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JUNE 2022

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GRINDSMART®660XW

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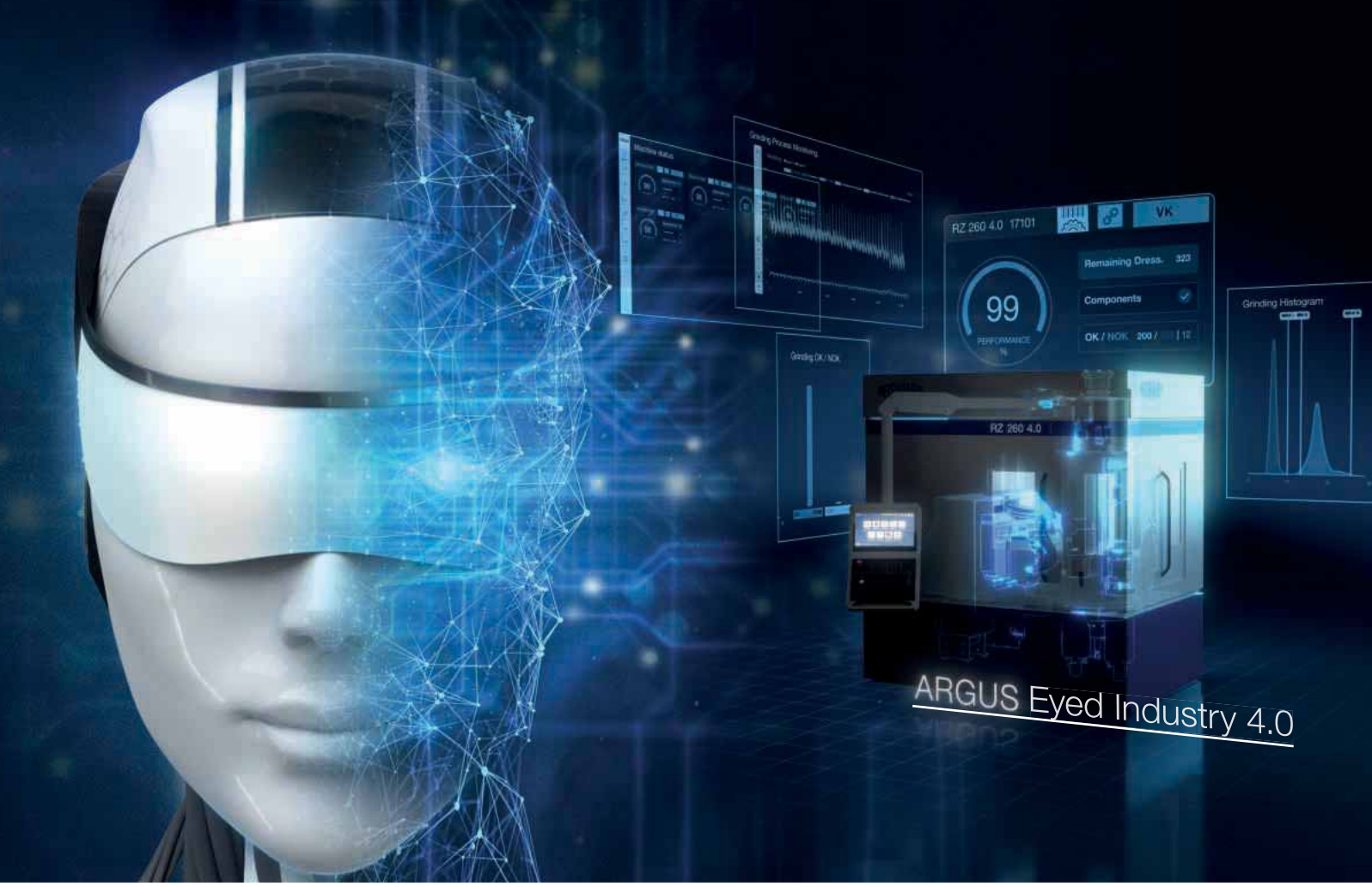

ARGUS EYES ON THE GRINDING PROCESS

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- Collision monitoring
- Monitoring of machine components
- Web-based process view
- Data analysis
- Process optimization
- Potential zero-defect production

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Gear Grinding Technology

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- Aerospace Report
- E-Mobility Report
- Filtration
- Surface Measurement
- Tool & Profile Grinding

A world first in CNC tool grinding

New ultra-efficient lean grinding process for cutting tools

The manufacture of cylindrical cuttings tools has, until now, called for the use of at least two grinding machines. Firstly, a blank prep cylindrical grinding machine is required to grind diameters down. This is followed by one or even two multi axis grinding machines to grind the tools neck, flutes and the end face tip. While these operations could in theory all be done on a multi-axis tool grinder, it can never be done efficiently and cost-effectively as the grinding wheels are of too small a diameter, the rotary speed of the headstock is too low and the cycle times are therefore very long.

The unique hybrid design of Rollomatic's new GrindSmart®660XW grinding machine overcomes these issues and combines, for the first time, the power and performance of a blank prep cylindrical grinder with the flexibility of a multi axis tool grinder to allow for all machining operations to be carried on the same machine and in one clamping.

Rollomatic's target when developing this new ultra-efficient lean grinding process was to remove as many non-added value operations as possible. This has now been accomplished as multiple machine setups by operators are no longer required, work in progress has more or less been eliminated and there is no intermediate inventory of batches of tools awaiting transfer from one machine to another.

Rollomatic's newly developed GrindSmart660XW tool grinding machine provides dramatic gains in production efficiency for tool manufacturers. The savings for tool manufacturers are enormous because lengthy setups on multiple machines are avoided all together and the handling and storage of partly finished tools between machines is also negated completely.

The machine is equipped with a large capacity loader taking up to 1,360 tools in six pallets and features the latest in linear motor technology on each axis. A powerful 14 kW constant torque synchronous grinding spindle ensures maximum grinding efficiency for all types of cutting tools from 0.1 to 12.7 mm in diameter. It features four linear and two rotary axis and the unique aspect is a special design of workhead that runs at 3,000 rpm which is mounted onto its own linear CNC axis. It allows for the well-known Rollomatic developed peel grinding process for fast and efficient blank prep cylindrical grinding.

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GrindingHub brings solutions to the surface

GrindingHub opened its doors for the first time in May as experts from all over the world attended the four-day event which proved a major success. Under the banner "Bringing solutions to the surface", more than 370 exhibitors showcased the latest grinding technology innovations, products and solutions on almost 18,000 sq metres of exhibition space.

The new trade fair for grinding technology was conceived in spring 2021. The desire for a new international meeting place for the sector came from within the industry itself. GrindingHub has been designed and planned and is being run by the VDW (German Machine Tool Builders' Association) together with its cooperation partner, Messe Stuttgart and Swissmem, the Association of the Swiss mechanical, electrical and metal industries, as the institutional patron. The "Schleiftagung" grinding conference has also been on board since early 2022. The team has an impressive amount of trade show and industry expertise, in-depth knowledge of the industry and the latest technical trends and, not least, of the major international players.

A total of 9,500 visitors crowded into the three fully booked halls, with around 40 percent of them coming from abroad. "Everywhere you see happy faces", said Dr Wilfried Schäfer, executive director of the trade show organiser VDW. "We are more than satisfied with the success of this first ever GrindingHub. The entire concept, planning and organisation were a triumph. The new trade show for grinding technology proved a complete success thanks to the great response from visitors and the strong commitment of the exhibitors."

Manufacturers from 23 countries pulled out all the stops for the debut event. They exhibited numerous grinding-related innovations, everything from new tool concepts through to innovative processes, procedures and interface technologies. An impressive sight was the total of more than 240 machines which worked live at the exhibition ground, many of them on large and prestigious stands. After more than two years, visitors were finally able to experience grinding technology live and at first hand again.

GrindingHub exhibitors covered a total of 38 industry sectors. The top five sectors included cylindrical and non-cylindrical grinding machines, grinding, polishing and honing agents, grinding machines for cutting and machining tools, disposal and treatment of cooling lubricants and surface grinding machines. The list of the companies' countries of origin illustrates the international orientation of the fair: 213 exhibitors attended from Germany, followed by 56 from Switzerland and 40 from Italy. Further exhibitors at the exhibition came from Austria, France, Japan and the USA. Wilfried Schäfer said: "All this shows just how wide-ranging and diverse the GrindingHub is. It covers the entire process chain of grinding technology. We are convinced the GrindingHub also offered genuine benefits to visitors and that, together, we will see the emergence of a new international hub for the industry right here and now."

The event also covered the latest trends and topics on two joint stands: GrindingSolutionPark Science and GrindingSolutionPark Industry featuring research-based applied production solutions and innovations. They showcased how theory and practice can go hand in hand. The GrindingSolutionPark Science stand featured numerous prominent institutes from all over Germany. The GrindingSolutionsPark Industry stand also included several well-known companies. The StartupHub offered six innovative companies the chance to showcase their ideas and products at GrindingHub. The main focus is on different software solutions, but also on cylindrical and non-cylindrical

and non-cylindrical grinding machines. umati is the joint connectivity initiative of VDW and VDMA (Mechanical Engineering Industry Association) and visitors were able to experience the benefits of using a global mechanical engineering language in a live demonstration on the umati stand. All those interested learned at first-hand about the benefits of open, standardised interfaces based on OPC UA in the proven "Meet the Expert" format.

The full exhibition halls, as well as productive conversations and meetings, were most gratifying for exhibitors. As Dirk Weber, executive director of Haas Schleifmaschinen GmbH in Trossingen stated: "What a great setting. Everything is so well organised and this is a great location with ideal conditions for the event. My overall impression on this third day of the event is excellent. It has been a great experience exhibiting here and I can only recommend everyone to come to Stuttgart and the GrindingHub."

Dr Stefan Brand, managing director of Vollmer Werke Maschinenfabrik GmbH from Biberach an der Riß, is also more than pleased with the response and the large number of new contacts: "Right from the outset, the halls have been full and the stand has been full. What more could you ask for?"

The visitors too were enthusiastic. The visitor survey gave the debut event a grade of 1.8 on a scale from 1 to 6. Nearly 90 percent of respondents stated they would recommend GrindingHub to others and 76 percent are intending to return for the next event in two years. In addition, one third of visitors said they were planning to follow up on investment and purchasing ideas they obtained at the show. Almost three quarters of all visitors have a decisive or advisory say in purchasing decisions within their companies.

Right from the start, the GrindingHub went to market with a hybrid concept and many digital offerings, including web sessions, exhibitor videos and forum contributions. More than half of the visitors took advantage of these offerings. They are also available to interested customers after the event on the website at **www.grindinghub-digital.de**

The most important country of origin for exhibitors and visitors outside Germany is Switzerland. Christoph Blättler, head of machine tools at Swissmem, the conceptual sponsor of GrindingHub, knows why: "Switzerland has the highest density of grinding machine manufacturers in the world from global players to start-ups. GrindingHub is therefore a first-class opportunity to further expand economic relations and develop customers on the German and international markets."

GrindingHub attracted visitors from all over the world, with a focus on other European countries, but also from South Korea, Brazil, Mexico, the USA and many more. Roland Bleinroth, managing director of Messe Stuttgart, welcomes the international popularity and sees further growth potential: "We had people from 56 countries as guests at the exhibition centre. A really great result. There were also visitors from Asia. We see great potential for the next events in the Asian and also the American market. We are now tackling these in partnership with the VDW." Looking ahead to 2024, VDW executive director Wilfried Schäfer affirms: "GrindingHub is here to stay. We want to improve the trade fair and make it even better for our exhibitors, to raise its international profile and position GrindingHub as the number one event for the sector in the world." Visitors, too, are also convinced of the potential. Two-thirds of them believe that the trade show will gain in importance in the future.

The next GrindingHub will take place from May 14th to 17th 2024 in Stuttgart, Germany.

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www.grindinghub.de

New operating philosophy with BLUE Solution control software

At GrindingHub, Kellenberger presented its innovative touch HMI software solution for the first time. With the new innovative touch HMI control software BLUE Solution, it has established a completely new operating philosophy that is equally adaptable across all Kellenberger and Voumard series. For the operator the new control is easy and logically intuitive to use, regardless of whether the focus of machining is internal grinding or external grinding. The BLUE Solution uses a completely new software architecture while the programs created in the previous, proven RED Solution software variant can be used on the BLUE Solution without any problems.

The BLUE Solution has already been implemented as standard on the KELLENBERGER® 10 and VOUMARD® 1000 for several months. By fall, the KELLENBERGER 100 and 1000 machines will also be equipped with the new BLUE Solution.

Simple, fast, intuitive

In the development of the new software, emphasis was placed on simple, fast and intuitive operation. The BLUE Solution was specially designed for touch operation with all known gestures. The operating icons have been designed to be quickly grasped and logically selected and during data entry, the operator is supported to the maximum by an intelligent control system. This system is equipped with a plausibility monitoring system that indicates incorrect entries and the operator can adjust his entries if necessary.

The home screen

The home screen is the linchpin from where six important areas can be accessed. These main areas consist of Setup, Program and Production which controls the actual production process, and the three secondary areas of Diagnostics, Settings and Functions which are only used when specifically required.

The programming of the production process always begins with the home screen, on which the main areas are arranged in a colour-coded central position. The secondary areas are marked with small dark icons next to them.

The production process: setup

Machine setup must be run through for each new production process. Grinding wheels and dressers as well as setup stations are defined here. Kellenberger and Voumard machines each have a maximum of four active grinding wheel positions/tools.

Grinding wheel management

Up to 1,000 grinding wheel positions and grinding wheels can be managed in the grinding wheel storage unit. When selecting a grinding wheel that is already stored in the unit, the majority of the setup is omitted.

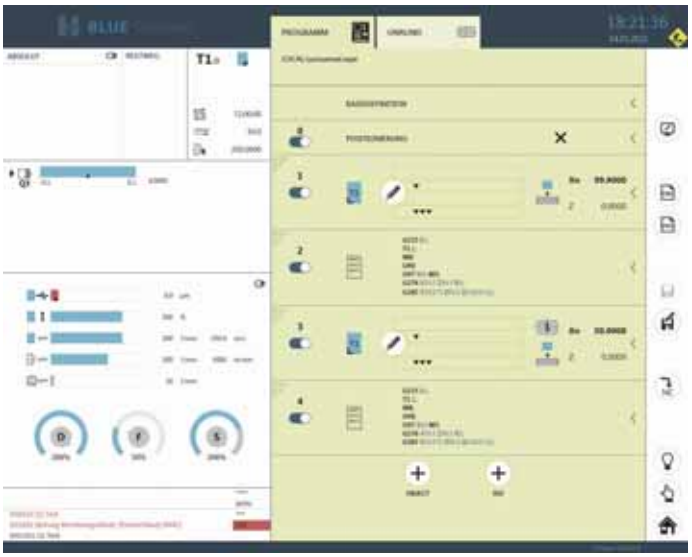
The properties of the grinding wheels, e.g. grit and geometry, can be set under the Setup item. The pre-selection of the grinding wheel is also made here: angled, straight or round edge, radius, facet or profile. The dressing of the grinding wheels can also be easily adjusted. The further steps, such as measuring the grinding wheel, manual dressing, manual grinding and calibrating can be directly accessed via individual icons. The sequence of data entry, from top to bottom, corresponds to the physical setup on the machine.

Program

When programming the workpiece, both OBJECT Guide and ISO Guide and their hybrid, OBJECT Guide mixed with ISO Guide, are supported. The illustration shows the hybrid setting. The ISO Guide of the BLUE Solution is 100 percent compatible with that of the RED Solution, i.e. all old programs can be adopted.

With the OBJECT Guide programming, a preselection of the grinding wheels, edges and processing is set. The grooving, pendulum grinding and multiple grooving processes can be conveniently and quickly preselected via icons. The grinding wheel

positions can be entered either by direct data entry or by taking over the position from a reference piece.

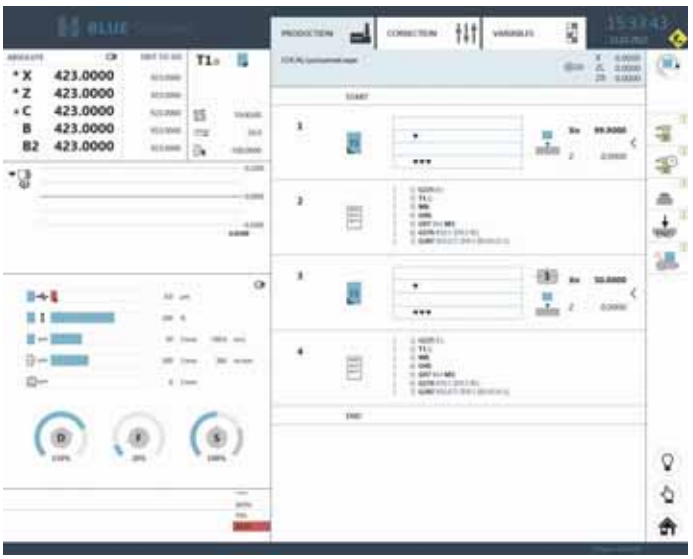


By selecting the "Technology Calculator" icon, all technology values are calculated automatically. Grinding wheel type, type of material and deflection serve as the basis from which the input is created automatically. The operator no longer has to intervene practically and this technology calculator can be switched off if required. The program also has a drag-and-drop function, i.e. the sequence of the work steps can be easily exchanged by moving an OBJECT. After entering all data, the icon "Create program" is selected. The machining program is calculated and written to the NC.

Production

After the machining program has been calculated and written to the NC, it can be executed with the CNC start key and the production is started. Even after the start of the machining program and during machining, corrections of the values are possible at any time.

When running the created program, grinding the workpiece, the operator has the possibility to interact with the process at will, for example by measuring or intermediate dressing.



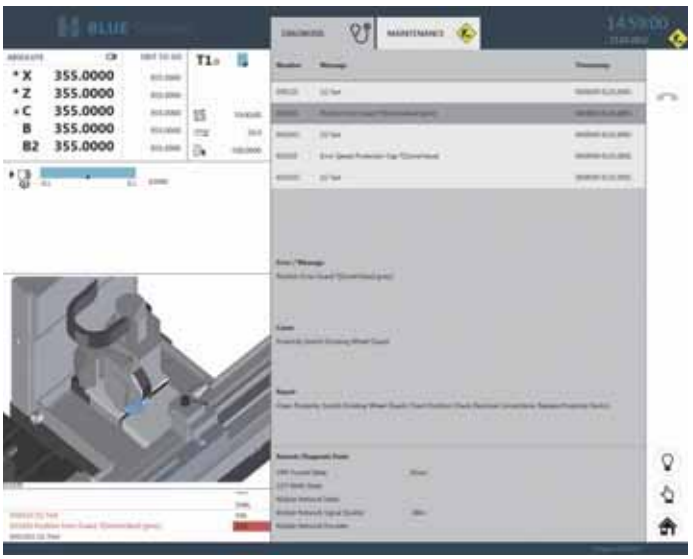
Regrinding cycle and non-circular grinding

When a part has been ground and the nominal size is not correct, the "Regrind" icon can be used to initiate a regrinding cycle which allows, for example, one or more seats on a part to be regrinded individually µ-by-µ. Switching to the handwheel is possible if regrinding is to be carried-out in stages. The controller remembers the manually set values and, if desired, incorporates them in the subsequent automatic operations.

