

EDITION 65

MAPAL TECHNOLOGY MAGAZINE



IMPULSE

FROM THE COMPANY

TECHNOLOGY HIGHLIGHTS

PRACTICE REPORTS



Cover story:

Alfing Kessler relies on setting fixture from MAPAL



Dear reader,
dear business associate,

For the MAPAL Group, 2017 came to an end as a very eventful year with new challenges. This is also true for me personally. I celebrated my 75th birthday and took an important decision for the company. After having been with MAPAL for more than 48 years, the time has come to pass the responsibility for the company on to the next generation.

Not only is the long-term planning horizon an advantage of a family-owned business, but also the possibility of a gradual transition of the responsibility. I am therefore very happy that I have been working together with my son Jochen for many years.

In this period of time he continually assumed responsibility for more and more areas of business. On 1 January 2018 he succeeded me as President of the MAPAL Group so that I can gradually step down. I am certain that my son will lead MAPAL into a successful future.

I would like to thank you for many years of good and trusting cooperation and I would ask you to extend this trust to my son.

Warmly

Dr Dieter Kress



Dear reader,
dear business associate,

Even though it had been planned for a long time that my father would one day hand over the businesses and responsibility for the MAPAL company, the transition was a large step for both of us. Because with MAPAL, my father is handing over to me his life's work that in the last almost fifty years, he has turned into what it is today.

I am very grateful for the faith he is placing in me. Be assured that I will approach my new task with the greatest possible commitment and will continue to manage the company in line with my father. Therefore we will continue to face challenges, such as

digitalisation or electro mobility for example, early on and with the necessary far-sightedness. Always with the aim to remain your technology partner and preferred contact for all topics related to machining.

In this respect, I look forward to a continuous cooperation based on trust and partnership with you and many exciting projects.

Yours

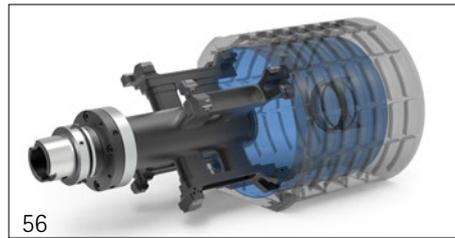
Dr Jochen Kress

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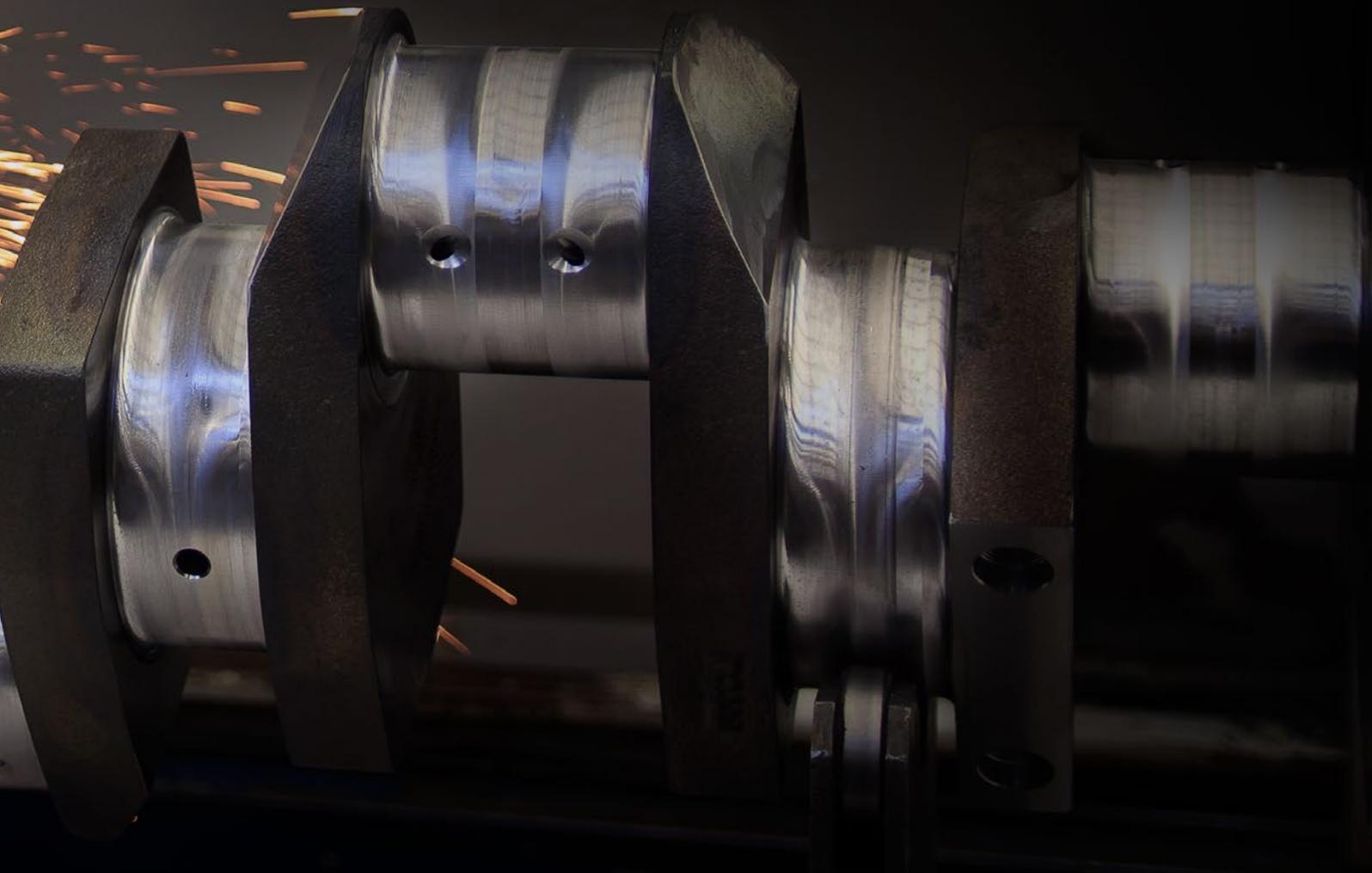
DIRECTLY TRANSFERRING



MEASUREMENT DATA

Maschinenfabrik Alfing Kessler relies on the UNISET-V standard setting fixture from MAPAL

Handwritten notes, printed labels, indirect communication and error sources – in future this will all be a thing of the past in the manufacturing of crankshafts at Maschinenfabrik Alfing Kessler. Therefore, when the time came for the new acquisition of a setting fixture, the requirements for the device were therefore the possibility of a direct connection to the turning-milling centres together with robustness and simple handling. The crankshaft manufacturer decided on the UNISET-V standard from MAPAL.



Large turning-milling centres, cranes, huge crankshafts and spark-spraying machining – the name of the division within Maschinenfabrik Alfing Kessler GmbH we visit lives up to its name – it is "large". The mechanical engineering works in Aalen manufactures crankshafts; large crankshafts with a length of up to eight metres. Alfing is the global market leader in the area of large crankshafts.

In "Large manufacturing 2", the division that Thomas Schönmetz supervises as a foreman, the crankshafts are somewhat smaller. But small is relative here. "We manufacture crankshafts with a length of up to 3.8 meters and a maximum weight of one tonne", explains Schönmetz. These crankshafts are used wherever large engines are required, for example in ship's engines or systems for transporting. "We manufacture around 80 different workpieces", says the production foreman. Around 50 tools are used for each workpiece.

Paperwork presents a risk for errors

And these tools – from the small reamer to the 800 mm long single-lip drill – are precisely measured and set. Because the highest level of accuracy is required when manufacturing crankshafts. "Above all, the radial run-out error must be below 20 µm for the final inspection of the crankshafts", emphasises Thomas Schönmetz. One of the sources of error that leads to cost-intensive rework or even rejects includes tools that are precisely set but whose data is incorrectly transferred to the machine. "We are currently working with labels", describes Schönmetz. Tools are measured and set. The relevant data is printed on a label and stuck on the tool. The machine operator finally manually enters the data in the machine. "This procedure presents a large risk for errors and delays, for example due to typing errors or lost labels", admits Schönmetz. All in all, there is a considerable potential for improvement with this paperwork. "Today cost pressure prevails everywhere. For this reason, it is absolutely necessary to make use of existing potentials and adopt a way for intelligent manufacturing without printouts and data breaches", emphasises Schönmetz.

Direct communication between setting fixture and machine

As one of the four setting fixtures had to be replaced in his division, the option to be able transfer data directly to the machine via a server was at the top of the specifications. "We would like the setting fixture to communicate with the machine, so to speak", explains Schönmetz. Currently Alfing is preparing and enabling all data as well as the machines and storage options for networking. The sought-after setting fixture must on the one hand have suitable connections and on the other hand have suitable software.

"Our goal is that setting fixture and machine communicate with each other."

Was Alfing looking for a highly complex, complicated to operate setting fixture? The opposite is the case. "On the one hand, we are looking for a robust unit that is suitable for workshop use", says Schönmetz. Because: The setting fixtures are directly in the manufacturing space not in a measuring room. Around 25 machine operators in manufacturing set their tools. Around the clock, seven days a week. "On the other hand, we therefore place importance on simple and uncomplicated handling and ease of operation", says Schönmetz.

The decision was made in favour of MAPAL

Alfing obtained offers for an appropriate setting fixture from several suppliers. Two of them were on the short-list. Finally the persons responsible with Thomas Schönmetz decided on the UNISET-V standard from MAPAL. "The setting fixture meets all our requirements. The price-performance ratio is entirely appropriate and MAPAL offers us excellent support", says Schönmetz, justifying the decision. "I am happy to work with MAPAL. Along with the regional proximity, the expertise of the employees and the very high quality of the products convince me."

"The UNISET-V standard measures tools very precisely, regardless of external influences", explains Michael Hils who, as Manager of the mechatronic systems at MAPAL, is also responsible for the setting fixtures. The device can be used without problem in harsh workshop conditions due to the rock solid mechanical construction and the use of high-quality materials such as carbon and granite. Alfing relies on purely optical measurement in its production hall, as this measuring method is particularly fast and user-friendly. MAPAL has therefore fitted the UNISET-V standard with an optical measurement unit for Alfing. And as Alfing only works with HSK-A100 connections, MAPAL customized the standard unit from a SK50 to the desired connection. After extensive training of the employees who work with the unit every day, using the UNISET-V standard is trouble-free.

High level of flexibility of the setting fixtures

But what about the networked communication? Michael Hils explains: "As the tolerance requirements of tools and parts increase, those for the setting fixtures do as well. Above all a higher level of flexibility is always required with regard to the software and the connections."

And the setting fixtures from MAPAL are designed accordingly. They provide all connections in order for the unit to successfully network with other units and machines and so create the preconditions for an intelligent factory. In addition the software is simple to operate and can be flexibly adapted. "The requirements have been created with the UNISET-V standard; now our IT department is working on the specific implementation", reveals Schönmetz. ■



(From left) Alfred Baur (Technical Consultant MAPAL), Thomas Schönmetz (Production Foreman Maschinenfabrik Alfing) and Michael Hils (Manager mechatronical systems MAPAL) discussing the use of MAPAL tools in the production at Alfing.

Numerous tools are precisely measured by the UNISET-V standard.

The UNISET-V standard measures tools very precisely, regardless of external influences. The device can be used without problem in harsh workshop conditions.

Alfing relies on purely optical measurement in its production hall, as this measuring method is particularly fast and user-friendly.



SUCCESSFUL EMO FOR MAPAL

Five appearances at the world's
leading trade fair

MAPAL can look back on a successful EMO in Hanover. With dedicated stands for MAPAL, c-Com and LASERPLUSS and with a stand at each of the mav and VDMA forums, the MAPAL Group presented itself no less than five times to the around 130,000 visitors. The Tool Traders Partners – BECK, MILLER and WTE – were integrated into the 440 square metre MAPAL stand.

"The new topics of e-mobility and digital transformation, in particular, attracted great interest from the visitors," summarises Dr Jochen Kress. MAPAL had taken a position on both topics: With c-Com, Tool Management 4.0 and the dispensing systems showcasing solutions for digitisation, and electro mobility in the form of tool concepts for the machining of stator housings for electric motors.

A sports car prototype of the Toyota subsidiary, Motorsport GmbH (TMG), was the highlight of the MAPAL fair appearance in 2017. But the Toyota TS030 Hybrid that has both a classic internal combustion engine and an electric motor was not intended merely to attract attention. MAPAL works closely with TMG and has been responsible for the company's complete tool management now for ten years. Furthermore, the car underlines the MAPAL competence in the →





"The new topics of e-mobility and digital transformation, in particular, attracted great interest from the visitors."





e-mobility sector. "The stator housings for many electric and hybrid vehicles on the market are machined with our tools," explains Dr Jochen Kress.

Additively manufactured hydraulic chucks were also at the focus of the visitors' interest. Of course, numerous product innovations from the fields of reaming, drilling, milling, actuating and dispensing were also on show. MAPAL presented itself once again as a full-liner with a broad portfolio covering practically all sectors of the metal processing industry.

"The EMO totally fulfilled our expectations once again," emphasises Kress, "and we were able to welcome numerous international customers, partners and potential customers to our fair stand. We made a large number of interesting contacts." A 75-strong fair team was on hand to look after the international trade public. There was also time to celebrate – traditionally at half-time of the six-day fair – at the MAPAL stand party with live music. More than 200 guests took up the invitation to visit the fair stand on that Wednesday evening. ■

Converted building in Shanghai officially opened

MAPAL CHINA CELEBRATES SPECTACULAR OPENING

With several events and hundreds of guests, MAPAL China celebrated the opening of its headquarters in Shanghai. The premises in the building in Hongzhong Road have been generously converted, modernised and expanded over the past 18 months.

