell headstock for easy and ergonomic access. While the dresser motor features standard HSK arbour mounting, additional support and stiffness is provided to the end of the arbour in the form of a rigidly mounted live centre. Given the requirement for multiple dresser profiles, dresser arbours up to 250 mm long are able to be used. Software enhancements also ensure the correct dresser roll is used at the desired intervals, as controlled by the user.

Coolant Delivery

Wheels used in grinding turbine blades must be dressed repeatedly to maintain cutting ability and correct profile. As a result, their diameter naturally reduces over time. To cater for

this, the TXcell is equipped with special coolant manifolds that will automatically adjust the coolant nozzle position to match the wheel diameter. This adjustment is fully automatic and controlled by the ANCA software. In addition, special nozzles are used to ensure a smooth laminar flow of the coolant to deliver optimal cooling and lubrication at the grind point. A second separate coolant nozzle is also included in the manifold to provide wheel cleaning capability via a high pressure (60 bar) coolant jet.

With up to 24 wheel packs on hand, ANCA can optimise the grinding cycles to ensure grinding occurs right where the coolant is being delivered – either at the 3 or 9 o'clock position on the wheel. This avoids the need for costly NC controlled coolant nozzles that swivel right around the wheel to different positions depending on the particular grinding operation.

It's the Results that Count!

Combining these technical enhancements with the application grinding experience of ANCA engineers, outstanding results have been achieved. Aggressive cycle time targets laid down as a 'hopeful challenge' were met. Additionally, post-process interrogation of the blade geometry, surface finish and material integrity exceeded customer requirements. It is these results that are allowing turbine blade manufacturers to step up to the challenging needs of the gas turbine industry; an industry where production demand is set to provide growing opportunities in the future. ♦

Medical Precision

Sheffield Precision Medical uses an ANCA TX7+ to great effect in supplying quality tools to the UK medical market. **Mike Welsh** reports.

Sheffield Precision Medical (SPM) specialises in the design, prototyping and low-to-high volume production of a diverse range of surgical instruments and associated products. The company has a rapidly-expanding global client base, including market-leading multi-national OEMs (original equipment manufacturers) who provide implants and instrumentation to hospitals and health professionals worldwide.

SPM provides its world-wide customers with a wide range of high quality drills, reamers, assemblies, wires, nails, screws, trials and rasps. Due to customer demand, the list of products manufactured by the company is constantly expanding.

In addition to the volume production of established products, such as precision orthopaedic medical instrumentation, SPM also carry out in-depth research and development. Their state-of-the art production facilities enable new ideas to be progressed from conception, through development, to efficient manufacturing. Their capabilities include a bespoke design service.

SPM embraces the latest production technologies and uses the most up-to-date CAD, CAM and post-processed CNC manufacturing techniques, together with CAD models to both mechanical and optical CMMs (Co-ordinate Measuring Machines) inspection. In addition to other 'exotic' materials, the company has extensive experience in machining stainless steels, cobalt chrome and titanium grades.





The critical nature of SPM's output and the high quality expectations of its demanding customers means that the company utilises only premium quality machine tools. All of the company's grinding operations are performed on high-quality ANCA tool grinders, including the recently installed, highly productive TX7+ model.

As Steve Lambell, Sheffield Precision Medical, Manufacturing Director explained, "the excellent reputation that we enjoy is built on delivering the highest quality products, on time at the right price. As well as employing highly-skilled personnel, this has been achieved by using the best available machine tools and ancillary equipment. In addition to ANCA tool grinders being ultra-reliable and capable of producing impressive volumes of parts, the high quality of their output is perfect for our needs."

"To further increase our ANCA machines' efficiency we use them in conjunction with NX Unigraphics advanced CAD/CAM/CAE software."

"To ensure that we are able to keep up with rising demand for our output, we have recently installed a second ANCA TX7+. Although we undertake long production runs, we also carry out short runs. The flexibility and the rapid set-up speed of the TX7+ means that we are able to minimise down-time when swapping between jobs."

"...the high quality of their output is perfect for our needs."

"The excellent technical back-up we receive from ANCA UK has been extremely useful to us. Although our operators have a wealth of experience in operating ANCA machines, the complex nature of some of our products means that occasionally we ring ANCA for assistance."

"Despite its compact size, our new TX7+ actually provides a large working envelope and enables the manufacturing of tools of up to 400 mm long and 300 mm in diameter."

"The positive experience we have had with ANCA tool grinders, combined with the excellent service provided by the company, will ensure that as our business continues to grow we anticipate purchasing further ANCA products."

Already a global leader in the field of tool-grinding, the quality parts produced by ANCA machines means that the popular tool grinders are also used by many of the world's leading manufacturers of surgical instruments and associated products.

As the rotary instruments used in surgical procedures have a lot in common with the rotary tools used in industry, the challenging surgical sector has gained many benefits through the use of ANCA tool grinders. For example, bone drills need to efficiently and safely penetrate and evacuate heterogeneous layers of material – a task that is comparable to drilling holes in the composite structures found in the aerospace industry. Also, bone drills tend to be long and thin, resembling the deep hole drills used to drill injector seats in cylinder heads.

Since its launch, the TX7+ has quickly established itself as a benchmark in the world of CNC grinding. The robust design and construction, combined with innovative tooling and advanced automation, provides users with high productivity and excellent levels of surface finish. ANCA continues to develop its capability with new software and accessories always under development. ♦

www.sheffieldpm.co.uk



Melbourne

*Visitors' tips
from a local*

Lisa Paterson

Melbourne city and the Yarra River

Melbourne is a cosmopolitan city that is both sophisticated and laid back. It is the Victorian state capital and the second biggest city in Australia. Melbourne has something for everyone, it produces some of the best music, art, cuisine and fashion found anywhere. From the Australian Formula One Grand Prix to the Australian Open tennis, there's always something happening in Victoria.

What helps make Melbourne so vibrant is its multicultural society. Its restaurants not only cover all possible cuisines between them, it also has many charismatic areas for a memorable night out. These include waterfront suburbs like St Kilda, riverside with city view regions such as Southgate and Crown Casino, and culture focussed streets such as Lygon Street (Italian) and Chinatown.

Melburnians are very serious about their coffee and you will never be far from a good cafe. There are also a wide range of eclectic bars throughout Melbourne. Many provide live music which give Melbourne its 'live music capital' status.

Another Melbourne passion is sport. Melburnians embrace most sports but the most popular is AFL – Australian Rules Football. This is played around Australia but the AFL 'home' is Melbourne, at the Melbourne Cricket Ground (MCG). The MCG was used for the Melbourne Olympics in 1956.

Victoria's capital city is also known for its variable weather. Sometimes there can be 'four seasons in one day'. The winters in June to August can be cold and have an average of 14° Celsius. The summers in December to February have an average of 25° Celsius but can be as hot as 30-40°. Apart from mid-winter the weather is mostly pleasant.

MUST SEE AREAS NEAR THE CITY

Brunswick St (Fitzroy) – This street reflects the soul of Melbourne in that nobody is made to feel out of place, here you can be Bohemian, poor, rich, alternative, trendy, young or old. You will find a great selection of funky cafes and bars, quirky shops, alternative fashion shops and restaurants specialising in everything from Spanish to Greek cuisine.

St Kilda (Acland St, Fitzroy St, Luna Park and the foreshore) – It is an easy tram ride from the city, just 6 km from the Central Business District (CBD – city centre) – or even a great place to stay. Definitely worth a visit. You won't run out of things to do with a beach, a long pier (with cafe), an amusement park (Luna Park), and Acland Street which is famous for its cake shops, restaurants and bars. You could even try the historic Esplanade Hotel, or the Sunday St Kilda Esplanade market.

Southgate and Crown Entertainment Complexes (CBD) – Two entertainment and dining complexes on Yarra river with magnificent views of the city linked by a popular walk along Yarra river. Crown includes a Casino and Cinema. Behind Southgate is the Arts Centre and National Gallery of Victoria.

Federation Square (CBD) – Situated next to Yarra River and Flinders Street Station it is Melbourne's most popular open meeting space. Its modern design includes restaurants, bars, several galleries and a tourist information centre.

Eureka Skydeck 88 (CBD) - Get the best views of Melbourne at the Eureka building that boasts the Southern Hemisphere's highest viewing platform. For the brave it also includes 'The Edge' a glass cube that projects out from the building.

DAY TRIPS WORTH MAKING

Healesville Sanctuary – experience close encounters with Australian animals such as kangaroos, koalas, dingoes and emus in a stunning bushland setting. Only one hour from the city. Or if short of time the Melbourne Zoo in the city offers close-up encounters with kangaroos at specific times.

Dandenong Ranges – worth the one-hour drive, the mountain ranges of lush mountain ash forest is a scenic trip with villages such as Olinda popular for their cafes and boutique shops. Puffing Billy, Australia's oldest steam train, based in Belgrave, is also popular with tourists.

Mornington Peninsula – a popular holiday destination for Melbourne locals in summer, an hour's drive will get you to the popular beaches of the peninsula, the trendy shops of Sorrento and the busy Portsea pub that overlooks the water.

Great Ocean Road – Drive along the coastal, winding road and enjoy amazing views from the steep cliff faces. A popular landmark along the way is the 12 Apostles rock stacks. The Great Ocean Road passes popular surfing and swimming beaches.

Yarra Valley – This relaxing open country side is a popular place for winery tours. Only one hour from the CBD, there are a wide range of popular and smaller wineries to choose from.

Ballarat (Sovereign Hill) – Ballarat is Victoria's largest inland city and the site of Sovereign Hill, which is a fun recreation of an 1850s gold mining settlement.

Phillip Island – the popular Little Penguin Parade happens every sunset. There are also other attractions and beautiful beaches to make up for the two-hour drive from Melbourne.

GREAT SHOPPING AREAS

Bourke St Mall (CBD) – a good central place to start. Australia's main department stores Myer and David Jones are here. There are several covered shopping complexes in the vicinity including Melbourne Central and the historic Block Arcade.

Chadstone shopping centre (30 minutes from CBD – worth the trip) – known as the Fashion Capital it is the biggest shopping centre in Australia. A tourist shuttle leaves from Federation Square.

Sunday Markets – great for souvenirs – St Kilda Esplanade market and Arts Centre market.

