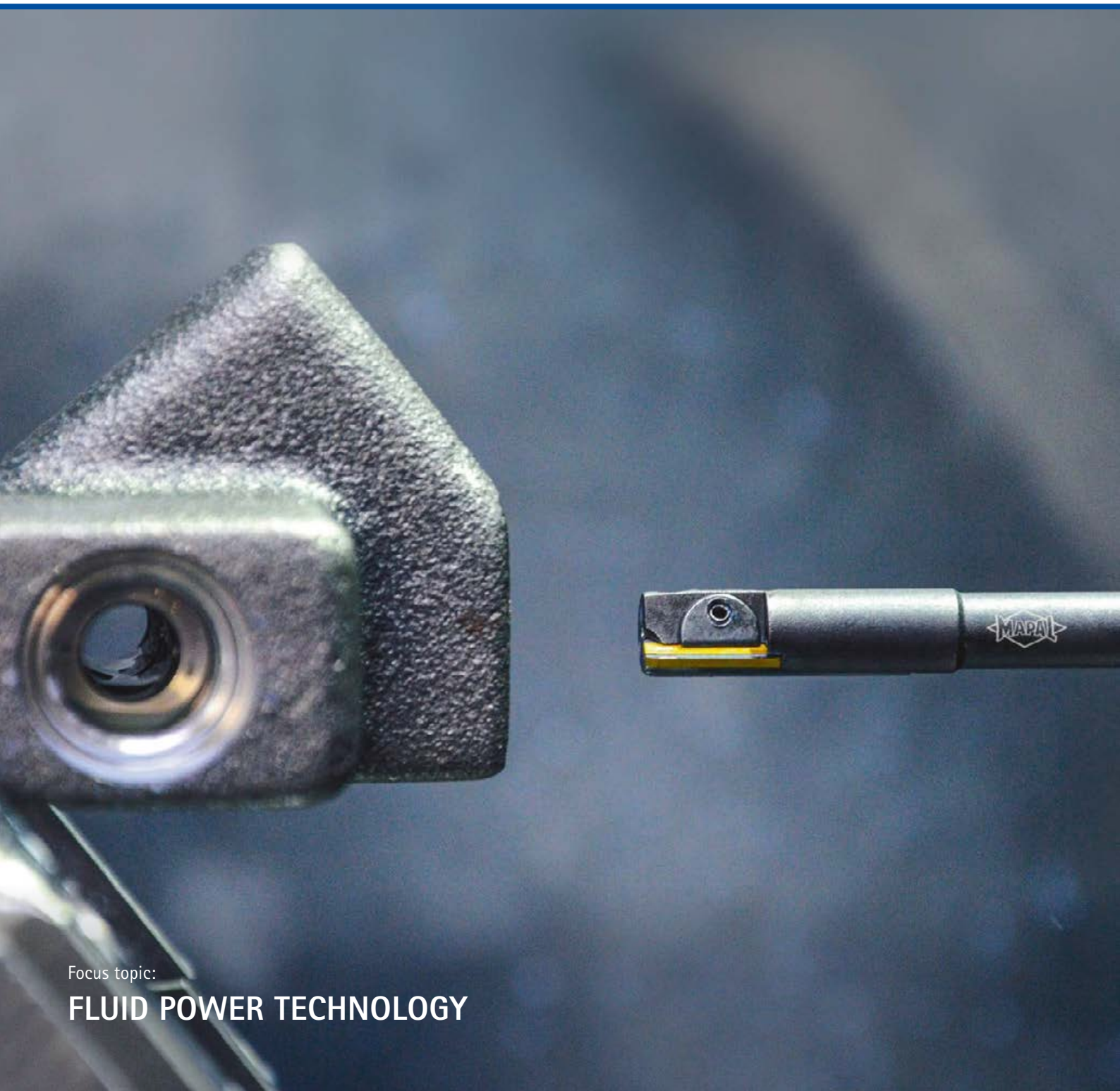




IMPULSE

MAPAL TECHNOLOGY MAGAZINE | EDITION 81



Focus topic:

FLUID POWER TECHNOLOGY

**Dear Business Partners,
and Readers,**

acting sustainably when doing business, producing and taking responsibility for the benefit of our customers and employees is a matter close to my heart. We have a duty to future generations, and as a family business we consider this to be particularly important. That is why we have proactively addressed many issues throughout the MAPAL Group and are also taking unconventional approaches to make our manufacturing more sustainable. We are nowhere near the finish line. But we have clear ideas that we are working towards with everything we can muster. In addition to what we can do in our own area of responsibility, we additionally focus on how our customers' manufacturing. With innovative tools and chucks that take into consideration the issues of energy efficiency, resource conservation and safety, we help our customers to make their production more sustainable. You can take a look at some examples of sustainable developments for yourself below.