Non-circular grinding

The input for non-circular grinding is made via a separate tab. Any number of contours can be stored. These contours are created in the Kellenberger BLACK CAM Solution software, which is available as an external software tool. For the Coromant Capto contour, there is also a direct creation and correction option in the BLUE Solution.

The dark icons displayed on the home screen control all processes outside the production process. Via the icon DIAGNOSTICS/MAINTENANCE, the operator can receive help in the event of malfunctions or error messages. The operator can also start the remote diagnosis directly from the application. Basic



settings to adapt the machine for the first time are made via the SETTINGS icon. The FUNCTIONS icon regulates, among other things, the setting of all manual functions such as switching the cooling water on/off or raising/lowering the grinding wheel guard.

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The customer-oriented revolution journey continues at GrindingHub

The UNITED GRINDING Group unveiled a series of world premieres at GrindingHub including a new cylindrical grinding machine, a new loading system, a tool grinding machine and, as an extension of the Group's machine portfolio, a revolutionary additive machine tool for manufacturing metallic components using "3D printing".

The Group presented its revolutionary innovations on a booth covering an area of 1,200 m². While EMO 2021 was still all about the digital revolution with the presentation of C.O.R.E. (Customer Oriented Revolution), the Group showed that there can also be revolutionary developments in mechanical engineering. These not only included world firsts in its traditional fields of technology, but also a surprise with a completely new revolution: an additive machine tool for manufacturing metallic components through selective laser melting of metal powder.

Revolutionary machine development in additive manufacturing

The revolutionary aspect of the new IMPACT 4530 machine is its high degree of automation and its repeatable accuracy. While the machines available on the market to date are largely based on manual processes and are difficult to integrate into the manufacturing process, the IMPACT 4530, by contrast, is designed for safe operation under industrial conditions. The separate operating and loading area, with an automatic changeover system for the containers of the metal powder and the components, ensures higher productivity. The clever design also keeps cleaning and maintenance of the system, a major issue in conventional systems, easy and uncomplicated. This greatly simplifies the handling of the machine and increases productivity.

"In the service segment, IRPD has been an active player in the additive manufacturing market since 2015. Our close cooperation with ETH Zurich and inspire AG meant we initially simply wanted to learn more about this promising technology," says Stephan Nell, CEO of the UNITED GRINDING Group. "However, as users of '3D printing machines,' we quickly noticed that these units offer considerable optimisation potential in terms of user-friendliness and repeating accuracy. For this reason, we have decided to develop our own additive machine tool under the IRPD brand."

Daniel Erni, managing director of IRPD, adds: "Given its stable reproduction conditions, accuracy, quality and scalability, the IMPACT 4530 is the first industrial-grade additive machine tool to bear the 'Made in Switzerland' label." The high repeating accuracy is reinforced through the use of smart software, as the new machine is already equipped with the new C.O.R.E. technology. The Group's innovative hardware and software architecture enables intuitive operation and networking with other machine tools and allows machines to prepare for production largely on their own.

World firsts in grinding technology

The Group also presented a number of innovations in grinding technology. BLOHM, for example, showcased its PLANOMAT XT Essential, an economical high-precision surface grinding machine in the entry-level segment, for the first time at any German trade show.

STUDER demonstrated its two new products in the area of cylindrical grinding: the S36 external cylindrical grinding machine for production and its uniLoad automatic loading system. The S36 is designed for small to medium-sized workpieces and a wide range of components. It is ideally suited for use in the automotive, hydraulic, pump and tooling industries and comes equipped with the new C.O.R.E. technology. One outstanding feature of the new machine is its large grinding wheel with a diameter of up to 610 mm and a maximum width of 125 mm.

With the new uniLoad loading system, STUDER focussed on universality and speed for its two universal external cylindrical grinding machines, the S31 and S33. The system can be operated without special training or programming knowledge and achieves automated processing of about one hour at full storage capacity.

In the area of tool machining, WALTER presented the HELITRONIC G 200, a new tool grinding machine with an innovative machine concept and a footprint of less than 2.3 m². The compact machine is suitable for the production and re-sharpening of rotationally symmetrical tools with a diameter range of 1 to 125 mm.

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STUDER

Radical in action and big on a smaller scale

Haas Schleifmaschinen received a great response to its two all-in-one tool grinding machines exhibited at GrindingHub. This is unsurprising, as they offer maximum precision for rotary and plate tools in the smallest possible space. This means that all customer requirements can be produced extremely flexible on just one tool grinding machine in large or small quantities with batch sizes ranging from 1 to 1,000.

In particular, the award-winning control concept created a good mood among the trade show audience. This is because the consistent decoupling of operation from the machine allows a level of freedom that has never been seen before. The Multigrind® Horizon grinding software runs in the company's own network and is executed via laptop, tablet or cell phone. This brings unprecedented mobility to the machine operator and automated unmanned series production becomes the production standard with this approach.

Parameterisation, templates and ERP information form the data basis. Programming is super simple and makes very fast production changes possible, just provide parts and start grinding. Additional performance, fast service, current updates, physical information, safety instructions, process parameters and very much more can be easily retrieved from the Cloud on request.

Multigrind CB XL

In contrast to the Multigrind® Radical was the Multigrind CB XL 3200 at the Haas Schleifmaschinen trade show booth in Stuttgart. This is because the 5-axis CNC grinding centre Multigrind CB XL, for the complete machining of workpieces up to 3,200 mms in length, sets new standards in terms of precision. Production in a single setup is particularly attractive for manufacturers of large tools, such as shaft parts with splines or gear cutting tools. But the oversized high-tech grinding centre has also become a pacesetter in the machining of long, slender parts such as landing gear parts for aircraft, turbine components, ball screw drives, racks and guideways. Its consistent symmetrical design gives the Multigrind CB XL the necessary stability and rigidity to meet demands in terms of precision.

The Trossingen-based precision specialist impressively demonstrated how its software takes manufacturers of highly complex XXL workpieces a decisive step further as the Multigrind Styx visualisation software enables digital pre-grinding with visible machining heel and all details, unevenness and transitions. Even residual ripples in the workpiece surface are displayed, for the most precise adjustments and corrections and the final polish even before the first. The advantage is clear: expensive blanks and machine hours are saved.

When turnkey grinding is no longer enough

The developments of recent years clearly show that the requirements in grinding are constantly increasing. However, this does not simply apply to the complete machining of complex workpieces, but above all to the upstream and downstream processes of production. The key to success here too is in the software with the decisive factor being the interface and this is where Multigrind Multimation will take over control in the future.

Multimation enables manual and automatic workflows, completely customised, just as customers need it and without any losses in process times. The interface to the ERP system is customised, of course, just like the process and is located in the company network and remains there. The process will be much easier than before, because the mapping of the setup processes was inconvenient up to now. With Multimation, the entire manufacturing process can be mapped and controlled. Process components, such as manual scanning, automation solution and cleaning system or labelling of the machine, can be digitally removed and added as required. Good for productivity, individual process components can be bypassed with Multimation in the event of a malfunction and can be controlled again after the malfunction has been rectified. Intervention in the job or order lists thus becomes standard practice, resulting in a significant reduction in downtime.

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Innovative solutions make production processes more efficient

The complete range for high-precision tools

With the introduction of the LaserSmart series, Rollomatic already introduced a powerful machine concept including easy-to-use software to the market about ten years ago. Now it has taken this a step further by presenting the next evolutionary stage of laser technology live for the first time at GrindingHub.

If you were already wondering where the LaserSmart 510 would take you in terms of precision, the premiere model has the answer. It can offer super fine surface finishes of up to Ra 0.04 µm and up to 30 percent higher machining speeds compared to other technologies available on the market. Furthermore, the new LaserSmart offers the full range of materials to be machined. In addition to PCD, PCBN, CVD, MCD and natural diamond, it can machine all types of ceramics, carbide, sapphire, glass or completely new material combinations.

Why two processes when you can do it in one?

In keeping with the small footprint of the GrindSmart®660XW, the Rollomatic specialists have streamlined the grinding process. The operations required to produce an end mill on two or three machines are no longer necessary because the GrindSmart660XW now handles skiving or grooving to prepare the blank, grinding of the tool geometry and peel grinding of the neck in a single setup. The result is a very lean process with reduced setup times, as well as an optimised manufacturing process from A to Z.

Autonomous grinding comes of age

Many tool manufacturers dream of a fully autonomous machine that controls a production line itself with very little operator intervention. "With our vision of autonomous grinding this will soon no longer be a pipe dream for users of Rollomatic machines. The goal is to produce over several days, unattended, within very tight tolerances and to interact with external robotic and automation systems," explains Damien Wunderlin, head of marketing and sales at Rollomatic SA.

Small footprint, huge opportunities

Anyone who has to keep pace with the constant changes in modern production, such as in the form of increasing production rates with simultaneous diversification, needs the flexibility to also be able to quickly adapt their plant capacities. What could be more welcome than a modular system that allows equipment features to be simply "docked on" as needed? The answer comes with the "ONE" from STRAUSAK, a member of the Rollomatic Group. Particularly for the production of small batches, the manufacture of special tools and precision resharpening, the grinding machine with its unbeatably small footprint of less than 3 m^2 has proven its worth. It is programmed via the NUMROTO software, which has established itself as a flexible, intuitive and user-friendly programming interface. STRAUSAK customers will find all the functions they need to program their tool geometries which is even more convenient thanks to the touchscreen-controlled control panel.

Grinding machine solutions

Of course, Rollomatic also presented some of its grinding machine solutions established on the market and its innovations for tools. "We have developed the GrindSmart 830XW, which is the only tool grinding machine to combine hydrostatic linear guides and linear motor technology. The surface finishes and cutting-edge qualities that can thus be achieved set completely new standards," explains Andrea Danna, international sales manager at Rollomatic.

Special features for designing all types of inserts have been integrated into the new version of the VirtualGrind Pro programming software. In combination with the GrindSmart630XW, its unique 6-axis kinematics and optimised short axis movements, the production of inserts is now even easier than before.

Strong in unmanned production of large and small batches up to 25 mm diameter is the ShapeSmart®NP50 pinch and peel grinder. One of its many special features is multi-pass grinding. It consists of a series of roughing passes followed by a final fine grinding pass, which avoids premature wear of the grinding wheels. In addition, the ShapeSmartNP50 is not your typical

cylindrical grinder but goes a decisive step further thanks to its patented Smart Punch process. With it, ellipses, eccentric shapes, squares and even triangles, hexagons and more are possible.

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Three new members of the VGrind family

The world premiere for the three new tool grinding machines from the Swabian sharpening specialists VOLLMER, VGrind 260, VGrind argon and VGrind neon, took place at the GrindingHub 2022 trade fair in Stuttgart. All three models are suitable for machining rotary tools made from carbide, such as drills, milling cutters or reamers. With these machines, VOLLMER is expanding its range of tool-grinding machines, which also includes the VGrind 340S and VGrind 360S models.

Like the VGrind 340S and 360S models, the new VOLLMER VGrind 260 grinding machine can be configured individually. For example, customers can choose between a direct drive or belt drive for the grinding spindles or equip the machine with a grinding-wheel changer for up to eight grinding wheel sets while also including interchangeable coolant nozzles, if required.

Several options are possible for the automation for unmanned, round-the-clock machining. The HP 160 pallet magazine offers space for up to 900 blanks or tools made from carbide and the HC4 chain magazine can be loaded with up to 158 shank-type tools or 39 HSK-A63 toolholders. As an alternative, the machine is available with an internal pallet loader. It offers space for two compact pallets with a capacity of up to 300 blanks or tools. Furthermore, random loading of different shank diameters is also possible.

Just like all other VGrind models, the

VGrind 260S also has outstanding kinematic properties with two grinding spindles situated above each other, with the grinding wheel set positioned at the C-axis pivot point for efficient multi-layer machining. This arrangement reduces the machining times thanks to shorter linear-axis travel distances.

Entry into the world of tool grinding with VGrind argon and neon

The new VGrind neon and VGrind argon tool-grinding machines are also based on the tried-and-tested "DNA" with the double-spindle concept. VOLLMER has designed the compact machines for cost-efficient entry into the world of tool grinding and provided them with functional features as standard. As with all VGrind models, they are equipped with an IoT gateway (Internet of Things) and have an internal wheel measurement system, which measures the grinding wheels and monitors their wear. The VGrind argon has a four-wheel grinding wheel changer as well as an internal pallet loader and is designed for fully automatic operation.

Two in one: VHybrid 260 masters grinding and eroding

The VHybrid 260 grinding and eroding machine combines technologies and experience that VOLLMER has gained over many decades in the fields of grinding and eroding. With the VHybrid 260, tools made of carbide or Polycrystalline Diamond (PCD) can be machined in one clamping. The machine offers tool manufacturers not only high efficiency for reduced machining times, but also maximum precision. A wide variety of automations allow the machine to be used unmanned around the clock. With the VOLLMER tool manager, users can intuitively manage the automatic change of up to eight grinding or eroding wheels.

The VOLLMER VHybrid 260 grinding and eroding machine can be used by tool manufacturers to grind and erode carbide and PCD tools such as drills, milling cutters or reamers in one clamping. The foundation of the VHybrid 260 is multi-plane machining, which is realised via two vertically arranged spindles. Here VOLLMER relies on the proven technology of its VGrind grinding machine series. With the VHybrid 260, the lower spindle can be used for both grinding and EDM, while the upper spindle is reserved exclusively for grinding.

With the VHybrid 260, VOLLMER has not only combined the best of both worlds, grinding and EDM, but has also further developed proven technologies. From the world of EDM flows the knowledge that it has gathered for more than three decades with machines from the fields of wire erosion and disc erosion with different series. At its heart is the VPulse EDM erosion generator, which sets new standards in terms of efficiency and surface quality. From the world of grinding, the state-of-the-art machine concept of the VGrind series ensures high precision in tool machining: both spindles of the VHybrid 260 are mounted vertically in the pivot point of the C-axis, which ensures high profile accuracy and enables precise grinding and EDM processes.

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Gear grinding made transparent

by Dr Christian Dietz & Walter Graf, Reishauer AG, Switzerland

Introduction

According to the German DIN 8589 standards, the definition of grinding is "a machining process with geometrically undefined cutting edges." This definition may lead to the misconception that the grinding process is only vaguely definable. This article dispels the notion of "vaguely definable." It argues that even as complex a process as continuous generating gear grinding can be defined, made stable and have its limits established by a new process monitoring system called ARGUS.

In simple terms, the ARGUS system monitors dressing and grinding intensities via intelligent real-time data processing and proven algorithms. Each ground gear's dressing and grinding data are captured and stored in a database and remain 100 percent traceable. The system offers comprehensive data analysis possibilities with stored and tracked process and tooling data and individual workpiece identification via Dot Matrix Code (DMC). Preset evaluation limits trigger the automatic removal of workpieces that fall outside the set limits.

Generating gear grinding process monitoring

Generating grinding machines have high output with very short cycle times. For example, for automotive transmissions, grinding cycle times range from eight seconds for small pinions to one minute for ring gears. Hence, not all parts can be measured as measurement times are much higher than the grinding times. For this reason, the automotive gear industry relies on sample measurements, generally not higher than five percent.

Today, 100 percent checking and constant monitoring of the grinding process has gained importance. The sample testing processes risk that gears of insufficient quality may end up inside transmissions. Furthermore, the tactile measuring methods cannot pick up minor waviness on the surface structure of gear flanks that may cause detrimental noise in transmissions.

The risk of introducing workpieces of insufficient quality can be eliminated if the grinding intensity generated during the machining process is used as an evaluation criterion. The real-time analysis of the intensity signal identifies a faulty workpiece during the process. Moreover, this method translates into a 100 percent checking of the workpieces.

"Grinding intensity" is a force model to calibrate and standardise the grinding forces. This model considers the continually changing chip forming zone, including the local cutting kinematics during changes in the grinding wheel diameter, the changing grinding condition due to variations in wheel RPM and the prevalent lever ratios across the grinding wheel width. This calibration makes it possible to set very narrow limits with high-resolution error evaluation. Hence, even small force vacillations can be detected and automatically evaluated during the process. A typical progression of a 2-step grinding intensity signal is illustrated in figure 1. The higher dark blue area on the left corresponds to the roughing pass and the lower dark blue area on the right corresponds to the finishing pass. The limits are either suggested by the process monitoring system itself or set by an experienced user.

The grinding intensity shows if a threaded grinding wheel maintains a consistent cutting performance across its entire width and usable diameter. As a rule, the operators evaluate grinding wheels subjectively as empirical data is unavailable. The inhomogeneous hardness variation can only be indirectly assessed via deteriorating gear flank profiles, even though this deterioration may have other causes. The system allows the hardness gradient across the grinding wheel width and the changing diameter to be made visible, measurable and classified, as shown in figure 2.

Figure 2 shows the grinding intensities across the shifting axis width Y of some 5,300 workpieces. The upper point cloud represents the roughing strokes and the lower, denser point cloud represents the finishing strokes. The roughing stroke illustrates a diminishing grinding intensity from right to left. In contrast, the finishing strokes show the reverse, i.e., an increase in the grinding intensities from right to left. The decrease in grinding intensities during the roughing indicates process-induced wear of the threaded grinding wheel. As a rule, the underlying calibrated force model guarantees an almost constant level of grinding intensities across the full grinding wheel width.

For this reason, the drop in intensity levels during the roughing process is exclusively due to a continuous deterioration of the bond-grain matrix of the threaded wheel. This deterioration leads to a gradually lower material removal on the workpieces. The increase in grinding intensity during the finishing strokes indicates the concomitant compensation of reduced material removal of the preceding roughing strokes. The

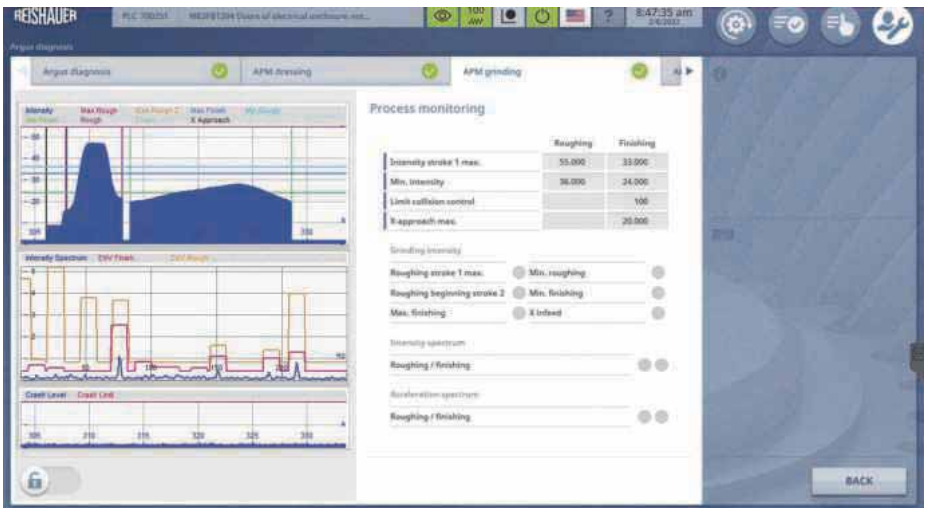

Figure 1: Grinding intensity progression

Figure 2: Hardness variation across the threaded grinding wheel width

described wear effect on the threaded wheel leads to an unstable process and rejected workpieces. These rejects are shown as dark red dots on the lower left side of the point cloud of the roughing stroke. As a consequence, the user had to change the grinding wheel.