Collins St (CBD) – Here you will find a range of luxury shops.

Brunswick St (Fitzroy) – independent and artistic shops, clothes, gifts, jewellery, art.

Chapel St (Sth Yarra) – quite upmarket, it is the place for clothes shopping.



The 12 Apostles on the Great Ocean Road.



Cafes in Brunswick Street, Fitzroy

VERY MELBOURNE THINGS TO DO WHEN VISITING

Catch a tram – a convenient way to get around the city. You will need a Myki card (tap on as you get on AND as you get off). For a unique dining and Melbourne experience book a meal on the 'Colonial Tramcar Restaurant'.

Go to an AFL game (March to September) – A local will be happy to explain how the game works! Or in summer you could attend a cricket game at the MCG.

Go to Queen Victoria market – known as 'Vic market' it is in the CBD and has everything from food to clothing and souvenirs. It is over a century old and is open five days a week.

Take a Yarra river cruise – a relaxing way to see beautiful views of the city.



Bathing boxes at Brighton Beach



ANCA's Jewel in the Crown

ANCA customer Precorp is reaping the benefits of a partnership designed to bring new technology to the production of PCD tooling. **Andrew Ritchie** brings us this profile.

Demands from the aerospace and automotive industries for more efficient and light-weight products are driving the development of new and exotic materials. As these become more advanced, they are challenging traditional manufacturing methods and driving advances in cutting-tool substrate and design. Industries such as aerospace and automotive are increasingly using materials such as Carbon Fibre Reinforced Plastic (CFRP) that offer advantages in performance and fuel efficiency. A result of this trend is the increasing demand for Polycrystalline Diamond (PCD) cutting tools.

For tool manufacturers looking to enter this growing market, ANCA now offers the new EDGE machine which is an innovative solution for the production of PCD tooling.

The EDGE machine is ideal for PCD tool refurbishment and manufacture. With its double-ended wheel spindle, it has the dual capability to erode PCD and grind carbide. This is ideal for customers looking to move into PCD by having a machine that is equally suitable for carbide or PCD tool production. This dual process machine reduces the financial risk associated with moving into new market territory.

ANCA has over 30 years of tool grinding experience and is well known in the industry for its tool design software. EDGE has capitalised on this legacy, now offering manufacturers of PCD tools a level of flexibility and productivity that ANCA customers have benefitted from for years. The user interface is easy for in-putting tool geometry and requires no time consuming programming.

The creation and development of the EDGE machine has involved a number of key partnerships. One of these is ANCA's industry development partner Precorp. Precorp is a leading manufacturer of PCD cutting tools and a key supplier to companies such as Boeing in their production of the 787 (Dreamliner) aircraft. Precorp's experience in PCD tool development provided the ideal beta test site for the EDGE

machine to ensure it would meet the demands of industry and perform in a production environment.

Precorp President Richard Garrick stated the ANCA EDGE machine had been beneficial in many aspects towards Precorp's business.

"A part of Precorp's strategy is to constantly push existing manufacturing technology to achieve a technical advantage and differentiation in the market place," he said.



ABOVE: Precorp Project Engineer Duncan Wellesley with the ANCA EDGE machine.



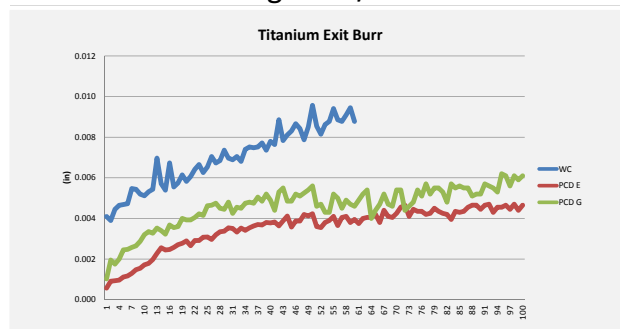
“Key to this is partnering with machine suppliers that are willing to push technology and think ‘outside the box’. ANCA has always represented themselves to us as one of these suppliers. Our work together on ANCA’s new EDGE has moved EDG technology forward with regard to the manufacturing of PCD drills.

“The ANCA EDGE machine facilitates the reconditioning of PCD drills which will, in turn, allow PCD drills and tools to be more widely used. The EDGE machine will allow the application and reconditioning of PCD tools in applications where traditionally it has been cost prohibitive. ANCA committed the necessary resources in the development of this project in order to ensure its success. Going forward we will continue to grow our relationship with ANCA and other suppliers that continue to deliver a technical advantage for our manufacturing processes.”

Another key partner is Royal Melbourne Institute of Technology (RMIT – Australian university), who through their PhD program assisted the project with research and data analysis. Their intellectual expertise coupled with ANCA’s Engineering group, were able to develop a product that uses the latest available technology.

ANCA’s proprietary EDGE-Spark generator monitors and controls the energy level of every spark and adaptively adjusts the gap distance for optimum surface finish, material removal and cycle time. This provides exceptional operator feedback

Automated Drilling of CF/Ti



ABOVE: A graph indicating exit burr results during Precorp drill comparison tests (drill manufacture via erosion versus ground). WC = carbide, PCD E = PCD eroded, PCD G = PCD ground.

BELOW: Tools eroded on the EDGE machine have higher performance figures.

in real time statistical information on the erosion process. It automatically adapts each spark for the resistivity of the substrate, be it tungsten carbide, diamond or cobalt binder.

The partnership with Precorp has allowed ANCA to measure and benchmark the performance of the tools being manufactured on the EDGE machine. Testing of tools eroded on the EDGE machine resulted with better figures for cutting force, exit burrs and drill life.

Comparative testing between a ground drill and an EDGE eroded drill has proven the ANCA machine produces a higher performance cutting tool.

“The tools eroded on the EDGE are producing drills with a keener cutting edge than what we have seen on a ground drill,” says Garrick. “The holes drilled with these tools are producing less exit burrs and delamination which is highly desirable when using them on composite materials stacks, for example, CFRP, aluminium and titanium.”

The EDGE is a versatile machine that is suited to a wide variety of industry tools and applications. Incorporating over 30 years of machine tool design in the tool manufacturing market, ANCA is excited about the launch of the new EDGE machine and believes that it will provide customers with a new level of capability for the production of PCD tools. ♦

PRECORP



Filtration for Precision Machining

Filtering the coolant is a crucial part of grinding. Ebbco Inc. briefs us on the latest development with filtration 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 machine tool manufactures 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 Evolution Series Filtration Systems are custom designed for each application, with flow rates ranging up to 120 gpm. 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 or drag conveyors for tool steel and non-magnetic stainless applications.

A heavy-duty filter cartridge housings containing up to eight micron-rated filter cartridges each, an in-line 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 featured the Evomatic, a backwash filtration system. The Ebbco Evomatic Automatic Backwashing Filtration System is designed for coolant or oil applications, cutting material such as high speed steel and carbide. The Evomatic Filtration System conditions coolants down to 5.0 micron, or oil down to 0.5 micron while maintaining a consistent 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 Systems are capable of providing flow rates up to 200 gpm.

Ebbco has delivered and installed several central Evolution and Evomatic filtration systems ranging from 100-200 gpm and chiller capabilities of up to 240,000 BTU.

For more information please contact:

Ebbco direct at 586-716-5151, email: info@ebbcoinc.com

www.ebbcoinc.com





Precision Machining Filtration

Systems Designed to:

- ✓ Eliminate Particulate Build up in the Machine
- ✓ Increase Fluid Life
- ✓ Maintain Consistent Part Finish
- ✓ Reduce Part Rejection
- ✓ Filtration Down to 1/2 Micron



Evolution Series

Complete Precision Machining Filter System



Prefilter and Polishing

Magnetic Prefilter and Cartridge Polishing



Grinding Fluids

**Centralized
Filtration Systems
Available**



Evomatic Series

Automatic Backwashing System

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51536 Industrial Drive
New Baltimore, Michigan USA
Tele: (586) 716-5151 Fax: (586) 716-4949
web: www.ebbcoinc.com
email: info@ebbcoinc.com



Benchmark Tools

Benchmark Carbide is an innovative grinding company that is taking full advantage of the efficiency that comes with ANCA grinders. **David Arnesen** went on a fact-finding mission.

"We have a very strong brand name and we have been making excellent tools since 1996," says Benchmark Carbide owner Paul St. Louis in Springfield, MA. Since 2001, the company had slowly improved its performance – until recently when orders for its patented end mills dramatically increased.

It takes a lot to keep up with that kind of demand. Paul counts on his 11 ANCA CNC tool and cutter grinders with automatic loaders. "We run our ANCAs 24 hours a day, seven days a week, producing around 1300 endmills a day. On a good weekend we can make over 3000 endmills," Paul said.

It is a neatly organised, compact shop. "Every machine is robotically loaded and we run a lean shop with only 18 people on the floor. Double wheel packs on twin spindles and in-machine dressing on the ANCA's means we have flexibility and the capability to operate long hours unattended, producing superior tools without interruption."

Three of the machines are the production-oriented TX7s with auto loaders running larger tools to 1.5" (38 mm). Eight RX7s run the smaller tools from .006 to .500." "With eight manual machines, I could not do a third of what we produce now," Paul said.

The automation and lean shop organisation permit Benchmark to operate as a low cost producer and to offer the market some highly innovative tool designs that reduce the cost of machining aluminium and other material.

The TX7s feature a powerful 49HP (37kW) 10,000 RPM spindle, an automatic wheel changer, auto-loading system, and a 3000 RPM headstock. ANCA's ToolRoom tool and cutter grinding software drives the machine.

The TX7 performs a complete changeover of wheel pack, coolant delivery system, work-holding collet and pallet in less than three minutes. Other brand machines require from 15-20 minutes to several hours for changeover to produce another type of tool. For the TX7, wheel packs and corresponding coolant manifolds are prepared off-machine and quickly exchanged to grind a new tool.

Innovative endmill line

Benchmark's customers look on them as innovators. They make endmills for machining aluminium a little differently than others do. And they work exceptionally well, outperforming other brands.

Most tools by other manufacturers are made with a cylindrical margin, where the shank is the OD of the tool that is cutting. Endmill makers typically flute it out and leave behind a narrow—often .003" wide—margin. This is often difficult to hold. If it is too wide, it will push away; too narrow, you get chatter.