In this issue of IMPULSE, we also present the fluid power market segment in more detail. With the areas of hydraulics, pneumatics and process engineering, fluid power is one of the most important supplier sectors for all industrial production. The products are used in a

wide range of markets. High-precision machining characterises the focus components of fluid power technology, and MAPAL solutions have been used here for many years. Today, comprehensive machining packages are available for important components, which are geared towards specific manufacturing situations and customised through close coordination with our customers. I am delighted that we have been able to strengthen our cooperation with you, our customers, in this market segment.

Our development activities are aligned with the requirements of our focus markets. We address the specific needs of our customers and support them in their current and future machining challenges through smart innovations and process solutions in order to increase productivity and economic efficiency. With this in mind, we are already looking forward to EMO and to meeting you at our exhibition stand in Hall 4, Stand A18, from 18 to 23 September, where we will be presenting you with our innovations and machining highlights and discussing them with you in more detail.

Have a good read!

Yours,

Dr Jochen Kress



FROM THE COMPANY



Particulars
Pages 6-7

MAPAL moves into
new building in Komornikii
Pages 8-9

Interview: Jacek Kruszynski
Faster thanks to structure
and agility
Pages 10-13

In dialogue
Impressions of customer events
Pages 14-15



New representation
in Denmark
Page 16

Up-to-date online
Pages 46-47

SUSTAINABILITY



New laser hardening system for
series production
Pages 17-19

MAPAL India's
Green Field Facility
Pages 20-21

Reaming mid to large
diameters with reduced
carbon footprint
Pages 22-23



CONTENTS

FOCUS TOPIC FLUID POWER TECHNOLOGY



24

Sound market segment
management
Pages 24–27

Highly economical machining of
hydraulic valve housings
Pages 28–31

Controlling, regulating
and moving fluids
Pages 32–35

In focus:
The axial piston machine
Pages 36–37



28



32

PRACTICE REPORTS



38

c-Com at thyssenkrupp Presta AG
Schönebeck GmbH
Pages 38–41

SME Aerospace Malaysia puts
MAPAL tools to good use
Pages 42–45



42

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MARK LICH

GLOBAL HEAD OF SALES MANAGEMENT OFFICE |
MAPAL AALEN

Mark Lich (born 1988) became Global Head of the Sales Management Office (SMO) on 1 January 2023. The task of the SMO is to support the MAPAL Group's strategic sales management in achieving its global growth and efficiency goals.

Lich studied engineering management and joined MAPAL at the end of 2013. He gained professional and managerial experience in various sales departments. Lich assumed the role of Driver for Initiative 1 (increasing market share in existing sectors) as part of the 2021 stability programme. From 2020 to 2022, he was Regional Sales Manager in Southern Germany. In his new role as Global Head of Management Office, Lich reports directly to MAPAL Group CSO Siegfried Wendel.



PARTICUL



MASSIMO ROMANIELLO

KEY ACCOUNT MANAGER | MAPAL AALEN

In May 2023, Massimo Romaniello took on the role of Key Account Manager for the BOSCH Group. In this new role, he will assist and support the technology transfer between the Bosch sites in Germany and the international subsidiaries. He reports to the Sales Director for Germany, Austria, Switzerland and Hungary, Frank Stäbler.

The 49-year-old last worked as a tool specialist in the Tool Technology department at the MAPAL Centre of Competence for PCD Tools in Pforzheim. He has been active in the tool industry for many years. "The new assignment excites me because it combines many elements", says Romaniello. He wants to sustainably expand the relationship with the BOSCH Group, especially for the future trends of e-mobility and the energy transition.

DIRK MENZEL

KEY ACCOUNT MANAGER | MAPAL AALEN

Dirk Menzel (born 1977) has been Key Account Manager for the Volkswagen Group since September 2022. He succeeds Uwe Homann, who has taken on a full-time role as Chairman of the Works Council at the Aalen plant.

Menzel has worked for MAPAL since 2002. As an application engineer, he first supervised the VW factory in Salzgitter, Germany. He was designated Technical Advisor and became supervisor of the VW factory in Hanover and for regional customers in northern Germany and North-Rhine Westphalia in 2009. He gained international experience while deployed at VW factories in China and Poland. He reports to Frank Stäbler, Sales Director DACH-HU and is looking forward to being the contact person for the entire Volkswagen Group.

ARS



MAPAL MOVES INTO NEW BUILDING IN KOMORNIKI



Symbolic ribbon cutting, from left: Aleksander Zielonka (CEO MAPAL Polen) and Dr Jochen Kress (President MAPAL Group)

MAPAL Narzędzia Precyzyjne (MAPAL precision tools) in Poland got a new head office. MAPAL acquired a 5,000 square metre premises in Komorniki, not far from the previous site in Poznań. A modern and generously equipped office building has been erected there.

To mark the grand opening of the new site in March 2023, Dr Jochen Kress, President of the MAPAL Group said: "Our business in Poland has developed brilliantly over the past 25 years. Demand for our products has steadily increased and it makes us proud that we are taking on a leading role as a tool supplier and service provider in Poland especially in the area of tool management. Of course, we also owe this to our competent team on site, which takes excellent care of our customers and ensures the smooth running of the manufacturing processes." MAPAL has now paved the way for the future with the new building. Dr Kress explains: "We are going to become even more involved in the E-mobility, Aerospace, Die & Mould and Fluid Power market segments with product programmes that focus on application and are going to expand our presence in these sectors."