MAPAL China can now use a total area of 6,200 square metres in the split building. Along with the new design of the existing rooms, additional facilities were created. In the manufacturing area, a new technology centre was integrated with a research and development department, an area for repairing and reconditioning tools as well as a showroom. The expansion takes account of the growth of the subsidiary.

The range of services of MAPAL China includes machining solutions for the automotive industry, for example in the powertrain and e-mobility areas, as well as process solutions for the hydraulics industry, aerospace industry, electronics industry and tool and mould making. The production processes at MAPAL China are included in the global production system of the international MAPAL Group with standardised production processes and quality standards as well as identical machinery and equipment. During the course of the conversion measures, additional machines were put into operation and space was made for future expansions. The office rooms were also enlarged and equipped. A welcoming foyer, prestigious visitor rooms and a large conference hall as well as a canteen facility were also included in the implementation of the construction project. →





MAPAL 中国 新楼落成庆典
MAPAL China Opening Ceremony







Drum roll and baptism

At the start of November 2017 the opening of the building was celebrated. The Managing Director of MAPAL China, Andy Liu, welcomed around 200 customers and partners from all parts of China to the ceremony. High-ranking guests from business, science and public administration took part. The setting for the official opening was a stage in the courtyard of the two-wing building. The guests followed the virtual baptism on a large screen that was introduced by several drumbeats from the Managing Directors. Water is highly symbolic in China and stands for stability and financial independence. The wish to create a solid foundation with these rooms for the long-term success in this market that is important for MAPAL was vividly expressed. MAPAL in China employs 400 employees and is the largest and most important subsidiary of the MAPAL Group after MAPAL Germany. Along with the headquarters in Shanghai, 17 regional service offices supervise customers in all parts of China.

mav Conference

The day after the ceremonial opening, MAPAL China was the host of the "Intelligent Manufacturing Conference", an event from the German "mav" trade journal. Customers from throughout the country who came for the occasion of the opening ceremony took the opportunity to participate. In the new conference hall of MAPAL China, renowned speakers presented optimised production solutions and provided an outlook for future developments. Dr Jochen Kress presented the c-Com company. The MAPAL subsidiary offers services for networking and system integration of data for tools and C-parts. The response to the event was very positive.

A series of other events as part of the new opening were also well attended. These included a press conference and several symposia, product training courses for customers and interested parties as well as various events and further education measures for employees from MAPAL China. ■

MAPAL China
玛帕中国



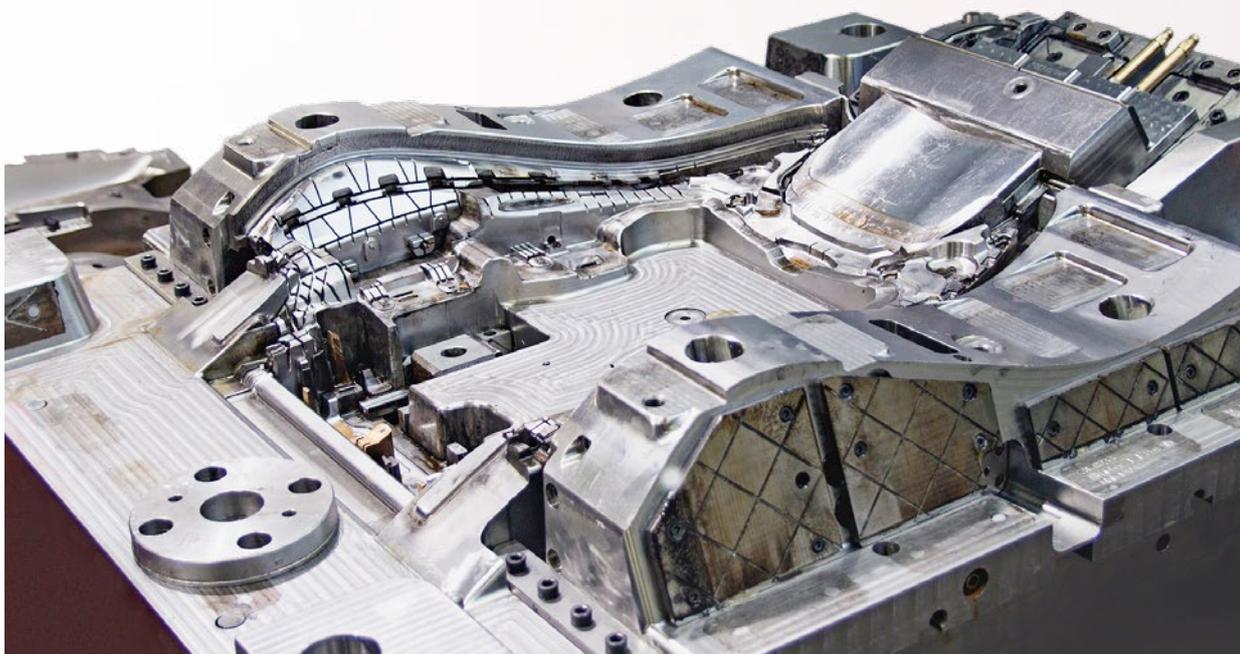
Expansion of the MAPAL Group

COMPETENCE IN MOULD MAKING

The MAPAL Group acquired the Radtke Präzisionswerkzeuge company from Haan in Western Germany. "The acquisition perfectly complements our offer for die and mould making industry", explains Dr Jochen Kress. MAPAL is expanding its market position in sectors besides the automotive industry and is developing new customer groups with the integration of Radtke Präzisionswerkzeuge. Besides toll manufacturers, these are also suppliers that produce for the motor sports, print and die making and machine engineering. Radtke Präzisionswerkzeuge was founded in 1995 in Haan as a sales agency for milling tools. A few years later, the owner Stefan Radtke

"The acquisition perfectly complements our offer for die and mould making industry."

had the first milling tools made of solid carbide for tool and mould making produced and built up his own customer base. From 2007 Radtke concentrated exclusively on its own tool range and gave up the sales agency. The product range covers a broad spectrum of milling cutters for various applications. This includes tools for milling graphite as well as various solid carbide milling cutters that are used for annealed steel and hard machining up to 63 HRC. They are available as standard tools from stock and are used predominantly for 3D applications and for the machining of free-form surfaces.



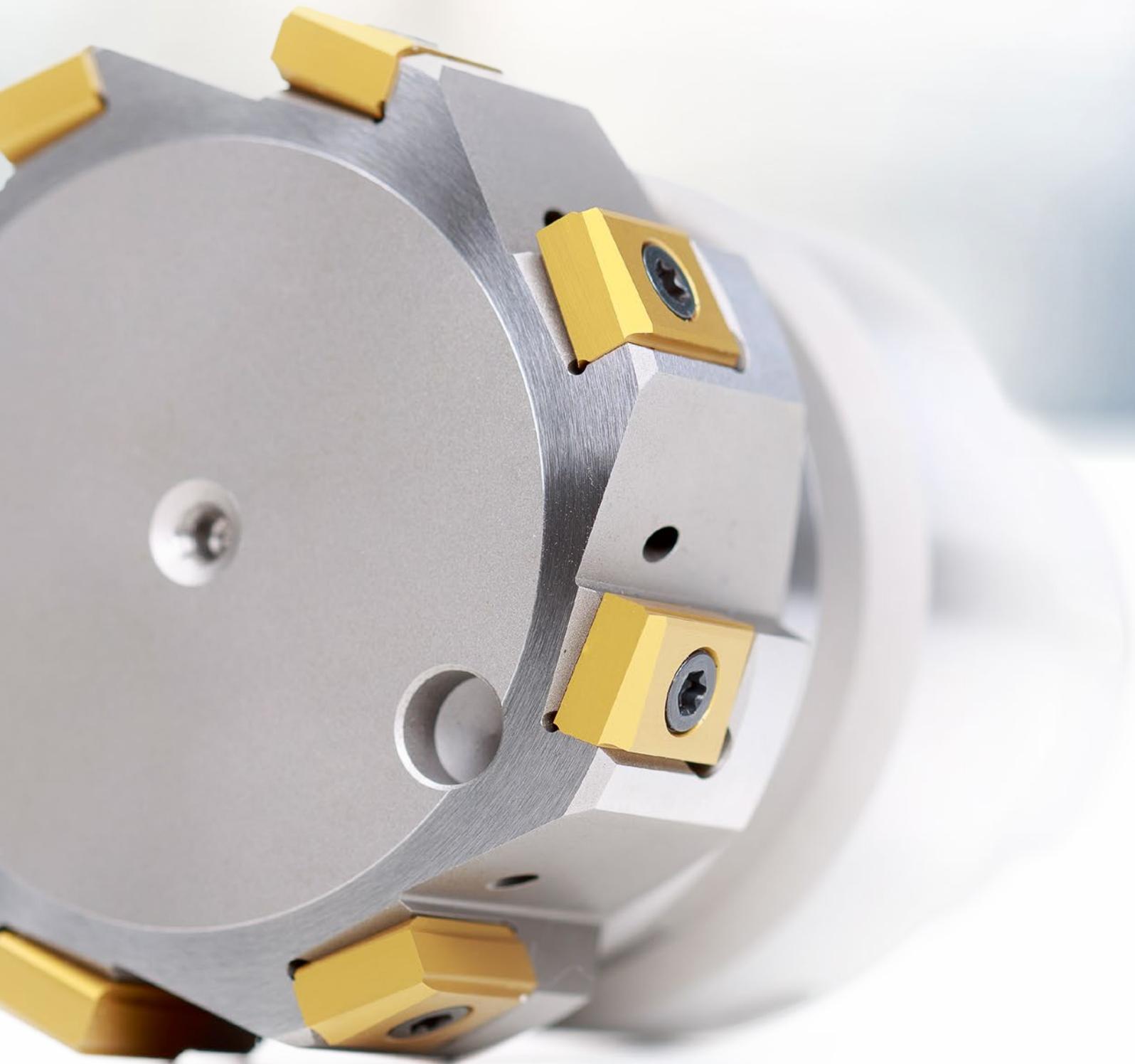


PRECISE, EFFICIENT AND EASY TO HANDLE

– Tools for fine machining bores from MAPAL

Reaming tools have to meet the demands for highest accuracy and feature a minimum handling effort. In addition customers always pay attention to efficiency, the lowest possible logistical expenditure and maximum process reliability. Since the introduction of the single-bladed reamer in 1954, MAPAL offers state-of-the-art tools for fine machining bores. The challenges that have to be overcome today and the solutions MAPAL offers for them are the topic of the interview with Michael Neumann, Product Manager for reaming and fine machining tools.





To further increase the efficiency of reaming large diameters, the indexable inserts of the new HPR 400 plus are designed with four cutting edges.

Mr Neumann, how would you summarise MAPAL's offer of tools for fine machining bores in three sentences?

We offer a suitable tool concept for every reaming process – standard as well as special tools. In the process, we cover a large diameter range between 0.6 and 350 mm. Our portfolio is divided into tools with guide pads, replaceable head reamers, high-performance reamers with cylindrical shank and special solutions for large diameters.

That's a lot of different tool types – what are their characteristic features and how to customers find the optimum concept?

The factors that make the individual reaming tools different are the setting effort, setting options, achievable accuracy, tool life and reusability. Depending on the requirements and circumstances that a customer has, we find or develop the best tool for the customer from our portfolio. The tool life for efficient manufacturing is extremely important for mass production, for example. Without a setting room or trained employees, handling must be as easy as possible.

Is a trend recognisable with regard to customer requirements?

As in the entire history of reaming tools, the trend is to further optimise the processes and therefore shorten the machining times making manufacturing more efficient. In addition, more and more customers require reaming tools that can be used without or with only a minimum setting effort. For in order to correctly set the tools and to thereby achieve the best possible accuracy, well trained specialists are necessary.

Nonetheless the bore quality remains very important for reaming. The best results are still achieved with guide pad tools as these tools can be set to an accuracy in the μ range and the tool is supported by the guide pads in the bore. For this reason, it is our job to further increase ease of use for our tools, make setting easier and shorten the setting times – all without cuts with regard to accuracy.



Impulse talks to Product Manager Michael Neumann about new solutions in the area of reaming.



MAPAL offers the CPR500/510 Replaceable Head Reamer with optimised cooling for an efficient machining of cast iron.

How does MAPAL complete these tasks?

Applications with very tight tolerance specifications that require a guide pad tool and at the same time personnel that are not appropriately qualified—these are the most difficult tasks. To significantly simplify setting, we use the EA (EasyAdjust)-System for our tools with guide pads. This is an initial step in this direction. Thanks to the EA-System, the back taper of the blade no longer has to be set. It is already integrated in a cassette manufactured to a high level of accuracy in which the indexable blade is inserted. However the radial setting of the blades must still be carried out. And yet: Thanks to the EA-System, around 60 to 70 percent of the time for setting is saved.

And what if no setting should actually be carried out?

Then the result is not accurate to the last μm . Nevertheless: We also obtain excellent results with tools that do not have to be set. For example, when reaming large diameters from 65 mm, we presented

a new tool concept at EMO in Hanover: the HPR 400 plus. A short machining time is achieved with this multi-bladed reamer. On the other hand the inserts can be reliably and very easily replaced by the customer himself on site. As a result, the tool logistics are significantly simplified. The tool does not have to be sent to the manufacturer for reconditioning. This reduces the required tool stock. The customer only has to have the indexable inserts in stock. The special features of these tools are indexable inserts with four usable cutting edges. For the previous model, the HPR 400, only one cutting edge was usable. This significantly reduces the cost per part.