"With our ANCAs we run the grinds on the OD: primary, secondary and a ground-on edge prep which reduces chatter and vibration and we can control the thickness of it to .0015" and .002" wide," Paul said, "so when the tools are milling aluminium they do not squeal or chatter. Machining is consistent and high quality. The tool repeats. And we have two grinds on the fluting to move the chip a little better."

The company makes two-, three-, four- and five-flute carbide tools for high-speed machining of aluminium. Variable helix mills are a Benchmark specialty, starting with a 45-degree helix and ending at a 60-degree helix.

“The machines are doing consistently high quality work over long runs.”

The helix design reduces vibration in the tool.

“With the ANCA’s producing five-flute tools we can remove .0001” per tooth and over 50% of the tool diameter. With that tool in a 10,000 RPM machining center spindle you could run 500 ipm (12.8 m/m),” Paul pointed out. The edge prep by Benchmark goes around the radius and does the end in a single grind.

The machine and software capability lets Benchmark maintain its edge. ANCA ToolRoom software is key to allowing Benchmark produce the variable helix.

The direct drive, high-speed 3000 RPM work head (A-axis) of the TX7 allows users like Benchmark to include cylindrical grinding operations in the tool grinding process without changing the set-up, and to fully grind stepped or tapered blanks to the final tool. This means tools can be produced complete in a single set-up, minimising production time for many tools that formerly may have required two operations to complete.

The ANCA TX7s at Benchmark use the patented Big Plus wheel mounting system which contributes to high precision running of the grinding wheels. The system, superior to a conventional tapered holder, provides a more complete and concentric contact plus flange contact. The resulting rigid assembly nearly eliminates runout and deflection, and benefits wheel life, surface finish, and part tolerance.

Mounted to the back of the chuck on the TX7’s high-speed work head, the dresser roll is easily accessed or introduced to the wheels with minimal axis strokes for in-process dressing.

On the TX7s, the loader is mounted to the left of the machine and has its own control panel to enable quick, safe set-up requiring only one operator. The loader brings the tool into the machine on a pneumatic carriage while the headstock automatically positions itself to receive the tool in a rapid tool change cycle.

The CNC wheel changer on the TX7s allows Benchmark to apply two wheel packs to one application, accomplishing more operations in a single set-up. Mounted on a manifold, coolant piping changes with the wheel packs, so that coolant flow is always tuned to the wheel in use for optimum coolant application.

Software is the key

Clayton Pirie manages the ANCA’s at Benchmark. He says he is always learning as ANCA is constantly enhancing its software and promptly provides the updates to the shop.

“ANCA’s user-friendly software has enabled us to produce a number of innovations that other tool makers just don’t,” Clayton said. “The CIMulator3D lets us lay out the whole tool off-line without wasting grinding machine time. We can dream up a tool and see if we can make it before we ever get to machining. It’s an innovator’s best tool.”

ANCA’s CIMulator3D provides an off-line tool development environment which enables the efficient design of new



MAIN IMAGE: The line-up of ANCA machines at Benchmark Carbide.

ABOVE: Benchmark’s endmills work exceptionally well.

BELOW: Benchmark boss Paul St Louis.

tooling and the required manufacturing process, avoiding loss of production. Set-up time for new tools is dramatically reduced, and production can begin more quickly. As an offline workstation, CIMulator3D can also be run on the CNC to simulate tool production programs before grinding.

Paul observes: “When we did half the volume, it seemed more stressful on the shop floor. Today, there are only three set-up people in each shift, yet it’s a calmer atmosphere. We are producing much more with much less stress, thanks to the ANCA’s. The machines are doing consistently high quality work over long runs.” ♦





Effective **Cooling** and Lubrication

The humble coolant nozzle can have a greater impact on the grinding process than you think. In this feature, Dr John A. Webster examines the role coolant plays in the search for a quality surface finish and micron accuracy.

Nozzles are an established way of supplying coolant into a grinding process to control the part temperature, keep the wheel clean and open for chip flow, allow the extreme pressure additives in the coolant to do their job, and flush the chips away from the cutting area and into the filter system.

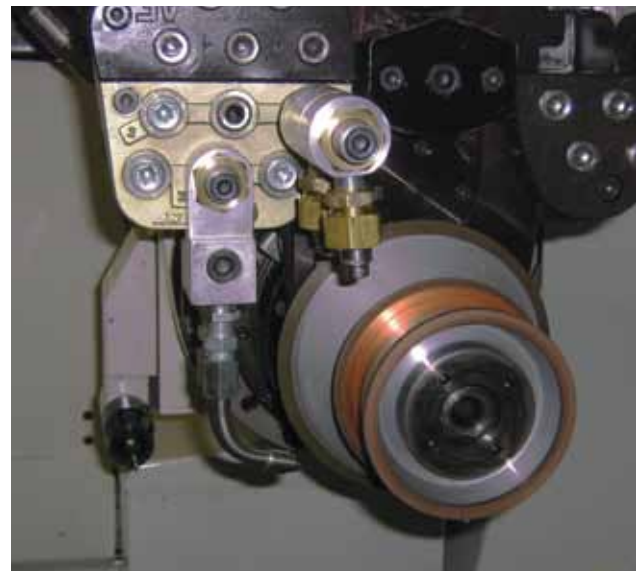
Plastic modular nozzles work well at low pressure (2 bar) but can move out of position at the higher pressures that give better grinding. They are easy to aim, but need to be placed close due to the dispersed jet nozzle geometry. Rigid metal tubes—such as copper and steel—are stiffer, but also give dispersed jets that entrain air into the coolant unless the end is accurately swaged or a nozzle tip attached to the end. Aiming and re-aiming them requires frequent bending that ultimately leads to fracture.

Over the last 20 years the author has demonstrated laser-like coherent-jet nozzles to be more effective than modular plastic and rigid tube nozzles, especially in grinding where most of the heat goes into the part, not into the chip. With wheel speeds of 6000 sfpm or greater, the boundary layer of air travelling with the wheel surface will prevent low-pressure coolant from wetting the wheel surface. The higher impact energy associated with coherent jets, and their ability to match the wheel speed, removes the boundary layer, cleans the wheel, and allows the wheel to transport the coolant through the grinding zone.

A medical tool manufacturer with an ANCA TX7 grinder experiences five times less wheel-corner wear, elimination of burr and burn from the gummy stainless material, no nozzle damage due to the greater distance from the wheel, easier jet aiming, and 40% increase in productivity, after fitting coherent-jet nozzles.

In grinding, a well-proven flow-rate model to effectively cool the process is 1.5 to 2 GPM per spindle horsepower, i.e. a 5 HP cycle requires 7 to 10 GPM of well-aimed flow rate directed into the process. An aerospace component manufacturer producing turbine blades could only run five machines in a cell of 10 from the central system as the nozzle apertures gradually increased over the years in an effort to control grinding burn.

Each machine was fitted with eight 10 mm diameter open pipes to cool two grinding wheels on the same spindle. After stripping



This twin-jet fluting nozzle system is shown fitted to an ANCA TX7 grinder. The round nozzle targets the corner of the wheel and the flat nozzle the OD of the wheel. The two outer wheels are lubricated by round swivel nozzles on ring manifolds

off the original nozzles and replacing them with five 4.5 mm diameter round coherent-jet nozzles, the dressing interval doubled, surface finish improved, grinding power reduced by 40%, flowrate reduced by 66%, the burn issue went away and all ten machines could run off the central system.

A manufacturer using coherent jets made the following comments on its benefits.

"The rigidity of the coherent jet system and the clearance away from the wheel is a key benefit for us as we do not need the coherent jets nearly as close to the contact/grinding area.

"Our experience shows that the wheel life, dressing frequency and surface finish are superior when using a coherent jet system over both copper and Loclines. The ability to direct a precise jet to exactly the proper position allows us to actually use less coolant banks/nozzles as opposed to the old copper/Locline style while still increasing the wheel performance."



A comparison between a coherent-jet nozzle and an open tube nozzle with water at 120 psi.

“ the dressing interval doubled, surface finish improved, grinding power reduced by 40% ”

For machine tool operators to be encouraged to use coherent-jet nozzles, it is important to integrate a high degree of adjustability into the design as well as high stiffness once aimed. This can be achieved by fitting nozzles with swivel joints that are locked after aiming. Pre-soldered round and flat nozzle tubes can be bent very close to the tip of the nozzle using special tube benders and then fixed to a manifold or pipe fitting using releasable collets.

This allows axial and rotary adjustment when aiming the jet, unlike conventional compression fittings that bite permanently onto the tube. Using a combination of flat and round nozzles, even a complex wheel profile can be fully covered by coolant using the available degrees of freedom listed above.



Push-fit round and flat nozzles that can be attached to copper tubing before bending and removed before the tubing is discarded when fatigued. These nozzles are ideal for machines such as the MX5, which predominantly use copper tubes.

Additional benefits of improved coolant application are:

- Longer-lasting, harder grade grinding wheels to be used for better form holding and without the concern of thermal damage occurring
- Better surface integrity due to direct cooling of the process, not quenching of a hot part before the next pass
- Reduced flow rate and pumping energy associated with more effective flow, plus less filter media indexing
- More rigid nozzles without the risk of jets moving, allowing the machine to be unmanned
- Less loading of the wheel (or tools) with chips produced in previous revolutions, giving more consistent spindle power and forces, resulting in better part geometry. ♦

The author, Dr. John Webster, has studied theoretical and practical aspects of the grinding process for 20 years at universities in Connecticut and the United Kingdom. After six years of implementing his coolant strategies at Saint-Gobain he launched Cool-Grind Technologies in 2004. Technical articles relating to coolant application can be downloaded from his website www.cool-grind.com.



A close-up of a TX7 coolant manifold fitted with a fluting nozzle system matched to the wheel angle.

On the Plus Side

*ANCA's latest innovation in the search for grinding accuracy has consistently returned run-out results of less than 3 micron. **Lisa Paterson** explains.*



ANCA has launched MicroPlus, a high accuracy workholding and tool support system that significantly reduces tool run-out. MicroPlus was developed to satisfy the growing demand for more precise tools. Consistent results of less than 3 micron tool run-out have been achieved with the use of the new system.