The new MAPAL office building at the Komorniki/ Poland site. Numerous guests attended the opening.



Modern equipped offices



Aleksander Zielonka (CEO MAPAL Poland) on a tour of the facility. Photos document the building process of the new facility.



The conference rooms with flexible partitions



Dr Jochen Kress (President MAPAL Group) talking to employee Ewa Jaworska and Dr Ryszard Raczyk (former Managing Director Gallo-Ex)

MODERN OFFICE BUILDING WITH CUSTOMER SHOWROOM

MAPAL employs 72 highly qualified specialists in Poland, including 31 engineers. Aleksander Zielonka, CEO of MAPAL Narzędzia Precyzyjne, explained at the opening ceremony: "It was a great decision to expand our available space. We now have sufficient resources in Komorniki to expand our activities. We can also provide our employees with a very appealing work environment where they feel comfortable and can continue to develop." The two-storey building covers an area of almost 850 square metres. It has modern office spaces, conference rooms and social areas, its own logistics and storage areas as well as a well-equipped showroom for the customers. MAPAL has invested around two million euros in the new site.

WITH ITS OWN BRANCH OFFICE SINCE 2002

In Poland, the company serves the production plants of international automotive and mechanical engineering manufacturers, among others. A collaboration with the commercial agency Gallo-Ex in Poznań that began in 1996 led to its takeover in 2002. Since 2005, the branch office has been trading as MAPAL Narzędzia Precyzyjne. In 1999 MAPAL received a major order in Poland from a diesel engine manufacturer in Tychy, and in 2004 it took on its first tool management project for the VW plant in Poznań. MAPAL reamers entered the Polish market as far back as the 1970s. At the time, the buyer was one of the largest ship engine manufacturers in the country.

TOOL RECONDITIONING AND REGRINDING SERVICE

The subsidiary has cooperated with the affiliated company MAPAL C & S in Mladá Boleslav, Czech Republic, for many years. MAPAL C & S is responsible for repairing PCD and solid carbide tools for customers in Poland. MAPAL Narzędzia Precyzyjne also maintains a close working relationship with the headquarters in Aalen, the Centres of Competence in Germany and the plant in Italy. ■

FASTER THANKS TO STRUCTURE AND AGILITY

As Chief Technology Officer, Jacek Kruszynski has been responsible for product and market segment management as well as research and development since October 2021. The editorial team at IMPULSE spoke to the Chief Technology Officer about structures, development priorities and plans in the field of digitalisation.

Mr Kruszynski, you have restructured MAPAL's Product and Market Segment Management and put it on a new footing. How has the new structure been received in the market? Are the projected benefits apparent yet?

The new structure has meant that our strategic orientation is clearly visible in the market, including for potential new customers. In this way, we can clearly show which areas and applications we are involved in, which contacts we have for the strategically important topics, and we highlight our high level of competence in the focus segments. In Product and Application Management, the focus is on products and applications where we can leverage our core competence – i.e., project planning and application-based solutions for cubic parts, for die and mould making and for complex materials, as we see in the aerospace industry. Product and Application Management receives concrete requirements from Market Segment Management. The close links of the new structure are paying off both internally and externally.

An important goal was to become significantly faster, for example when configuring tools or whole machining processes. How did you achieve this goal?


The requirements of individual markets and regions, and of individual customers in a region, vary considerably in terms of product volumes and quality requirements. The costs of a machining solution also play a role. We based our

Basic Performance Expert classification on this requirements matrix, which we use to envisage application- and customer-specific machining solutions to a certain degree. With this approach, we meet our customers where they are in terms of production volume and quality requirements.

Incidentally, this classification has been in place for years for catalogue products. Carrying it over to components reflects our expertise in terms of customer-specific solutions. A basic solution is, put simply, designed for small series, for prototype production. However, this certainly doesn't mean that the machining solution is "simple". Of course, many standard tools are used here with the associated cost benefits. A highly complex custom tool used in the expert solution for mass production with high quality standards would never pay off in such a case. The classification provides a basic framework that our technical advisors can use to address specific needs.

MAPAL presented the Basic Performance Expert solutions on the stator housing for electric motors last year. Does this portfolio of sample solutions also exist for other parts?

Yes, absolutely. We use this approach for many focal components where we see corresponding quality requirements, production quantities and cost targets. For example, in fluid power for valve housings or control blocks. →

A man with glasses, wearing a dark blue suit jacket over a light blue button-down shirt, is seated at a dark, reflective conference table. He is gesturing with his hands as if speaking. The background is a bright, out-of-focus office environment with large windows.

"MAPAL's focus has always been and will always be on the customer."

Jacek Kruszynski, Chief Technology Officer

What are the advantages of this classification? For the customer? And for MAPAL?