Does the tool have to be reset after the insert change?

No. Because inserts and insert seat are manufactured with a high level of accuracy. →



MAPAL's indexable inserts for reaming are specifically coated to match the material's requirements.



*Thanks to the EA-System,
around 60 to 70 percent
of the time for setting is saved.*

Are there also concepts that offer similar benefits for fine machining smaller diameters?

Among others, our new CPR Replaceable Head Reamer that is available for the diameter range between 8 and 40 mm. The reaming head of the CPR system can be easily replaced when the head is at the end of its tool life. Nothing has to be set here. This system also

offers an additional advantage: We only manufacture the heads from cost-intensive solid carbide. This saves a lot of material. We offer this tool system for numerous materials: for machining cast iron, steel, titanium, aluminium, VA, CFRP, GFRP and for hard machining. →

Milestones in the development of reaming tools at MAPAL

MULTI-BLADED REAMERS

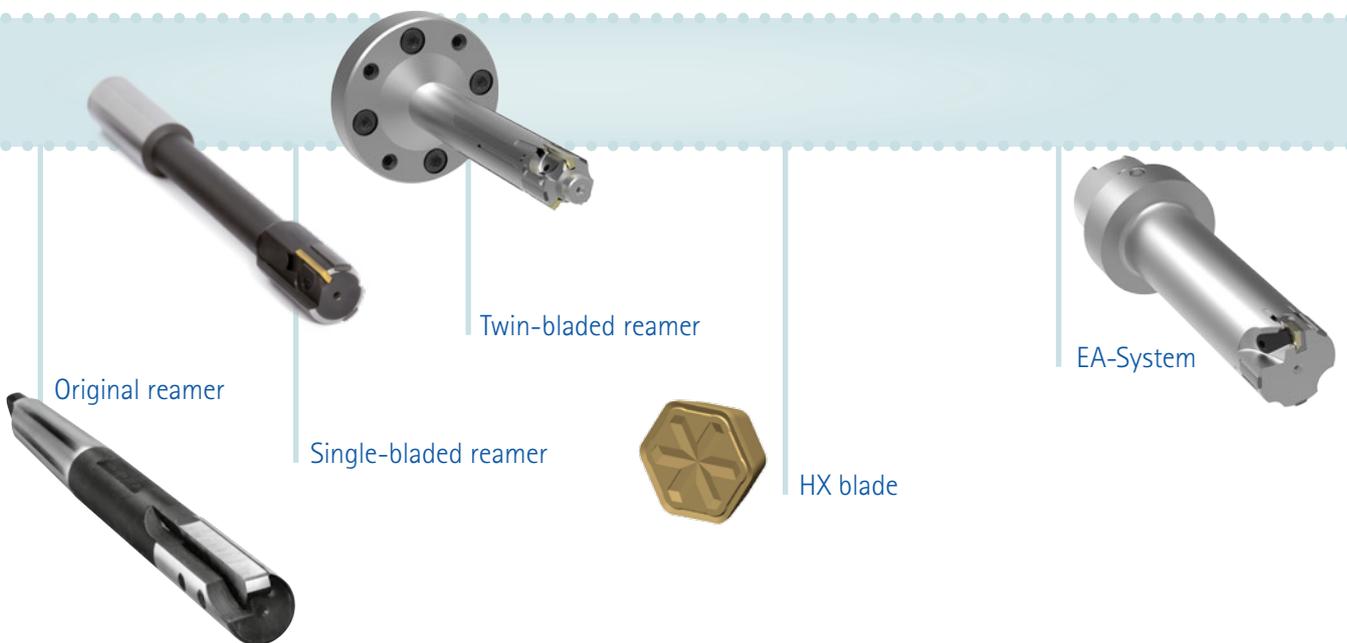


1954

2017



TOOLS WITH BLADES AND GUIDE PADS



Original reamer

Single-bladed reamer

Twin-bladed reamer

HX blade

EA-System



For a high tool volume, this is still a high proportion of cost-intensive solid carbide. Is there an alternative for this in the field of reaming?

We have developed cutting heads that we press with close contours using moulds specially for applications with very large quantities and a correspondingly large volume of one and the same tool. Although a higher investment is necessary for the appropriate mould, this type of replaceable head pays off as the tools themselves are then significantly less expensive.

Apart from these innovations: Why should a customer decide on a reaming tool from MAPAL?

On the one hand, as already mentioned, we offer a broad range of products and have decades of experience in fine machining bores. On the other hand, we have other unique selling points such as guide pad tools, for example. Moreover, MAPAL is the only tool manufacturer that has developed and successfully uses a CVD coating for reaming cast iron. Our HC418/419 cutting material ensures the best surfaces for excellent dimensional tolerance and has a significantly higher tool life compared with PVD coated cutting materials. ■

MAPAL developed cutting heads that are pressed with close contours for mass production.

MAPAL TOOLS FOR MOULD MAKING

Workshop at CEFAMOL, the Portuguese national mould maker association

Tool and mould making in Portugal holds a leading position in Europe. One of the centres of the sector is around the town of Marinha Grande. Under the title "MAPAL – Innovations for milling and drilling", around 80 mould making specialists came together here at the start of October 2017 for the joint workshop of CEFAMOL, the association in Portugal, BM2Tools, MAPAL as well as Alamo-Ferramentas, the Portuguese representative of MAPAL.

After the presentations, all participants went to the production site of the mould maker BM2Tools to experience the production expertise of the mould maker as well as the tools from MAPAL live. Different machining processes were shown on a total of six machines. Among others, solid carbide tools from MAPAL were used in the form of drills, milling cutters as well as combined reaming and drilling tools.

CEFAMOL was satisfied with the outcome in all respects and plans to repeat the same workshop in the second centre of the sector between the towns of Marinha Grande and Porto. ■



c-Com

Creating added value in production with collaborative data management

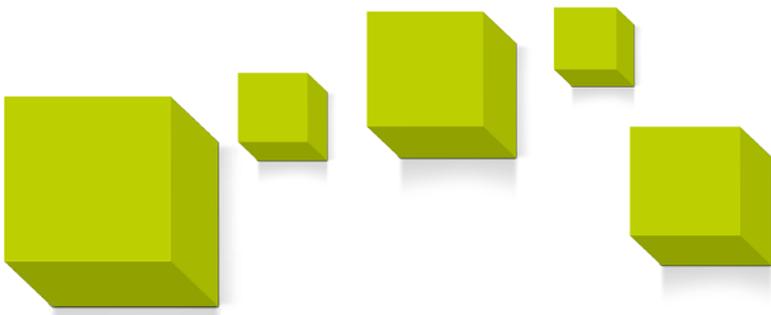
The c-Com open cloud platform has been launched onto the market, ready for sale, at EMO 2017 in Hannover – it includes the following four modules: "Tool Dashboard", "Dynamic Order Optimizer", "Reconditioning Management" and "Machine Run-Off", along with corresponding apps. c-Com GmbH, the company behind the platform, promises innovative, collaborative data management of tools and C-parts in the production environment, with unprecedented levels of transparency and efficiency.

About c-Com:

Everything at c-Com revolves around digital services. Established in June 2017, c-Com is a young start-up of the MAPAL Group, offering digital services for the manufacturing industry. Based on an innovative collaborative approach, the open cloud-based platform c-Com enables a new and efficient tool data management between customers and suppliers.

The modules of the c-Com platform are supported by different apps for tablets and smart phones.





c-Com, an SaaS (software as a service) solution, allows suppliers and customers to manage and share data relevant to day-to-day work or projects. The seamless data flow, without media breaks, ensures that all stakeholders can access up-to-date data in real time. Finally, c-Com makes use of the high safety standards offered by SAP infrastructure, ensuring the best possible data protection. But what is behind the platform, and what does day-to-day work with it look like? The following example of a machine acceptance will help demonstrate the benefits of c-Com and what it is like to work with it. Here, the "Machine Run-Off" module is used:

Machine acceptance with c-Com

The field service specialist of a tool manufacturer, along with the project manager at a machine manufacturer, is testing various tools for a new project. The machine is due to be delivered abroad soon, where, in a few weeks, the OEM who ordered the machine has to present the first machined parts for the PPAP (Production Part Approval Process). While the tool is being run in, the field service specialist enters the values covered into the c-Com platform using the Datacare app on his tablet. There, he manages the project along

with the project manager. The modified data is made available in c-Com, in real time, to all those involved. The data, time and reason for modifications are recorded precisely.

How are modifications handled?

While machining the part with the T200 tool the following is noticed: the bore is only just within the defined tolerances. A tool modification is needed. The tool manufacturer's field service specialist sends information about the necessary tool changes – including pictures of the corresponding machining results – to his design department. The design department receives a direct notification via c-Com, the designer adapts the tool accordingly, prepares a new drawing and publishes it in c-Com. The field service specialist and the machine manufacturer's project manager both approve the modifications via c-Com. Two of the three T200 tools that were delivered to the machine manufacturer are sent back to the tool manufacturer to be modified directly. The third tool remains in the machine so that it is possible to move forward the pre-acceptance tests. Here, some confusion may arise in relation to the delivery of the modified tools. Which tools have already been reworked and →



which ones haven't yet? The fact that the tools are serialised with QR codes means c-Com can always be used to find out where each tool is being located.

The machine is delivered abroad, to the OEM, together with the tools. This is where the final machine acceptance takes place. Thanks to c-Com, the local representatives of the machine and tool manufacturers have all the necessary information (e.g. on cutting values or tool changes) available, and complete the acceptance with the OEM within the specified time period.

This example is an impressive illustration of how tool manufacturers and machine manufacturers benefit from c-Com during the machine acceptance process. Exchanges of Excel files between suppliers and customers are a thing of the past. The same applies to time-consuming back-and-forth queries relating to tool modifications prior to the final machine acceptance. No longer will missing tools or tool data put deadlines at risk.

At the core of c-Com

The three other modules that c-Com has presented in September also make day-to-day work easier in relation to a range of tasks. In this regard, the "Tool Dashboard" application is at the core of the platform. Here, all the users along the supply chain (production, purchasing, logistics...) can find the tool data relevant to them, correlated with individual parts and applications. This gives rise to what could almost be described as an overarching technology database within the company, something which distinguishes c-Com from all previous cloud solutions. Although these solutions can be used to release tool data to different users, this data is not correlated with the respective parts or machining processes. As a result, these data cannot be used for any other processes relating to the tool, such as reconditioning or planning. However, the c-Com platform's "Tool Dashboard" module networks this data, offering information on usage supplied by a tool dispensing system, combined with valuable evaluations in real time. For instance, this allows the performance of individual tools or tool costs to be analysed precisely. In addition,

Apps have been developed that correspond to the individual modules, allowing c-Com to be used at any time and any place without restrictions. The native apps can be used on tablets and smartphones – so, with any web enabled mobile device.

The fact that the tools are serialised with QR codes means c-Com can always be used to find out where each tool is being located.





c-Com offers the possibility of comparing the identical or similar machining processes within a company, across different sites.

The "Tool Dashboard" module offers many benefits, not only for customers, but for suppliers too. If all project-related data is maintained on the platform, there is no need to share data using Excel or Word files, either with the customer or within the company. Within the company, this ensures synergies when developing new solutions and sharing technical know-how, as real time up-to-date data can be accessed by all those involved. In addition, a better service can be offered to customers.

Mastering the challenges of handling re-grinding

The "Reconditioning Management" module deals with the issue of regrinding, one of the crucial issues relating to tools. Admittedly, tool reconditioning is an important cost factor in production, however, the processes relating to tool regrinding create a substantial administrative workload. The handling of the regrinding of hobbing cutters is a concrete example of the benefits c-Com offers with the "Reconditioning Management" module. These highly cost-intensive tools are used, for instance, in the production of gearboxes and can be reground up to 15 times. Knowing the exact number of regrindings of every single tool is crucial for planning tool usage and making sure stock levels are not too high or too low. However, this information often isn't available to customers. That's where c-Com comes in.

A pilot customer and highly-esteemed TIER1 supplier for the automotive industry is using c-Com for this purpose. The supplier, which carries out production in southern Europe, uses around 60 different hobbing cutters from different suppliers in more than 70 machining processes. The logistics in relation to the hobbing cutters were previously managed using huge Excel files, which were constantly being e-mailed back and forward between the company's logistics department and the respective suppliers. This approach didn't offer any transparent or comprehensive overview. It resulted in stock levels that were unnecessarily high or too low and regular problems with suppliers because of missing tools, which halted production. All of this was related to the large administrative workload required to resolve shortcomings. Although the manufacturers of the hobbing cutters had stored the information detailing the number of regrindings of every single tool in a database, this data wasn't available to customers.

As part of the pilot project with c-Com, two of the hobbing cutter suppliers lasered a QR code onto their tools. And via c-Com, they share all the data available in their database that is relevant to tools, such as tool status and number of regrindings, with the customer. Using a tool dispensing system connected to c-Com, the TIER1 supplier documents every time a hobbing cutter is dispensed or returned. It's possible to find how many new, reconditioned and blunt tools are in stock at any given time by scanning the QR code. This data is combined with the number of regrindings per tool, i.e. the data provided by the supplier. As a result, the TIER1 supplier has a detailed overview of its tools at all times. →

Improving logistics with order recommendations

The supplier also uses the fourth c-Com module, "Dynamic Order Optimizer", in addition to the "Reconditioning Management" module. They are thus provided with recommendations regarding how many tools they should order and when, in order to meet its needs. When it comes to this, the module takes into account the number of times the tools in stock can be reground again as well the respective delivery times of reconditioned and new tools. c-Com's pilot customer has reported a huge improvement in its logistics. In the future, it not only wants to use the platform for hobbing cutters, but for its entire production process.