The application of this system has significant economic benefits. Besides monitoring geometrical inconsistencies, detecting grinding burns is essential to ensure stable production conditions. Therefore, one of the most common strategies to prevent thermal damage is to reduce feed rates, as thermal damage thresholds are unknown. However, suppose the grinding intensities are calibrated on ground components and proven free of thermal damage. In that case, the process can be optimised with higher feed rates and lower shifting rates. This process optimisation leads to shorter grinding cycle times, increased tool life of grinding wheels and diamond rolls, and better process economics.

Machine component monitoring

Machine tool maintenance is subdivided into two distinct forms: preventive and predictive maintenance. Preventive maintenance is according to a given plan. It is based on time, such as the age of components, guidelines by the component manufacturer, number of axes movements, etc. The independent system described in this paper uses predictive maintenance. Hence, maintenance decisions rely on the actual state of components and not on their age or recommended service intervals. On this basis, machine tool services have become more predictable and more economical. Given stable grinding processes and acceptable pre-machining, fully functional machine components result in workpieces of higher quality.

Figure 3: Machine component monitoring of several machine tools

ARGUS automatically initiates recurring NC testing cycles to measure and evaluate all the relevant grinding machine axes and bearings involved in the process. It thus enables early detection of electromechanical deviations via sensors that measure vibrations, forces, acoustic signals and temperature. Maintenance costs are optimised in planning and diagnosis and some potential EOL gear anomalies may be avoided.

Combining database and Cloud computing, the fully integrated system offers 100 percent retraceability of the ground workpieces. Each grinding, dressing and clamping process parameter and the actual state of all the machine components can be allocated to each specific workpiece. Combining the data-based experience of the machine tool builder and the machining processes with real-time monitoring, data analysis and AI can predict required maintenance with a high degree of probability. On the web-based representation of the total number of machines in operation, maintenance tasks are indicated in a colour scheme of varying escalation steps, from green to orange and red. Green describes machine status as being "ok", while orange indicates upcoming maintenance within a few weeks. Red indicates that maintenance action is required immediately.

Conclusion

The ARGUS system shows that even the most complex grinding process can be made transparent and controllable. In the authors' opinion, the EOL feature of predicting and analysing potential NVH issues is possibly the most significant customer benefit. ARGUS's level of transparency and control carries economic benefits and leads to zero-error production demanded by the end-users of grinding processes.

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Gearwheel manufacturing in a 34-second cycle

Minimising production times to ensure competitiveness is one of the most important challenges in the automotive industry. Henry Ford recognised this over a century ago. After decades of optimisation, it is difficult to reduce machining times further while maintaining the same level of quality. Nevertheless, Volkswagen (VW), near the German town of Kassel, has managed to achieve this in its gearbox production facility using Kapp Niles gear grinding machines, available in the UK from the Engineering Technology Group (ETG).

The Volkswagen plant in Baunatal is one of the larger German locations of the enterprise with a workforce of about 17,000. Its production focuses mainly on car gearboxes in ten different series. Gearing centres from Kapp Niles are being deployed on 50 percent of the manufacturing lines. Kapp Niles, based in Coburg, Bavaria, is primarily known as a specialist for hob grinding with dressable tools; a process combining productivity and quality.

Kapp Niles machines are also applied in the production of the DL382 dual-clutch gearbox for Audi. A total of sixteen gearings is required to shift the seven gears with this type of gearbox, ten ground and six honed. The production unit runs 24 hours a day, five to six days per week, depending on demand. VW strives to achieve an EPEI (Every Part Every Interval) value of 1 day in the production unit. This means that all components can be produced on each day for the aforementioned gearbox. This type of streamlined production requires seamless processes and a high degree of flexibility.

Technical clerk at Volkswagen, Christian Hahn oversees production of the DL 382 dual clutch gearbox

In wheel production The KX 100 DYNAMIC

Technical clerk, Christian Hahn is in charge of the production process of the DL382 dual-clutch gearbox: "We have five gearing centres from Kapp Niles in the wheel production unit and two more in the shaft production unit. To achieve an EPEI value of 1 day, we change over the machine in the wheel production unit twice a day. This way, we can produce ten different wheels per day."

The challenge with flexible production is the short cycle times. With an output of 880 gearboxes per day, one machine in wheel production must produce 1,760 parts per day. Including all setup times and failures, it yields a line cycle time of 34 seconds. An average line cycle time is about 39 to 40 seconds. Bernd Kümpel, application technician at Kapp Niles, analyses these figures: "Saving five to six seconds per cycle does not sound like a lot at first, but together it can be a 15 percent reduction. If I consider that at least 40 percent of segments cannot be influenced, I have to reduce the actual process time by 30 to 40 percent. Seen in this way, 34 seconds is a real challenge."

A total of seven Kapp Niles machines are being deployed which, with their low space requirement, are ideally suited for the highly automated production lines at Volkswagen. The machines include three KX 100 DYNAMIC, two KX 260 TWIN in wheel production and two KX 160 TWIN in shaft production.

Christian Hahn and Bernd Kümpel agreed from the very beginning that the desired cycle time could only be achieved with a

Gearwheel manufacture in 34-second cycle

combination of several measures. To minimise the daily setup effort, Christian Hahn makes sure that the wheels that are to be produced on one machine have boreholes of the same size. Thus, he has to change over the machine, but not the clamping tools. The remaining setup time is minimised by the intelligent setup concept of the KX 100 DYNAMIC. For one machine, he needs just 20 to 25 minutes. "The semi-automatic setup makes the KX 100 DYNAMIC extremely user-friendly," says Bernd Kümpel, describing the process.

"All you need is an Allen key for the entire setup operation. With it, you operate the hydro-expansion clamping chuck of the dresser roll. Everything else is connected without any screws via HSK interfaces."

Additional visual aid is available in the form of a menu guide and an easy-to-understand cycle on the machine controller. By completing the step-by-step process and the acknowledgement screen, the operator ensures that no work steps are executed incorrectly or forgotten. High-cost failures are prevented in this way.

The tools are dressed using full profile rolls, allowing all threads of the cylindrical

With a 5-pass full profile roll, the dressing time can be reduced by more than half without compromising on quality

worm to be approached and moulded simultaneously. Thus, with a 5-pass full profile roll, the dressing time can be reduced by more than half without compromising on quality. The integrated measurement system is another important time-saver.

The search for optimisation potential also includes the actual grinding process. Cubitron™. Machine tools by 3M™ show a highly promising approach, with geometrically specific triangular-shaped cutter heads, compared to conventionally dressable grinding wheels.

Christian Hahn highlights the benefits of these machine tools: "With these, you can step it up a notch, to say it plainly. That is, remove more material in one thread and remove it faster."

For this purpose, Kapp Niles provided relevant preparatory work with a large number of grinding tests in-house to be able to use the benefits of this machine tool with the DL382 components. Bernd Kümpel adds: "With CII, you can remove a considerable amount of shavings without any thermal damage to the component. This way, we reduce time consumption by a solid 30 percent compared to other grinders, depending on the component."

Loading to and unloading from the conveyor belt is done by a transfer unit

Production is characterised by a belt chaining, or linkage, that goes through the entire hall. Among the employees, it has gained the nickname 'the highway'. The available space is limited, hence the highly compact KX 100 DYNAMIC machines are the preferred choice. This machine type has two separate rotatable mounted columns, each with vertically movable pick-up axes with one workpiece spindle. While a workpiece is being machined, the other pick-up axis places the machined workpiece and loads a non-machined part onto the workpiece spindle. The workpiece is aligned outside the work area. This allows the workpiece spindle, already accelerated to machining speed, to be swivelled in the work area, keeping non-production times to a minimum.

The time for conversions and commissioning is, in most cases, very limited, but the highly ambitious goals have been achieved.

Christian Hahn concludes: "Throughout the process, I have been very satisfied with the on-site support and the local service. We were convinced by the machine concept and managed to overcome any obstacles together. The cycle time was a critical aspect but we did it."

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Hydraulic Projects invests in a Tschudin centreless grinding machine

Advanced Grinding Solutions has announced the sale of one of the new Tschudin Cube centreless grinding machines to Hydraulic Projects Ltd of Dawlish for the production grinding of valve spools

Hydraulic Projects, winner of British Design Awards, supplies the world's leading autopilot manufacturers with hydraulic pumps and cylinders. It also designs and manufactures the renowned 'Hy-Pro' range of sectional spool valves. All are machined and assembled within the UK.

Established in 1966, Hy-Pro is an expert in the design and manufacture of a diverse range of hydraulic control valves and pumps for the mobile and marine market sectors. Hydraulic steering systems have been designed specifically for marine secondary steering applications. These units come pre-filled and bled with thrusts of up to 10,840 N for boats up to 30 m. Hy-Pro Constant Running Pumps feature heavy duty fan-cooled motors giving outputs of up to 4.5 litres per minute. Developed specifically for marine autopilot applications in the commercial and larger pleasure boat (up to 35 m) market the pumps can be used with single or twin ram systems. Other Hy-Pro hydraulic systems can be found on off road vehicles and submarines.

Elaine Slater, who was appointed MD at Hy-Pro in 2003, reports that over the past year, the company have seen a considerable level of growth in the demand for valves and marine autopilot pumps, from both their existing customers, as well as new ones and this level of demand far exceeds anything they have experienced in the past. The investment in the Tschudin Cube centreless grinding machine is part of a large investment in capital machinery to boost production. Elaine further comments that Hy-Pro design and manufacture 95 percent of all of their components in-house in the UK, giving them control, quality, flexibility and economy. "With ISO 9001 accreditation driving our processes, state of the art machinery, sophisticated measuring equipment, and the latest computer systems, we ensure that our products are produced to the highest standards of quality and are delivered on time at the right price."

Production manager at Hy-Pro, Kevin Saunders instigated the project to improve the centreless grinding processes within the production facility and, after being previously disappointed in the results from other machines, opted for the Tschudin machine based upon its proven ability in trials to make much more accurately ground valve spools combined with its compactness and ease of use. Kevin comments that Hy-Pro looked carefully at all the options available to them to ensure that Hy-Pro were making the right choice when it came to upgrading our production and that the Tschudin machine is very much now proving its worth.

The Tschudin Cube machine enables users to achieve significant productivity gains and the machines particularly quick and flexible changeover times help to minimise machine downtime. What sets the Cube machine apart in particular is its very small size and radical open design for easy access. Users only need access to the rear of the machine to perform maintenance and servicing tasks, which means that several machines can be positioned together without any gaps. The grinder can be manually loaded in a very safe and ergonomic way outside of the grinding zone.

The Cube uses Tschudin's patented W-axis which has the workrest blade mounted onto its own CNC axis that allows for parts to be loaded to it outside of the grinding area making loading efficient, fast, and very safe. Traditional centreless grinding machines require parts to be loaded to a fixed work-rest blade that sits inside of the machine between the grinding wheel and control wheel making loading difficult, more expensive, and sometimes unsafe. This also makes changeovers more complex and therefore lengthier. The Tschudin machine overcomes all of these issues and claims to be the world's easiest and fastest centreless grinding machine to set-up.

Another huge benefit from Tschudin's CNC workrest blade axis is that it allows multiple parts to firstly move to an initial position for a rough grinding operation to remove a lot of stock material quickly, before automatically being transferred to a second position for a final finish grinding position to enable fine finishes and tolerances to be achieved. For example, it is possible to load five parts to the work rest blade and have a machine with 10 grinding wheels, five rough grinding wheels and five finishing wheels, with the parts being automatically transferred between the two different sets of wheels.

Two young engineers mastering centreless grinding on the Tschudin Cube at Hydraulic Projects, Dawlish: Jamie Jones (left), Tom Gay (centre) and production manager Kevin Saunders (right)

The CNC controlled workrest blade has one final feature in that it has the diamond dressing disc or optionally single point diamond dresser mounted onto it. This removes the need for a secondary expensive separate dressing system that is mounted to the rear of the grinding wheels on other conventional centreless grinding machines.

The automatic loading of five to10 parts at a time to a conventional grinding machine is almost impossible given that there is restricted space available between the grinding wheel and control wheel and that it only takes one small miss-load between the fast rotating wheels to cause a disaster. However as the Tschudins workrest blade is always loaded outside of the machining area the use of multiple grippers is not a problem and the gripper design is never compromised due to a lack of available space.

In addition to this, another optional feature, that's unique to Tschudin centreless grinding machines, allows the workrest blade to move or oscillate backwards and forwards on its own CNC axis during the actual grinding process. This allows finer finishes to be obtained from a relatively rough grinding wheel enabling high accuracy at the best possible cycle times.

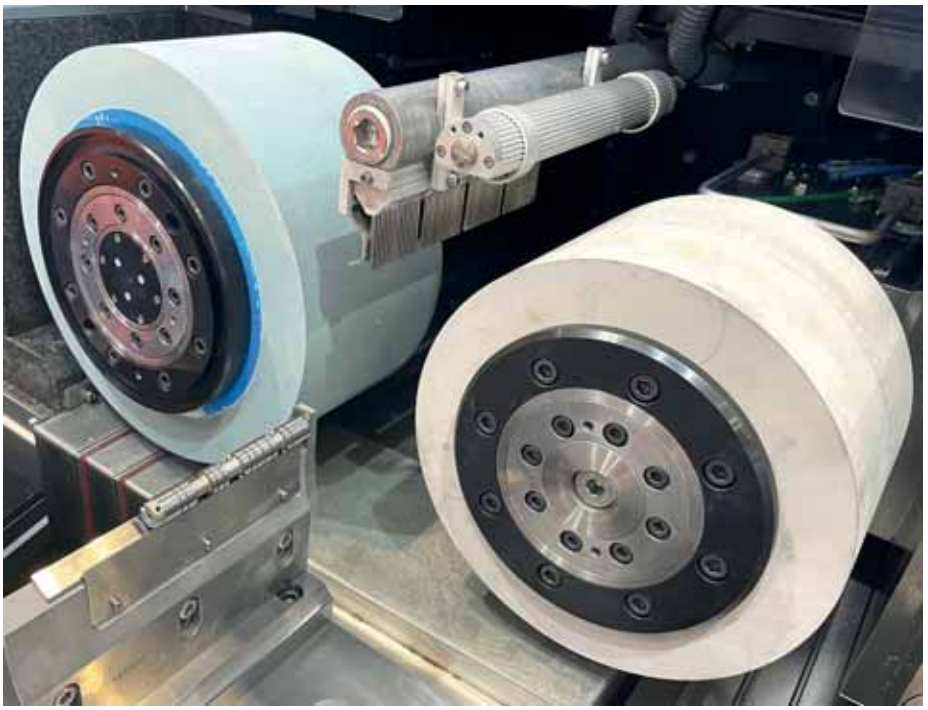
Linear direct drives on the X, U and W axes ensure flexibility and productivity with the Cube being specifically developed for the grinding of small components with part diameters of up to 20 mm.

The Cube's simple and low-maintenance

machine design helps to reduce operating costs. The natural granite machine base and upper structure guarantee the best possible thermal stable, high-precision and a very safe grinding processes. One major benefit of the machine is that it allows for the easy and safe CE-compliant loading and unloading outside of the grinding zone. Tschudin's "easy" software, which the company developed in-house, makes the machine easy to operate and automate. The patented, movable workpiece support ensures process options such as the rough and finish grinding in one cycle and the grinding of sharp edges with precise radii.

Areas of application include plunge-cut grinding, grinding of several parts in a single cycle, oscillation of the component during grinding and throughfeed grinding. This versatility means that the Cube is suitable for a wide range of applications.

The Cube can be specified with a grinding wheel of 150 mm wide (option of 205 mm) with a 12 kW grinding spindle for grinding up to 63 m/sec and is perfect for the production grinding of parts from 0.1 mm in diameter up to 20 mm in diameter and brings true sub-micron grinding capability



for the centreless grinding of a huge variety of parts.

There are several other larger machines within the Tschudin range to grind very large parts including the Tschudin ecoLine or proLine 400 and Tschudin ecoLine or proLine 600 machines. The 400 machine will grind parts of up to 100 mm in diameter when throughfeed grinding or up to 150 mm in diameter when plunge grinding. It is fitted with grinding wheels of 400 mm in diameter and offers a maximum grinding length of 280 mm. It can be fitted with a 37 kW grinding spindle, weighs 10 tonnes, and has an axis resolution of just 0.1µm.

The Tschudin 600 machine will grind parts of up to 150 mm in diameter when throughfeed grinding or up to 250 mm in diameter when plunge grinding. It is fitted with grinding wheels of 610 mm in diameter and offers a maximum grinding length of 500 mm.It can be fitted with a 60 kW grinding spindle, weighs some 24 tonnes, and also has an axis resolution of just 0.1 µm.

The ecoLine versions use a manual change in workpiece height in relation to the grinding and control wheel to take into account the wheel wear whereas the proLine machines have a separate automatic system. This is enabled by automatic height control of the regulating wheel that's mounted onto its own CNC Y axis. As grinding wheels wear the part programme takes this into account and will alter the height position of the regulating wheel to automatically compensate for the wheel wear and to keep the grinding contact angle constant.

Tschudin AG is on course for continued growth with a record number of sales this year and in addition to establishing a new subsidiary in China, the Swiss company is also looking to increase its market share in Europe. Tschudin's new industrial machine tool manufacturing building with a five-storey office annex is now fully operational at the Tschudin headquarters in Grenchen, Switzerland. The high-tech company is fully focussed on the fields of research and innovation in centreless grinding and sells tailor-made solutions, not just machines.

Chris Boraston of AGS comments that the cube machine as supplied to Hydraulic Projects Ltd is the latest of several Tschudin machines that have been supplied to the UK and Eire as engineering companies seek to invest in the very best machines to bring them the leading and best manufacturing solutions that they need.

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Grinding solutions for components

At GrindingHub, EMAG Group exhibited its universal cylindrical grinding machines from EMAG Weiss and the VLC 350 GT combination machining machine while providing an insight into developments in the field of Industry 4.0 and IoT.

Whether electric drive, hybrid motor or conventional drive, production planners face the great challenge of developing a wide range of manufacturing solutions for the future. On the one hand, they need new production solutions for a wide variety of components, on the other hand, costs must be reduced and production processes optimised.

EMAG is also aware of this challenge and therefore began investing in digital solutions in addition to machining technologies a few years ago. EMAG's customers are now benefiting from this investment in networked production and with the combination of highly productive production technology and data analysis, they have completely new ways of production planning and thus possibilities for cost optimisation at their disposal.

EDNA IoT solutions

The future belongs to data-optimised production, EMAG is convinced of this. Optimising cycle times and unit costs is important, but it goes one step further and focuses on Overall Plant Efficiency (OEE) and its optimisation based on production data. Through data analysis, unnecessary downtimes can be reduced or even completely avoided. Productivity increases of over 10 percent are the rule here.

In order to make it as easy as possible for EMAG customers to enter the world of data-optimised production, machines can now be delivered IoT-Ready. This makes it possible to integrate the machines directly and without major effort into existing IoT networks. An EDNA IoT Core, an IPC, is then installed in the control cabinet of the machines, which is already fully installed and networked with the machine control. In addition, the machines can be equipped with the EDNA Neuron 3DG sensors, acceleration sensors, which enables regular automatic monitoring of machine health. With the right software offer from EMAG, data-optimised production can be started directly.