Our customers benefit from the fact that we are considerably faster at preparing quotes. The proposed tools are already fully developed and qualified. Moreover, the internal processes are also standardised to a certain degree, which leads to further time savings when developing customer-specific solutions.

MAPAL has always been known for getting the most out of "the last µm" for the individual customer. Does this new approach make the old one obsolete?

Not at all! MAPAL's focus has always been and will continue to be on the customer. Our highly trained technical advisors have a deep understanding of customer processes and are first and foremost on hand here. Across market segments and components, there is a trend towards producing components with ever greater precision in order to minimise waste and also save energy. Therefore, even with the basis provided by our Basic Performance Expert classification, we are still challenged to get the most out of the famous last µm with our team on site, who are ideally equipped for this.

How are MAPAL's focus markets developing?

In the automotive field, particularly e-mobility and chassis & brakes, we believe we're on a very good path. Our figures in correlation with market data confirm that we continue to gain market share. In aviation, the drilling and milling of CFRP materials is developing very positively. As for die and mould making, this was a field we had to really explore from scratch. We're on the right track and our performance is clear, but there's definitely room for improvement here. Finally, in the fluid power technology sector, which for us at MAPAL is like going back to our roots seeing as MAPAL started with these types of machining, we're making notable progress.

What are the current development priorities?

The focus in terms of development is as ever on applications for the field of "New Mobility". Nevertheless, we certainly aren't neglecting applications for our traditional core business in the automotive sector, where we also continuously launch innovations. The workpiece materials of aluminium, titanium and CFRP are a further priority in development activities, as will become apparent this year in new product ranges for aluminium machining in the automotive and aerospace industries. Not to mention deep drilling and precision bore machining.

In addition to a focus on process solutions for specific parts, MAPAL has consistently established and expanded its standard portfolio in recent years. There is now an online shop with a range of products in stock. Why was this a vital step and what is your objective with standard products?

An application-based solution, also known as a custom tool, is very often a time-saver and simplifies the machining process. Standard tools might not have the same complexity, but often bores or surfaces can also be machined with standard tools. They therefore have to be available in sufficient quantities. We have consequently defined a range of products in stock and added an online shop. This range will be expanded further – but rather than arbitrarily, this will be in line with our application portfolio and focus components. We're not going to become a full-range supplier by any stretch of the imagination. But we provide the complete range for our core components in a way that meets market needs.



Standard tools supposedly make manufacturers directly comparable. How does MAPAL still impress?

We don't shy away from comparisons. We know where we stand and what we can do. At the end of the day, it's always a question of value for money and cost per part. Our diversified offer with Basic, Performance and Expert solutions therefore also plays a role in this regard. We're guided by benchmarks in all areas, and sometimes we are the benchmark ourselves. Being compared and measured is part of it, especially as a technology leader. We accept the challenge with confidence.

In addition to customer-specific and standard tools, digital, data-based tools and solutions are now a vital third dimension that every tool manufacturer has to have. How great is this challenge? And how does MAPAL deal with it?

We are of course working hard on digital solutions for our customers. In addition, we're pushing ahead with increasing efficiency in our own production through digitalisation and automation. Providing a digital platform to discover a

brand and its products is a requirement of today's markets. This is also the case in our sector and has a big impact. There are many digital solutions nowadays. But in my opinion, there are hardly any "easy-to-use" solutions on the market. Of course, online shops and selection guides exist. MAPAL itself provides software solutions for tool management via c-Com, where we monitor the logistics and circulation phase as well as draw conclusions to optimise tools. When it comes to comprehensive solutions though, there's actually still plenty of room for improvement. These assume that customers are willing to open up their production facilities to us or, more generally, to suppliers, and that they are prepared to enter into in-depth partnerships.

The basic prerequisite for everything digital is, of course, the database. It has to be right. All of our products have to be ready for digitalisation. Various formats and platforms play a role. Due to the importance of this issue, we've recently created the new Product Automation department, which takes care of all matters relating to the digitalisation of our products and structures, and creates and maintains the digital twin across the individual processes. Incidentally, we have been able to fill many of the advertised po-

sitions in-house. I'm particularly pleased about that. We have these specialists at various sites in our organisation, who also know MAPAL and can work productively straight away. As a result of pooling resources and skills, I hope to see lots of synergy and an acceleration in this area.

What are your objectives for the next five years?

I absolutely want to achieve our goal of being number 1 in New Mobility in the next five years, providing solutions quickly and reliably. It's also important that we continue to tangibly increase customer satisfaction. I'd also like to have a digital environment in five years where our technical advisors and engineers can prepare even more targeted offers. Looming over all these goals is the quest to significantly increase our agility.