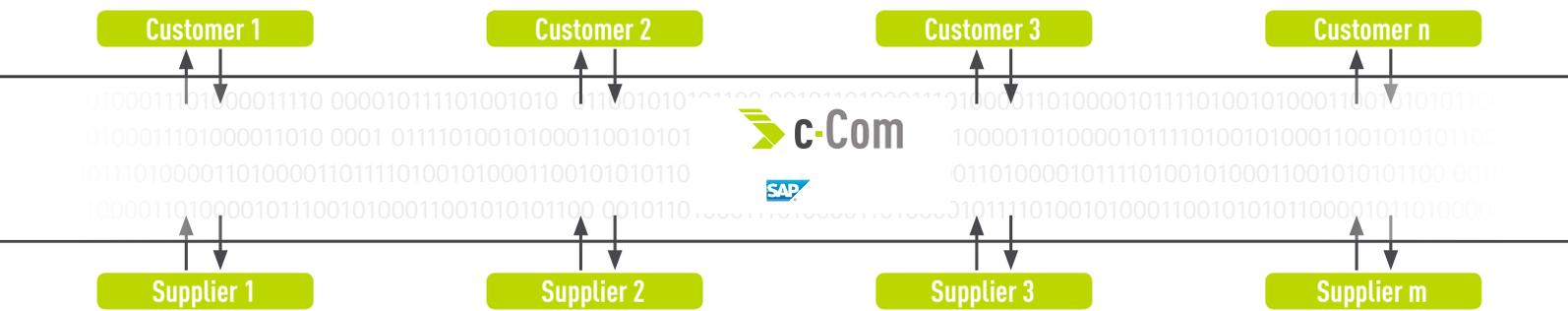
These first four modules, of which more will follow, are supported by different apps, such as the Datacare app mentioned above, or the Tool Manager app. The latter is a native app for tablets and smart phones. This allows tool managers and field service specialists to put together reports on tests or faults relating to tools and to share these in real time with those responsible, for example the product manager or development engineer. In this way, it facilitates a form of quality management, tool management and tool monitoring that weren't previously possible.

Outlook – what's next for c-Com?

More modules and apps for c-Com are on their way. This is why, for instance, c-Com GmbH is collaborating with Siemens and its MindSphere IoT system. Like c-Com, MindSphere is based on the SAP Cloud Platform. The system collects machine data that can

With the c-Com module "Reconditioning Management" the customer is always able to find out how many new, reconditioned or blunt tools are in storage.

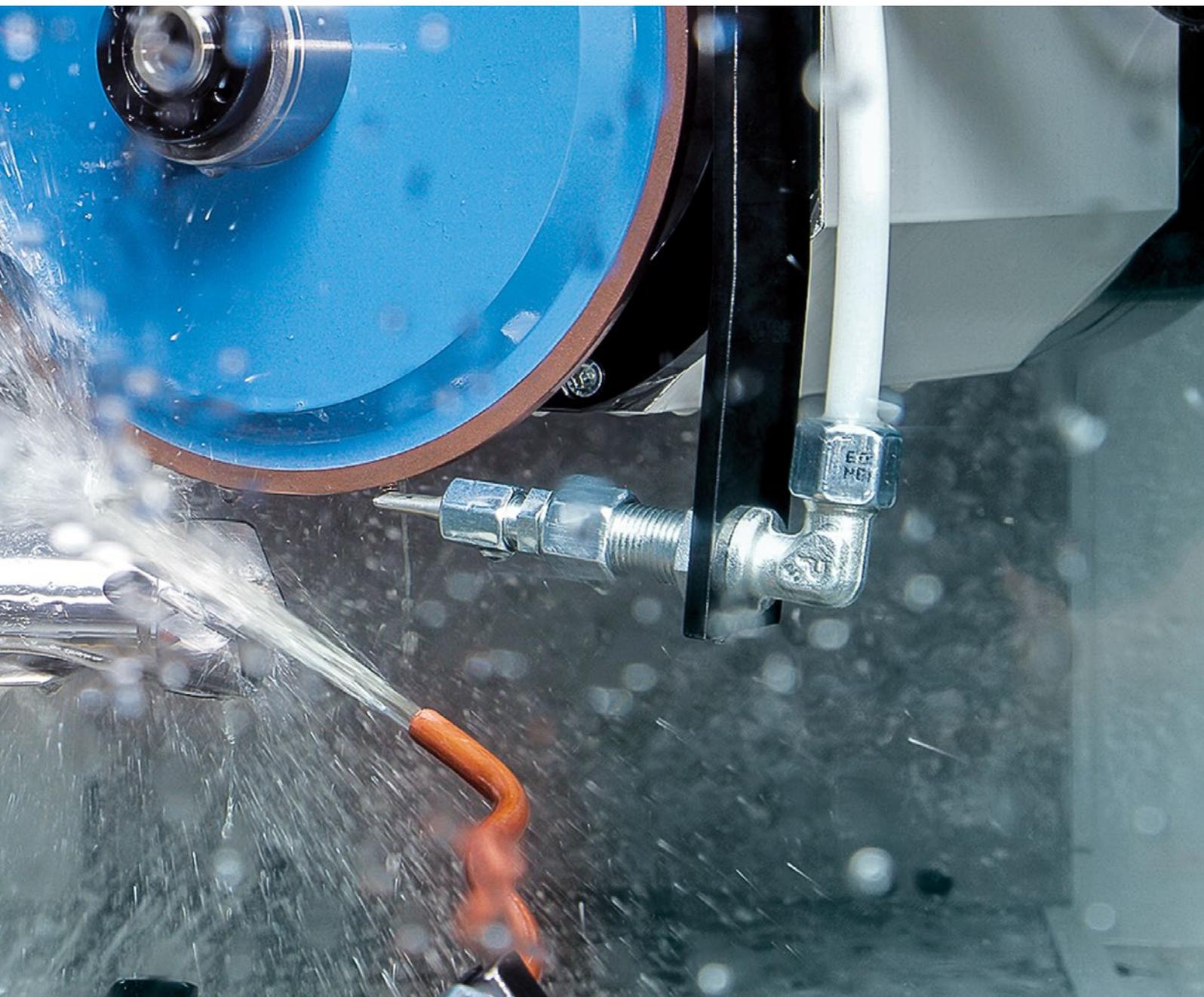




There are many companies who have already been won over by the benefits c-Com provides, and who use the collaborative data management as pilot customers.

be used for different purposes, such as predictive maintenance or energy management. In the future, c-Com and MindSphere will share data, such as the number of parts machined with a tool or the cutting values, so they can better monitor processes, introduce standardisations and improve quality.

There are many companies who have already been won over by the benefits c-Com provides, and who are collaborating with the company. Initial pilot customers include Bass, Emuge-Franken, Vergnano, Schnyder and Lübberring, to name just a few. Numerous other collaborations have already begun or are currently in the pipeline. ■



Sven Bühring, Member of the Executive Board and Co-owner of Bühring Betriebsunternehmen GmbH:

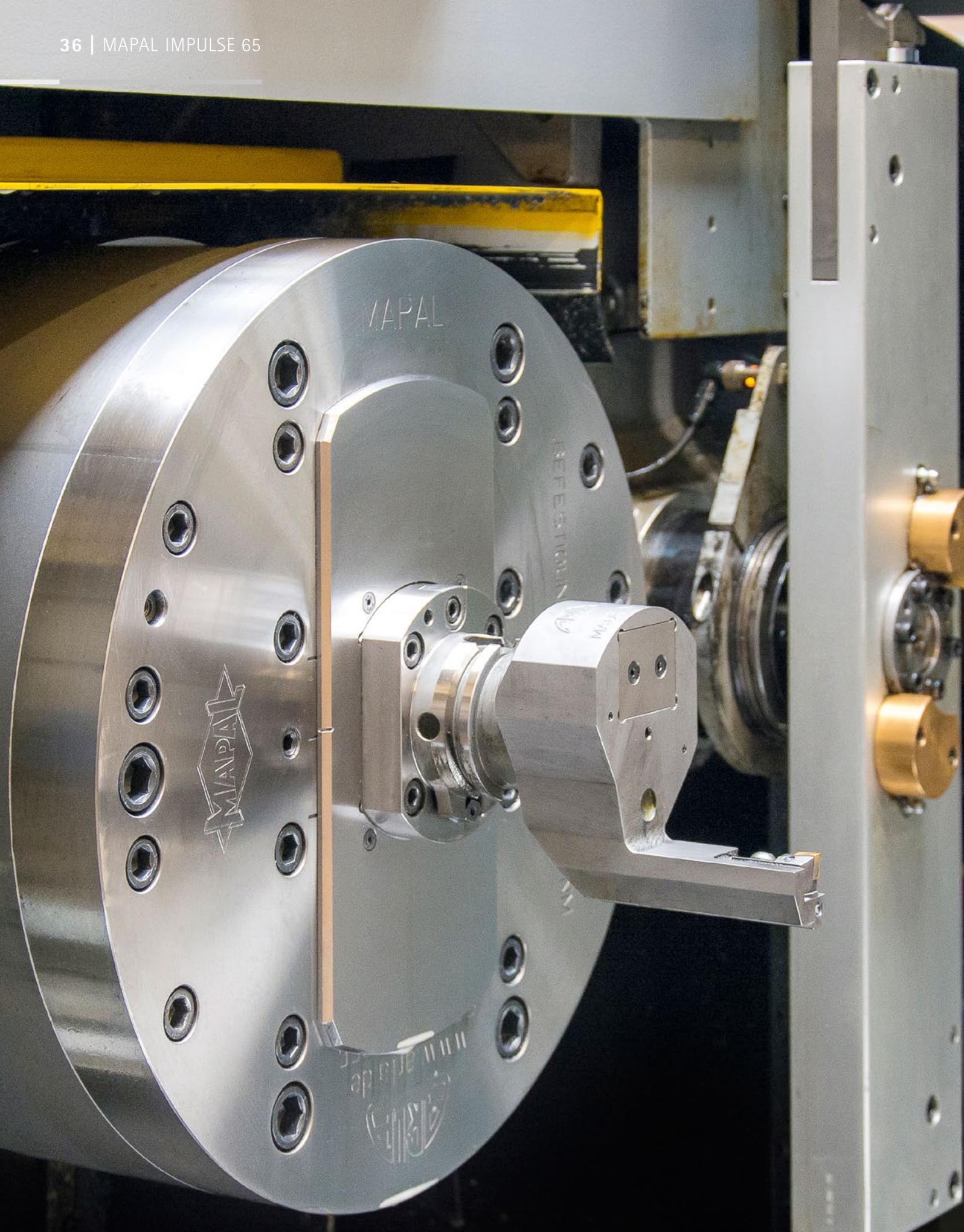
"Without a wide range of production techniques and a high availability of production equipment, a toll manufacturer does not have any future prospects. Reliable and tailored machining solutions and an efficient technical support like the one from MAPAL are an important part in having continual success."



CONCENTRATED FLEXIBILITY AND EFFICIENCY

Using facing heads and mounting tools, complex contours on rotationally symmetric components can be realised without the use of a lathe for stationary workpieces. This benefits end machining centres when both pipe ends have to be machined simultaneously and independently of each other. The Bühring machine manufacturer therefore decided on a CNC machining centre with a corresponding tool solution from MAPAL and since then operates significantly more flexibly and economically.





Two tailored single slide facing heads with automatic tool change allow for the realisation of complex machining contours in conjunction with appropriate mounting tools.

When the new end machining centre was delivered to Maschinenbau Bühring Betriebsunternehmen GmbH, based in Dreileben, Saxony-Anhalt, three forklift trucks had to be used to their full extent: A 26 tonne, a 4 tonne and a 5 tonne lifting truck were used together to lift the around ten metre long system from the transporter and take it to its working position. "That was real precision work", says Sven Bühring, who operated one of the forklift trucks and, together with two other family members, manages the skills of contract manufacturers in the fifth generation.

The effort and commitment paid off. The machine fitted with the latest technology has significant advantages compared with the outdated system previously used.

Simultaneous machining of both pipe ends

The new CNC machine built according to the specifications of Bühring ensures the reliable and efficient machining of pipe ends. The pipe to be machined can be between 400 and 2,500 mm long with this machine. By using tailored single slide facing heads from MAPAL with an external diameter of 380 mm and a face stroke of 55 mm, pipes with a diameter of up to 275 mm can be manufactured with complex inner and outer contours.

Facing heads are predominantly used on special machines when it is necessary to machine special contours. The precisely ground guiding tracks ensure the highest positioning accuracy. For machining at Bühring, MAPAL designed a facing head as a single slide with automatic tool change and with concealed imbalance compensation slides. As a result of this balance, particularly dynamic and precise machining is guaranteed. Other features of the facing head include the central oil lubrication, the internal coolant supply and the barrier air at the HSK connection which is used to automatically hold the mounting tools. The barrier air keeps the HSK connection free of impurities. With this, the facing head fulfils all the functions of a front edge of spindle. Using the facing head, machining with a stationary workpiece and in one clamping setup can take place on both ends simultaneously and independently of each other.

"Along with high process reliability, one of biggest advantages of the new system that showed effect immediately is the significantly faster component change", explains Bühring. "Refitting on the system previously used took around 2.5 hours. We now require around half the time. This is noticeable as we generally change the product at least once a week."