Grinding solutions from EMAG Weiss

Weiss has made a name for itself in recent years as a successful developer of cylindrical grinding machines. Founded in 1993, the company has acquired its know-how through the maintenance and modernisation of Karsten's cylindrical grinding machines. Since 2002, CNC-Technik Weiss has had its own range of cylindrical grinding machines, ranging from classic conventional cylindrical grinding machines to high-tech CNC cylindrical grinding machines. Weiss presented two of these machines at GrindingHub: a W 11 CNC and a W 11 EVO. The W 11 CNC is a grinding machine equipped with a modern, fast, grinding-oriented control. It can be used to automate many operations. If, for example the diamond and the workpiece are set, it can be done fully automatically. Radii, slopes, profiles and much more, the dressing amount is compensated fully automatically. The W 11 EVO is a further development of the well-known K11 series from Karstens. It is a new, contemporary version of the conventional grinding machine with many extras that make production life easier: hydraulic-free, axle drives with servo motor and ball screw, modern HMI with touchscreen, automatic parallel dressing and free-driving and much more.

Both machines offer the highest precision in external round machining with a grinding length of up to 2,000 mm and a maximum grinding diameter of 360 mm.

Combination machining with the VLC 350 GT

EMAG also showcased a VLC 350 GT for the first time at GrindingHub. The abbreviation "GT" stands for the words "Grinding" and "Turning". They indicate the great strength of this machine as the combination of grinding and turning, plus other processes, with the proven EMAG pick-up automation enables countless manufacturing solutions.

The complete machining of e.B. transmission components can be mapped with it. The machine is designed for components up to 350 mm in diameter and offers the option of integrating a grinding spindle with NC swivel axis. On it, for example, there is a cylindrical abrasive with which internal holes can be ground. It is fundamentally important that the combination of hard turning and grinding ensures fast processes and high machining quality: after turning, only a residual thickness of a few microns remains. The grinding process with corundum or CBN grinding wheels is therefore significantly shorter.

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Did you miss the chance to get to MACH 2022 in April?

With one of the largest grinding machine ranges available from a single supplier, RK International excels in working with suppliers who can provide a high quality product and support. If you didn't get the chance to visit MACH 2022, or just want to remind yourself what was on show, scan the code for more information.

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Mazak returns to STUDER for advanced grinding machine

Having used STUDER grinding machines for its high-precision grinding tasks for many years, Mazak has recently installed an advanced STUDER S41 CNC universal cylindrical grinding machine at the company's Worcester based European Manufacturing plant.

Established in 1919, Yamazaki Mazak has been contributing to the development of the machine tool industry for more than 100 years. Yamazaki Mazak manufactures advanced machine tools, such as multi-tasking machines, CNC turning centres, vertical and horizontal machining centres, CNC laser cutting machines and flexible manufacturing systems.

In addition to five manufacturing plants in Japan, Yamazaki Mazak has manufacturing operations in the United States, the United Kingdom, Singapore and China. Mazak's Worcester based European Manufacturing plant opened in June 1987 and was immediately recognised as the most advanced machine tool manufacturing plant in Europe.

The impressive European Manufacturing plant is a complete machine tool manufacturing facility. Here Mazak machine components such as spindles, turrets, and tool magazines. As with all Mazak manufacturing plants, the most rigorous Kaizen programmes ensure continuous improvements. Serving all of Europe's markets, more than 80 percent of the machine tools built in Worcester are exported from the UK into Europe. More than 17,000 Mazak machines have been manufactured here so far and this number continues to grow each day.

As would be expected from a machine tool manufacturer that boasts such a comprehensive range of products, the vast majority of the cutting-edge machine tools and highly-efficient FMS systems used in its European Manufacturing plant are Mazak's own products. Although, on the rare occasion that the need for a machine tool cannot by satisfied from Mazak's extensive product portfolio, the required production aid is submitted to a rigorous selection procedure. This was the case prior to the recent installation of the STUDER CNC universal cylindrical grinding machine.

Although the staff of Mazak's grinding department have enjoyed excellent service from their existing STUDER grinding machines, as it was possible that further progress could have been made by other manufacturers and in accordance with Mazak's policy of ensuring best value for money, other grinding machine brands were also considered.

The list of criteria that were considered when comparing the offerings from five leading grinding machine manufacturers included, high-precision dimensional and surface finish capabilities, efficiency, flexibility and thread-grinding abilities. In addition, the levels of customer service provided by each potential vendor were also taken into consideration.

Having carefully evaluated each of the alternative machines, it was found that only the STUDER S41 CNC universal cylindrical grinding machine met and, in some cases, exceeded Mazak's list of demanding operational criteria. Furthermore, the levels of support previously provided by STUDER and the company's UK agent, Micronz, aided Mazak's purchasing decision.

Mazak's recently installed S41 machine, with distances between centres of 1,000 mm and a centre height of 225 mm, is now delivering on all of the promises made by the staff of Micronz and STUDER. Michal Saletra, new investment lead for the UK at Mazak, explains the reasons behind the

STUDER S41 purchase. "In accordance with our Kaizen programs, we are continuously seeking improvements throughout our plant. The STUDER S41 machine was installed as part of an ongoing investment program in our busy, temperature-controlled grinding department.

"Our new STUDER S41 will be used for the highly precise external grinding of a wide range of company components, including parts that have single figure micron dimensional tolerances, such as our spindles. In addition, many of our components have demanding geometric and surface finish specifications, including parameters such as roundness and roughness. As all of these attributes need to be ground to an extremely high degree of accuracy, we have been very impressed with the highly-precise grinding results and the speed and ease of operation of our new S41 machine.

"Another major reason for the STUDER S41's purchase was its ability to very accurately and efficiently grind external threads. Previously we were using a subcontractor for much of this work. Our new STUDER machine has eliminated our outsourcing in this area and enabled us to bring thread grinding in-house."

The S41 CNC universal cylindrical grinding machine is available with distances between centres of 1,000 mm/1,600 mm and centre heights of 225 mm/275 mm and is able to machine workpieces with a maximum weight of 250 kg.

The S41 boasts a range of progressive technical features, including the revolutionary StuderGuide® guideway system, high-precision axis drives with linear motors, and an extremely fast direct B-axis drive. Owing to the availability of a wide

range of options, such as in-process gauging, balancing systems, contact detection, and length positioning, the machine can be supplied to correspond with all users' specific needs.

The S41's StuderWIN user interface creates a stable programming environment and contributes to the efficient use of the machine. StuderWIN allows the integration of in-process gauging and sensor technology, as well as contact detection and automatic balancing systems, enables the standardised programming of different systems.

Granitan® S103 Mineral Casting is used for the S41's bed. The excellent dampening behaviour of the machine's base ensures outstanding workpieces surface finish. In addition, temporary temperature fluctuations are compensated by the favourable thermal behaviour of Granitan S103.

The StuderGuide© guide system, for the longitudinal and cross slides, is moulded directly into the machine base and finished with a wear-resistant Granitan S200 surfacing material. The precision guideways with high load capacity and dampening properties, provide the highest possible levels of accuracy through the machine's entire speed range.

Longitudinal and cross slides are manufactured from high-quality grey cast iron and have highly precise, ground guideways. The slides rest completely on the guideways of the machine bed through the entire traversing range, providing the cornerstone for the S41's excellent straightness specification of 0.003 mm over 950 mm measured length.

The upper face of the longitudinal slide has a surface that is ground over its entire length and acts as a support for the workhead, the tailstock and all accessories. An additional T-slot with

a ground surface enables the optimal utilisation of dressing devices and the slides are powered by linear motors with high-resolution, direct measuring systems. The maximum travel speed for both axes is 20 m/min. This system forms the basis for high-precision and efficient grinding with the shortest possible auxiliary times.

The S41's wheelhead has an integrated B-axis that swivels automatically and enables the use of up to four grinding wheels. This enables workpieces to be completely machined in a single clamping with minimal auxiliary times and superior precision.

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Grind tungsten electrodes safely and economically

Inelco Grinders A/S focuses on the development, manufacture and sale of tungsten electrode grinders that are primarily used for TIG welding. It was originally part of Inelco A/S but, in a bid to sharpen focus on tungsten electrode grinders, Inelco Grinders A/S was founded on 1st January 2010. Its aim is to boost its position in new and existing markets with tungsten electrode grinders and to develop its business area within this sector.

The company has many years of experience in both dry and wet grinding of tungsten electrodes and today enjoys a solid position on the market with dealers all over the world, as well as collaborating with some of the largest manufacturers of welding equipment. With its products, it aims to boost the quality of TIG welding with perfectly ground electrodes yet, at the same time, wishes to contribute to health and safety at the workplace by only offering tungsten electrode grinders to the welding industry that are safe and not harmful to the health of the employees working in the industry.

Available worldwide

Throughout the years, Inelco Grinders A/S has expanded its net of distributors and prides itself on great collaborations with them. Relationships with new dealers are continuously being built all over the world through great cooperation and trust. Its long-term partnerships have formed through common goals based on continuous desire to grow and contribute to sustainable innovation. The dealer network currently spans over 55 countries and across all continents. It is important to the company that dealers possess great knowledge of, and are specialised in, the welding industry with the purpose of advising and selling to clients by identifying and meeting their needs.

Commitment to reducing the environmental impact

Inelco Grinders has started its sustainability journey with the purpose of educating itself and evaluating its next steps in a more green and more sustainable world. Last year the company was accepted to be a part of a Danish sustainability project called "GCO", concerning the conversion to a green and circular business model.

It wants to reduce its own carbon footprint and contribute positively to the sustainable agenda. Furthermore, its intention is to help customers save natural resources in terms of the extraction and production of tungsten, as it is considered to have an extensive and negative impact on the climate. Thus, it intends to examine possibilities of reducing customers' carbon footprint as well as its own.

Green focus areas

Recognising how important transparency is, the company wants to take customers on a journey by highlighting the following focus areas that it is working on: reducing its own carbon footprint, making its Ultima-TIG more environmentally-friendly, development projects going forward must include its new focus on sustainability.

In regard to reducing its own carbon footprint, the company is talking with suppliers in order to make a calculation of its current CO_2 emissions. Additionally, it has already taken the first steps by looking at reducing the amount of waste it produces and recycling the rest of that waste.

Its Ultima-TIG is already one of the most environmentally-friendly tungsten grinders on the market. This is due to the enclosed grinding chamber and the dust collector that prevents the toxic grinding particles from spreading and polluting the environment because it ensures safe disposal of the tungsten grinding dust. Moreover, it is looking into possibilities that can reduce the carbon footprint of the carbon footprint of the Ultima-TIG.

Ultima-TIG

Additionally, it wants to make a commitment that in all future decisions the focus will be on sustainability. For instance, packaging, supplier's and distributor's values as well as always learning and researching sustainable and eco-friendly opportunities to keep bettering itself and to minimise its environmental impact. Hence, to represent its new sustainability journey, it is introducing a new icon that will embody these new intentions. This icon will be presented together with its other three important focus areas.

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Award-winning abrasives expert develops optimal solutions in collaboration with customers

Abtec is a specialist supplier of abrasives and associated products to the metalworking and other industry sectors. Working with all sizes of businesses and organisations all over the world, the aim of the East Anglian business is to use its expertise to formulate the right abrasive product for each customer whatever the work challenge.

Founded in 2002, Abtec is a family business with three generations still working for the business. With offices in Cambridgeshire and Norfolk, Abtec started out very much as a local business but, with the launch of its website and monthly newsletter, the abrasives specialist now operates throughout the UK and boasts a growing international client base. As a family company, Abtec is quite rightly proud to offer a high level of personal service commenting that this is something that is central to its ethos.

Working with a diverse customer base ranging from automotive, marine and aerospace companies through to DIY enthusiasts, the agriculture and oil and gas sectors, imbues Abtec with valuable insight and experience, some of which in turn is brought to bear for its metalworking customer base.

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The wheels continue to turn at Tyrolit

John Willis has been managing director of Tyrolit UK for 25 years. Now, as he steps down from the role to enter retirement, he shares some insights into his time in the business and how the company will continue to thrive in the future

Managing director John Willis, Tyrolit UK

How did you get into the abrasives business?

I started my career with Triefus in Sussex where I served my apprenticeship. After six years, I left and joined the Wendt group in Germany, helping install diamond dresser technology in Germany and the USA. After just two years, I returned to the UK. In 1982 I joined Tyrolit as a junior salesman, instigating the sales of super abrasives for both precision and construction applications. From there I initially became a construction sales manager, then sales director and for the last 25 years I have been the managing director of Tyrolit UK.

What have been the changes to business over the time period?

Clearly technology has changed the working environment beyond recognition, we used to have eight typists and four salesmen. Today, we have a salesforce of 21 engineers and no typists. Business transactions, stock management, order and invoice processing are pretty much handled automatically.

Commercially today there is much more emphasis on suppliers managing the supply chain of abrasives as well as a growth in integrators, very similar to the development in the USA. Now Tyrolit services a high volume of its end users with fully managed consignment stock. In parallel, we have built up a strong network of distributors which service thousands of end users. Globally the company has grown to a turnover in excess of €700m with 28 production plants worldwide.

What have been the advances in grinding in recent years?

Technically the introduction of sintered abrasive grain has meant that conventional abrasives have closed the performance gap on super abrasives, such as diamond and CBN, with dramatic improvement in parts per wheel and reductions in cycle time at a fraction of the investment cost of super abrasive tools.

For many years, the solution to grinding improvements was managed by constant changes in wheel specification. Today we understand for the better how the grinding wheel works and more importantly why it doesn't. Theories on the need for constant peripheral speed being the reason why wheels stopped working as they reduced in diameter proved to be just part of the problem. Now we understand that arc of contact and chip thickness are the reasons why wheels fail prematurely. We can model these two factors to ensure that grinding processes remain in a safe zone for the entire life of the wheel and that dramatically reduces the machine down time for testing and process improvement.

Our understanding of coolant and its application has also been a major advance. The use of high-pressure scrubbing nozzles to clean debris from the wheel and load the wheel with coolant that can be carried into the grinding zone ensured major advancements in grinding. It allowed the use of smaller wheels that could fit on multi axis CNC machines requiring the grinding wheel industry to develop high porosity wheels and the need for ever stronger bond systems to hold the grain in place under extreme forces.

At the same time, we can use power monitors that show us power drawn from the spindle which is relative to forces and heat generation in the contact zone. This means we can show that improvements to cycle time can be achieved without the risk of burning or micro fracturing the component.

The quality of our engineers has also advanced beyond recognition. We don't employ salesmen as such, we now ensure

our team is full of commercially aware application engineers that understand the part, the machine tool and the process. The combination of experience of our staff, having worked as engineers within the industries that they serve, their expertise in these industries and their ability to use 3D modelling to design fixtures, dressers and wheel design, as well as define a cutting strategy means the days of guess work have long gone.

Materials have also changed and the use of highbred alloys including titanium and other lightweight high temperature resistance materials mean that there are huge challenges ahead for the grinding industry. Printed parts also mean that parts that need to be ground will be nearer net shape and grinding as a process is more about accuracy than stock removal.

How has Tyrolit managed to navigate a tricky couple of years for businesses in light of the global pandemic?

There has obviously been a lot of pressure placed on our industry and businesses in general and we have suffered in the same way. As fast as the business declined, we discovered solutions in order to continue to

supply customers without visiting them. We also had a huge advantage in the form of our UK-based warehouse, which acted as a cushion between manufacturing times and delivery times, ensuring we could continue to supply customers quickly.

Have there been any new markets that Tyrolit have experienced growth in as a result of the pandemic?

We made plans and positioned ourselves to get into new markets. At the end of July 2020, the TYROLIT Group acquired Bibielle S.p.A, a leading manufacturer of high quality three-dimensional abrasive material. This increases our potential for growth moving forward and it was something which helped to soften the blow with regards to the aerospace industry, in which we are a big player. I would say that our automotive business continued to grow despite the pandemic disruption that occurred for that industry. We got heavily into the rail business, which has proved to be very successful and we are now taking steps in the medical industry. In the USA, we have been working with our sister company Radiac Abrasives to gain traction with large medical companies.

What have been the main changes to manufacturing industry?

UK industry has moved away from the heavy industries of steel and foundry, toward the high-tech industries such as automotive, aerospace and medical. The assumption that we don't make anything anymore is not true.

Sadly, however, we have seen the demise of the majority of UK abrasive manufacturing with only a handful of suppliers left. The reasons for this are simply the constant pressure in the UK for short term returns, resulting in a lack of investment and a general reduction in productivity creating high-cost pressure. If manufacturing industries aren't to go the same way, then continued investment is a must. Sadly

owners, who are predominantly overseas, seem to take a long-term strategic view on investment and returns.

However, Tyrolit continues to buck the trend of abrasive companies in decline, continuing to invest in acquisitions and develop in new markets. I'm delighted that I leave the company in a strong position and genuinely believe the company will continue to go from strength to strength under the management team.

I wish them success and will be watching their development with pride, knowing I was a contributor in Tyrolit's success.

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More powerful and precise grinding machines require superb grinding wheels and dressing rolls

On the road to top performance, the DVS TECHNOLOGY GROUP and its subsidiaries are offering a turnkey solution for internal and bore grinding as a milestone for future mobility.

The iCompact from Buderus combines a modern design, a solid construction and the most efficient hard finishing technologies all within a small footprint of only 7.5 m^2. In order to get the most out of the machine, the abrasives specialists at DVS NAXOS DISKUS have developed an entire series of vitrified bonded diamond and CBN grinding wheels that are tailored to the grinding process required for the iCompact, which provides the foundation for further increasing the precision and repeatability of the machine tool processes. The wheels also enable the processing of materials with hardnesses well in excess of 60 HRC and they also help to significantly decrease the dressing and profiling intervals on the iCompact. Optionally, the grinding wheels can be manufactured straight and with a coarse profile in order to reduce the time required for wheel changeovers. This further increases the productivity of the iCompact.

How cubic crystalline boron nitride is revolutionising internal grinding

DVS NAXOS DISKUS offers CBN grinding wheels that maximise the service life when it comes to grinding bores. In addition to diamonds, Cubic Boron Nitride (CBN) is another super-hard abrasive. The CBN grinding wheels from DVS NAXOS DISKUS have stood the test of time in real-world applications over many years and combine high process stability with higher cutting performance. "Our customers are very pleased with the results and, compared to conventional abrasives, such as corundum or silicon carbide, these grinding wheels have a much longer service life and never lose quality," reports Mario Arnold, technical manager and member of the management board of DVS NAXOS DISKUS at the Butzbach plant. In addition, the time-consuming dressing cycle is extended many times over when grinding with vitrified bonded CBN grinding wheels. "What's more, we adapt the specifications individually for the various applications of our customers. This allows us to design the right grinding tool for our customers for every application," adds Mario Arnold.

DVS NAXOS DISKUS offers different disc variants that can be used with the new abrasive grain generations for internal grinding. When it comes to internal grinding, CBN offers another advantage over corundum: "Tools made of CBN can be produced in small diameter ranges. Corundum grinding wheels max out its geometric production limits faster," Mario Arnold explains.

The first users of this technology are from the DVS TECHNOLOGY GROUP, where the quality requirements are very strict. "We see a lot of opportunity in the E-mobility sector and with manufacturers of industrial gears," Mario Arnold states. "Electric drives require gears and shafts with extreme surface qualities. This can only be achieved with high-quality internal grinding tools."