Thank you for the interview. ■



IN DIALOGUE

Impressions of customer events, trade fairs and other events in the first half of 2023



9 FEBRUARY 2023 | MAPAL TECHNOLOGY DAY | COLOGNE

Over 60 customers and interested parties attended the MAPAL Technology Day West at the premises of TOYOTA GAZOO Racing Europe on 9 February 2023. The MAPAL team showcased trends and new developments and also demonstrated the performance potential live. Visitors very much enjoyed the

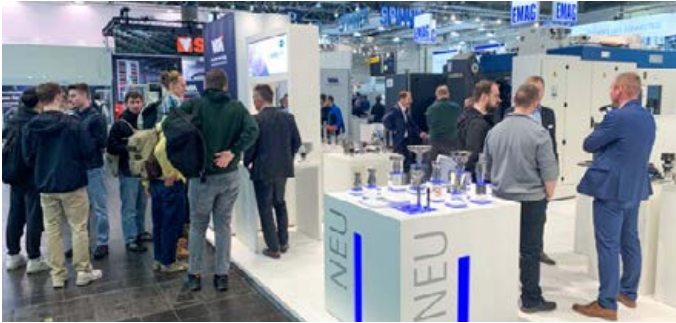
varied event as well as the tour of the manufacturing area and the visit to the TOYOTA motorsport museum.



23 FEBRUARY 2023 | MAPAL OPEN HOUSE | QUERÉTARO, MEXICO

The team at MAPAL Frhrensa welcomed around 50 customers and interested parties to the Open House event at MAPAL's Mexican subsidiary in February 2023. Visitors were able to experience MAPAL's broad expertise in small groups. Specialist presentations on the focus sectors thus led to intensive discussions

and a lively exchange. The Querétaro site was set up in 2018 and focuses on reconditioning PCD tools and regrinding solid carbide tools. Visitors had the opportunity to go on tours of the factory to check out the ultra-modern equipment and manufacturing facilities.



7-10 MARCH 2023 | INTEC | LEIPZIG

"The INTEC was very successful with lots of interesting leads and numerous new customer contacts", sums up Area Sales Manager Andre Ranke. "Die and mould making was a particular focus at the trade fair, as was electric mobility." The live machining on the exhibition booth also attracted a lot of attention.



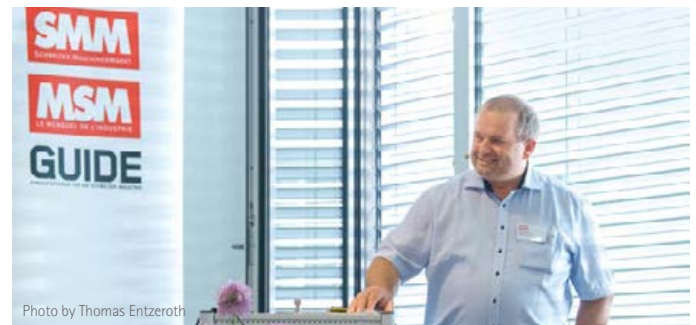
11-14 MARCH 2023 | INNTEQ | BERN

Those responsible also responded positively to the INNTEQ in Bern, as highlighted by Area Sales Manager Andreas Mollet: "We had technically in-depth discussions, were able to develop our contacts as well as win over interested parties with our solutions."



23 MARCH 2023 | MAV INNOVATIONSFORUM | BÖBLINGEN

The presentation "Basic Performance Expert solutions – always the right solution for stator bores in e-drives" by Matthias Winter, Global Head of Segment Management Automotive, received a lot of positive feedback at the MAV Innovationsforum congress. Topics regarding MAPAL's solution portfolio for electric mobility were discussed and delved into in face-to-face conversations at the exhibition stand.



1-2 JUNE 2023 | SMM TECHNOLOGY DAYS | SEON

Andreas Mollet, Area Sales Manager Switzerland, gave a talk at the SMM Technology Days at Fehlmann AG in Seon on the topic "When it has to be precise and reliable – external reaming and fine boring with tools with guide pads from MAPAL"



21-24 MARCH 2023 | OPEN HOUSE GROB-WERKE GMBH & CO. KG | MINDELHEIM



10-12 MAY 2023 | OPEN HOUSE CHIRON GROUP SE | TUTTLINGEN

NEW REPRESENTATION IN DENMARK

MAPAL extends the long-standing partnership with Edeco Tool

Since February 2023, Edeco Tool ApS has been the official sales representation of MAPAL in Denmark.

Edeco Tool ApS is already a long-standing partner of MAPAL and has been working successfully with various centres of competence of the company group. Due to these good relationships, the management of MAPAL decided to give Edeco Tool ApS the official representation for Denmark.

Edeco is active in various areas of industry. The company serves customers in the automotive and mechanical engineering sectors, as well as die and mould making, the energy sector and the aerospace industry.

Armin Kasper, Vice President Representatives: "We are pleased to have found a strong and well-established partner with Edeco Tool ApS. Due to its organisational structure, as well as its technically experienced staff, we can ensure the best possible support for our customers in Denmark. We are confident that this change will be well received by the market."

The team in Denmark knows MAPAL's range of products and services. They are specialists who understand the customers' requirements and bring considerable experience to the extended cooperation. Thomas Hagger Kirk, Sales Manager Edeco Tool: "Our customers can trust us to provide them with tool solutions that perfectly

match their requirements with regard to process reliability, precision and efficiency."