The advanced MicroPlus system consists of two separate assemblies: the Flexi-Chuck assembly provides effective workholding, while the Overhead Top Clamp Assembly (OTC) provides tool support and guidance. The combination of the two assemblies provides a precise arrangement that delivers consistently lower run-out than existing systems.

Flexi-Chuck work-holding assembly

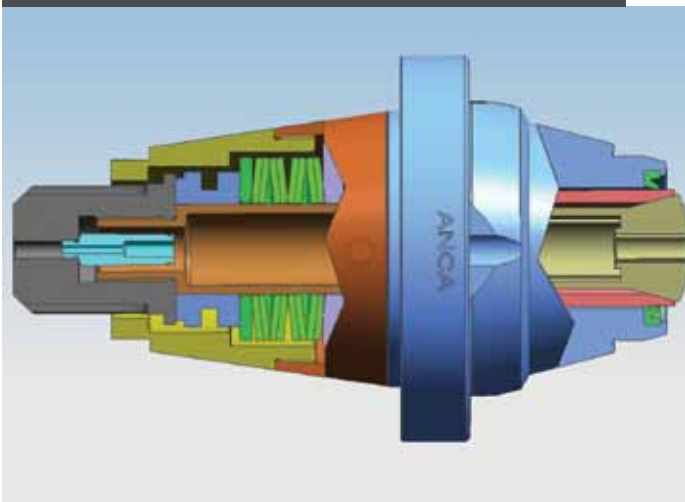
The function of the Flexi-Chuck is to clamp and rotate the tool, enabling the tool and internal components to move independently of each other, minimising any misalignment. This prevents adverse factors such as collet inaccuracy, inconsistent collet clamping and any misalignment caused by loading tools, automatically or manually.

ANCA's patented Flexi-Chuck has internal springs, which generate the clamping force and make it a completely independent unit. The Flexi-Chuck does not use the traditional draw-bar design and is therefore not affected by that design's potentially negative influence on tool run-out. The clamping force is generated by disc spring stacks within the Flexi-Chuck assembly. This extremely effective technique provides sufficient force to clamp the tool securely.

In other less advanced systems, if the draw bar and tool are not in a completely straight line, the centrelines may differ. This would result in the draw bar pulling the tool at a different angle, which would cause tool run-out. Also, rigid draw-bar mounted collets can over-constrain the system, preventing the OTC assembly from being able to totally dictate tool guidance. As accuracy of microns is the goal, it is not difficult for this to occur.

The advantage of ANCA's Flexi-Chuck is that it enables the tool and the internal components to move independently of each other, and therefore absorb any potential misalignment. Precise tool guidance is achieved by the OTC assembly and the collet float of the Flexi-Chuck. This arrangement allows the OTC to guide the tool without the Flexi-Chuck influencing tool alignment accuracy.

ABOVE: The Flexi-Chuck work-holding assembly.



ABOVE: Section view of the Flexi-Chuck showing the integrated spring design.

BELOW: MicroPlus is providing consistent results on several ANCA machines including the MX5.

Overhead Top Clamp tool support assembly

The role of the OTC assembly in the system is to support the tool, ensure the alignment accuracy for the tool and reduce tool runout. The OTC retains the tool in the rigid V-block with an overhead clamp. The clamp is a rigid metal finger with an acetal pad that ensures the tool shank is not damaged when it is rotated during grinding. The OTC is mounted on a rigid steady bed, while the tool is clamped and unclamped by a pneumatic actuator. The operator is able to adjust the pneumatic clamping pressure of the finger to suit different tool types and sizes.

Automated set-up assistance for MicroPlus is provided in ANCA's ToolRoom software. This helps the operator to set up parameters such as the centrelines of the OTC assembly with the Flexi-Chuck, in both vertical and horizontal planes.

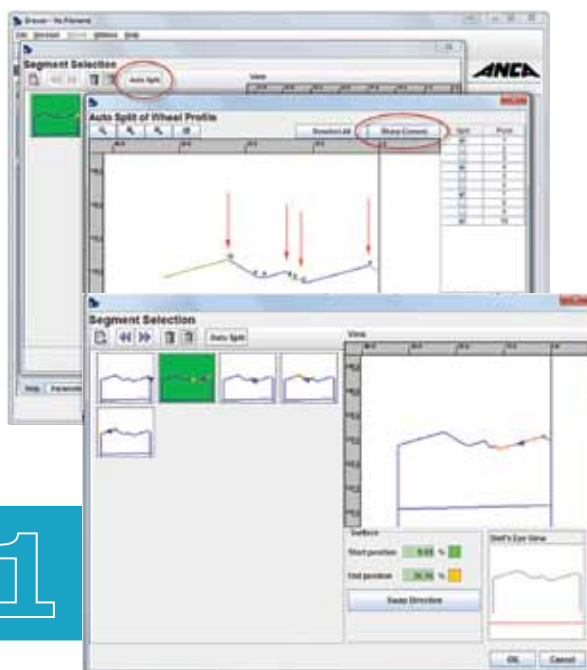
Key benefits of the MicroPlus include: less than 3 micron (0.0001") run out for tools measured 50 mm (2") from the face of the collet, reliable elimination of both radial and axial run-out, suitability for both manual and automated loading of tools, an ideal production grinding range of 3-13 mm diameter tools and an easy changeover of collets.

The MicroPlus is currently available for ANCA's MX7, MX5, GX7 and RX7 tool grinders. ♦



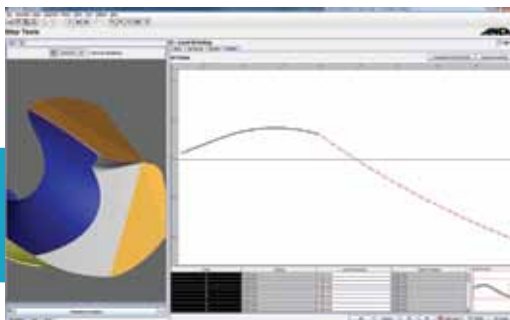
16 of the Best

Jeff Hazeldine with 16 of the best tips to make the most of your ToolRoom 2012 software.



1

A unique feature in the Dresser software is the Auto-Split function. Able to detect sharp corners in profiles, this function allows the profile to be split to enable specified dressing of the profile's individual segment geometries.



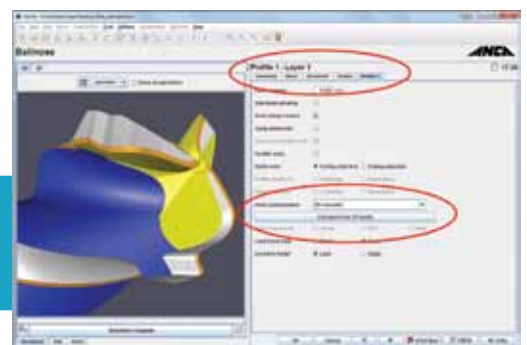
3

Achieving a correct K-land lip has been made easier with the introduction of the Auto Break function. Using the 2D editor in the K-land operation, the programmer is able to automatically split the K-land lip geometry into a specified number of edges at the point of highest curvature every time.



2

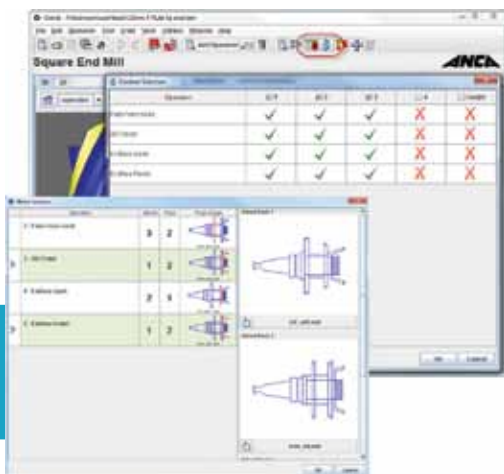
When using the white stick for wheel conditioning, programmers can split one (physical) stick into two virtual sticks via the Dresser software, turn two physical sticks into four virtual sticks, further pushing the capabilities of white-stick wheel conditioning.



4

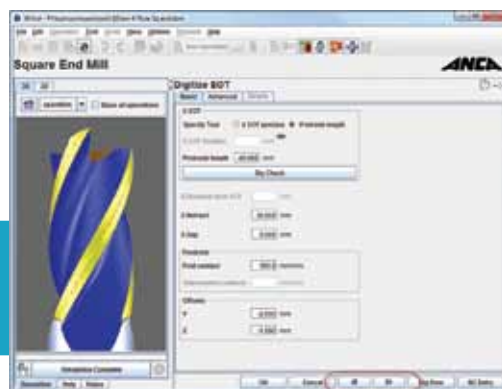
Profile software now includes the HOOK COMPENSATION – 3D CALCULATE option which enables the software to precisely calculate and grind the tool profile. This has multiple benefits. It eliminates the need to digitise the tool and therefore enables grinding of profiles on small tools where digitising may not have been possible. Advantages include enabling tools to be simulated before grinding and the ability to grind accurate profiles on the end-face. The option is available on the DETAILS 2 tab of the profile software.

5



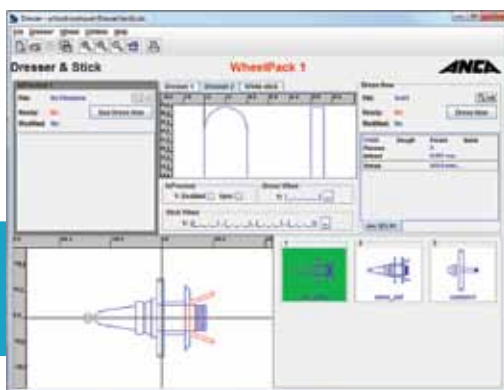
Use the dialog boxes for quick access to coolant and wheel selections.

6



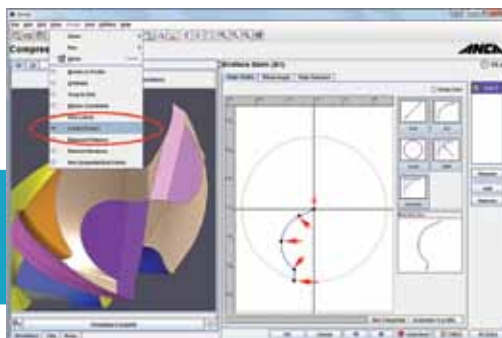
When moving between worksheets try using the FORWARD or BACK arrows, you will find it a lot quicker than closing one worksheet and then opening another.