Optimum grinding solutions for many industrial sectors

Vitrified bonded CBN and diamond grinding wheels made in-house at NAXOS DISKUS are the best choice when highly efficient production is critical for the machining of individual or series parts for the automotive industry, hydraulic components and injection nozzles for combustion engines, products made of technical ceramics, parts that are coated using the HVOF process and numerous components for future mobility.

The product range from DVS NAXOS DISKUS includes cylindrical

grinding wheels or grinding wheels based on user drawings. They can be mounted via the bore or on a steel or carbide spindle. To find the ideal grinding solution in each case, the application engineers at the abrasives specialist work in close cooperation with the customer.

Efficient dressing processes

Dressing tools made of CBN and diamond complement the product portfolio of DVS NAXOS DISKUS. They are used for the economical dressing of grinding wheels in different bonding systems. When used in the Buderus iCompact, they offer maximum accuracy in the dressing process. Grinding wheel dressing produces precise concentricity and a correct geometric shape on the grinding wheel. Dressing is also used for profiling or calibrating grinding wheels. It also removes impurities from the grinding wheels caused by material abrasion and the blunted abrasive grits and it lays bare sharp abrasive grits. This reduces heat generation during the grinding process and keeps the required removal rate steady.

Diamond dressing rolls have different diamond designs. Today, industrial diamonds made of MKD, CVD and PCD are increasingly taking the place of natural stones. This is due to the fact that the defined shape of industrially manufactured diamonds ensures a steady and reproducible quality over the entire service life.

CNC-controlled form rolls are used particularly for small and medium-sized series or prototype applications because CNC control facilitates changes in the production process. This keeps the workpiece-related dressing costs down and drops the "price per piece" to a minimum.

Since the introduction of CNC-controlled dressing processes, the number of CBN and diamond form dressing rolls on the market has increased significantly. So, for users it has become virtually impossible to select adequately between all available variants.

This is why the abrasive plants in close cooperation with the sister companies DVS Tooling and Buderus Schleiftechnik are looking to reduce the wide variety available. The goal is to keep the warehousing effort feasible and enable cost-effective tool production. The companies of the DVS TECHNOLOGY GROUP are thus optimising the grinding processes of customers in terms of economics.

Forming rolls in natural and CVD diamond designs are mainly used for conventional grinding wheels. DVS NAXOS DISKUS is also offering various models of self-sharpening tools for extremely tough grinding wheel applications. Through the precise coordination between the dressing tool and the machine-integrated dressing spindle, they enable the highest concentricity accuracy.

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Vertical and horizontal bore honing production machines

Honing machines

Barnes Bore Honing and Finishing Systems was founded in 1907 as Barnes Drill Co. during which time it began to manufacture the first all-geared drilling machines. Since then, Barnes Bore Honing and Finishing Systems has been considered a leader in developing innovative new technology and processes to help manufacturers improve product performance, quality and cost. The earliest Barnes honing machines were the first-ever to make honing a practical and efficient means of finishing automotive cylinder bores in a production environment. As production requirements increased, so too did Barnes' ability to meet the need for greater speed, accuracy and efficiency.

Barnes is considered a leader in developing innovative honing and bore finishing technology and processes. As honing and bore finishing requirements evolved, it introduced a multitude of new products and innovations including multiple spindle machines, automatic part load/unload and transfer, automatic tool changing devices, in process part gauging, servomotor controlled honing stone expansion systems and single pass bore finishing. This long history of innovation has culminated in a new generation of machines, tools, fixtures and abrasives that deliver improvements in honing and bore finishing accuracy, surface finish, productivity and efficiency that were unimaginable just a decade ago.

The honing process

The honing process provides the final sizing and creates the desired finish pattern on the interior of tubing or cylinder bores. Finishing is accomplished by expanding abrasive stones of suitable grit and grade against the work surface. The stones are rotated and reciprocated in the part with hone abrasive under controlled pressure. Combining rotation and reciprocation produces a cross-hatch pattern in the surface of the part being honed.

Stroke honing machine

Barnes Stroke Honing Machines & Finishing Systems offers a complete line of products for all honing requirements. It can offer fully integrated systems and honing machines for high volume production applications and equipment for low volume job shop applications. It also offers rebuild and upgrade services for existing honing machines and provides customers with fully engineered complete custom solutions and a full line of accessories and consumables in addition to comprehensive training and repair services.

Its extensive line of stroke honing machines have the ability to hone machine bores with diameters ranging from 0.25-30 inches and bore lengths up to 75 ft. It offers systems for both medium to large-scale serial production as well as small batch production. These systems can be made to be manually operated or fully automated. With innovation and customer service as its main objectives, Barnes Stroke Honing Machines & Finishing Systems is continuously researching and developing new technology and machinery. By consistently staying on top of the latest developments on the market, it ensures that its customers are provided with the most state-of-the-art production and control.

What is stroke honing?

The rough honing part of the process removes the bulk of the material remaining after boring and provides the final sizing for the bore in a "peak honed" bore or leaves a minimal amount of stock in a two-step process. Rough honing creates the desired finish pattern on the cylinder walls in a "peak honed" process or provides the valleys for a "plateau" honed bore. By combining rotation and reciprocation at precise rates, honing produces a specific cross-hatch pattern in the surface of the part being honed. Two step honing can further refine the "peak honed" surface to clean up torn and folded metal produced by rough honing or can produce a plateau on the surface to help meet emissions requirements.

The bore walls can be finished by expanding abrasive brushes or abrasive stones against the work surface. The brushes or stones are rotated and reciprocated in the part, with the finishers expanded under a lower controlled pressure.

Single pass honing machine

The Barnes Bore Finishing Systems single pass machine line is suitable for a variety of single pass honing applications. The flexible machine design can be configured with a single spindle for lower volume production requirements for the smallest of machine shops. It can also be arranged with multiple spindles to satisfy high volume production requirements for the most demanding of companies.

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SUNNEN®

Partnership · Precision · Performance

Newly designed with input from machine operators, the new Sunnen SV-3000 series vertical honing machines feature powerful new system control and OPC protocol. Setup times are minimized, cycles are automatic and robotic load/unload is possible for mid- to high-production part production

Sunnen advances the state of honing technology with the new SV-3000 series vertical honing systems. The SV-3000 features a new Beckhoff-based industrial control with proprietary Sunnen2 software, designed to include EtherCAT industrial communication for fast response time and increased process control.

The powerful control system includes a large touch screen and capacity to program custom part load/unload operations, eliminating the need for a second control for automation. Intuitive adjustments as well as tool selection, damping, setup mode, handling, expansion/retraction of tools, and more are all adjusted via the touchscreen. A handwheel may also be used for stroke adjustment.

The SV-3000 series incorporates synchronized servo stroke and spindle motors that enable constant crosshatch finishes. The drive technology also enables the machines to hone only on the pull stroke to easily produce custom profiled and tapered bores.

It also includes a load-sensing feed system that maximizes productivity and produces tolerances below 0.5 µm on a wide range of small-diameter parts.

Sunnen solicited input from global customers during the development of the SV-3000 series. The software for these next generation hones has been completely re-written using the latest programming languages and technologies.

All programming was done by Sunnen software engineers who understand the honing process. The intuitive nature of the control means new operators can be trained quickly to process complex or difficult-to-hone parts, and setup times are greatly reduced.

In addition to an all-new exterior appearance, the latest ergonomic and safety features have been incorporated. Guarding is designed to provide access to critical areas for machine maintenance, while a rear-mounted electrical enclosure and removable side panels allow improved access to the spindle and column from all sides.

A centrally mounted operator station can be easily positioned to suit the operator's preference and/or shop-floor space. The new SV-3000 uses a OPC UA interface, allowing real-time remote process monitoring, an important consideration for the implementation of Industrie 4.0.

Sunnen is a total bore solutions provider, including the tooling, abrasives and cutting fluids to keep production running smoothly. The Sunnen technical team can help determine the correct tooling and abrasive combination for specific applications. For additional information on Sunnen honing systems, tools and abrasives, contact us.

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Innovative solutions in honing

NAGEL Maschinen-und Werkzeugfabrik GmbH is a worldwide specialist in the field of honing and superfinishing technology. Its innovative solutions have given customers a valuable technological edge for more than half a century.

The NAGEL product range offers solutions for the machining of bores in all lengths, up to 20,000 mm and diameters from 1 mm to 2,500 mm. Its product range includes different machine systems which can be individually adapted to meet customer requirements in relation to output.

The MSU4 high-end honing control system which is used in all machines of the NAGEL company enables problem-free application of all types of honing processes.

VARIOHONE honing centres

These honing centres, as a single machine with one or two independent or linked honing stations and up to four honing spindles, are able to execute the typical operation sequences used in honing machining.

Thanks to the MS-U honing control with its intuitive operation, all imaginable honing processes can be realised in no time at all. With a modular design and equipped with tool changers, on request, these closed honing centres can handle the complete finishing of workpieces with varied bore dimensions. Naturally the VARIOHONE honing centres can also be fitted with electromechanical honing spindles with patented speed reduction at the reversing positions.

VARIOHONE honing centres can be found in the production for the automotive industry and also in the testing and prototype production for customers.

Flexible linked honing centres

These are modular VARIOHONE honing centres which can be linked serially or in parallel to create a production line. This new concept, introduced to the market by NAGEL for the first time, successfully allows the combination of high flexibility regarding the range of parts and the preliminary processes to be implemented together with the productivity of large-scale series production. According to customer's requirements, the linking can be made via a gantry loader, a roller conveyor or robot systems. Naturally, all honing centres can be equipped with automatic tool change systems.

A commonly requested configuration variation consists of a number of VARIOHONE machines whereby each machine can completely machine a part with a single clamping process. The redundancy of these machines linked in parallel leads to even higher availability. Also, an investment made in several stages through the subsequent integration of additional centres can be made without any significant production downtime. In the case of new production starts, the new workpiece type can already be directed to one of the existing machines while the current production continues on the remaining machines.

Intelligent process stream consolidation

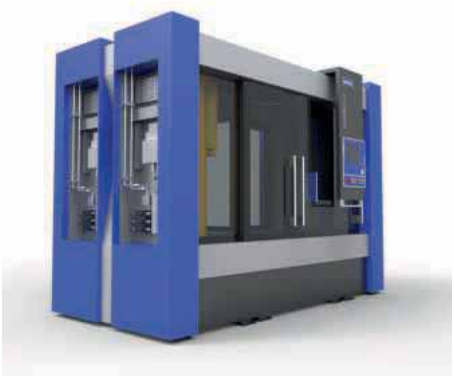
The BOREHONE process, developed together with GROB, represents a quantum leap in the finish machining of cylinder blocks. Modern abrasives enable a higher performance first honing stage and this allows complete elimination of the fine drilling finishing together with the dimensional checking which previously was carried out in the process before honing. This high-speed honing process is easily able to manage the dimensions of the remaining fine drilling for semi-finishing, with cycle times suitable for large-scale series.

The diameter measurement included in the first honing process enables the semi-finishing fine drilling machine to automatically compensate for wear via a corresponding feedback signal. This allows better usage of the semi-finishing cutting and also achieves a diameter consistency with semi-finishing bores not previously

possible. As a result, the cutting of the next high speed honing process can be made with tight diameter tolerances which in turn lessens wear on the stick, reduces the amount of honing sludge and realises consistent honing times.

A pre-checking gauge before the first honing stage additionally enables realisation of automatic tool change during fine drilling for the first time. This in turn enables a new degree of flexibility and availability for the fine drilling of cylinder bores.

The BOREHONE concept is available as a transfer or centre solution. The concept impressively reduces investment costs, requires less space and considerably reduces annual running costs for tools, energy and the number of required personnel. This is all without any technical risk because ultimately the order of machining tasks proven over many years remains unchanged. The fine drilling continues to ensure the position and angularity of the bores and honing takes place after the fine drilling of the bore, generating the micron



Innovative machining concept for the honing of gearwheels

Equipped with electro-mechanical honing spindles and the latest NAGEL control system generation, VARIOGEAR offers the best possible flexibility for high output levels.

The highly flexible fixture concept, developed especially for this task, enables extremely short setup times and therefore even maximises availability with a large variety of parts. This new degree of flexibility also leads to a considerably lower requirement for fixture change parts and simultaneously means that today you are equipped for the workpiece generations of the future.

The VARIOGEAR machining concept enables post process measurement after each of the three possible honing operations, giving an effective feedback control for each separate process stage. This functionality provides the basic condition for the best possible process reliability and perfect quality of the machined parts.

The machine can be loaded automatically or manually. The rotary table transportation serves to reduce non-productive time and so enables the best possible productivity. During development of the machine, considerable importance was attached to providing good access for operating and maintenance personnel.

Combining experience with innovation

NAGEL's machines, tools and service in the field of honing and superfinishing provide the highest level of quality, productivity and process reliability on the production lines of customers. According to the principle of simultaneous engineering, it develops the ideal fine machining process parallel to customer's product development and then delivers the right solution to enable them to reach their targets.

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Abrasive powders for clear coat polishing

The Saint-Gobain Surface Conditioning Group are experts in abrasive technology for surface preparation and finishing applications. One aspect of surface preparation it specialises in is developing abrasive powders for clear coat polishing, typically for automotive finishing.

Clear coat polishing for automotive finishing

Since the end of the 20th century, clearcoat has been the standard finish on newly manufactured or older, repainted vehicles. Clearcoat is the top layer of body work, which is translucent, glossy and has a thickness of about 25 micrometres (μm), thinner than the average human hair. This layer offers high gloss and a level of mechanical protection from outside influences such as scratching, weathering and so on.

Automotive finishing used to require earthen material abrasive powders for their polishing compound. These are cheap materials, however they are not always cost-effective. They offer little in the way of options for engineered customisation as the only modification possible is particle size, making it difficult to fine tune the overall performance of the abrasive powder. Modern clear coat systems demand something more fine-tuned to ensure polishing is carried out efficiently and with great results.

The composition of abrasive material has a direct impact on the performance of the abrasive powder, as well as its morphology and microstructure. In a polishing compound, mechanical and electrostatic aggregation of particles causes inefficiency in cutting, meaning polishing time must be extended to achieve the desired surface finish. This in turn increases the overall cost of the operation.

Abrasive powders from Saint-Gobain

Saint-Gobain has optimised abrasive technology, measuring abrasive powder's true cutting performance. This led to a progression beyond simple PSD and phase control which has meant enhanced performance and surface finish. This progression has resulted in a wide range of particles at the forefront of the automotive polishing industry.

Its IDEAL Cut is an advanced abrasive media, created to yield maximum cut rates in the initial step of automotive polishing. This abrasive powder is engineered for robust cutting action and can correct severe surface defects quickly and uniformly, meeting demanding gloss requirements.

Abrasive powders from Saint-Gobain can also be tailored to support individual client requirements and can suit a diverse range of automotive clear coat formulations and applications. Saint-Gobain can expertly modify abrasive powders to suit varying automotive polishing applications. The cut rate can be designed around substrate hardness and composition and can provide levels of quantitative control which was not previously possible in automotive polishing.

New abrasive compounds have been developed to streamline the automotive polishing process for body shop and production line applications by offering novel abrasive particles which are able to morph from a high-cutting action to an enhanced finish. The emphasis on commercially viable single-step automotive polishing inspired Saint-Gobain's IDEAL range of alumina, Al2O3, abrasives and its IDEAL Super product offers maximum cut with a higher finish quality.

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IDEAL

Precision lapping and polishing system

The PM6 is the newest addition to Logitech's wide range of precision lapping and polishing systems. The bench-top, research & development scale machine reproduces processing results typically found on production scale equipment. Highly flexible in use, the PM6 allows you to work with many different materials including gallium arsenide, silicon, rock and soils.

It is used extensively in the preparation of geological thin sections: i.e. rock lapping system and the preparation of semiconductor materials i.e. polishing silicon wafers. Designed as a single workstation machine, the PM6 has dual abrasive feed cylinders with metered delivery from peristaltic pumps and comes with optional automatic plate flatness control.

Automatic plate flatness

The automatic plate flatness control system continually monitors the plate shape and automatically corrects any deviations from the pre-set shape. This removes the need to recondition the plate before processing, maintaining the shape indefinitely to within 1 micron of the operator's target. This can be flat, concave or convex to a precise degree. The ease with which the value can be set provides operator time and delivers great sample output.

The PM6 system is made from aluminium and rigid polyurethane to withstand the most rigorous lapping and polishing environments. All functions are controlled from the Graphical User Interface (GUI). The PM6 is fully Bluetooth enabled and can provide real time data feedback which can be extracted through the USB port for external data analysis.

Geological sciences

In many areas of geological study such as mineralogy, petrography and sedimentology you are required to analyse the characteristics of the materials such as soil or rock. To be able to do this a thin section needs to be prepared for microscopic examination.

Logitech precision equipment is ideal for thin or ultra-thin section preparation. Our wide range of versatile systems enable you to trim, lap and polish geological thin sections such as rock, coal, concrete and soils.

Each of our systems are fully supported by a wide range of accessories and consumables, such as abrasive powders, polishing cloths and mounting media.

Semiconductors

Semiconductor materials are used in a wide variety of devices such as field effect transistors, integrated circuits, focal plane arrays and infra-red detectors.

Whatever the application or material, each semiconductor wafer undergoes several common stages during manufacture, which include slicing the wafer from the crystal, preparing the surface prior to fabrication and thinning the device after fabrication through the use of lapping and polishing techniques.

Logitech provide complete system solutions including consumables for the precise thinning of these III-V, I.R. and similar materials.

CMP applications

Primary applications areas are in the field of tribology science and research, particularly with regards process and analysis results. For example, Coefficient of Friction monitoring (CoF).

The Tribo chemical mechanical polishing system is also readily adaptable as an enabling technology in Micro-electromechanical Systems (MEMS) fabrication, particularly polysilicon surface micromachining, Opto-MEMS and Bio-MEMS packaging, assembly and even fabrication.

Optoelectronics

Advances in communication technology have led to the development of a wide variety of optoelectronics and integrated optics devices for applications such as Dense Wavelength Division Multiplexing (DWDM), optical isolators, signal processors and optical switching.

Logitech has a large selection of adaptable systems for the preparation of optoelectronic materials such as; silicon, lithium niobate, lithium tantalate, bismuth silicon oxide, barium titanate and similar materials.

Its systems, accessories and consumables provide defect free face and edge polishing on optoelectronic substrate and scratch free surfaces with exacting and repeatable dimensional tolerances.

Optics

The importance of optical polishing and the processing of optical components has never been greater with the ongoing development of the telecommunications market. Whether for infra-red and polymer waveguide production or fibre optic cable polishing. The precision design and manufacture of Logitech equipment enables you to obtain maximum results from the cutting, lapping and polishing of these optical materials.

Other applications

Logitech systems are used by organisations across the world for many different complex sample preparation processes.

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Timesavers explains Surface Rougness (RA)

When you are working in the metal finishing industry, you probably have heard about surface roughness. It measures the irregularities on the surface and is one of the characteristics of the surface texture. The friction and wear of sheet metal is depending on the surface texture, thus is it important to examine.

There are numerous parameters to measure a profile's roughness, of which the value Ra is the most common. Ra measures within a certain sampling length the average of the peaks and valleys of the metal surface, including the deviation from the mean line. That can be done with a profilometer or laser scanner. The greater the deviations, the rougher the surface, so if the Ra is small, the surface is smooth. The Ra will either be calculated in micrometres (µm) or microinches (µin.), and is a useful, often used average. Another one is the Rz, which stands for the mean roughness depth. It is the average value of the difference between the highest peak and lowest valley from each of the five sampling lengths. The Rt value presents the total height of the profile, by measuring the difference between the highest peak and deepest valley within the whole evaluation length.