The trading company, which serves customers in Denmark and Sweden, operates a central warehouse for standard products in Swedish Karlstad that also supplies to customers in Denmark quickly and reliably. Edeco Tool ApS is based in Glostrup near Copenhagen, a regional office is located in Thisted and serves customers from Jutland. A wide range of MAPAL tools is available at the Edeco Webshop. ■



The team of Edeco Tool ApS, from left: Rasmus Thomsen (Technical Engineer), Thomas Hagger Kirk (Sales Manager), Claus Ørvad (Inside Sales) ©Edeco

INVESTING IN HEALTH, SUSTAINABILITY AND QUALITY

New laser hardening system for series production

MAPAL has commissioned a new, unique laser hardening system in manufacturing, which will gradually take over all the tasks that were previously carried out in a salt bath in the hardening workshop. This not only has advantages in terms of quality, but also protects the health of the employees as well as the environment. →



Furnaces with exposed molten salt – the method of choice for hardening tool connections up to now – represent a source of risk and danger to the health of the employees.

Different hardening processes can make workpiece materials harder, therefore making them more resistant. At MAPAL, among other things, different tool connections are hardened. These safety-related parts are exposed to high forces. Hardening ensures that the tool connection has a long tool life despite these forces and despite multiple insertions and replacements, and that it is reliable in performing its service.

Up to now, the tool connections made of tempered steel at MAPAL have primarily been hardened in a salt bath – the usual process. That being said, it is not possible to determine up to which point exactly the workpiece is hardened. This can result in quality problems or difficulties in the further processing of the adapters. For this reason, comprehensive quality controls were previously mandatory after hardening.

HEALTH RISK AND HIGH GAS CONSUMPTION

Other disadvantages of hardening in molten salt are obvious. Furnaces with the exposed molten salt are a source of risk and danger to the health of the employees. Maximum concentration under difficult conditions is a must in the hardening workshop so as not to put oneself or others in danger. The salts have to be dis-



The laser hardens the required connection zones at 1,100° C – without major setting or clamping effort.

Together with the machine manufacturer EMAG, MAPAL has developed a solution for hardening tool connections in series using a laser.



posed of at great expense, and a huge amount of energy in the form of gas is consumed to maintain the temperature.

RESEARCH COLLABORATION ON LASER HARDENING OF CONNECTIONS

One alternative to the salt bath is laser hardening. The experts at MAPAL converted an existing machine for the purpose of hardening connections using a laser. In actual fact, the machine was originally designed for laser deposit welding. However, it was not clear at the time whether the process would be robust enough for the connections. To gauge this, MAPAL carried out research together with the Machine Tool Laboratory, abbreviated to WZL, at RWTH Aachen University. Together, they investigated torsion resistance, which is how resistant a laser-hardened connection is to torsion. This yielded positive results. Laser hardening is able to replace the salt bath when it comes to connections.

For about two years now, MAPAL has been using the converted machine to harden all tool holders with MAPAL's own module connection. The machine's laser heats the tempered steel to such a degree that when it cools down, the same structural changes occur as in the salt bath and the connection is hardened accordingly. This process is possible because tempered steel is a so-called self-quenching steel. This means that the tempered steel draws the heat generated by the laser inwards very quickly and thus cools down again very quickly – in other words, it quenches itself.

Only then do the crucial structural changes take place. However, this process is very complicated and requires too much for hardening workpieces suitable for series production. MAPAL went in search of a solution and found the ideal partner in the machine manufacturer EMAG.

A WORLD FIRST

Together, the experts from both companies have developed a machine that hardens the hollow shank taper both inside and out by laser – and without much adjustment and clamping effort. After a lot of work and two years in the making it was ready – the only machine in the world so far that hardens tool adapters with a laser. It's located in MAPAL's manufacturing facility in Aalen. Currently, all current versions are being gradually converted to the new process. By the end of the year, all connection sizes are to be hardened on the machine. Then it's goodbye to the salt bath in the hardening workshop and with it the adverse working environment and all the dangers that come with it.

ADVANTAGES, ADVANTAGES, ADVANTAGES

The new unit is therefore not only an advantage to the health of the employees, but also in terms of the quality of the connections. After all, the laser is much more precise than the salt bath when it comes to hardening. All upstream and downstream processes benefit from this. As a result, there are significantly fewer distortions in the material. Exactly when the hardening

After the molten salt bath, the parts to be hardened are quenched in oil in the hardening workshop.



procedure is incorporated into the process is no longer an important factor. Another plus is that the work can be automated – after all, it is becoming more and more difficult to find employees willing to work in the hardening workshop or take on the evening or night shifts. Although at the moment the workpieces are still inserted into the machine by hand, this will soon be done by a robot. Then the process can run automatically as much as possible, especially during the evening and night shifts.