7



If dressing multiple wheel profiles regularly is something you do, then ANCA's Dresser software has the solution. The Dresser software now enables users to mount multiple rolls to maximise flexibility and minimise set-up times.

8



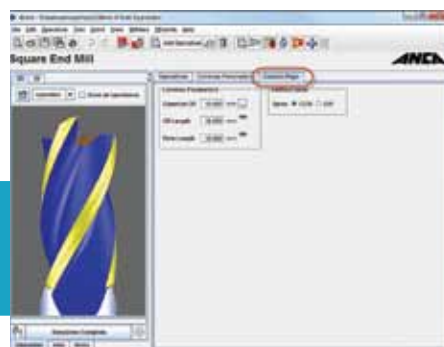
Turning on control points in any 2D editor highlights the start and end points of each element. The programmer has the ability to drag and drop these points, enabling mouse manipulation of the 2D geometry. This is particularly useful when editing, for example, the geometry for a custom walk. Control points also work with splines.

9



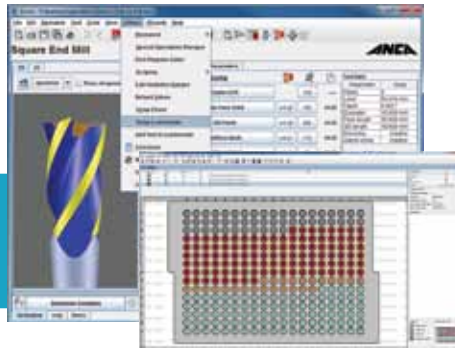
NC Functions are used to assign NC code to a parameter value instead of an explicit value. This enables a parameter to be set as a function of other parameter values. To open the NC Function editor right-click on a numeric parameter and select NC FUNCTION from the pop-up menu. To assign a function to a parameter first select the NC CODE radio button at the top of the dialog and enter the function. For convenience, a list is shown of other parameters in the operation. Select a parameter from the list to insert the corresponding variable into the function editor. NC Functions are particularly useful in creating template files.

10



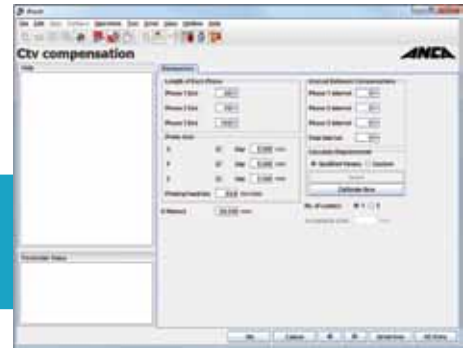
The Custom Page, when created, enables almost any parameter to be displayed and changed in a single convenient location. The Custom Page is used to streamline the fine tuning of grinding parameters distributed across several operations. To add parameters to the Custom Page, right-click on a parameter and select the ADD TO CUSTOM PAGE command. The Custom Page will appear as a separate tab, next to the COMMON PARAMETERS tab when the first parameter is added.

11



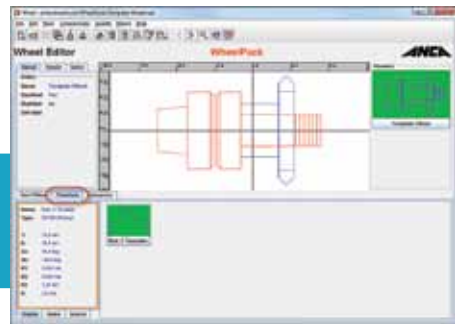
When re-sharpening, it is common to have a group of similar tools but the amount of re-sharpening required for each tool may vary. This is where SET-UP LOADERMATE will help you. In iGrind, a master TOM file is created upon which all tools are based. Edit the parameter(s) accordingly for each tool's re-sharpening requirements, then from the UTILITIES menu select SET-UP LOADERMATE. In Loadermate, from the JOB menu, select IMPORT FROM IGRIND. Loadermate is then set for each tool with its relevant TOM file.

12



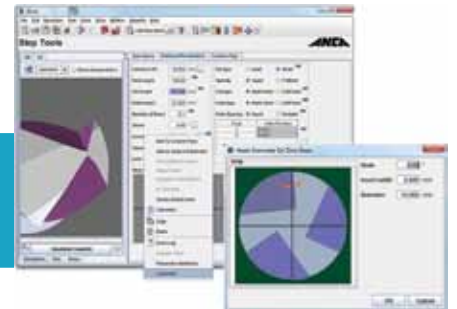
iPunch software now features a new Coolant Temperature Variation (CTV) operation. Released as patch number 47.15 for RN32.1, CTV helps to maintain correct tool size when external influences such as thermal fluctuations, vibration, loading and general wear can have an impact. Particularly useful when grinding large batches with a tight tolerance, or when it is not possible to control the operating temperature of the machine.

13



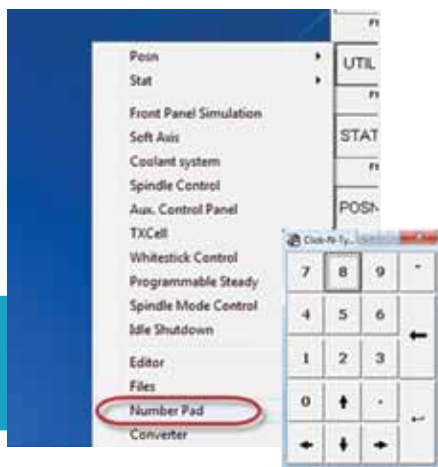
Template wheels can be created to enable user-defined default values for new wheels. Wheels can be inserted into the TEMPLATE tab by right-clicking on any wheel icon and selecting TEMPLATE. Edit the wheel dimensions, properties and name the wheel. This new template wheel will be saved. Handy for commonly used wheel geometries.

14



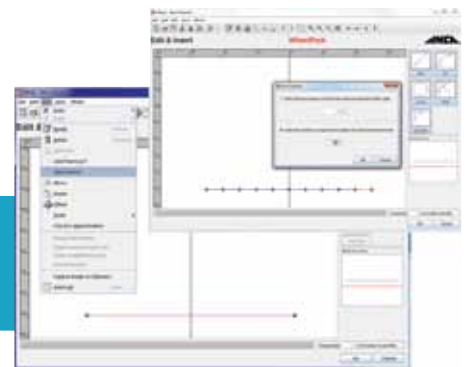
For zero shear tools a convertor is now available that enables programmers to convert between the hook angle and insert width. To use this feature simply right-click on the INSERT WIDTH parameter.

15



Use the number pad to enter parameters. You'll find it easy to use because you can put the number pad next to the parameters you want to change and not need to use the front panel keyboard, saving time and effort. The number pad can be found on the UTILITIES (F11) drop-down menu.

16



The ability now exists in the 2D editors to split geometry elements into smaller elements. This now adds a new level of flexibility in the 2D Editors.

The 1 Minute Endmill

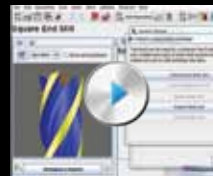
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According to the Script



Scripting is easy to learn, yet adds new levels of automation that will simplify the programming process and reduce tool design times says ANCA software product manager Paul Bocchi.

The new weapon in ANCA's flexibility and customisation arsenal is scripting. Easy to learn yet powerful to use, scripting represents a new level of automation that can significantly expand the power of the ANCA software suite. Best of all, it is free to use and a standard part of the ToolRoom software suite. So what is it?

Scripting is a simple programming language created specifically to automate tasks within ANCA application software such as iGrind. On a simple level, it can be used to automate most tool design tasks that can be achieved using the keyboard and mouse, such as entering parameter values or drawing line/arc elements in 2D editors. On a higher level, it can be used to create sophisticated solutions such as fully featured custom-tool wizards with graphical user interfaces.

Scripting is somewhat similar to using macros in Microsoft Excel. Macros can be simple 'record and repeat' automation functions or can be programmed to perform very sophisticated tasks. This is what has made Excel the flexible and successful software tool that it is today.

Don't let the term 'programming language' scare you away from scripting. Scripting has been designed to keep it simple. The integrated scripting editor also provides various tools to make writing scripts as easy as possible. Scripting can provide tremendous productivity benefits for a relatively small amount of training investment. Furthermore, scripting is an evolving technology. Capabilities are expanding rapidly with every ToolRoom release.

At a glance, some of the benefits provided by scripting include:

- **Reduced programming and set-up times:** automate the tool design process.
- **Reduced programming errors and reduced scrap:** automation of common tasks means fewer mistakes made due to manual input.
- **Simplify the programming process:** capturing complex process or geometry knowledge in a script means less work for the programmer or operator.
- **Knowledge retention:** capture design and process intelligence in your scripts and utilise it in your software.
- **Competitive advantage:** make the software behave how you

want it to and set yourself apart from the competition. Only ANCA software has this powerful feature.

- **Protect your proprietary knowledge:** a number of security options allows scripts to be encrypted (made unreadable). Scripts can also be license-protected.
- **Distribution and sale:** protected scripts can be distributed or sold. Manufacturers can send re-grinder's custom re-grind wizards without divulging geometry details.
- **Return on investment:** scripting is easy to learn and powerful to use. With so many uses for scripting, it is easy to apply the knowledge to realise many of the benefits listed above.

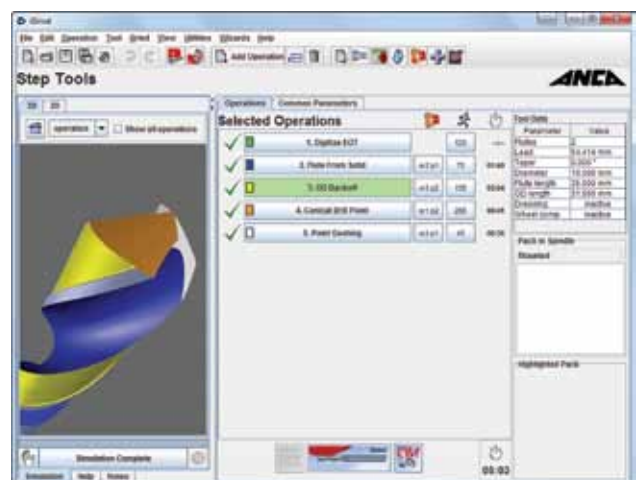
It is not the intention of this article to be a tutorial on scripting. However, the example below shows a very simple script to set the Back-off Diameter of a simple drill to be 95% of the current tool diameter.