The benefits of a smooth or rough surface

A smooth and non-absorbent surface can be cleaned more easily and has a low adhesion. This makes it beneficial in industries such as the food and pharmaceutical industries where hygiene is top priority and the risk of bacterial adhesion should be minimised.

Rough surfaces, however, are harder to clean and more sensitive to friction. They offer resistance to moving objects due to the many irregularities. Such surfaces are also suited for design purposes because of its dull looking finish. Moreover, it has a larger surface area, which provides good adhesion of coating and painting.

Create the desired finish

Tooling is a deciding factor in applying the right finish. The right surface roughness can be achieved with the use of abrasive belts, brushes or rotary brushes. When aiming for a specific roughness, it is important to choose the right grit size for the abrasive, as well as the type of abrasive mineral. The coarser the grit, the rougher the surface. The minerals influence the amount of stock removal and the surface reflection.

Timesavers machines for finishing

There are a variety of finishes that can be made by Timesavers machines. For products to be placed in every possible direction, a non-directional finish is needed that can be applied with Timesavers' popular rotary brush technique, built in all of the RB series deburring machines. The ultimate Timesavers finishing machines for sheets and coils are the 71, wet working and 72, dry working, series. These can apply a No.3 or No.4 finish that are common for products designed for escalators, elevators and architectural buildings. The hairline finish is one that is mostly desired in Asia, where it is being used for escalators. Timesavers machines are also able to produce a Duplo or Microlon finish, which are great for food processing equipment and the pharmaceutical industry.

Rimex about the Timesavers 72 series for hairline finish

The latest addition to the Rimex range is a custom-made Timesavers 72 series with a 1,600 mm working width for hairline finishing. "We have been able to supply hairline products, but it wasn't straightforward and we had to modify/reset existing machines to do it, which added time and cost. The decision to invest in a bespoke machine from Timesavers to achieve that finish has streamlined the whole process," says Nick Barnes, sales director for Rimex. While this investment in the hairline machine will assist exports to the Asian market, it is also expected to open up opportunities across other markets.

"The Timesavers machine gives us the confidence that we can supply consistent quality from order to order and that consistency is vital as our products are in constant view across projects from elevators to building exteriors, so any discrepancy will be easy to spot," says Nick Barnes.

In normal polishing and finishing, such as Rimex's Satin products, the surface finish undergoes abrasion from a fast-moving abrasive belt and rotary brush in a Timesavers 62 series 1600 WWB machine. This gives a finish with short and varied 'scratched' surface. With hairline, the material is polished and finished as normal, then passed through the 72 series hairline machine. Here the abrasive belt is moving at much slower speed around 0.6-2 mm/min while the material is passed beneath it. The effect is to create a continuous 'scratch effect' from one end of the sheet to the other. A finish that is seen as more aesthetically pleasing for internal architectural features such as elevator doors and internal walls. To achieve this the Timesavers machine is equipped with a harder than normal contact roller over which

the abrasive belt passes. This ensures the correct 'aggression' on the material being finished as a harder roller ensures firmer contact with the material. The actual finish is then governed by the grit size on the abrasive belt, which can be quickly changed if required to meet customer requirements.

"This hairline machine is the is fifth Timesavers machine we have installed here over a 30 year period," says Richard Watson, production director for Rimex. "In that time, we have built an excellent relationship with the people at Timesavers. We are now focusing on creating a standard hairline finish, using a grit size that gives a softer look to the surface that meets all the standards for external cladding, where the surface finish has to be less than 0.5 Ra. However, with the Timesavers machine we do have the ability to quickly change the abrasive belt to a larger or smaller grit size, which means that we can, if a customer specifies. It creates a wide range of hairline finishes."

Webinar about surface roughness
In March, Timesavers held a webinar about this topic. Would you like to expand your knowledge of surface roughness on sheet metal and watch the live demonstration of Timesavers 31 series and 42 RB series? Simply scan the QR code, fill in the request form and receive the free recording and presentation of the webinar immediately.

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High performance filament brushes HFB disc brushes

Lesmann high performance surface finishing tools achieve excellent deburrings and edge radi-using on exterior and interior areas of workpieces. Next to the applications in machining centres, especially in linear deburring and finishing lines with planetary brush systems, HFB brushes obtain high efficiency.

HFB disc brushes are used for the deburring of: blanked parts, sintered parts, hydraulic and pneumatic workpieces, aluminium workpieces and many more. Workpieces that are exposed to high pressures demand precise edge radiuses. Lessmann HFB brushes are ideal tools which achieve these requirements outstandingly.

Filling material

In a special production process, Lessmann HFB brushes are manufactured with a very high filling density. High abrasive nylons are available with silicon carbide, ceramic or diamond grit. High quality filling material, PA 6.12, is used as standard in the HFB brushes. It is very bend and abrasion resistant.

Due to the application orientated selection of the filling materials, an excellent deburring and constant edge radiusing in a short working time is achieved. Depending on the HFB application, brushes can be used under dry conditions or with the addition of coolants.

Arrangement filling material

Depending on the requirements, the brushes can be manufactured with individual filling fields. For example, full filament is possible but also the division of the abrasive bristles into defined fields or deviation of the bristles. Depending on the direction of rotation, more effective processing is possible. For example, due to the optimum removal of cooling water.

Revised clamping system

Lessmann manufactures brush types for all common brands of machines and drilling patterns according to customer specifications. The basic versions are suitable for the common machines with cutter head holder, DIN 6357, or combi-milling arbor holder, DIN 6358. They are also suitable for special models that are available for the short-term. Lesmann HFB brushes are suitable for accessories for working under wet conditions, for example clamping screws with coolant holes. On request, it can deliver brushes with bore according to customers special requirements.

Revised design

Lessmann HFB brushes are being constantly improved and developed in order to meet the latest technical requirements. The latest adaption is the revised design of the brush plate, which has been given a curved shape. Thus, the brush can be used more flexibly and its body is more stable. The resulting dynamic rotation gives the brush optimum conditions for precise work. In addition, less chips and oil are trapped in the brush during machining which leads to less abrasive wear.

More than 10,000 solutions

Due to its own engineering, tool and equipment design and modern, flexible production facilities, Lessmann is able to produce special brushes in small and large batches.

Since 1948, Lessmann has been producing surfacing tools "Made in Germany" at its production site in Oettingen/Bavaria. Ultra-modern industrial facilities, permanent quality controls and tests ensure the highest brush quality.

The family-owned enterprise located in Oettingen has all departments in one area. As its production, administration and research and development department as well as warehousing and logistics teams are closely together, it can provide short internal roots and fast processing times.

New and further developments of Lessmann tools for surface finishing is the basis for its success. With its motto: "Brushing is better than chemistry", the company opens new application fields daily. Brushes are always developed and optimised so that they are suitable for the defined requirement profile.

Its research and development departments have years of experience and its technical application engineers bring their knowledge directly in your company to find solutions. Practical background, choice of materials and functionality are the basis for innovative new products.

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Kemet expands range of in-process deburring brushes

Following Kemet's successful launch of the Xebec deburring brushes and the reaction from industry at the recent MACH 2022 exhibition, the range is being extended to now include extra-large crosshole deburring brushes for larger internal bores, either for surface finish improvement or the deburring of secondary cross holes within the bores.

With these new brushes it is now possible to automate deburring of inner diameters from 20 mm to 35 mm, an increase of 15 mm from the previous range. To do this successfully, Xebec has developed a new material which gives improved grinding power and wear resistance and longer tool life. This is because the new material flares out even more than the current material, providing a longer usable range of bristles and a separate brush and shank meaning only the brush element needs to be replaced when the brush has worn out.

Xebec Technology's ceramic fibre products utilise a unique, patented process to produce brushes, sticks and stones that greatly outperform traditional deburring methods. One Xebec ceramic bristle consists of 500-1,000 ceramic fibres that work as cutting edges.

Xebec's cutting fibre is the world's only brush made by continuous ceramic fibre. This unique material allows for higher grinding power, consistent performance and superior surface finish. The fibres are formed into bristles for brushes or bound into stones. Self-sharpening tips lead to superior grinding performance. End-to-end solid abrasive rod material assures consistent performance.

Unlike brass wire, steel wire and abrasive impregnated nylon brush filaments, the unique design of the Xebec fibre rod allows it to maintain its shape with no deformation even after repeated use. This leads to consistent performance time after time. Achieve a beautiful, finely finished surface without tool marks or residues.

The Xebec ceramic fibre has three features that enable CNC deburring and polishing: unsurpassed grinding power, consistent cutting performance and no deformation.

The Xebec back burr cutter range has also

been improved. Longer tool life and shortened cycle time/increased feed speed have been made possible by increasing the number of blades to three. A shortened neck length offers higher rigidity, improving quality. Non-coated versions are also available to provide the sharper cutting edge needed on nonferrous metals and resin. These are all available with or without a custom-made preprogramed tool Path™.

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Metal cutting robots

Kadia has been designing deburring robot cells based on 6-axis industrial robots for many years. In the meantime, a new trend is now emerging; solutions with an even higher value-added component, i.e. with general machining processes such as milling, drilling or thread cutting. The robot is thus no longer just part of a deburring machine.

The Nürtingen-based company pursues two concepts with its Deburr-Robot-Cells. Either the robot grips the workpiece and moves it to fixed tools, often brushes, or it guides the tools itself, such as milling tools. The latter case is the bigger challenge and one example is the deburring of large gears. The term deburring is no longer quite appropriate for this application as it is more a matter of edge shaping. The gears are given chamfers of up to 5 mm and the tool used for this is a solid carbide end mill. Programming is complex because the cutters follow the involute contour of the tooth flanks.

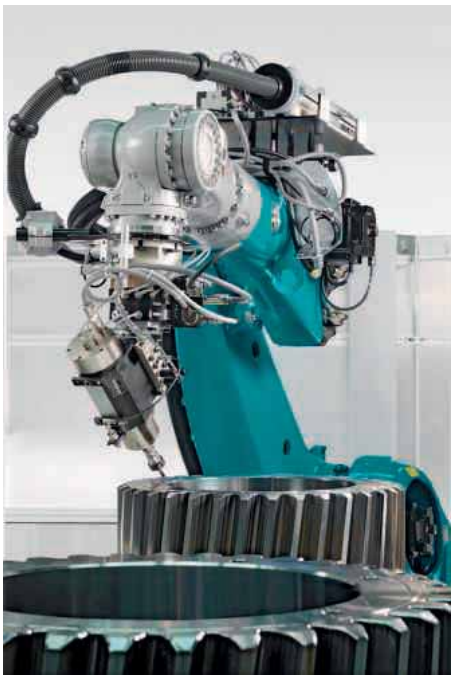
A further development in recent years has been Deburr-Automation-Cells in which the robot performs comprehensive handling tasks in addition to deburring. In this constellation, for example, it works together with machining centres, i.e. it places the components, removes them again and, if necessary, also acts as an interface for neighbouring system parts such as quality or washing stations. Deburring is then just one task among several and these tasks are joined by others. That's why Kadia is now offering a third category of robot systems as an application: Machining-Robot-Cells.

"More and more customers are asking whether it is possible with the robot, for example, to also apply a thread or a flat surface," explains Jannik Weiss from deburring machines sales at Kadia. The customers want to avoid reclamping operations. If the deburring robot, which often continues the process chain after mechanical processing, can take work away from the other processing machines, a lot of time can possibly be saved. "We are repositioning ourselves a bit as a result," explains Henning Klein, managing director at Kadia. "Since we have accumulated many years of know-how with our automation solutions with robots or with our Deburr-Robot-Cells, the step to becoming a supplier for robot-assisted mechanical processing is no longer a big one."

Cost-effective machining solution

In principle, a 6-axis industrial robot is suitable for a wide range of machining technologies: Drilling, milling, thread cutting, etc.; dry, wet or using minimum quantity lubrication is possible. The main advantage is that the robot is a comparatively low-cost machining solution. With it, all exposed sides of a cubic workpiece can be easily reached. If the same number of degrees of freedom is to be achieved with a machining centre, much more complex 5-axis machine concepts are required, which results in high costs. In addition, a robot can alternately pick up grippers and tools and is therefore suitable for multifunctional scenarios.

The limitation of a robot for mechanical processing is its comparatively low rigidity. It cannot offer the repeatability of precision guides available on a machining centre. The further the arm reaches out, the less accurate the result. Its use is therefore limited to applications with correspondingly large tolerances and small chip depths. However, there are certain adjustments and parameters that can influence the results.



The programming can compensate for deviations from the ideal path at the reversal points within certain limits. "The process development department at Kadia determines which parameters need to be optimised and how. We take the necessary time for this so that we can give the customer a capable process at the end," says Jannik Weiss.

Milling of car battery housing trays

One application for which a robot is ideally suited is the machining of the parting surfaces on aluminum housing trays for holding vehicle batteries. These housings, made from extruded profiles with crash protection structures, are effectively the successors to fuel tanks. The quantities required are increasing rapidly. Due to the required surface requirements and tolerances, a machining centre would be oversized. A robot, on the other hand, meets the dimensional accuracy requirements and fully exploits its cost advantages as well as its flexibility.

Kadia recently developed a corresponding machining concept for an automotive manufacturer. It required milling of the parting surfaces with subsequent brush deburring so that the frames can later be bolted and sealed with a steel cover. An important detail of the customer's requirement was flat-milled surfaces with low waviness, specifically the quality of the surfaces with Rz < 20 µm / Ra < 4 µm.

The solution? One cell with three robots. To meet the cycle time, two robots are required on one side of the workpiece, where the machining volume is larger and one is sufficient on the other side. The setup requires less than 80 seconds for complete machining, i.e., milling including brush deburring. In case a future workpiece variant with further details would have to be machined, the cell still offers space for a fourth robot.

Tests carried out in advance with milling tools showed that minimisation of vibrations is the big issue when defining almost all machining parameters in robotic cutting. The cutting geometry, macro- and micro-geometry, for example, are important adjusting screws, since they have a decisive influence on the cutting forces. Among

other things, the depth of cut is a key criterion so the application engineers limited this to 2 mm to reduce vibrations. At the same time, they optimised the cutting speeds and feeds so that chatter marks are avoided. The cutting edges are cooled during machining by means of minimum quantity lubrication.

Programmable spindle units mounted on the robotic arms are responsible for analysing the cutting data as they form a 7th axis. The solution described above achieves a surface finish of Rz = 10 µm / Ra = 2 µm. The required surface finish by the user is thus undercut by a factor of 2.

At first glance, a cell with three robots is a complex system. However, its operation is simpler than expected. Kadia designs the cells with usability in mind, the operating staff do not need to be a CNC programmer or a robot specialist. It follows that if a workpiece is out of tolerance, the operator can quickly and easily correct the corresponding workpiece and tool coordinates on his own.

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Offering a cleaner, safer solution to workers in the flooring industry

By James Miller, director at Dustcontrol UK

Working in environments where excessive dust is prevalent, such as the flooring industry, can have serious ramifications on a person's long-term health. The use of heavy-duty machinery when floor grinding, cutting, or drilling creates and encourages the spread of hazardous dust, which presents significant health and safety issues for contractors on the job.

Floor grinding, for instance, represents one of the most challenging applications for source extraction. The grinding discs used on floor grinders are highly abrasive and generate large quantities of fine dust. In fact, up to 100 litres of respirable crystalline silica dust can be generated every hour, which can cause serious damage to the health of those who inhale the fine particles which cannot be seen by the naked eye and can be easily inhaled.

Being exposed to and breathing in such high levels of fine dust can lead to widespread occupational lung diseases such as pneumoconiosis, while also increasing the chance of developing other dust-related diseases such as cancer, asthma, allergic alveolitis and irritation, as well as a whole range of non-respiratory illnesses. Overexposure to dust for a prolonged period of time can even cause permanent disabilities and death.

It is therefore essential that efficient measures are put in place to ensure the protection of contractors and the quality of their products, while adhering to the relevant health and safety regulations. Every contractor working in flooring must follow the regulations set out in the Control of Substances Hazardous to Health (COSHH) Regulations 2002, which highlights the Workplace Exposure Limits (WEL).

A worker using the DC 2900L and AirCube 1200

The WEL requirement is split into two parts, with the first referring to inhalable dust, which is regarded as entire dust particles that can enter the nose or mouth. The second refers to respirable dust, which are the fine dust particles invisible to the naked eye. They offer differing limits, with the inhalable dust limit set at 10 mg.m3 and the respirable limit at 4 mg.m3.

These limits are legally binding and businesses must ensure that they abide by the limits contained in the act, with the Health and Safety Executive (HSE) advising businesses on how to best manage the problems caused by excess dust. It's construction information sheets 36 and 69 outline the necessary steps to take when it comes to on-tool dust extraction; the most efficient form of dust prevention for those working in the flooring industry.

Marking 50 years of experience in developing dust extraction solutions to fit client requirements in the construction industry, Dustcontrol UK remains committed to making work environments cleaner and therefore safer. This is achieved through equipment that are cyclone based, HEPA 13 filtered and built to Application Class H as standard for a no compromise approach to performance and dust containment.

Take our DC Tromb 400, our most powerful single-phase dust extractor. It has been designed to meet modern safety requirements and to work in conjunction with tools that have become ever more efficient on today's construction sites. The maximum airflow is as high as 400 m3/h, which is more than enough capacity for equipment such as floor grinders with a working width of 500 mm and large electric

Floor grinding using the DC Tromb and AirCube 1200

cut-off saws. It is also easy to transport around construction sites, move in stairwells and lift into tight spaces, while the wheels are puncture-proof and lockable for working on uneven ground. In addition, bag replacement is easy, and its HEPA H13 filter offers optimum quality, containment and performance.

Also offering outstanding extraction performance and the latest addition to the DC Tromb mobile extraction unit family, is the DC Tromb Turbo. One of the major updates is the three-phase turbo motor that has been added specifically to enable running for long periods without the need to switch off. The new model has also been developed with a thermal protector that activates at high temperatures, while a simpler filter change has also been included for easier and quicker removal.

There's also the DCF Tromb, which is ideal for floor grinding and semi-mobile systems where large quantities of dust are handled. The pre-separator reduces the strain on the extraction source and is equipped with a container/bag solution for dust-free bag replacement, therefore allowing the user to avoid unnecessary and time-consuming shutdowns.

Another piece of equipment suited to the wood flooring trade is the DCF 60, a mobile pre-separator that has been specifically designed to deal with large quantities of dust. Its large inlet also makes it particularly suitable for coarser dust. The DCF 60 can be connected to any of our DC 1800 eco, DC 2900 and DC Tromb 400 dust extractors. It can remove up to 90 percent of the dust, considerably reducing the load on the dust extractor, while the operator doesn't have to empty the canister too frequently.

The DC Storm being used for floor grinding

We also offer the DC Storm, a powerful and reliable mobile dust extractor built on a robust and sturdy steel chassis for maximum durability. With a direct-driven, three-phase turbopump, the DC Storm can be used for continuous operation, conveying heavy material away, source extraction and cleaning.

The powerful dust extractor also provides sufficient air flow for several users at the same time and it can also be used as a semi-mobile central unit in a tubing system. Furthermore, it has a tiltable cyclone for ergonomic filter replacement and is suitable for source extraction for grinding discs up to approx. 800 mm/ 31" in diameter.