In addition to the advantages mentioned already, the machine also has a measurable advantage in terms of sustainability. The EMAG machine counters the 420,000 kilowatt hours of gas used by the salt smelter with 60,000 kilowatt hours of electricity per year. Everything considered, the machine therefore makes a huge contribution to more health, sustainability and quality. ■

A quantum leap in efficiency and sustainability:

MAPAL INDIA'S GREEN FIELD FACILITY

MAPAL invests in India and expands its capacities. In Coimbatore, the headquarters of MAPAL India, the company recently opened a "Green Field Facility". The new company premises set standards in the areas of production, technology and sustainability.

Since 2015, the headquarters of MAPAL India has been located in Coimbatore, a city with over a million inhabitants in the south of India. "Many of our nationwide customers and business partners produce here and rely on our products and support," emphasises Thanigaraj Sripathy, CEO of MAPAL India. Business in India and also export business is developing well for MAPAL India. Long-term growth is predicted for the Indo-Pacific economic region, with positive effects for the machining industry. "With an eye on the future, we have significantly expanded the capacities in Coimbatore and invested in a new company area," reports the head of the subsidiary. A production hall, a reception building and an administration building have been built on an area of about 8,300 square metres. The production capacities have now tripled. Furthermore, additional space the size of four football fields is available to ensure an expansion of the site in the coming years. "With this investment, we are strengthening our position

as a leading manufacturer in the upmarket tool segment and significantly expand our capabilities," Thanigaraj Sripathy emphasises.

FASTER, MORE ACCURATE AND MORE FLEXIBLE

MAPAL India is successful in many business areas and supports a loyal customer base, particularly in the automotive, aerospace, wind power and mining sectors. 160 employees at five locations coordinate all activities for the domestic and export market. Special and standard tools are manufactured at the headquarters in Coimbatore. The focus is on PCD, fixed and fine boring tools as well as repairs and reconditioning. Production is carried out in accordance with the MAPAL Group's uniform global quality standards. The ultra-modern equipment of the new production plant enables even more precise, safer and more flexible manufacturing processes. And this with significantly shorter reaction times. "We will also expand the product portfolio beyond the existing product range," announces Thanigaraj Sripathy.

SUSTAINABLE PRODUCTION

The greenfield construction was designed and executed with three clear objectives: Zero Maintenance (trouble-free production), Zero Discharge (wastewater recycling) and Green Compliance (environmental sustainability). An intelligent building control system guarantees

optimal manufacturing conditions and ensures a consistent energy supply. The subsidiary produces about one third of the electricity it needs on its own via photovoltaic systems on company-owned buildings and parking areas. As a further contribution to environmental and climate protection, investments were made in high-performance HVAC systems (heating, ventilation, air conditioning), resource-saving building materials, energy-efficient lighting and sustainable landscaping measures. The company premises are surrounded by a green belt with 1,800 native trees and plants. These ensure clean air and a dust-free environment. MAPAL India treats the waste water produced in the factory and uses it for landscape irrigation. ■



Aerial view of the new company premises in Coimbatore with (from left) reception building, administration building and production hall.





1 View of the modern offices. The workplaces have been designed and laid out according to ergonomic principles.

2 A green belt with 1,800 native trees and plants ensures clean air and a dust-free environment.

3 Company and customer car park: A PV roof provides electricity and shade.



At MAPAL India 160 employees work in the areas of customer service, design, production, materials management, finance and IT. In addition to the headquarters in Coimbatore, the Indian subsidiary operates four regional service centres in Bangalore, Chennai, Pune and Delhi. The employees ensure close contact with customers and provide continuous support.

Less "tool tourism" – higher sustainability

REAMING MID TO LARGE DIAMETERS WITH **REDUCED** CARBON FOOTPRINT



Innovative reamers with exchangeable indexable inserts from MAPAL achieve the same accuracy as tools with brazed blades. The tool manufacturer promotes these solutions because they are not only beneficial to the client but also considerably reduce CO₂ emissions.

Across the board, industrial enterprises are endeavouring to reduce their carbon footprint. Machining concepts that require less cutting force and coolant are an important lever in this effort. There is also a surge in demand for precision tools with indexable inserts in order to counteract the "tool tourism" that occurs when brazed tools have to be reground or reconditioned. Once these tools are worn or blunt, they have to be shipped back to the manufacturer. CO₂ is released every time tools are transported between the manufacturer and customer.

CALCULATION MODELS WITH HPR400 AND HPR400 PLUS REAMERS SHOW POTENTIAL

The potential to reduce CO₂ has been verified by a calculation model based on CO₂ equivalent (CO₂e) that compares mid and large diameters of brazed and screwed tool systems for reaming. With HPR400 and HPR400 plus reamers, MAPAL already has solutions in its portfolio where indexable inserts are screwed and not brazed. The customer can quickly and easily exchange these inserts on site. The calculation model considers,

for example, both transportation routes of 500 km – which are usually done by road within the EU – as well as air cargo over 2,500 km. The different tool concepts already have an impact during initial procurement. For example, a customer deploying brazed reamers buys six new tools to bridge repair times during operation, whereby five reconditioning cycles are factored in. The same customer is able to realise the same amount of uses with only two HPR400 tools and four insert sets.