! Get the Tool Diameter from the currently opened file

```
toolOD = get("tool_od");
```

! Set the OD Backoff Diameter to 95% of the Tool Diameter

```
set("r_od_bk.backoff_od", toolOD * 0.95);
```



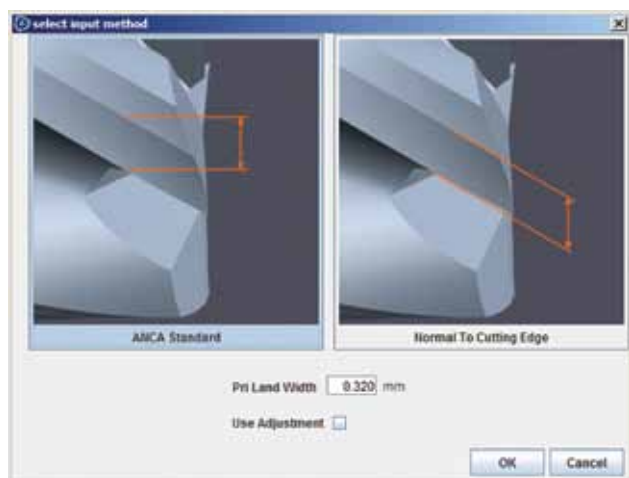
A simple script example. Set the OD Back-off diameter (shown in yellow) to be 95% of the tool diameter. The script could be extended to set several tool parameters based on various geometry rules. Programming of entire tool families can be automated using this simple scripting mechanism. Scripts can be assigned as menu items (allowing one-click execution) or run directly from the scripting editor.

Rather than discuss scripting at length, several examples of what can be achieved using scripting are demonstrated here. These examples represent a small subset of what is possible using scripting.

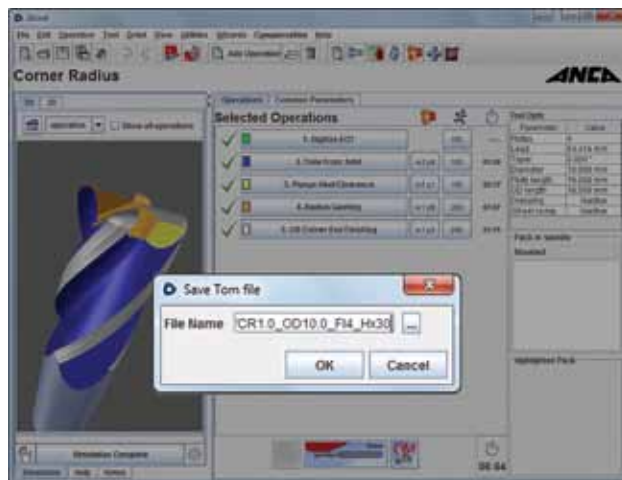
These are just some examples of the power and flexibility of scripting. Scripting solutions can be as simple or as sophisticated as you want them to be. Don't be fooled into

thinking that the examples shown here are complex to develop. In fact, they are surprisingly easy to implement.

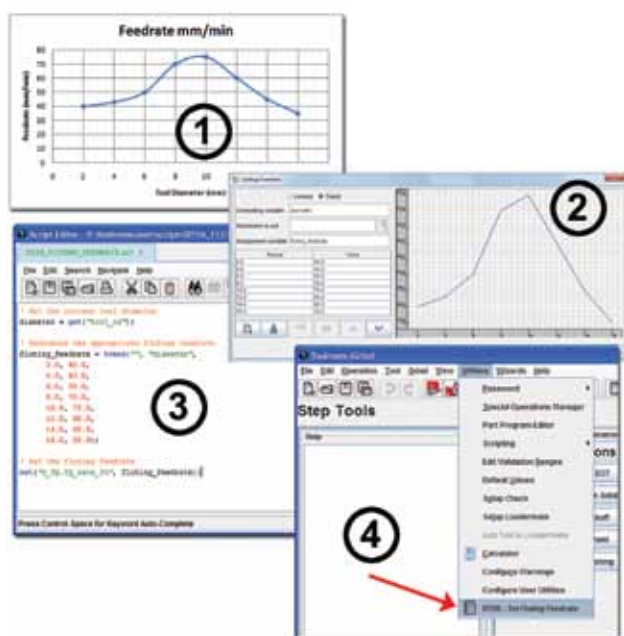
Hopefully this article will inspire ideas on how scripting can be used to get the most out of your ANCA software. Scripting allows you to work smarter, improve productivity, and give you a competitive edge. Contact your local branch or grinding@anca.com to further discuss scripting solutions. ♦



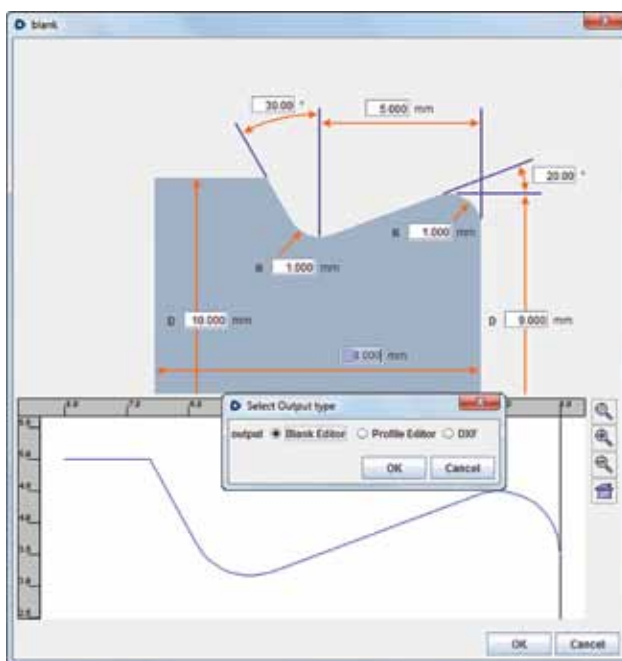
Graphical interfaces are easy to create using scripting. This example shows how the ANCA software can essentially be extended to suit your needs. Depending on the drawing, a customer had an issue where primary land width could be specified in one of two ways. To simplify the programming, a simple script was written with two graphical buttons. Simply select the land width definition type, enter the required value, and the script will calculate the required land width value. Calculations such as these are best automated within scripts to avoid manual calculation errors.



An example of a convenient script to save endmill files using a specific filename format. The script in this example extracts certain information from the currently opened file and then creates a file name based on this. For example, mill type, corner radius, tool diameter, number of flutes, helix and taper angle. When 'OK' is pressed, the script will then also save the file in an appropriate directory. This is an example of how scripts can automate and simplify daily tasks.



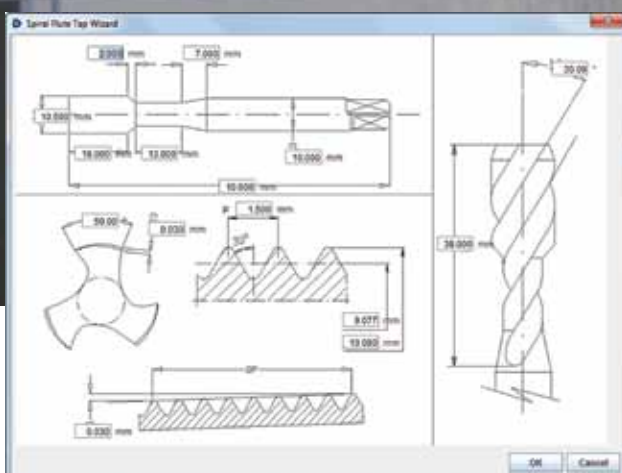
Process knowledge, such as fluting feed-rate verses tool diameter, can be easily captured within a script. In this example: (1) The feedrate verses tool diameter relationship is established from prior experience. (2) Scripting has utilities in the scripting editor to easily program such relationships. (3) Much of the code is automatically written into the editor where the script is written. (4) The script is saved and can be optionally added to the iGrind "Utilities" menu. This allows the operator to simply click a menu item to automatically set the fluting feed-rate based on the current tool diameter. This could be easily extended to also set the number of passes, in-feed per pass, core diameter, etc.



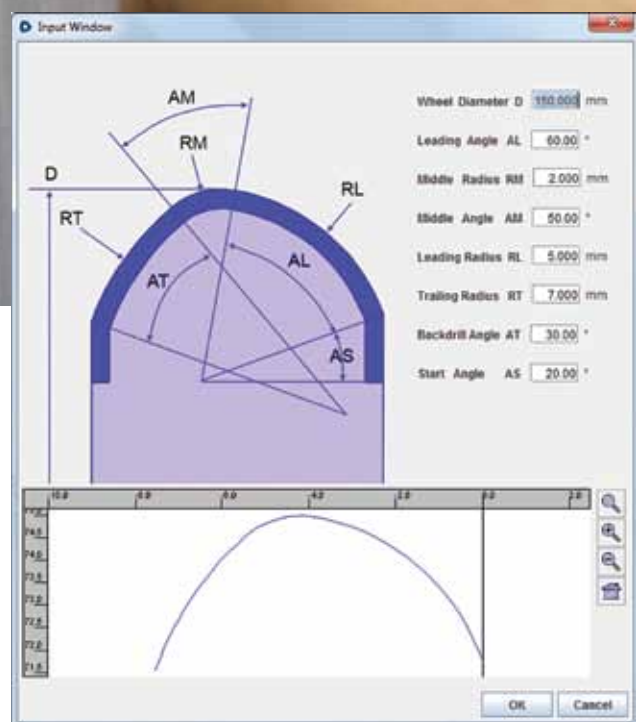
Scripts can be extremely useful to create utilities. From these recently created utilities, operators are able to easily create custom geometry. In this example, a script was written to simplify programming of the geometry shown. Although powerful, this script is simple to write. Add in an image, position some length and angle parameter boxes over the image, add the logic to create the geometry from these parameter values, and show the dialog. Furthermore, it is easy to select whether the geometry is to be added to either the Blank or Profile editor, or to export to a DXF. These types of scripts are great time savers and greatly minimise the risk of programming errors.