Automated tool change using HSK-A63 connection

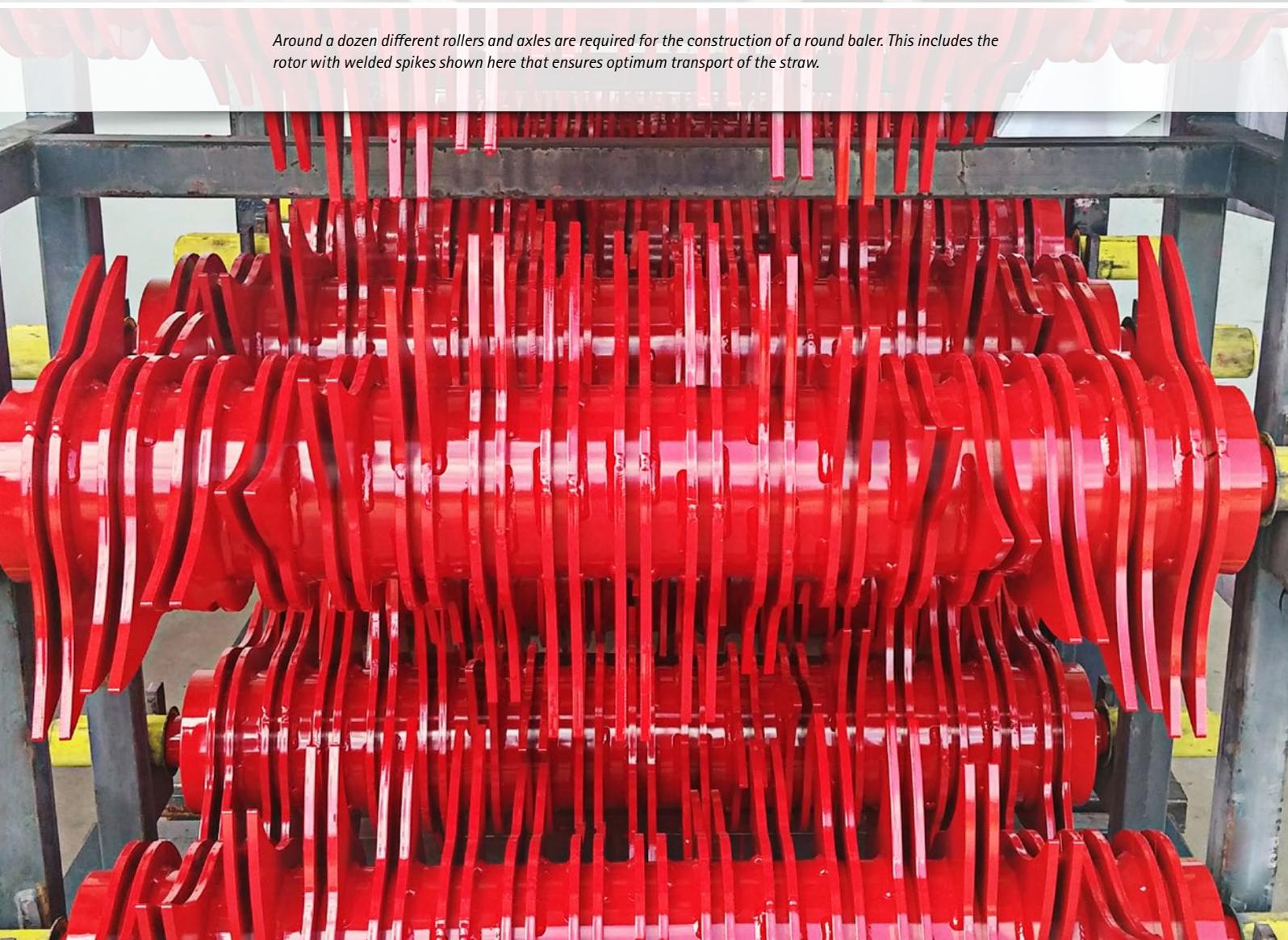
An automated tool change is responsible for this increased availability of the new machine, among other factors. A hydraulic system for the automatic tool change is installed in the operating slide of the facing head. Disc revolvers with twelve tool positions each on both sides of the machine provide Bühring with sufficient space for the required tools.

The products currently being manufactured are a dozen components that the customer requires for the construction of straw bale presses. Bühring generally delivers the components ready for installation, i.e. completely machined, welded and painted. One of these components is a rotor with 17 welded double rings each with two spikes that within a round baler is responsible for the optimum transport of the straw from the pick-up system to the straw bale press. The basic body of the rotor is a 1,200 mm long thin-walled roller tube made of steel with a diameter of 250 mm. It must be faced and chamfered at both ends inside and at the front so that a serrated stub can then be welded on it. Afterwards the axle may only have a radial run-out error of 3 mm to ensure optimum handling characteristics of the press trailer. Accordingly the machining of the ends must be precise.

Depending on the diameter of the workpiece, Bühring varies the speeds between 650 and 900 RPM. "As the pipe diameter increases, we have to gradually reduce the speed for the bale press components because otherwise the production-related pipe tolerances and the surface property can lead to rising vibration that would have a negative effect on machining." →



For many years, machining pipes at both ends has been one of the specialties of the Bühring machine manufacturer that among other areas of activity functions as an extended workbench for agricultural machine manufacturers.



Around a dozen different rollers and axles are required for the construction of a round baler. This includes the rotor with welded spikes shown here that ensures optimum transport of the straw.

MAPAL provides a suitable machining process

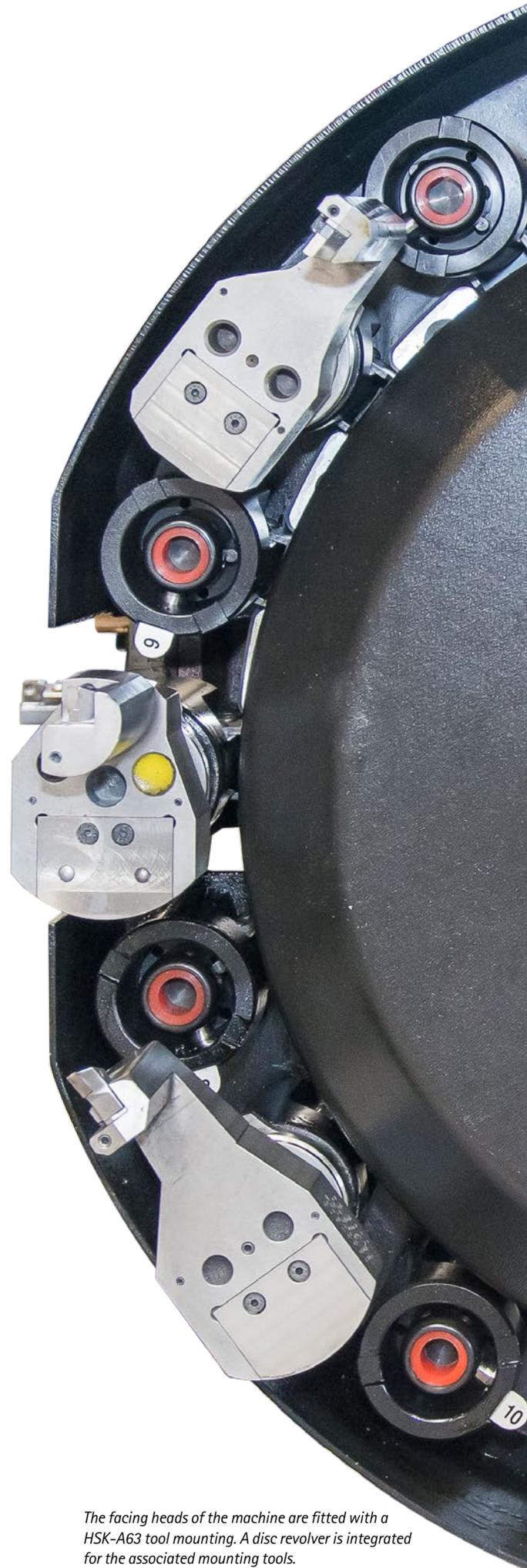
The machining process was designed by the machine manufacturer together with experts from MAPAL as classic wet machining. Standard ISO indexable inserts are used for the different machining processes at the pipe ends. "In contrast, special cutting materials of a manufacturer were required for the machine previously used because solely dry machining without coolant was intended there", recalls Bühring. "As a result we not only had high cutting material costs, but also an extreme generation of noise in the hall that burdened the employees." With the new machining process based on mounting tools, this is also a thing of the past.

The surface quality required for the order – a roughness of $R_z 25 \mu\text{m}$ must not be exceeded – is achieved without problem using the new machining concept. The main times vary depending on the machining task from a few seconds to a few minutes. "We can produce more precisely and efficiently with the new machine and the MAPAL tools", says Sven Bühring. "And we have not yet optimised programming due to a lack of time so we expect further improvements in the future."

Machine capacity freed up for new applications

Sven Bühring wants to make use of the additional machining capacities of the machine in the future to address new customer groups. "In my view the diverse and flexible machining options are particularly attractive for potential customers. These result from the combination of the end machining centre with the mounting tools and a laser pipe cutting machine that we also have in the company."

Bühring receives optimum support for its expansion from MAPAL's technical support team that the company has come to value. "When teething troubles of the machine contaminated the hydraulic drive system of the facing head in the commissioning phase, an employee from MAPAL was on site the next morning, picked up the faulty part and took care of everything else without complication. This is decisive because we must have products ready at short notice for many customers. Here we have to look for technology partners like MAPAL who we can rely on completely." ■



The facing heads of the machine are fitted with a HSK-A63 tool mounting. A disc revolver is integrated for the associated mounting tools.



Dry machining of composite materials for

AIRCRAFT CONSTRUCTION

The challenges that tool manufacturers have to overcome for optimum solutions in final assembly are diverse. Not only the different materials or the demand for the highest process reliability play a decisive role here, but also the cooling concept, narrow tolerance specifications and the machine used. MAPAL has been researching intensively into these challenges and has brought appropriate tool concepts onto the market. This includes the reliable dry machining of material combinations such as CFRP/aluminium or different aluminium alloys.



Materials that are both high-strength and light are of vital importance in the aerospace sector. Thanks to new material combinations, the weight can be further reduced, strength and corrosion resistance increased and assembly can be simplified by means of an integrated design. While structural parts made of aluminium, titanium or high-strength steels are machined on machining centres or portal machines, parts in final assembly are mostly machined by hand-held machines, drill feed units or robots.

Challenges for tool manufacturers in final assembly

The requirements for tool manufacturers and tools for final assembly therefore differ significantly from those for part manufacturing. While machined parts in part manufacturing have a value of around 1,000 to 50,000 Euros, parts in final assembly, depending on the assembly progress, are significantly more cost-intensive with a value of around 50,000 to 2 million Euros. Faulty machining must either be manually reworked, which is time-consuming and expensive, or the parts have to be completely replaced. For this reason, the suppliers for final assembly must be carefully chosen.

A challenge for tool manufacturers is the variety of materials, particularly if several materials with different properties are to be machined at the same time. To ensure a qualification as a tool manufacturer, it must be possible to machine all materials reliably and economically. The qualification for a tool manufacturer takes between one and five years. Tools and processes also require an additional qualification. Existing processes are only adapted in exceptional cases. For it must be ensured that all machining is carried out with a consistent quality. For example, a low scatter of the bore diameters, a CpK value larger than 1.7, must be ensured for drill machining in final assembly.

State-of-the-art:

Manufacturing bores for rivet connections

Aircraft manufacturers use rivet connections for connecting the outer skin to the structural parts underneath. For this purpose, innumerable bores are drilled. To achieve the lowest resistance to the airstream as possible (low cW value), the rivet heads are countersunk in the outer skin. For this, an additional countersinking must be added to the bore entrance. In the past, a process with up to four individual machining steps was often required →

(drilling from the solid, boring, reaming, countersinking). Today machining in just one step, where bore and countersink are realised in one process, is state of the art. Only in this way was automatic machining using robots possible. Previously this type of machining was realised with minimum quantity lubrication (MQL). After machining, the parts had to be disassembled, cleaned and remounted. In addition the cooling medium got inside the aircraft where further assembly steps were taking place at the same time. The demand for tools for dry machining different composite workpiece materials was the consequence.

Call for dry machining

With dry machining, the use of a cooling lubricant is completely dispensed with. Cooling lubricants are primarily used for heat dissipation and the reduction of friction between tool and workpiece by lubrication and support the removal of chips. By dispensing with a cooling lubricant, these tasks must be compensated by the tool. The main challenge for changing the drilling process to dry machining is therefore the concept of heat dissipation or more specifically the prevention of heat development as well as the removal of chips. If the heat cannot be dissipated in good time, the temperature becomes too high and the material will get damaged. For example, an excessive heat introduction for fibre-reinforced carbon will cause the resin used to burn. The material becomes brittle as a result. In contrast, a high level of burr formation is observed for aluminium.

One-step processing

In contrast to a multi-stage drilling process, the combination tool must undertake all work steps (drilling, boring, reaming and countersinking) during machining and bore the rivet connection in one step. In this way, both the position of the bore and the alignment between the cylindrical part of the bore and the countersinking are ensured. Angular errors or offset that can occur with multi-stage operations are therefore excluded.

Together with other quality characteristics of the machining result such as diameter, transition radius and countersinking angle, the burr at the bore outlet plays an important role. If a burr has formed at the bore outlet for multi-stage bore machining that was manually executed, it can be removed without great effort with the aid of a countersink. If the process is automated in only one step, manual deburring is not possible. For this reason, the relevant tool must be able to drill virtually burr-free. Aircraft manufacturers usually specify a maximum burr height of 0.1 mm. In addition to the burrs at the bore outlet, the interlaminar burrs between the layers can arise. If they form, the multilayer composite must be dismantled at the end of the drilling operation to remove the interlaminar burrs. Dismantling is time-consuming and cost-intensive and so these burrs must also be avoided.