In terms of complementary air cleaners, the DC AirCube 2000 is our most powerful single-phase air cleaner with a capacity of 1,800 m3/hr. It comprises an energy saving ECO-fan, a pre-filter, a HEPA H13 microfilter of 10 m^2, a filter indication lamp and variable speed transmission to save energy consumption. It has the capability to clean air from hazardous particles as small as 0.3 micrometres, including both silica dusts and airborne viruses.

This is achieved through regularly cleaning the air to reduce the spread of particulate, making the machine a favourite for construction site work areas, as well as in their receptions, canteens and changing facilities in light of the more recent COVID-19 situation.

Cleaned air can also be recirculated back into the room or exhausted via a hose to create a negative pressure environment. The robust machine's ergonomic design also makes it easy to carry and transport. Ultimately, the DC AirCube 2000 is an ideal complement to source extraction on construction sites and in high pedestrian traffic areas, where air can be constantly cleaned and recirculated.

Overall, we all know the dangers caused by activities such as drilling, sweeping, pouring, or grinding when fine dust becomes airborne and subsequently inhaled. That is why we've adopted a no compromise approach. All of our machines are manufactured to application Class H standard with a pre-filter and HEPA 13 filter to cover a wide range of applications, ensuring a healthier, cleaner working environment for those operating in the flooring industry.

The DC Tromb being used in floor grinding

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Transforming through innovation with ANCA

At GrindingHub, ANCA showcased its technology range that enables customers to grow capacity, improve profit margins and gain efficiencies. Deciding what technology to invest in should be driven by business goals, working with existing objectives, processes and ideas.

Pat Boland, ANCA co-founder says: "Designing the best technology required a multi-pronged approach. We immerse ourselves in the market, are continually inventing, keep a keen eye on new developments and bring them into our applications. We seek out intelligent, talented people and interact with customers daily to understand their specific needs. This is how we design and manufacture our market-leading solutions."

Automated small batch and regrinding solution and insert grinding demonstrations

ANCA understands the requirement to continuously reduce costs within the production processes, which is a particular challenge in smaller production batches of complex tools and in the regrinding process. To address this challenge, it has developed a flexible solution utilising RFID technology, its LaserUltra closed loop measurement and barcode reader, interfaced into iGrind and end-customer's ERP system. This system was demonstrated on the FX7 Linear platform.

The demonstration highlighted how to set up a tool for regrind utilising a barcode reader and QR code and how to easily make adjustments within the ANCA software. It also showed what inputs are possible in an ERP system, setting up the RFID to allow mixed diameter automation and the actual grinding process itself. The FX7 Linear machine was also fitted with the Pop-Up Steady, AutoStick, Auto Wheel Qualification and iView.

The standalone MX7 Linear with RoboMate loader demonstrated ANCA's solution for grinding and auto loading of indexable inserts. The machine and loader was installed with workholding, grippers, pallets and interchange station specifically for the manufacture of special inserts.

New toolroom RN35

ToolRoom RN34 designs and manufactures complex cutting tools servicing the aerospace, power generation, die mould, woodworking, and general machining markets.

ToolRoom RN35 focuses on productivity and cycle time improvements especially machine running costs. New process optimisation features help to enable reduction in cycle time which in return provides better quality tools and wheel life. This includes an automated reduction in air grinding time and gaps calculated based on tool simulation models. Some of the major enhancements include:

Feedrate optimisation

Integration of Q-Prime feature in ToolRoom software achieves constant Material Removal Rate (MRR) based on wheel manufacturers specifications. This is done by calculating and controlling non-constant feedrate where applicable to achieve better cycle time and extended wheel life.

Airtime reduction

Automated reduction in airtime by optimising gaps based on tool simulation models and wheel shapes.

Statistical Process Control (SPC)

This gives control of your production process during high volume manufacturing by monitoring the variations due to wheel wear and other process-controlled activities. Process capability data can be graphically displayed or stored for future QC purposes or further evaluation. It also helps customers to control critical tool dimensions like diameter by updating wheels at regular intervals.

Profile fluting

This gives the ability to control and maintain hook/rake angle along the trajectory of the cutting edge on a given profile. Increases cutting performance and life of the tool due to uniform hook/rake angle along the edge.

ANCA'S tool of the year is the Oscars for cutting tools

ANCA's industry first competition is back with two discrete competition categories to celebrate both the functionality and creativity of cutting tool manufacturers. The Tool of the Year 2022 will be the winner in the category of #MadeonANCA. Competition entry tools will showcase the sub-micron surface finish, complexity and superior cutting performance expected from ANCA machines. These are functional and practical tools that start as ideas and are ground into reality, as the tools that shape our world.

The second competition category is for virtual tools as the "Most innovative tool design." The winner of #MadeonANCA receives $10,000 AUD worth of ANCA innovations for parts, accessories or software that fit your grinding needs and the winner of the most innovative virtual tool will receive the full CIM software package.

Enter now at **www.anca.com/Tool-of-the-year**

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1st MTA MACHINE TOOL ACCESSORIES

CNC generating and profile grinding

The LCS series from Liebherr offers a machine system for finish machining of hardened gears, characterised by its productivity and versatility. Two methods can now be used on a single machine: the LCS "Combi" Gear grinding with dressable worms or form wheels has been a successful and well-established technology for many years. Today, with the use of dressable sintered alumina tools, aluminum oxide, Al2O3, it has reached a remarkable level of performance. The CBN method, in comparison, stands out for its high machining consistency over the total tool life. With its exceptional tool life of up to 200 production hours, it offers a decisive advantage for high volume production. The Liebherr LCS series covers both technologies without limitations, opening up totally new possibilities for the user.

The high-volume production of the automotive industry is extremely demanding. Production equipment must perform without any compromise remaining highly productive in three-shift operation conditions, operator and maintenance friendly and reliable over the complete equipment life cycle. Liebherr gear cutting machines are internationally renowned for these qualities. Their modern and innovative technologies set the standard for success in transmission manufacturing: high productivity at the lowest cost per piece.

Optimal cost performance ratio

The wide range of machine sizes always offers the most suitable model for each application. The basis of the new LCS series of machines is the Liebherr gear hobbing and gear shaping machine platform. Synergy within the modular component system offers the user the most cost-effective equipment.

After many years of experience with CBN generating and profile grinding, Liebherr can now optimise each application by combining the specific advantages of both methods. This universal concept opens up new and different possibilities for the user.

Independent of the grinding technology, the user has a choice of using CBN or sintered alumina tools. CBN ensures high production consistency over a long tool life, while sintered alumina offers additional flexibility. Both methods may also be combined.

The new LCS machine design is based on the well-proven platform of Liebherr gear hobbing and shaping machines. Roller guideways for the linear axes, direct drives for tool and workpiece spindles, with their backlash free characteristics, guarantee maximum machining accuracy.

The completely symmetric design of the machine frame, with enclosed circulating coolant system of the machine bed, allows uniform distribution of temperature to maintain thermal stability. This is essential for high workpiece quality and process reliability and the rigidity of the machine bed has been optimised for the grinding process by using finite element analysis. High acceleration values can be achieved in the linear axes without influencing the dynamic stability of the system.

Its direct-drive work spindle combines high speeds of up to 800 rpm with an extremely high positioning accuracy. High dynamics reduces non-productive indexing times for profile grinding, allowing large rotational table movements without time losses. A proven, highly dynamic motor spindle with a maximum speed of 12,000 rpm, 20,000 rpm, drives the grinding tool. This allows cutting speeds of more than 100 m/s.

The grinding head, with main and counter bearings, permits the use of tools up to 210 mm in length for longer tool life. An integrated NC dressing unit is used for profiling dressable grinding tools. Pressure angle corrections for twist-free grinding of crowned helical gears, as well as form dressing of grinding wheels, are possible. The ring loader, with CNC drives, is extremely flexible, further reducing setup and workpiece changing times. A variety of modular workpiece storage systems are available while standardised interfaces for workpiece transfer simplify the integration into interlinked production systems.

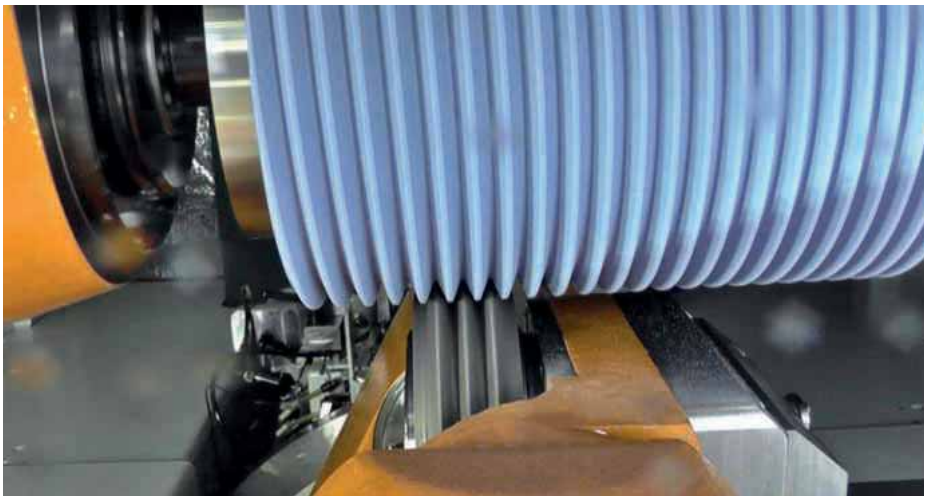
CBN generating grinding for the highest performance

The most efficient grinding method for gears is CBN generating grinding. The continuous contact of grinding worm and gear eliminates non-productive idle times and CBN allows cutting speeds of more than 70 m/s. They are achieved with a small tool diameter of 140 mm and high spindle speeds up to 12,000 rpm resulting in very short cycle times. The generating action leads to extremely short contact times of less than 0.003 seconds between the grinding crystals and workpiece. Despite the

high grinding performance, only a very low thermal impact occurs in the grinding zone. This minimises the risk of grinding burns.

A standard tool combination is a coarse grit roughing worm (B251) for stock removal up to 0.15 mm/flank and a fine grit finishing worm (B91) for high accuracy, for stock removal of 0.03 mm/flank. For smaller modules, <2.5 mm, longer mono-worms (B91-B251) are available with an extended shift range and, therefore, a longer tool life. The high performance of generating grinding can be further increased by the use of multistart worms.

CBN generating grinding is ideally complemented by profile grinding. This technology is of particular advantage for workpieces requiring small tool diameters, since the long CBN tool life guarantees maximum process reliability. The combination of a CBN roughing worm with a CBN finishing wheel meets the requirements of both high productivity and accuracy. This arrangement is very economical for machining commercial vehicle transmission parts. For this type of application, the roughing worm can be designed with an extended shift range for longer tool life. CBN form wheels are also used for special applications, such as internal gears or steering segments.



Machine tools and automation systems by Liebherr

With around sixty years of experience in the field, Liebherr is one of the world's leading manufacturers of CNC gear cutting machines, gear cutting tools and automation systems. These innovative products are the result of advanced ideas, highly qualified employees and the latest manufacturing systems at each of their locations. They are characterised by ease of use, quality and reliability in combination with a high degree of flexibility.

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CNC machine tool company and carbide cutting tool manufacturer collaborate to create next-generation production automation

Star Cutter and Garr Tool develop innovative multi-process CNC machine tool for complete end mill manufacturing

US manufacturers Star Cutter Company and Garr Tool have jointly developed an innovative 5-axis CNC machine tool that completely automates the production of complex profile end mills from blank to finished tool.

Star Cutter Company specialises in carbide and preform manufacturing, cutting tools and CNC machines for tool/cutter grinding and hob sharpening. Founded in Detroit, USA in 1927, the company nowadays operates six manufacturing facilities at strategic locations throughout Michigan. Its Elk Rapids Engineering division is responsible for the renowned Star brand of CNC tool and cutter grinders.

Garr Tool is a leading manufacturer of high-performance solid carbide cutting tools. From humble beginnings with Fred Leppien in his garage in 1944, it now operates a state-of-the-art 200,000 sq ft manufacturing facility in central Michigan with over 150 CNC grinders. Garr Tool specialises in solid carbide cutting tools, including end mills, drills, reamers and routers.

Garr Tool makes extensive use of CNC automation, including tool grinding machines from Ulmer Werkzeug-schleiftechnik (UWS) and Star-Cutter. All of these machines are based on control technology supplied by the specialist CNC company NUM. Star Cutter, for example, has partnered with NUM for cooperative development of application-specific CNC hardware and software since 1998 and nowadays bases nearly all its machine tools on NUM's open-architecture Flexium+ CNC platform.

John Leppien II, vice president of Garr Tool, states: "We use NUM's NUMROTO software for tool production and reconditioning on all of our Star and UWS machines. Our operators regard it as very flexible and user-friendly and we find that it encourages interdepartmental knowledge sharing and also helps to reduce our training overheads."

A few years back, Garr Tool began producing a series of large diameter tools for use on high torque machines employed in the aerospace industry; however, manufacturing the tools involved multiple machines and multiple processes. The company therefore embarked on a collaborative project with Star Cutter's Elk Rapids engineering team, to develop a multi-process machine capable of handling the entire production task. The result was a 2018 development of a Star CNC Tool grinder which included NUMROTO end mill software, cylindrical grind, along with linear motors and drives, with all 5 axes on a closed loop chiller/coolant system. This thermally stable machine allows Garr Tool to maintain .001" in diameter on the OD of these tools during lights out for 48-hour unattended runs.

Star's latest machine, the NXT tool and cutter grinder, now also incorporates these same features that were introduced to Garr Tool. Based on NUM's Flexium+ CNC system and NUMROTO software. This new 5-axis machine tool features linear motors instead of ball screws on the X, Y and Z axes, direct drive torque motors on the B and C rotary axes and a liquid-cooled spindle motor. There is a choice of three different types of spindle motor, to best suit application needs. These include a very high-speed unit capable of 24,000 rpm, and a very high power unit rated at 28 kW.

The NXT has an exceptionally small footprint, including the spindle/axis chiller, of just 7' 6'' x 6' 6", 2,300 x 2,032 mm and an installed height of only 7' 5", 2,284 mm. These dimensions mean that the machine can easily be accommodated on the shop floor, where space is often at a premium. The base of the machine is cast in Zanite® Plus polymer composite to ensure mechanical rigidity and thermal stability.

Despite its diminutive size, the NXT offers a substantial grind zone with maximum X, Y and Z travels of 19.7", 25.6" and 29.5", 500 mm, 650 mm and 750 mm, respectively. The machine can accommodate up to 15", 381 mm, end work and up to 10", 254 mm, diameter parts. Automated wheel changing and probing is standard with up to 8", 203 mm, diameter wheels and the NXT can

also run up to 10", 254 mm, diameter wheels with coolant manifolds and up to 12", 305 mm, diameter wheels without.

The ability to use large diameter grinding wheels for profiling applications, or small, sub-1", 25 mm, diameter wheels for PCD pocket grinding on the same machine, introduces a remarkable level of production flexibility. Star Cutter's new NXT tool and cutter grinder features a fully integrated FANUC 200iD compact 6-axis short arm robot to facilitate fully automated processing of round and flat tool blanks, the standard gripper can handle from 5 mm to 32 mm blanks, with other options available. In-process measurement data is fed directly to the CNC system's NUMROTO software, to provide adaptive real-time control of the entire grinding process.

Based on a modular architecture, the NXT is designed for ease of integration with other forms of industrial automation and handling robots. An extensive range of factory-build and retrofit options include a traveling W-axis and a 12,000 rpm wheel dresser.

Aaron Remsing, Jr., sales manager for Star Cutter's Elk Rapids Engineering division, says: "We believe that the NXT is the smallest and most capable CNC tool and cutter grinder on the market. Even though it is an evolutionary design, its performance is nothing short of revolutionary."

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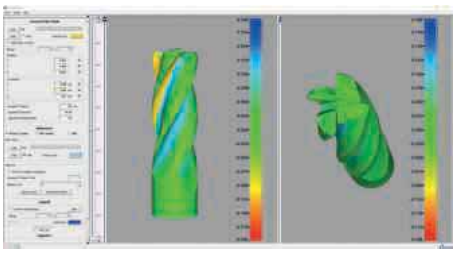
Walter's new 3D laser sensor out-performs everything for measuring high-performance

Walter Ewag UK has announced a step change in the fully automatic measurement and digitisation of tools with the launch of the Walter 3D laser sensor. It enables the Walter Helicheck Pro and Plus tool measurement machines to scan with four times the resolution than previously possible and to process that data four times faster.



Screen shot shows a scan of the tool after it has been viewed by the 3D sensor (left)

Ideal for inspecting high-performance tools as used in industries including automotive, aerospace and medical where cutting edge geometry, pitch and spiral pitch vary widely, the 3D sensor could replace two separate machines traditionally used for measuring such tools; perhaps a combination of conventional and laser checking.

Available as an option on the Helicheck Pro and Plus machines and their corresponding Long versions, which can accommodate tools up to 80 mm diameter and 605 mm long, the 3D sensor has swivel angle ranges from -55° to 90° to also enable the complete scan of indexable inserts.

Easily and quickly programmed using wizard routines, with resulting short setup times, the 3D sensor effectively 'visualises' the workpiece as a point cloud, in differing formats and enables various measurements to be undertaken on the three-dimensional image.

When the resulting image is 'placed' on the tool's three-dimensional design drawings, or a master part, any deviations can be clearly seen, via the integrated 3D Viewer, as three-dimensional comparisons of point cloud and target model, including surface reconstruction. The result is tool measurement that has never been more accurate or faster.

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Aligning strong cleaning performance with worker safety

Significant role of shot peening in aerospace

Wheelabrator Impact Finishers, part of the Norican Group, is a specialist subcontract shot peening supplier to industries requiring expertly outsourced shot peening services. With over 50 years' experience, Wheelabrator's well-established client base comprises various industries such as aerospace, architecture, automotive and motorsport, oil and gas as well as general engineering sectors.

Given the increasing requirements today to produce lighter, more fuel-efficient aircraft, designers are employing lighter and stronger alloys. Shot peening plays a significant role in increasing the fatigue life of highly stressed critical airframe components. The process allows the further reduction of weight using parts designed with less mass but the same, if not enhanced, fatigue properties. Shot peening works by striking a surface with a shot, round metallic, glass or ceramic particle, with enough force to generate plastic deformation. When a group of shots impact the surface they generate multiple indentations, resulting in the component being encased by a compressive stressed layer on the metal surface.

With ever increasing aircraft build rates and demands on lead times, it has to ensure a quick turnaround time for its customers. Aerospace components processed at Wheelabrator Impact range from very large wing ribs, spars, wing skins and undercarriage components such as gear ribs, linkages, hydraulic cylinders and bolts, as well as landing gear wheels, down to a very small spring or fixing. In addition, aero engine compressor blades, fan blades, drums, spinners and supporting components are fully catered for.

Regulatory change prompted a replacement search for n-propyl bromide

In the past, Wheelabrator cleaned the processed parts with n-propyl bromide (nPB) in an open machine. The components were cleaned in dip tanks and every single part had to be hand wiped after the cleaning process which was time-consuming.

In 2017, nPB had been registered as a Substance of Very High Concern (SVHC) under REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals), which regulates the supply and use of chemicals in Europe. For nPB, a final date of July 4th, 2020 was set, after which its use would be banned. Thus, there was a need for Wheelabrator to find an alternative cleaning setup that would offer reliable parts cleaning, while being environmentally compliant and safe for their workforce.