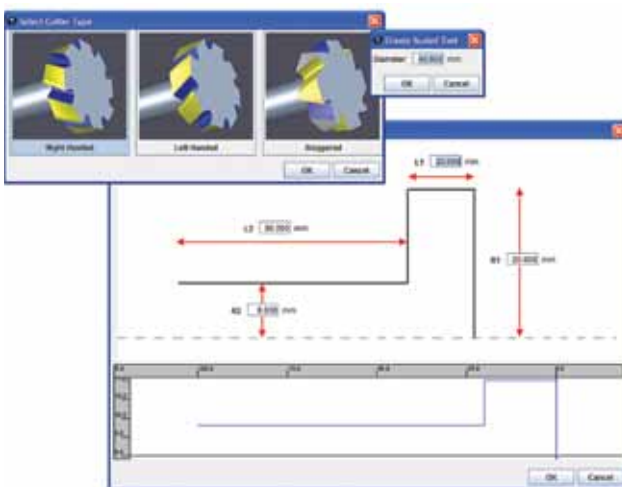
The ability to run scripts is a standard part of the ANCA ToolRoom software, and it's free!



Simple yet powerful scripts can be used to highly automate the programming process. In this example, a Script is written where a simple Tap drawing has been added to a dialog. Parameter boxes are then positioned over the drawing to allow operator input. When 'OK' is pressed, the script simply copies the parameters into the appropriate Tap file operations. The blank is also created automatically. This is a very easy script to create, yet allows a great amount of flexibility, customisation and automation.



Scripts to create geometry can also be very useful to create wheel files. If the Wheel Editor does not have a standard template you require, a script can be easily written to achieve it. The script can output the geometry in DXF format to import into the Wheel Editor.



Scripts can be written to create complete Tool Wizards that set all parameters. Scripting has been used to create full tool wizards for several existing ANCA customers. This enables operators to simply enter a very small amount of information (in some cases, just a tool diameter) and the tool file is created automatically.

Scripting helps **reduce** tool design times and can **protect** your proprietary information.





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LaserPlus

Take control of the measurement process

ANCA's new-release LaserPlus system for MX5 and MX7 machine is a highly-accurate way to measure tools on the machine, reducing downtime, cost and material wastage, whilst improving productivity in the grinding process. By **Simon Richardson**.

When manufacturing cutting tools, it is important to produce a tool within a tolerance that is right first time. In today's marketplace it is essential to reduce waste to maintain a profitable production facility. Customers need to be confident their grinding machine can produce accurate tools.

In response to these problems, ANCA has released the LaserPlus system – a new product introduced to provide repeatable measurement and compensation of cutting tools. LaserPlus is the solution to reducing scrap and ensuring tools remain within specification.

LaserPlus is also extremely beneficial for maintaining tight tolerances and providing stability to the grinding process.

LaserPlus is an enhancement (not a replacement) for the touch probe on the MX7 and MX5 machines. The LaserPlus uses a non-contact laser beam to accurately measure and compensate features on a cutting tool. Because the laser is non-contact, the cutting edge cannot be damaged.

The laser is permanently mounted inside the machine and will not interfere with the typical grinding processes. Using the laser, the operator is able to perform accurate in-process measuring without removing tools from the machine.

In many cases LaserPlus will also reduce the need for using off-line external measurement equipment, which will save customers money.

The laser measurement process is fully automated and requires no operator intervention. If a customer has a machine fitted with a LaserPlus, they can confidently leave the machine to run unmanned for long periods using the laser to measure and compensate for grinding inaccuracies. The LaserPlus system can measure and maintain an accuracy $\pm 0.002\text{mm}$ ($0.0001''$) or less, over a large batch of tools.

One of the reasons the LaserPlus system can achieve these levels of accuracy is because the laser measures the top and bottom of the tool. The maximum diameter the LaserPlus can accept for top and bottom measurement is 20mm ($3/4''$).

One of the most important features that needs to be measured and controlled on a cutting tool is the outside diameter (OD). To manage this critical operation, ANCA has interfaced the laser measurement with Statistical Process Control (SPC) software to monitor and control the OD.

Test results showed the LaserPlus and SPC successfully controlled the size of the diameter on a 6.0 mm tool over a batch of 50 tools. The laser achieved a Cpk of 1.82 on a tolerance of $\pm 0.005\text{ mm}$ ($0.0002''$).

“ Because the laser is non-contact, the cutting edge cannot be damaged. ”

The laser is permanently mounted on the inside of the machine where it will not interfere with the typical grinding process.

Controlling and compensating for tool run out also pose no problems to the LaserPlus system.

The LaserPlus system is capable of measuring and compensating the following cutting tool features:

- Outside diameter (OD) of tapered and non-tapered tools with Facet and Eccentric relief
- Ballnose profile and corner radius profile
- Ballnose radius and corner radius

The LaserPlus was introduced after extensive testing and verification of the product. When implementing a laser onto the MX7 and MX5 machines, ANCA was faced with several difficulties that needed to be addressed. Providing accurate laser measurements when using coolant in a mist-filled environment proved to be a challenge.

During the testing stage, it was identified that any residual oil on the tool may affect the laser measurement. This is because any remaining coolant on the tool causes a film which may become opaque to the laser.

However, ANCA overcame these difficulties and solved the problem by establishing a proven cleaning process. The first solution was a procedure to spin the tool at specified intervals and different rotational speeds. The second solution was to design a compact air blast unit to disperse any residual oil from the tool.

The air blast unit consists of a protective cover and two air pipes that can be adjusted to direct a flow of air to a precise point on the tool. These two operations ensure the tool is free of any dirt or contaminants, which is essential for consistent error-free measuring.

The laser has an IP (ingress protection) rating of 68 which means the product is protected from dust

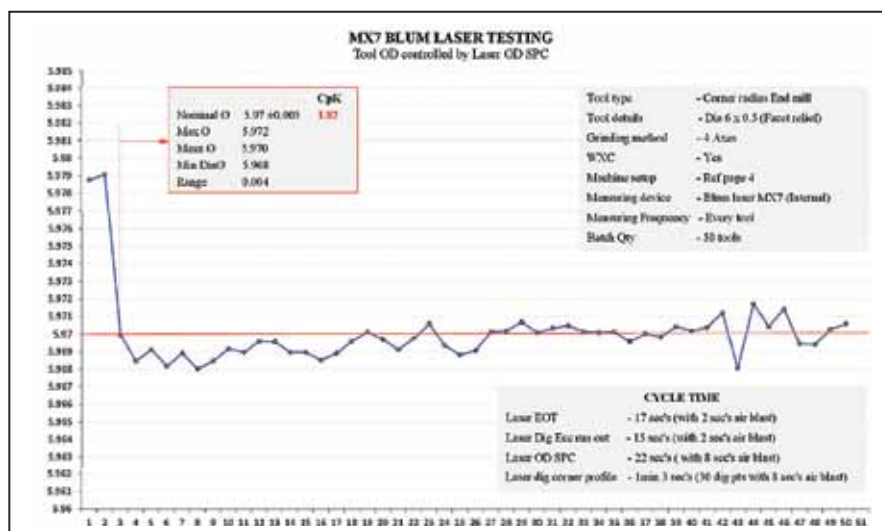
ingress and can withstand long-term immersion in liquids. The laser body consists of two turrets – one containing the transmitter optic and the other a receiver optic.

A measurement is registered when the laser beam is interrupted. The laser optics are protected by pneumatically-operated shutters. Each shutter is closed during grinding and an air purge minimises any contamination gathering around the optics.

The LaserPlus provides a robust measurement solution with quick measurement times which will not significantly add to the grinding cycle time. An example of a typical measurement cycle time for measuring the OD using SPC for a 6.0 mm ballnose tools is 30 seconds (including eight seconds for tool cleaning).

The LaserPlus will prove to be an enhancement to any customer with MX7 or MX5 machines who want to take control of the measurement process.

Planned future developments will include application on the ANCA TX7+ and TXcell machines and tool OD profile measurement and compensation. ♦



This graph shows the LaserPlus measurement results achieving a CpK of 1.87 for the tool OD (overall diameter).



Giving some Stick

Grinding wheels are shaped to do a specific job, but the more they are used the more out of shape they get, and tool quality declines. The answer is to keep your wheels in shape right across the batch, with ANCA's new Auto-Stick wheel conditioning process. **Simon Richardson** reports.

The task of sticking (conditioning) grinding wheels is an important one within the grinding process. Until now, conditioning of grinding wheels has been a manual task performed by the machine operator. This task can be unsafe and a time-consuming activity for the user. When continually grinding, wheels can become glazed or loaded, which impacts their performance. However, regular sticking of a grinding wheel will ensure wheels perform as expected.

ANCA understands these problems and has released Auto-Stick as the answer. Auto-Stick is the automated wheel-conditioning assembly for the MX and TX range of machines. Auto-Stick is used for in-cycle conditioning of resin bonded CBN and diamond grinding wheels.