When machining with drill feed units, the tools used must be fitted with additional stabilising features.



The drilling/countersinking tool for dry machining CFRP/aluminium composite materials combine the properties of a drill for machining aluminium with those of a drill for CFRP machining.

Consequences of the machining concept

The machine concept significantly affects the tool geometry. CNC applications on machining centres or portal machines are characterised by a high rigidity and stable machine control. As a result, the tool is very well guided in the bore. Applications with drill feed units, robots or hand-held machines are less stable and require tools with additional stabilising features for high accuracies.

Another special feature of drill feed units are the so-called "nose pieces", also called guide bushes. The chips are removed above the tool through the long and narrow guide bushes up to a suction channel that is located at the end of the guide bush. To be able to remove the chips, long chip spaces are required that must be correctly dimensioned and adapted.

The bores at the outer skin (fuselage and wing) are drilled with portal machines or robots. The inaccessible drill machining steps, mainly in final assembly, are then drilled with drill feed units or with hand-held drills.

Challenges of machining multilayer composite materials

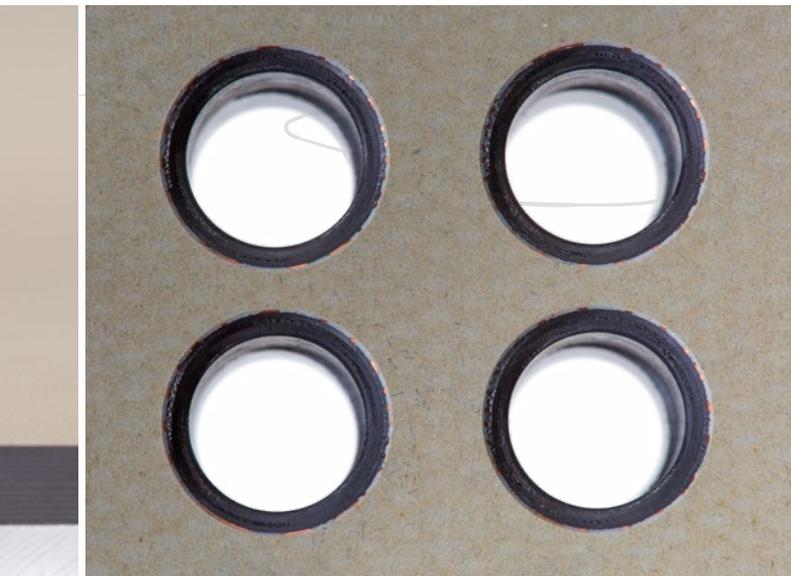
Along with the process and machine concept, the materials used have a significant influence on the tool design. Each material places individual requirements on the tool and process parameters.

The selection of the individual material combinations in aircraft construction depends on the loads that act on the part during flight operation. There is also generally always a focus on reducing weight.

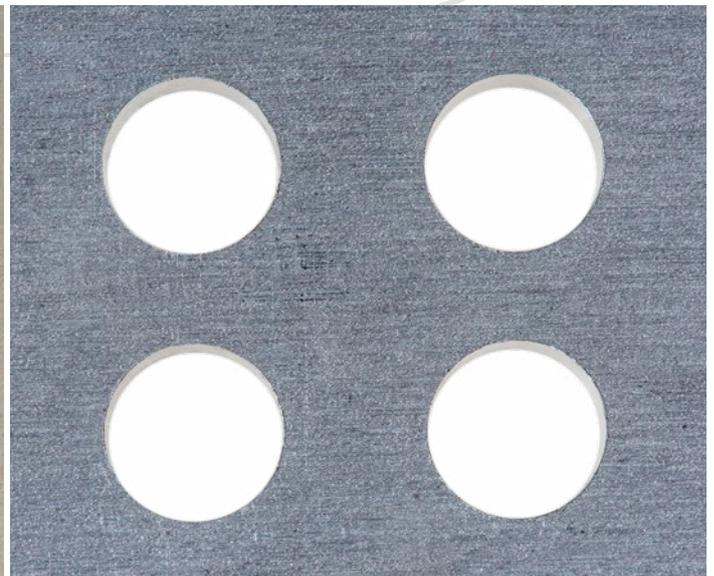
Tools for machining composite materials

The outer skin and ribs of the latest generation of aircraft consist primarily of a composite made of CFRP and aluminium. In addition, combinations made of different aluminium alloys or CFRP titanium are often used in the aerospace sector. The dimensional accuracy of the bores in this composite material is crucial. The bore must feature exactly the same diameter in both materials of the respective combination. In principle drilling always takes place from the outside to the inside. For example, the bore entrance and the countersinking is in the outer skin that consists of CFRP when machining CFRP/aluminium, and the bore outlet is in the structure underneath that is designed in aluminium. During the individual machining of CFRP and aluminium materials, the geometries of the tools as well as the cutting data are fundamentally different.

In contrast for CFRP-titanium combinations, tools with a cutting edge that is sufficiently stable are required to withstand the ductile titanium and simultaneously have the appropriate sharpness to cut the CFRP. Whether merely one boring process suffices to produce a bore or whether the bore must be subsequently reamed depends on the required bore tolerance for this material combination. →



A special CFRP with a copper mesh is often used in aircraft construction. Any delamination or fibre protrusions at the bore entrance are prevented with the MAPAL tool.



The machining result of the bore outlet in aluminium is also impressive – burrs at the outlet are kept to a minimum.

Tools for drilling composite materials made of different aluminium alloys, for example 7050 and 2024, do not need a wear-inhibiting coating. This is because the grades of aluminium used in aircraft construction contain no or very little silicon and can therefore be drilled virtually without wear. This multilayer composite is significantly different to composites that contain CFRP when machining.

Tools that are used for material combinations that contain CFRP are generally provided with a diamond layer. This counteracts the abrasion of the CFRP and enables long tool lives. Regrinding these tools is not possible as the diamond layer used has a very high hardness.

What has to be taken into account when designing the tools?

To ensure process reliability during machining, attention must be paid to the quality requirement, the material and the process for the design of the tool geometry. As the majority of bores in aircraft are produced with countersinking due to the rivets, the bore outlet is to be assessed more critically to exclude cost-intensive rework. De-

lamination and fibre projections must be prevented in CFRP material and burr formation in aluminium. Chip removal is also important for machining all individual materials as well as all composite materials.

If perfect chip removal is not ensured, the bore quality for dry drilling is significantly outside the required tolerances. However the biggest challenge for the development of a dry drill is the adaptation of the tool geometry to the unstable machining stable of the drill feed units in combination with cutting parameters and clamping systems (concentric collet).

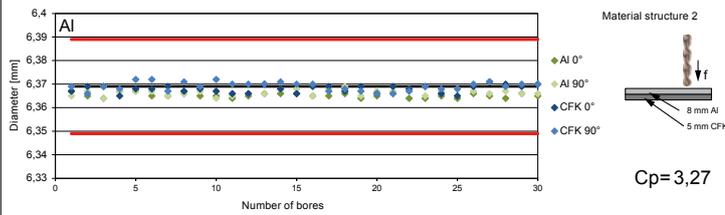
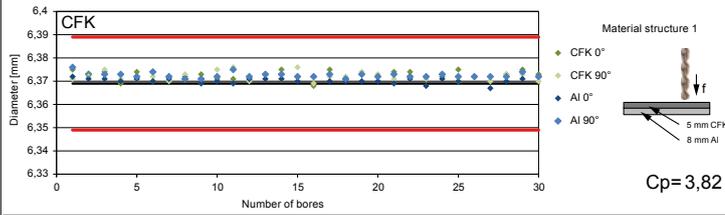
Drilling/countersinking tool for machining aluminium/aluminium combinations

MAPAL has developed a drill with countersink step for dry machining composite materials made of different or the same aluminium alloys. Burr formation is kept as low as possible and an improved centring is achieved thanks to the special geometry features. The coating of the drill prevents the formation of a built-up edge at the cutting edge. Specially formed chip flutes ensure optimum chip



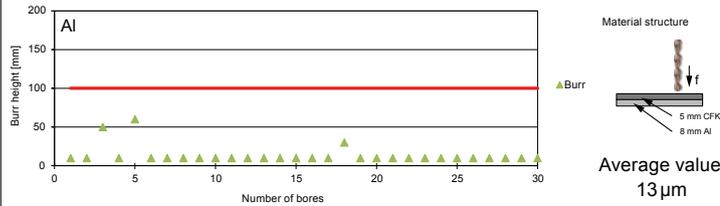
So-called nose pieces are used for additional stabilisation. These impede the removal of chips.

Surface layer diameter (CFRP/Al)



The bore diameter in the surface layer for machining CFRP/aluminium composite materials with the MAPAL tool are reliably within the specified tolerances.

Burr height at the outlet, lower layer (Al)



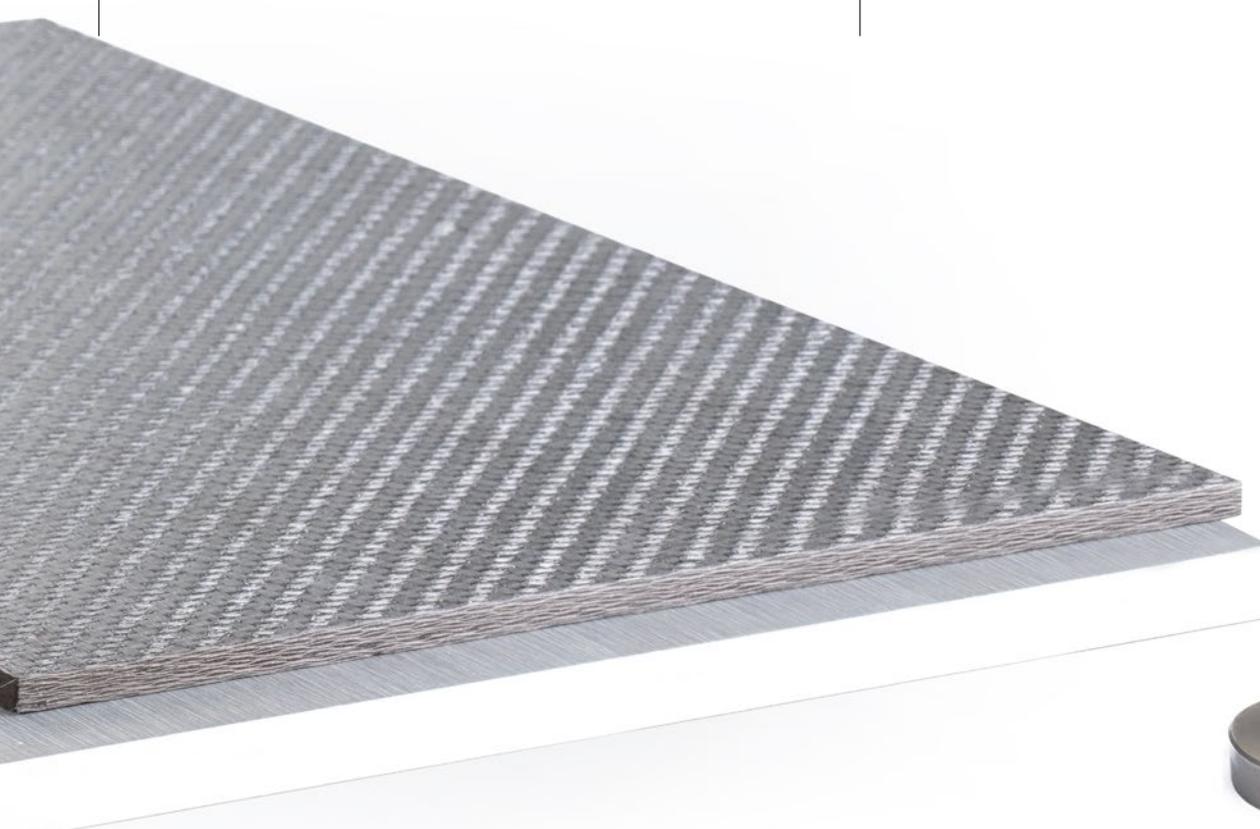
The burr heights at the bore outlet for machining CFRP/aluminium composite materials with the MAPAL tool are also within the specified tolerances.

removal. Air is used for cooling, preventing overheating of both the cutting edge and the aluminium and hence burr formation. The compressed air is also used to blow out the chips.

At one aircraft manufacturer, the drill is used i.a. for the bores on the longitudinal seam in the rear main span. A spindle speed of 2,959 RPM and a feed of 0.154 mm are applied here. The drill with its diameter of 4.748 mm and a 100° countersink step reliably produces 1,600 bores before the bores no longer lie within the demanded tolerance of 4.73 - 4.805 mm.

Drilling/countersinking tools for machining CFRP/aluminium combinations

To reliably dry machine composite materials made of CFRP and aluminium, MAPAL has also developed a drill with countersink step. The special geometry of the tool ensures that the heat caused by machining is not transferred to →



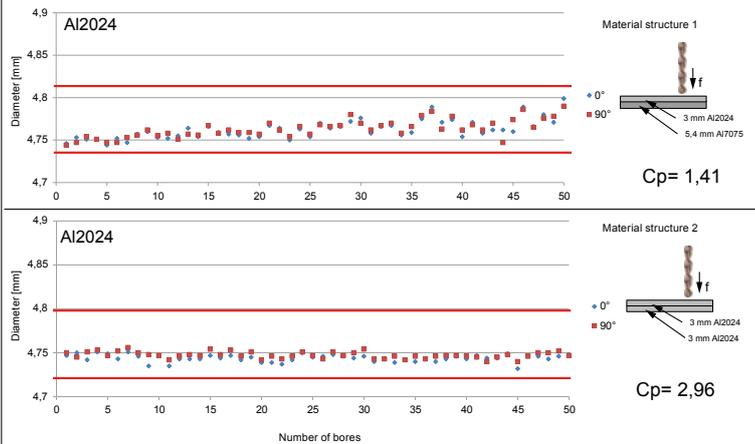
the part. In addition, neither part nor work environment is contaminated with coolant. The drill with two cutting edges made of solid carbide combines the properties of a drill for machining aluminium with those of a drill for CFRP machining. Reliable removal of the chips is ensured by the specially designed chip spaces. As CFRP is an extremely abrasive material, the drill is diamond-coated. This means that eight times the tool life is achieved compared with an uncoated drill.