Key criteria for finding a new cleaning solution

The alternative solution must comply with very specific criteria, as Ron Orchard, production manager at Wheelabrator Impact, explains: "The safety of our working staff is absolutely paramount. We wanted to

make sure that their exposure to solvent was going to be minimal. At the same time, the solution should be one that is cost-efficient, reliable, fulfils the highest cleanliness requirements and, very importantly, would be approved and accepted by our customer base that includes Airbus and Boeing, amongst others."

At the beginning of 2020, Wheelabrator started discussions with SAFECHEM and D&S Ultra-Clean Ltd, the UK distributor for the metal cleaning equipment manufacturer Union S.p.a. It decided on a Union closed cleaning system, MDMV2 PX, under vacuum

"Considering that the phase-out of nPB was approaching fast, one big advantage that Union offered to us was the relatively short build time of the machine. And having D&S Ultra-Clean Ltd. based in the UK with their servicing and installation for the machine was a huge benefit for us too," adds Ron Orchard.

The Union machine would be running on DOWPER™* MC, virgin-grade and highly stabilised perchloroethylene supplied by SAFECHEM. The cleaning solvent caught Wheelabrator's attention as it is already widely accepted and in use within the aerospace industry. There was no need to gain permission for using the product which saved time.

"All the educational work SAFECHEM has done around the safe usage of perchloroethylene in closed cleaning machines, in combination with the SAFE-TAINER™ System, has given us additional confidence that DOWPER MC is the right product to go for" notes Ron Orchard.

The use of the SAFE-TAINER System

developed by SAFECHEM, a closed-loop state-of-the-art solvent management system for the safe transport, storage and handling of solvents in combination with closed cleaning equipment, is considered to be the Best Available Technique (BAT) in the market.

Reduced solvent consumption and environmentally compliant parts cleaning

The machine was installed in October 2020 and, since then Wheelabrator has received great service and support from D&S Ultra-Clean Ltd. The vast majority of the parts that it cleans fits perfectly into the machine, which is equipped with an automated basket system. Parts are now 100 percent degreased in fully controlled and enclosed conditions.

It has also signed up to SAFECHEM's COMPLEASE™ Chemical Leasing, a tailor-made leasing package aiming to increase efficiency of the parts cleaning process with less resources. The offering covers supply of new solvent in the SAFE-TAINER System. It provides waste handling and service elements to safely extend the working life of the solvent, along with staff training in process management to ensure a safe and efficient parts cleaning process all for a monthly fixed fee.

"We used to spend a huge amount on replacing solvents. Now, thanks to the built-in distillation unit in the Union closed cleaning machine, used solvent can be constantly reused and recycled. This routine recycling means there are very low solvent replacement volumes necessary. This has allowed us to reduce our spend considerably, which in itself is a solid financial argument to justify the investment of the machine."

Would Wheelabrator make the same choice again? Ron Orchard concludes: "In a heartbeat. The impact on the environment that we have now is a fraction of what it was. We are clearly satisfied and SAFECHEM and D&S Ultra-Clean Ltd. have been reliable partners to us throughout the process. With the Union machine in combination with DOWPER MC, we have gained process control, plus improved health and safety for our operators. We have also been able to cut down on emissions and chemical waste, our solvent use has been reduced by a substantial 95 percent."

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Walther Trowal builds the largest multivib vibratory finishing machine in the company's 90-year history

New multivib vibrator MV 50 can finish workpieces with a diameter of up to 1,300 mm

At the Surface Technology exhibition Walther Trowal introduced the MV 50 multivib vibratory finishing machine for the fully automatic surface finishing of large components for aircraft turbines like blisks, but also for forging dies. With an internal diameter of 1,650 mm, the MV 50 is the largest machine of its kind ever built by the company.

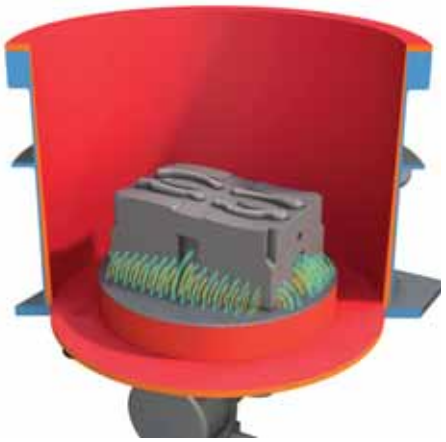
The first of this new generation of mass finishing machines will be used for finishing blisks, "blade integrated disks", for aircraft turbines. To a considerable extent the quality of the surface finish on these components determines how well they are performing under operational loads. A good surface finish allows the turbulence-free airflow through the integrated blades. This helps decrease the fuel consumption and noise emissions and optimises the overall efficiency

The company that purchased the first MV 50 finishing machine chose the mass finishing technology because blisks require an extremely smooth surface, but with the sharp edges of the blade segments remaining intact.

With a usable diameter of 1,300 mm, the MV 50 can also handle planetary gears for wind turbines where the finishing of internal surface areas is especially critical. Likewise, it can also be used for large forging dies, which, to date, could not be treated in a mass finishing machine.

The new finishing system was designed for fully automatic operation. Once the workpiece has been mounted into the bottom of the processing bowl, no additional manual operations are required. Compared to previous finishing methods this improves the process consistency and stability. Moreover, the new finishing system saves time because on average the finishing process requires cycle times of less than three hours.

Christoph Cruse, sales director at Walther Trowal, discusses the special quality requirements of the aerospace industry:



"Especially in the production of components for aircraft turbines any manual manufacturing operations can be detrimental because they can be highly inconsistent. With the new automated machine, we are eliminating the risk for human error. Moreover, the finishing time per blisk is reduced from several days to a few hours."

For finishing the surface of blisks, Walther Trowal is using the processing media AF. This media generates extremely low surface roughness readings on the materials typically used for the manufacture of blisks.

The first MV 50 machine will be delivered to an aerospace customer by September this year.

At the Surface Technology exhibition Walther Trowal displayed the smaller sibling of the MV 50, namely, the MV 25 that can handle workpieces with a diameter of up to 600 mm and that is utilising the same "multivib" technology.

Technical background

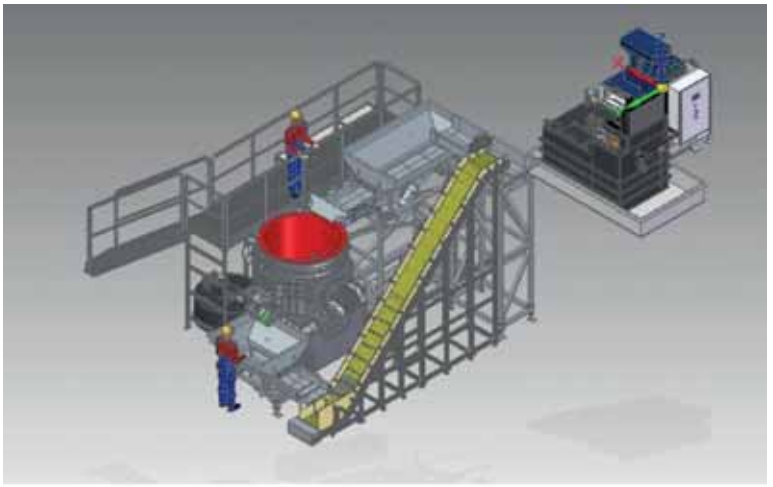
One workpiece at a time is attached to a special workpiece holder outside of the machine and is then placed into the processing bowl of the MV 50 by crane. Subsequently the workpiece holder with attached workpiece is placed on an adapter plate in the processing bowl, where it is magnetically clamped.

In the next step the bowl is automatically filled with processing media. Specially placed vibratory motors induce a vibration into the processing bowl. This causes the media to flow over all surface areas of the workpiece. Since this is firmly attached to the processing bowl, the contact between media and workpiece is particularly intensive, but at the same time extremely gentle. External as well as internal surface areas are subject to the same processing intensity. This results in a highly

homogeneous finish of the entire workpiece surface. On average, surface roughness readings of Ra = 0.2 to 0.4 µm can be achieved.

Upon completion of the finishing process, the unload gate in the processing bowl is opened discharging the media onto a conveyor belt. This transports the media into a storage hopper, from where it is returned into the processing bowl for the next finishing cycle. Any residual media is removed from the finished workpiece with a pneumatically movable rinsing nozzle.

Since the aerospace industry demands an extremely high process consistency with repeatable results, the media in the storage hopper is weighed and, if required, new media is automatically added. This is a very critical part of the process, because over time the media wears and becomes smaller. This could result in a lower fill level in the vibratory finishing machine and would result in deteriorating results. The media replenishment system ensures that the process remains consistent. At the same time, it minimises the need for manual operations.



Surface finishing technologies from the inventor of the "Trowalizing" process

Since 1931, Walther Trowal has been developing and producing systems for the refinement of surfaces. Initially focusing exclusively on mass finishing, the term "Trowalizing" originated from the company's cable address "Trommel Walther". Ever since, the company has continuously expanded its product portfolio.

Over time it has developed a broad range of machinery and systems for mass finishing, shot blasting and coating of mass-produced small components.

With the invention of new systems like, for example, drag finishing and the development of special finishing methods for 3D printed components, the company has proven its innovative capabilities repeatedly.

Walther Trowal develops and implements complete surface treatment solutions that can be seamlessly integrated into linked production systems existing at the customers. This includes the entire process technology, perfectly adapted to the specific surface finishing requirements of the workpieces: equipment and the respective consumables always complement each other in a perfect manner.

Each individual workpiece and each manufacturing process must meet special technical requirements. That is why the experienced process engineers in the test lab, in close cooperation with customers, develop the optimal process technology for the finishing task at hand. As a result, workpiece surfaces meet the required specifications, with short processing times and a high degree of consistent, repeatable results.

Walther Trowal is one of the few manufacturers who develops and produces all machines and mass finishing consumables in-house including ceramic and plastic grinding and polishing media as well as compounds.

The company's equipment range also includes all kinds of peripheral equipment for handling the workpieces like lift and tip loaders, conveyor belts and roller conveyors. Additionally, special driers for mass finishing applications and, last-but-not-least, systems for cleaning and recycling of the process water are also part of its range.

With its exchange program for wear items like work bowls, which are part of a continuous recycling program, Walther Trowal conserves valuable resources and, thus, makes a significant contribution towards sustainability in the field of industrial production. Quick technical support and global repair and maintenance service ensure high uptimes for equipment.

Walther Trowal serves customers in a wide range of different industries all over the world including automotive, aerospace, medical engineering and wind energy.

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The solution to costly aircraft paint adhesion failure

The importance of understanding surface quality and being able to measure it in an accurate, reliable and demonstrable way is important for ensuring a high-quality finish and, ultimately, a high-quality product. Any manufacturer that is not able to do this increases their risk of producing inconsistent, poor-quality products and damaging both their reputation and their bottom line. This was made abundantly clear recently when Qatar Airways sued commercial aircraft manufacturer Airbus for over $600 million in a dispute over paint quality and damage to the airline's A350 jetliners.

At the heart of the dispute are the jets' airworthiness which Qatar claims has been jeopardised by cracked paint and exposed copper mesh safety systems. Photos and a video posted by Qatar Airways reveals paint on the aircrafts' fuselages peeling and cracking, exposing a copper mesh layer beneath the paint that protects the planes from lightning damage. While Airbus maintains that the problem is purely cosmetic, the airline claims the paint flaw is a safety issue: "These defects are not superficial and one of the defects causes the aircraft's lightning protection system to be exposed and damaged." The dispute will now be settled in court.

Typical adhesion failure modes on aircraft surfaces

A major contributor to potential paint quality problems for aircraft manufacturers is the largely manual process for surface preparation. Because it is an expensive procedure to automate, it is done manually. As a result, it is difficult to measure surface quality, a critical capability that would help manufacturers avoid costly and time-consuming mistakes and potential damages. The cost to repaint a commercial jetliner is in the neighborhood of $100,000 - $300,00 per aircraft.

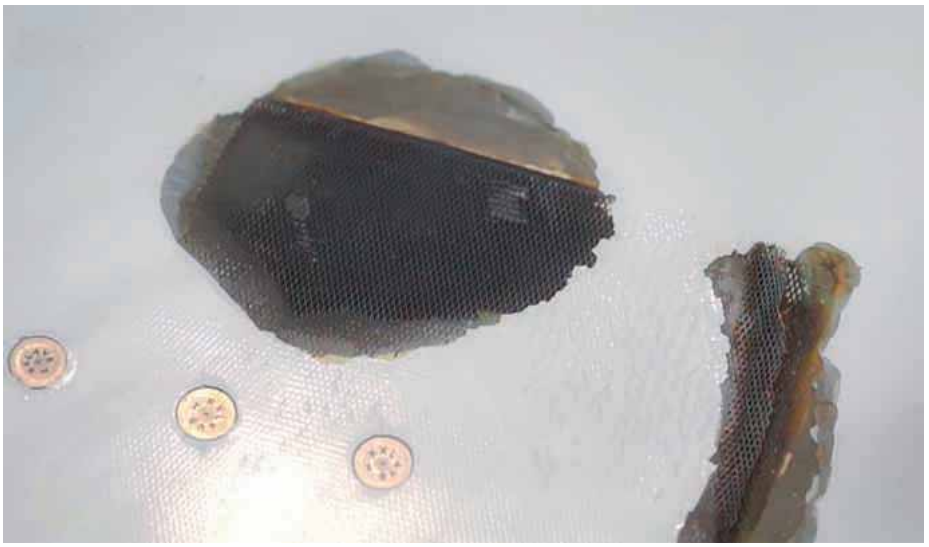
Topcoat peeling on an aircraft is perhaps the worst kind of failure. While the other coating failures are problematic and expensive to correct, topcoat peeling is a clearly apparent defect for all to see. The ease with which this highly visible problem can be quickly made public through mainstream and social media can be a public relations nightmare and a major corporate headache.

The three material systems to understanding failure modes

Experienced commercial coating professionals know that to ensure a top-quality finish, there must be optimal interaction between the three materials involved: the substrate, primer and topcoat. Any anomaly with any of these material systems that affects their ability to interact correctly will result in poor surface adhesion and correspondingly poor results.

Good adhesion starts with ensuring a scrupulously clean substrate that will enable the primer to adhere across the entire surface properly and consistently. It is important to note that primer can thicken with age: a primer that is too thick is weak, making it more difficult for the topcoat to adhere properly.

What makes the interface between primer and topcoat on aircraft exterior surfaces even more critical is the need for these systems to be resistant to chemical attack because these surfaces are exposed to hydraulic fluid, fuel and maintenance chemicals when in service. Flexibility and adhesion of paint systems are crucial because of the thermo-cycling, aerodynamic forces and body structure stresses put on the airplane between takeoff and landing. If the paint viscosity is too low during and after application, the paint will run and sag. Conversely, if the viscosity is too high, the paint does not flow well and the result is a bumpy "orange peel" appearance.



The secret to success

Paint engineers can gain critical insight into the quality of the two interfaces between the three elements by measuring the contact angle of the surface as this reveals how well a compound will coat a surface. A contact angle, also referred to as a wetting angle, is formed when a drop of liquid is placed on a material surface and the drop forms a dome shape on the surface. The

angle formed between the surface and the line tangent to the edge of the drop is called the contact angle. As the drop spreads across a surface and the dome becomes flatter, the contact angle becomes smaller. If the drop beads up on the surface, as you might see on a water-resistant article of clothing or a waxed car, the dome becomes taller and the angle becomes larger.

When the angle the drop makes with surface is measured, the resulting angle indicates whether the drop is more attracted to itself or to the surface it is on. Forces on the surface of the material start acting on the drop as soon as it hits the surface. If these forces are strong, their pull on the drop will cause it to "wet out" or spread further over the surface. If the forces are not stronger than the attractive forces the drop has for itself, then the drop will constrict into a shape as close to a sphere as it can. These two forces are working in tandem on the drop, creating an angle that can be measured. This measurement enables engineers to understand the relationship between the liquid drop and the surface. On a larger scale, this will reveal how well coatings such as primer and paint will adhere to a surface. Generally, greater wettability means greater adhesion for a better coating.

The ability to produce rapid, accurate and reliable surface contact angle data provides engineers with a tool that will enable them to determine a baseline for assessing coating adhesion quality, a key component of total quality control for many products. In the case of aircraft manufacturing, companies such as Airbus can use it to reduce paint failures and have a significant impact on their bottom line and customer satisfaction.

Read the eBook, Checklist: Adhesion Failure Root-Cause Analysis for Manufacturers, to learn how contact angle measurements provide a reliable method for manufacturers to easily monitor and maintain clean surfaces throughout development, production and repair.

Brighton Science is a cutting-edge materials science based company that delivers effective adhesion quality control for manufacturers who are concerned with adhesive bonding, painting, coating, printing, and cleaning.

Brighton Science equips manufacturers with the insight to reduce scrap, recalls and rework caused by adhesion failure. Our action-oriented Surface Lab services, coupled with fast, easy, accurate and non-destructive surface inspection products provide quantifiable, repeatable tests that produce results that will allow manufacturers to fix adhesion problems.

The Brighton Science story

More than twenty years ago, Brighton Science began as a development lab for plasma polymerised coatings. Through research and development work led by Chief Scientist and Founder Dr Giles Dillingham, Brighton Science made great strides in the field of material science and adhesives in manufacturing. It was during this time that Brighton Science developed the Surface Analyst, the first hand-held contact angle measurement device used in the development of adhesive bonding for the F-35 Joint Strike Fighter program.

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A simple solution to polish alloy wheels to a bright finish

British-built ActOn wheel polisher machine enables clients to improve in-house surface finishing process

Most of the online tutorials show how to manually polish wheels. This includes going through many steps such as cleaning the rims, prepping and sanding the surface, buffing the rims with different wheels, manually polishing and, in some cases, coating.

As the automotive industry is rapidly evolving towards more efficient vehicles where automotive components have to be durable and fuel economic, the ActOn Finishing team has developed automotive surface finishing solutions which benefit the industry by reducing processing times and producing a repeatable and quality product. One of these automotive finishing applications includes achieving a bright polished finish on alloy wheels.

ActOn was recently approached by one of its customers to develop an efficient process to polish alloy wheels to a bright finish. The client also needed to replicate the finishing application in-house. ActOn Finishing has developed, in partnership with major manufacturers in the automotive industry, a high quality, repeatable finishing solution to polish alloy wheels in just a few hours. For this application, it has also designed the AWP188 wheel polishing machine which is suitable for achieving a highly polished finish on both automotive and motor bike wheels.

Wheels go through the grinding process using an aggressive plastic media and LQ16 which is a concentrated cleaner and polishing compound. Depending on the initial condition of the surface the process time can take up to 10 hours. For this project, only five hours were needed to cut down the wheel.

After the surface has been cut down, it needs to be smoothened and prepared for the polishing stage. This is achieved using a medium abrasive media and LQ16 compound. The final stage includes polishing the wheels with ceramic polishing media and LQ9. This media is great for achieving a bright highly polished finish while LQ9 has been formulated for polishing both ferrous and non-ferrous metals.

The process delivered bright polish alloy wheels in a considerably reduced time and the dimensional integrity of the part was maintained. The finishing process produces a repeatable and high-quality finished product. Moreover, ActOn's customer has purchased the AWP188 finishing machine and consumables, which allows it to replicate the finishing process in-house.

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