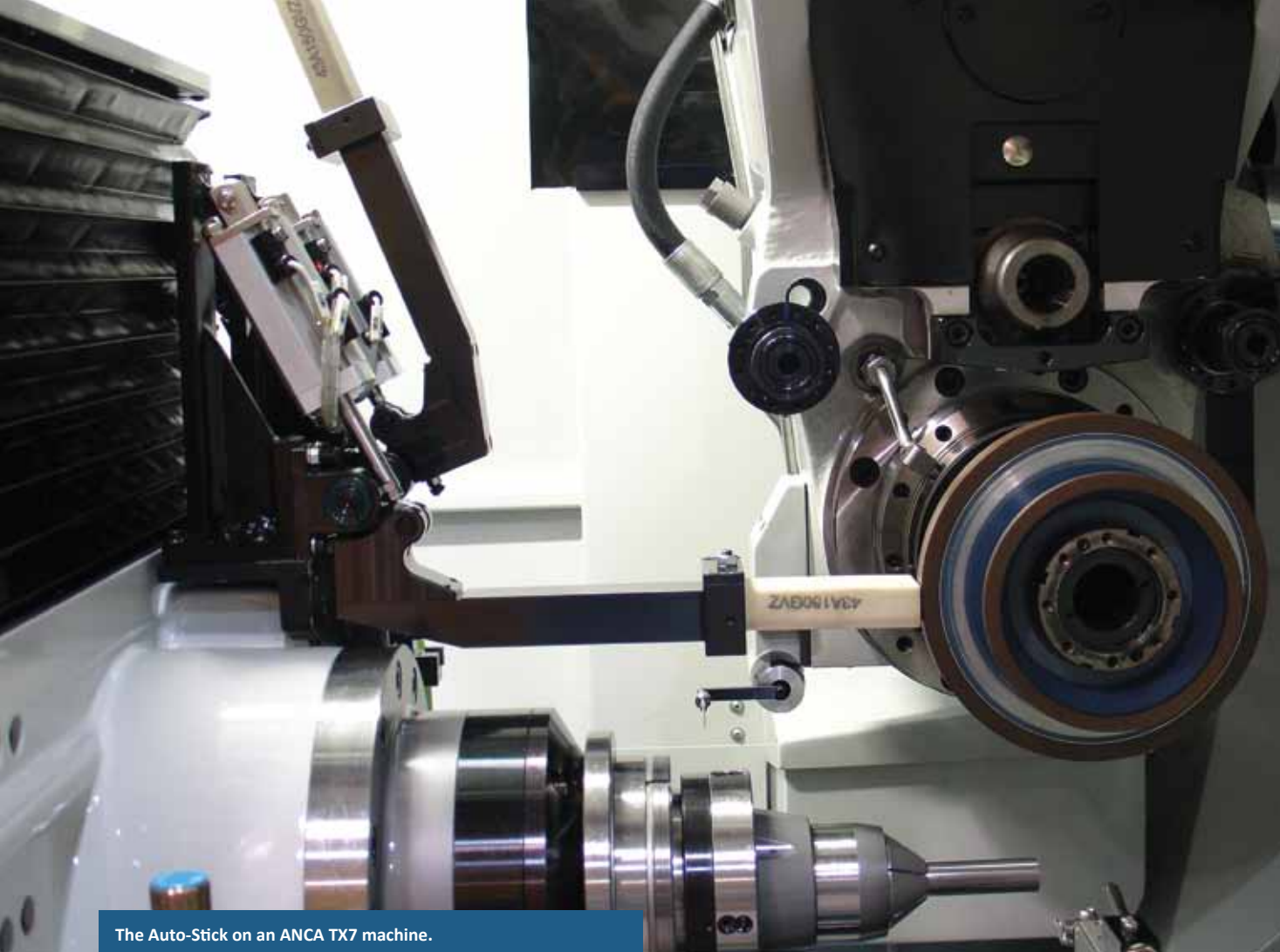
The primary purpose of Auto-Stick is to condition the wheel to clear away chips (carbide or high-speed steel swarf particles) and resin bond to expose the wheel grit. Once the chips and swarf have been removed from the grinding wheel, the wheel will cut better. Sticking grinding wheels on a regular basis not only cleans the wheel, but returns it back to its proper condition. It does this without removing large amounts of the bond which binds the grit together.

It must be remembered that a well-conditioned wheel will grind with lower grinding pressure, will produce more parts in less time, and last longer. However, when wheel conditioning is not performed, a wheel can become dull and blunt. A blunt wheel will then grind with greater grinding pressure and have a lower grinding ratio.

The grinding ratio is the ratio of the volume of ground material removed from the work piece, to the volume removed from the grinding wheel. The importance of regularly conditioning grinding wheels cannot be underestimated within the overall grinding process.

Auto-Stick can hold multiple sticks and is pneumatically actuated. Having the option for multiple sticks means wheels of different grades and types can be conditioned using the correct stick type. The Auto-Stick holder presents the selected white-stick to the grinding wheel at specified intervals during the grinding operation.

The holder on the Auto-Stick assembly is capable of holding standard off-the-shelf size sticks with dimensions of 25 mm x 25 mm (1" x 1") and 25 mm x 20 mm (1" x 3/4"). The maximum



The Auto-Stick on an ANCA TX7 machine.

overall length of the stick that can be used is 120 mm (5") with the longest protrusion length of 90 mm (4"). These conditioning sticks are usually made from aluminium oxide or silicon carbide.

Regular sticking of wheels with Auto-Stick will offer the user several benefits and advantages such as:

- Reduced tool burn and material damage
- Free-cutting wheels with lower spindle loads
- Improved feed rates and reduced cycle times
- Increased life expectancy of the wheels
- Reduced down time during production due to automation
- Longer unmanned production runs because wheel conditioning is maintained as part of the grinding program.

Grinding wheel conditioning can be accessed within the iGrind software, via wheel dressing operations. The software allows the user full control over the management of wheel sticking with the following parameters:

- Wheel profile
- Wheel speed
- Frequency of sticking
- Depth of sticking via plunge/wipe
- Compensation for wheel wear
- Selection of wheel surface

These features, plus the flexibility of the software, will ensure the least amount of wheel material is removed in the most efficient manner. Auto-Stick, with wheel, dressing provides the

“Auto-Stick automates a manual process, ensures better material removal rates and greater productivity.”

ultimate combination for optimal grinding wheel performance.

Testing of the Auto-Stick showed that the automated process offered more consistent and repeatable results than manual sticking. An automatic sticking assembly is inherently more rigid than manual sticking because there is less vibration. The automated process also removes any operator inconsistency. This means less wear (and waste) with more repeatable results on the conditioning stick and grinding wheel.

Auto-Stick automates a manual process, ensures better material removal rates and greater productivity. Auto-Stick is a new innovation which will enhance the grinding experience for ANCA customers, take them to new levels of grinding wheel performance and facilitate full unmanned machine operation.

If companies who grind cutting tools want to increase their profits and get the most out of their grinding wheels then Auto-stick is the solution. ♦



technical specifications

CNC Data

ANCA AM5000, Core 2 duo, min. 3GB RAM, Ethernet port

Mechanical Axes

	X-axis	Y-axis	Z-axis	C-axis	A-axis
Position Feedback Resolution	0.0001 mm	0.0001 mm	0.0001 mm	0.0001 deg	0.0001 deg
	0.0000039"	0.0000039"	0.0000039"		
Programming Resolution	0.001 mm	0.001 mm	0.001 mm	0.001 deg	0.001 deg
	0.000039"	0.000039"	0.000039"		
Travel	435 mm	457 mm	275 mm	320 deg	360 deg
	17.1"	18"	10.8"		

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

Workpiece: Diameter 220 mm (9.4") max., weight 20 kg (44 lb) max.

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

Machine Data

Grinding spindle: ANCA bi-directional, 8 kW (10 HP) peak power, 3.7 kW (5HP) (S1 at 6000 RPM), 10,000 RPM, integral direct drive

Grinding wheel: max. diameter 202 mm (8")

Wheel bore: 31.75 mm (1.25")

Wheel packs: two wheel packs with max. four wheels per pack

Other Data

Electrical power: 13.2 KVA (18.2 KVA with entry-level 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 including coolants: Width: 2160 mm (85"), Depth: 1530 mm (60"), Height: 1990 mm (78"), Weight: 4500 kg (9921 lb)

EDGE-Spark Erosion Power Generator

Voltage output range (min/max): 48-300 VDC

Current range (min/max): 0.5-23 Amps

Time ON range (min/max): 0.5-300 µs

Time OFF range (min/max): 0.5-300 µs

Polarity: Positive/Negative

Gap control: Energy

Communication: Ethercat

Other features include: short circuit detection, arc detection, spark detection, adaptive erosion

ANCA global

Asia Pacific

ANCA Pty Ltd,	Melbourne	Australia	+61 3 9751 8200
ANCA Machine Tool (Shanghai) Co. Ltd	Shanghai	China	+86 21 5868 2940
ANCA India	Bangalore	India	+91 80 4219 8107
ANCA Japan	Nagoya	Japan	+81 561 53 8543
ANCA Thailand Ltd	Rayong	Thailand	+66 3 895 9252
ANCA Motion	Taichung	Taiwan	+886 4 2359 0082
Sahamit Machinery	Bangkok	Thailand	+66 2 295 1000
CKB	Hamamatsu	Japan	+81 53 459 2239
	Hiroshima	Japan	+81 82 227 3211
	Nagoya	Japan	+81 52 776 4832
	North Kanto	Japan	+81 50 8881 7820
	Osaka	Japan	+81 6 6442 3270
	Tokyo	Japan	+81 3 3498 2131
SH International	Seoul	South Korea	+82 3 1777 3130

Europe

ANCA GmbH	Mannheim	Germany	+49 621 338 100
ANCA Italia	Vicenza	Italy	+39 0444 341 642
ANCA (UK) Ltd	Coventry	United Kingdom	+44 24 7644 7000
Karel Redig – ANCA	Edegem	Belgium	+32 3448 4165
Christophe Chaumet – ANCA	Meximeux	France	+33 675 186 395
Slawek Antoszczyk – ANCA	Wielkie Drogi	Poland	+48 668 150 552
Springmann Austria GmbH	Feldkirch	Austria	+43 5522 70960
ALBA Precision sro	Brno	Czech Republic	+420 548 214 098
KR Trading	Juelsminde	Denmark	+45 75 69 01 35
Tek Team Ltd	Yehud	Israel	+972 3 632 3576
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Springmann SA/AG	Neuchatel	Switzerland	+41 32 791 1122
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CNC İleri Teknoloji ve Tic. Ltd. Şti	Istanbul	Turkey	+90 212 786 6200
BATEX Ltd	Kiev	Ukraine	+380 44 583 5382

North America

ANCA Inc.	Wixom, MI	USA	+1 248 926 4466
Focus Technology	Mooreville, NC	USA	+1 704 799 6820
Grinding Solutions	San Pedro Garza	Mexico	+81 1776 5851
Innovative Machine Solutions Inc.	Watertown, WI	USA	+1 414 333 1343
Machine Tool Marketing Inc.	Bixby, OK	USA	+1 918 369 7065
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Magnum Precision Machines	Phoenix, AZ	USA	+1 602 431 8300
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Smith Machinery	Salt Lake City, UT	USA	+1 801 263 6403
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ANCA is the technology leader in tool manufacture with over 35 years of experience and a reputation for versatile and user friendly machines and software. This expertise has been applied to the development of the EDGe machine. The EDGe includes the revolutionary EDGe-Spark Erosion Power Generator for control over the energy level of the spark, surface finish, material removal and cycle time. Contact ANCA to find out more.



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