The drilling/countersinking tool for dry machining CFRP-aluminium combinations has been successfully used by customers. A spindle speed of 5,000 RPM and a feed of 0.1 mm are applied. The tool impresses not only with regard to process reliability, tool life and machining result, but also because of the steady boring process. ■

SUMMARY

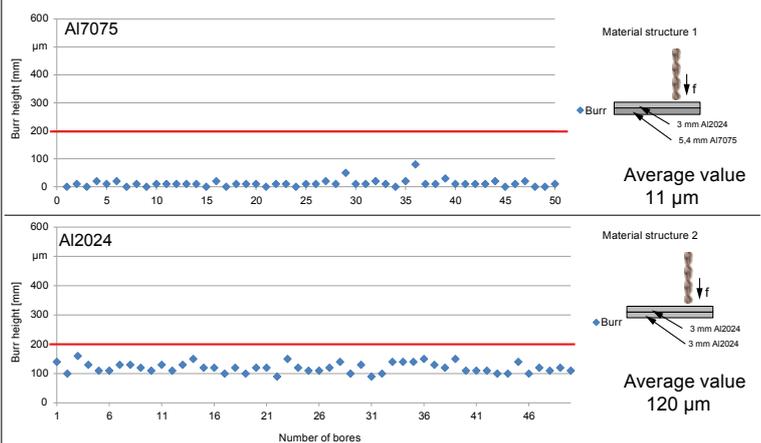
Different material combinations, narrow tolerance specifications and the low machine feed pose great challenges for tool manufacturers. With regard to automated manufacturing using robots, dry machining is also gaining more and more importance in the aerospace sector. In close cooperation with leading aircraft manufacturers, MAPAL has mastered these challenges and developed innovative drilling/countersinking tools for reliable dry machining of composite materials made of CFRP/aluminium and aluminium/aluminium. The specific design of the tool geometry with regard to the material combination, machine concept and drilling process in practice enables a significant increase in process capability as well as the tool lives. Bores outside of the tolerance as well as defects at the bore entrance and outlet are therefore a thing of the past.

Surface layer diameter (Al2024)



The bore diameter in the surface layer for machining aluminium/aluminium composite materials with the MAPAL tool are reliably within the specified tolerances.

Burr height at the outlet, lower layer (Al7075/2024)



The burr heights at the bore outlet for machining aluminium/aluminium composite materials with the MAPAL tool are also within the specified tolerances.



TRADE FAIR DATES 2018

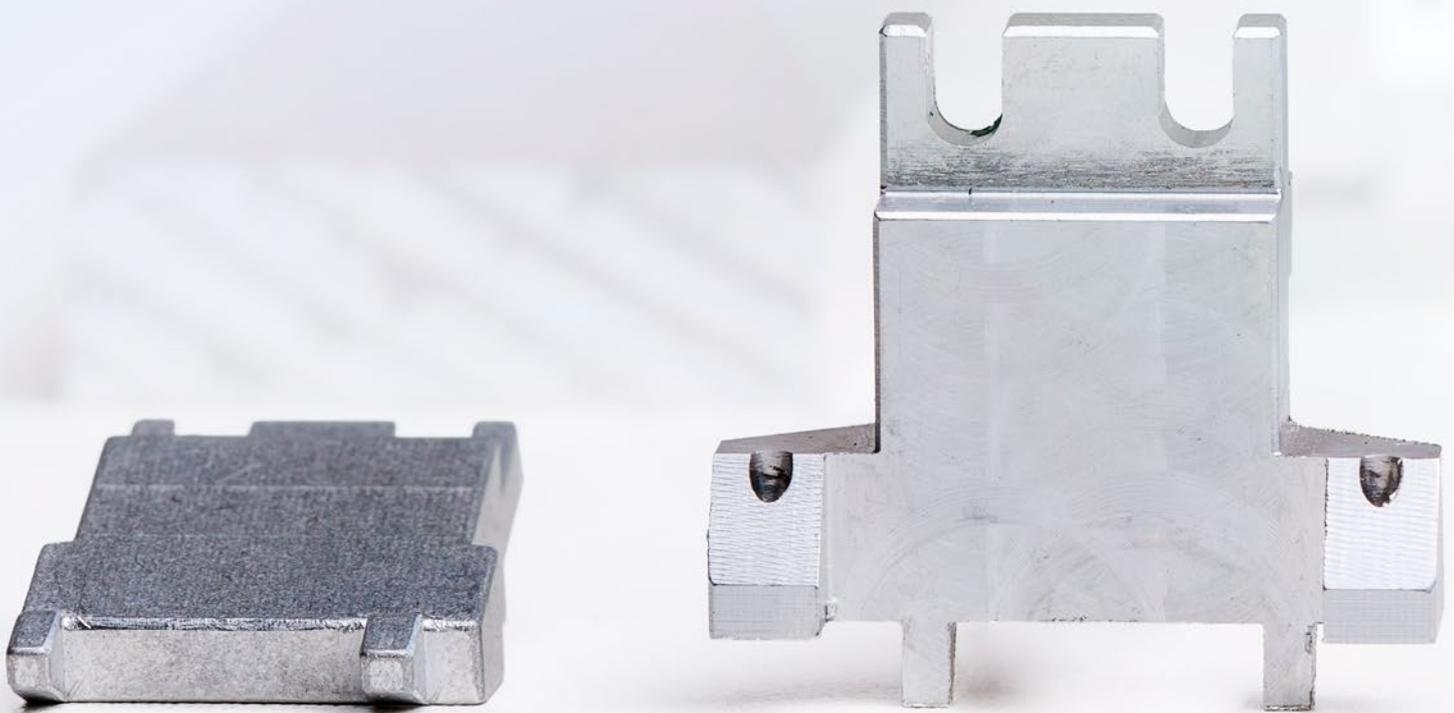
MAPAL will again be present at the international trade fairs with numerous new products and innovations in 2018. The trade fair teams look forward to the conversations with customers, journalists and people interested in machining.

16.-18. January	EUROGUSS	Nuremberg Germany
20.-24. February	METAV	Dusseldorf Germany
6.-8. März	JEC Show Composites	Paris France
6.-9. March	SIMODEC	Roche Sur Foron France
14.-17. March	GrindTec	Augsburg Germany
20.-22. March	FABTECH	Toronto Canada
22.-24. March	MECSPE	Parma Italy
27.-28. March	AeroDef Manufacturing 2018	Long Beach, CA USA
9.-13. April	CCMT	Shanghai China
9.-13. April	MACH	Birmingham Great Britain
14.-16. April	ISA Annual Convention	Baltimore, MD USA
17.-20. April	EXPOMAQ	Leon/Guanajuato Mexico
17.-20. April	SIAMS	Moutier Switzerland
24.-27. April	Control	Stuttgart Germany
15.-18. May	Intertool	Vienna Austria
10.-15. September	IMTS	Chicago USA
18.-22. September	AMB	Stuttgart Germany
2.-4. October	Aerospace Manufacturing & Automated Fastening conference & Exhibition	Charleston, SC USA
9.-11. October	Aluminium	Dusseldorf Germany
23.-45. October	SIANE	Toulouse France
1.-6. November	JIMTOF	Tokyo Japan
6.-8. November	Composites Europe	Dusseldorf Germany



re.tooling is worth it – even for small and medium-sized companies

THE MACHINING PROCESS SAFELY UNDER CONTROL



Stefan Plätzer Maschinenbau GmbH produces intricate robot grippers for an automotive industry supplier. Increasing batch sizes required reorientation of the production strategy.

re.tooling an existing production system can significantly contribute to the improvement of cost-effectiveness as well as productivity and the precision of a machining process. Particularly good results can be achieved when the tool, clamping solution and machining concept are precisely tailored to the machine and machining task. This is shown with the example of Stefan Plätzer Maschinenbau GmbH (Plätzer) that has increased the output of an existing machining centre from four to 30 parts per hour with the support of re.tooling services from MAPAL.

When Stefan Plätzer had the opportunity in spring 2011 to take over a small but excellent machine manufacturer in Eggolsheim, two factors were decisive to go into self-employment: The proven reliability of the company and the excellent quality of the manufactured product. Stefan Plätzer learnt the metal profession from scratch and was recently the operation manager at a renowned automotive industry supplier. With his own company, Stefan Plätzer took off. "As a small manufacturer of individual parts, small series and medium series, we can only survive on the market if we can continuously offer prices in line with the market", he says. Important factors for this include the machining processes as well as the tools used. However a wide variety of tools for drilling and milling are offered on the market. Often small metal processing companies do not have the time or human resources to explore their potentials for their own manufacturing

Quick access to new technologies

Here it may be worthwhile to bring a strong partner such as MAPAL on board that is right at the forefront with the development of the latest tool technologies. In addition, MAPAL has vast experiences in the design of machining processes and clamping concepts as well as the programming of machine tools.

Small and medium-sized companies that specialise in the manufacturing of individual parts, small series and medium series particularly benefit from these competences. This is shown by the current project from Plätzer. The company focused primarily on improving the machining time and the process reliability for the manufacture of two types of robot grippers. The customer of Plätzer uses these grippers to securely fix tiny ceramic parts so that they can be automatically shaped as specified with a grinding wheel. The tolerance specifications are correspondingly narrow: The parallelism and squareness deviation of the areas is limited to only 0.02 mm. →



Increasing production quantities require a more stable and efficient process

"Initially our order was to produce ten pieces of intricate aluminium grippers per month", explains Stefan Plätzer. "The monthly quantity required then increased to several hundred pieces over time. This could no longer be realised with our previous machining concept."

This concept was based on the use of conventional carbide drills and milling cutters. Four parts were milled from the solid and finish machined one after the other in three clamping setups. Machining took over one hour. Plätzer therefore had to split manufacturing on two machining centres.

Christian Sandmann, responsible Quality Manager at Plätzer, looks back. "Time and again, we had to make readjustments, make use of additional machine capacities and partly arrange overtime to be able to deliver the ordered amount in good time. This is not acceptable in the long run."

Halving the machining time: PCD instead of carbide

In this situation, the quality manager remembered his friend, Markus Meyer, who works at MAPAL as a Technical Consultant. At a company visit arranged at short notice, Meyer was presented with the machining process and identified a promising approach for the reduction of the productive time: changing from simple carbide to PCD tools that are characterised by significantly higher feed rates and tool lives.

In an initial step, the MAPAL sales representative suggested the use of two PCD milling cutters. The grippers were milled from solid. This is why the milling proportion and the saving potential for this machining task are high. Stefan Plätzer took up this suggestion. And with great success: Without additional optimisation measures, the machining time for one part was reduced from 15 to two minutes.

"We had stuck with the conventional technology for a long time. The tightly scheduled daily routine left us no room for a far-reaching evaluation of new technology", remembers Stefan Plätzer. "Since we have had MAPAL by our side, we benefit from the experience and innovation of the company and its employees, among other things. In this way, we can recognise and make use of optimisation potentials much earlier."

The quick way to a custom-made machining process

Stefan Plätzer was open-minded when Markus Meyer brought the retooling services for the complete gripper production into play, particularly to increase process reliability using new fixture. "For us it was important that the tools as well as the fixture could be used universally as far as possible, as we are primarily active in a segment that is characterised by single piece and small series production", says Stefan Plätzer.

After the appropriate concept was drawn up in close coordination, MAPAL received the order for its implementation. The service team

"As a small manufacturer of individual parts, small series and medium series, we can only survive on the market if we can continuously offer prices in line with the market."



Connected by friendship and career: Stefan Plätzer (m.), Managing Partner of Stefan Plätzer Maschinenbau GmbH with his comrades-in-arms for the implementation of optimum machining solutions, Christian Sandmann (l.), Quality Manager at Plätzer, and Markus Meyer, Technical Consultant from MAPAL.

of the tool specialist undertook all the required work: Starting with the design of the machining process including clamping chuck, the design and organisation of the fixture and the machine programming on site. Specialists from the tool manufacturer also completed the running in of the process.

re.tooling provides maximum efficiency and process reliability

The result is convincing: Plätzer now manufactures 24 parts in just 48 minutes with a significantly higher degree of precision and process reliability than before. The new fixture contributed significantly to the noticeable improvement in addition to the use of the PCD tools and a custom-made solid carbide step drill from MAPAL. The clamping fixture for the first gripper type has 24 clamping stations and the one for the second gripper type has 36 clamping stations. In addition the number of clamping setups was reduced from three to two.

The time saved is so great that production of both gripper types can be realised on just one machine. Plätzer has thereby gained four weeks of machine capacity for a production quantity of 800 pieces. These are now available for new projects. Stefan Plätzer explains: "If new projects are pending, we consult Markus Meyer if required and clarify whether MAPAL can support us in being able to accept the projects at prices in line with the market. During the consultation, we experienced several times that the sales are not decisive for MAPAL. It is important for the tool manufacturer to make us ready for the future so that we can progress further as partners." ■



After the planned and implemented re.tooling services project by MAPAL, Plätzer produces the quantity of robot grippers on one 5-axis machining centre, Spinner U-1520 type, in two weeks that was previously machined on two machines in three weeks.



Along with the change from carbide tools of various manufacturers to PCD tools from MAPAL, the use of a tower with 24 clamping stations noticeably increased the through-put and process reliability.



MAPAL USES THE SUSTAINABLE BONDERITE DUALCYS PROCESS FROM HENKEL

The synergy of coolant and cleaner saves costs and is environmentally friendly

MAPAL relies on the Bonderite dualCys process from Henkel in the production of special tools for machining drill bits for the mining industry. The synergy between the water-soluble coolant and the water-based cleaner leads to a significant performance improvement with less lubricant and energy consumption as well as reduced disposal expenditure. The procedure was perfectly tailored to the specific application in close cooperation with both companies.

"We have been successfully working together with Henkel for many years. We first used the new Bonderite dualCys procedure for machining with special tools with which an Australian end customer then manufactured drill bits for the mining industry," says Andreas Rotenberger, who works in the Research & Development department at MAPAL. The drill bits have up to 200 bores in which the hardened steel pins can be glued into place. Normally the coolant used for machining must first be removed from each of these bores with a solvent. In contrast, with the Bonderite dualCys process, the bores only have to be blown out.

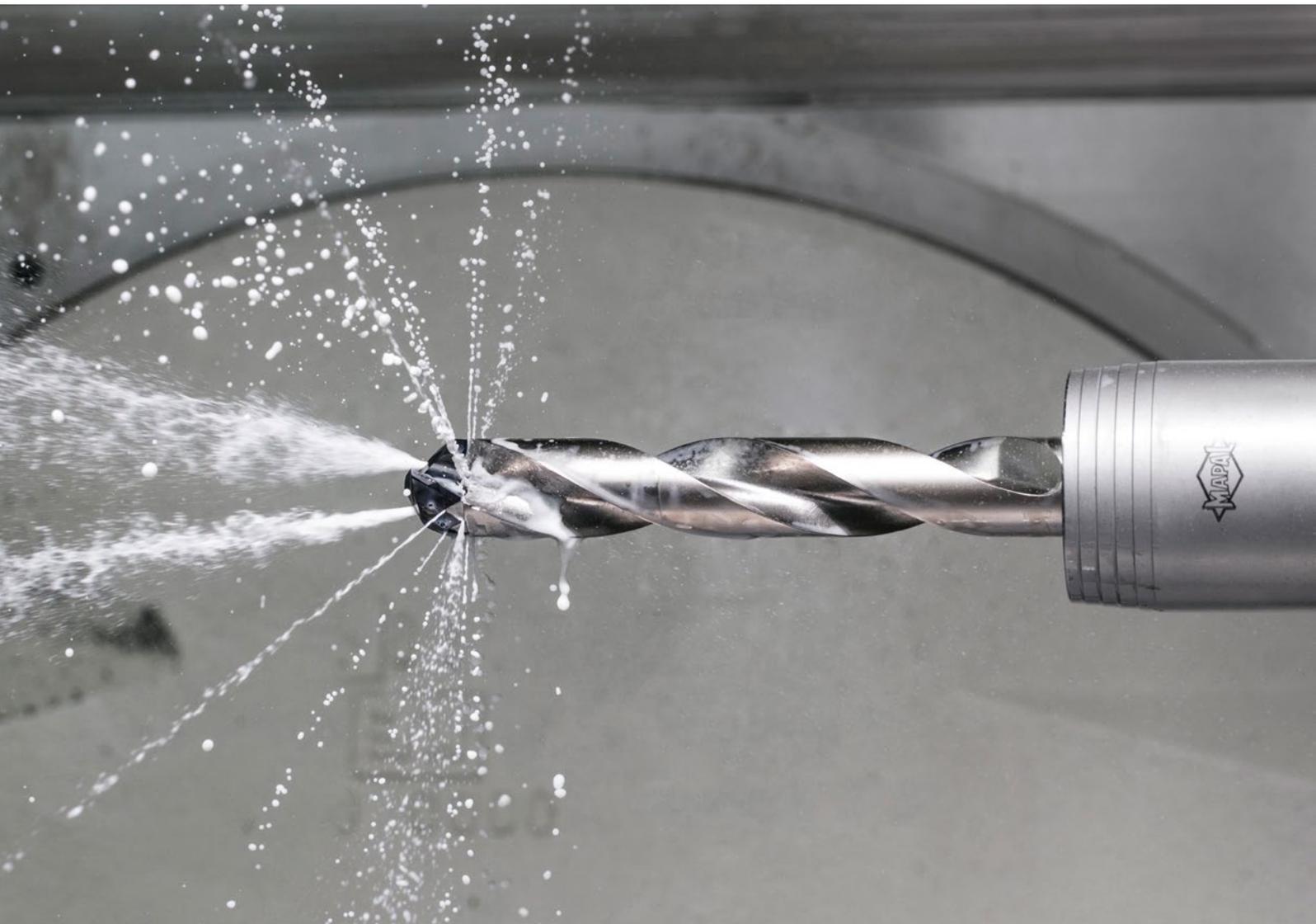
"Many of our customers are attaching increasing importance to the cleanliness of the work room and are placing high demand on simple cleaning of the components after machining so that no manufacturing bottlenecks arise at this point", explains Jürgen Schöllkopf, Project Manager of lubricants at Henkel Adhesive Technologies. "The properties of the lubricant play an important role for this. On the one hand, it must ensure a high lubrication capability during machining and on the other hand it must not make subsequent degreasing of the parts difficult." →



Tools and clamping chucks from MAPAL for manufacturing drill bits for the mining industry.



From left: Jürgen Schöllkopf, Project Manager of lubricants at Henkel, and Andreas Rotenberger from MAPAL.



The use of dualCys dispenses with the use of solvents otherwise required for degreasing and subsequent adhesion of the components.

To test the Bonderite dualCys process from Henkel, MAPAL tested the performance of the procedure at its research and development centre in Aalen with constantly changing components, machining situations, procedures and materials. **"The results are entirely convincing. The drag-out of the coolant could be reduced by over 50 percent,"** emphasises Rotenberger. Along with lower emulsion consumption, energy savings were achieved as the cleaning bath can be operated at lower temperatures. "At the same time we produced absolutely clean parts – with reliable reproducibility and significantly faster than previously", says Rotenberger.

Real benefits

Bonderite dualCys combines the advantages of Bonderite L-MR 21466 lubricant with those of Bonderite C-NE 10466 neutral cleaner. The water-soluble lubricant is an extremely finely dispersed, bactericide-free and boron-free product with a high lubrication capability and excellent flushing performance that already acts as a prewash during machining. Its micelles (emulsion droplets) are 1/5 to 1/10 smaller than conventional, largely dispersed lubricants and can be precisely set. The cleaner is already active at room temperature (recommended operating temperature 45 °C), is suitable for common spraying and immersion applications and does not require any boron or formaldehyde additives for degreasing.

What's more: Instead of disposing of the cleaning bath as for standard procedures, it can be completely recycled in the lubricant without affecting the performance. Overall the components of the Bonderite dualCys process are characterised by a low, stable and predictable foam formation for common levels of water hardness. They are suitable for most ferrous and non-ferrous materials – including aluminium, aluminium alloys and titanium compounds as well as grey cast iron materials and steel alloys – and provide excellent corrosion protection. When used by MAPAL, the procedure has also proven to be an ideal solution for reaming aluminium and titanium.

The machined surfaces are much drier and less oily than for standard procedures so that less lubricant is dragged out. This reduces the typical refill rate of the emulsion from 2 to 0.4 percent, whereby the first coating is up to two-thirds less. In addition the process contributes in keeping the machines cleaner and drier. The high flushing efficiency leads to the fact that the metal chips that are discharged via the chip conveyor are drier than with conventional procedures. This makes disposal more economical and contributes significantly to sustainability.

Quick amortisation

As an alternative to conventional systems, Bonderite dualCys can be used in existing systems without changes or additional investment so that it quickly pays for itself. "Overall, changing to the Bonderite dualCys process brings about a cost saving of up to 40 percent", says Schöllkopf. "We also offer a corresponding added value calculator to quantify efficiency based on customer-specific configurable process parameters. The customer immediately sees which savings are possible."

Andreas Rotenberger concludes: "Our customers expect innovative and reliable tool concepts for the best economic manufacturing with less reworking. This requires us to be able to support them as a qualified technology partner in all areas concerning the machining process. As a competent solution provider with economic and sustainable products such as Bonderite dualCys, Henkel is an important partner for us as part of this strategy."

Bonderite is a registered trademark of the Henkel Group with protection in Germany and other countries. ■



The Bonderite dualCys process makes cost savings of up to 40 % possible with simultaneous superior sustainability compared with conventional solutions for machining and cleaning in metal machining.

ABOUT HENKEL

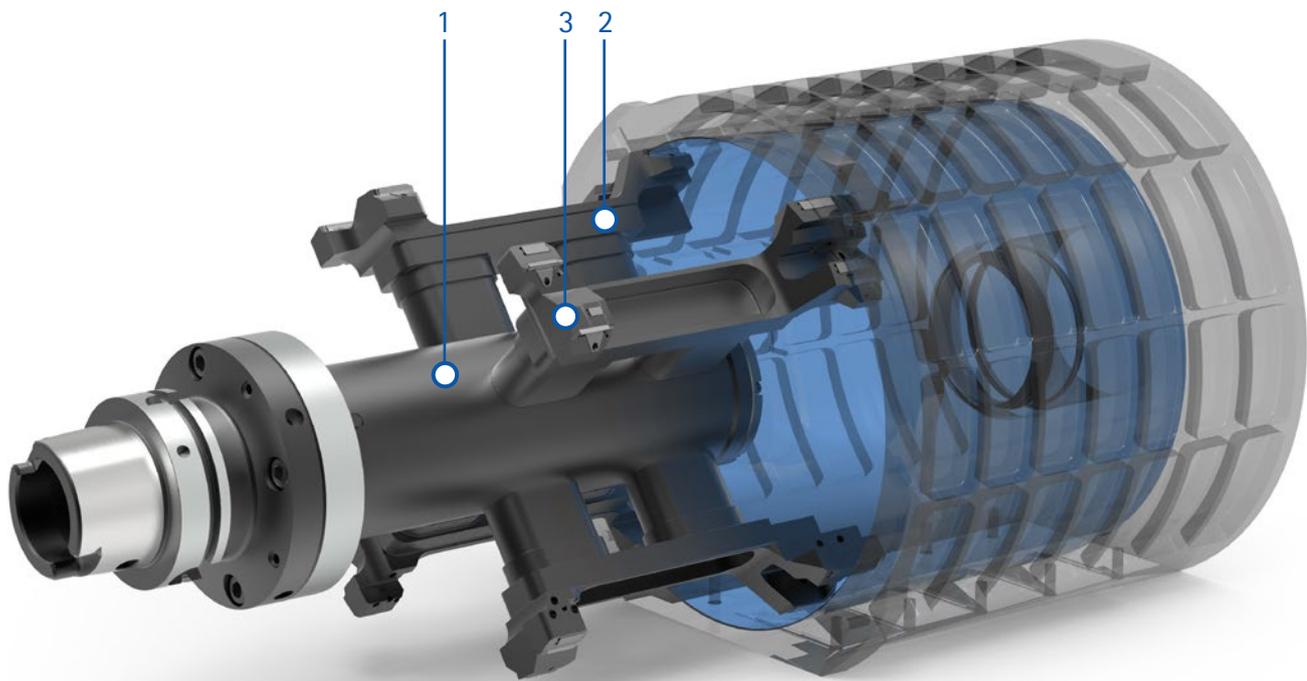
Henkel has a well-balanced and diversified portfolio throughout the world. With strong brands, innovations and technologies, the company holds leading market positions with its three divisions – both in industry and consumer business: Henkel Adhesive Technologies is a global market leader in the adhesive sector. With the Laundry & Home Care and Beauty Care divisions, the company is also a leader in many markets and categories. Henkel was founded in 1876 and looks back on a success story spanning 140 years. In the financial year 2016, Henkel had a turnover of 18.7 billion Euro and an adjusted operating profit of 3.2 billion Euro. The three top brands Persil, Schwarzkopf and Loctite alone achieved a turnover of more than 6 billion Euro. Henkel employs more than 50,000 staff worldwide that make up a diverse team – connected by a strong company culture, a common corporate purpose and common values. The leading role of Henkel in the field of sustainability is confirmed by many international indices and rankings. The preferred shares of Henkel are listed in DAX. www.henkel.de.

MAPAL SPOTLIGHT

Tool solutions for e-mobility machining stator housings

MAPAL transfers its many years of experience in machining transmission cases directly to innovative housings for electric motors. The tools are particularly lightweight for machining the mostly thin-walled, unstable housings. A tubular design serves as tool body, making the tool extremely light but

also very stable and rigid. The carriers of the inserts, and for fine machining tools also the guide pads, are welded on and support one another by means of connecting ribs. The welded designs have only half the weight of a conventional boring bar.



THE MOST IMPORTANT FACTS:

- Lightweight tool solutions
- Reliable machining of bores with a large diameter (> 250 mm)
- Highest accuracy thanks to guide pads
- Low-vibration machining even for extreme length to diameter ratios
- Short machining times by using combination tools
- The complete process from a single source

- 1 | Tubular design of the tool body – Lightweight design and stability combined
- 2 | Welded carriers for the inserts and guide pads, mutual support by means of the connecting ribs
- 3 | Finely adjustable PCD-tipped indexable inserts as well as guide pads