Predestined for sustainable reaming of medium and large diameters: The HPR400 plus reamers (left) with rotationally symmetrical indexable inserts and four cutting edges each and the HPR400 reamers (right) with prismatic units for best centring.



Machining around two million brake callipers a year, the HPR400 reamer saves more than five tonnes of CO₂.

Looking at the transport for initial procurement, the carbon footprint is thus already reduced by almost 70 percent with EU transportation or 67 percent with air cargo. Over the complete life-cycle, taking 36 tool lives into account, the CO₂ reduction in transport alone amounts to almost 95 percent when HPR400 reamers with screwed indexable inserts are used.

FIVE TONS OF CO₂E SAVED WHEN PRODUCING BRAKE CALLIPERS

In practice, many more tools are usually on site, as is the case for a MAPAL customer that produces around two million brake callipers per year. For this manufacturing volume, 67 tools with brazed inserts would be used, which would have to be reconditioned 335 times. With the screwed version, two HPR400 reamers with 398 insert sets are enough. This results in CO₂e savings of around 450 kg for EU transport and more than 5,500 kg for global transport.

CO₂ REDUCTION JUST ONE OF THE BENEFITS OF SOLUTIONS WITH INDEXABLE INSERTS

Sustainability is not the only advantage of reamers with indexable inserts. They also reduce

the logistics effort for the customer, thus saving time and money. MAPAL would like to do away with brazed tools because they also come with disadvantages during production. After all, the tools have to be coated while mounted, and the brazing process limits the choice of coating. The finishing step for the connection that follows makes the process more expensive, as do corrections of distortion caused by thermal load during coating. The HPR400 and HPR400 plus systems allow tool combinations to be deployed that were previously technically impossible, such as leading stages with ISO indexable inserts or the use of hydraulic chucks.

ECONOMICAL REAMING OF MID TO LARGE DIAMETERS: HPR400 AND HPR400 PLUS

The difference between the HPR400 and HPR400 plus reamers is the insert. The insert seats of the HPR400 series have a prismatic-shaped connection and allow optimal centring. Due to the form-fitting insert seat, the indexable insert only fits in one way. In order to make best use of the cutting material, MAPAL developed the HPR400 plus, a variant with rotationally symmetrical indexable inserts with four cutting edges. In-

sert seats and inserts of the high-performance reamers are manufactured by MAPAL with a precision of $\pm 2 \mu\text{m}$ thus equalling the precision of brazed tools. Both tool systems are available as standard in the diameter range of 63 to 319 mm and produce tolerances $\geq \text{IT}7$ (HPR400 plus) respectively $\leq \text{IT}7$ (HPR400), depending on bore diameter. Component-specific custom tools can be made with diameters as small as 32 mm. ■





Hydraulics, pneumatics and process engineering

SOUND MARKET SEGMENT MANAGEMENT TO MEET CUSTOMER NEEDS IN FLUID POWER TECHNOLOGY

Fluid power is one of the most important supplier sectors for all industrial production. MAPAL manages this important area as an independent market segment and supports customers with demanding machining operations as a solutions provider.

Fluid power products are used in a wide range of markets, such as mechanical and plant engineering, energy and environmental technology, automation technology, printing machines, woodworking machines, as well as food and packaging machines. Driven by rising population figures worldwide, agricultural engineering, construction machinery and infrastructure projects in particular are absolute growth markets. The prospect of a growth industry is by no means the only reason for MAPAL to focus on fluid power technology. The workpiece materials to be machined (cast iron, steel, stainless steels and non-ferrous metals) are ideally suited to the tool manufacturer's product portfolio. Over and above carrying out demanding machining steps, MAPAL can support the entire process worldwide here as a technology partner. "The customers' needs fit our MAPAL DNA", is the analysis of Jochen Schmidt, who heads up the Fluid Power segment. To him, being a technology partner means understanding both the customers' needs and the actual product and how it functions in the end product.

FINE WORK FOR THE ROUGH STUFF

One such end product might be an excavator. Using a le-

ver or a joystick to move loads weighing several tonnes to their destination with millimetre precision means that every single movement must be executed very precisely and reliably to ensure perfect interaction. Each lever is connected to a specific valve housing. The more functionalities the machine has, the more of these valves are installed in series. The number of parts that can be moved during excavation corresponds to the number of hydraulic valve housings installed. For Jochen Schmidt, manufacturing them is the supreme discipline in the world of hydraulics. For many years, MAPAL's expertise has been in demand for the spool bore in the valve housings. The gap size with the spool depends on the accuracy of this bore and is very narrowly defined in modern hydraulic valves so that the hydraulic oil can only flow in the required direction.

In addition to hydraulics, the fields of pneumatics and process engineering are also the focus of the fluid power technology market segment. As a technology driver in automation technology and the digital transformation, pneumatics is the key to increasing productivity in industrial production. Valves and cylinders of any design and requirement are focal components for MAPAL, for instance. The performance of such components in the overall system depends on tiny details that can be decisively influenced by MAPAL solutions. Typical products in process engineering include valves, pumps, compressors and actuators. "It's everything to do with the

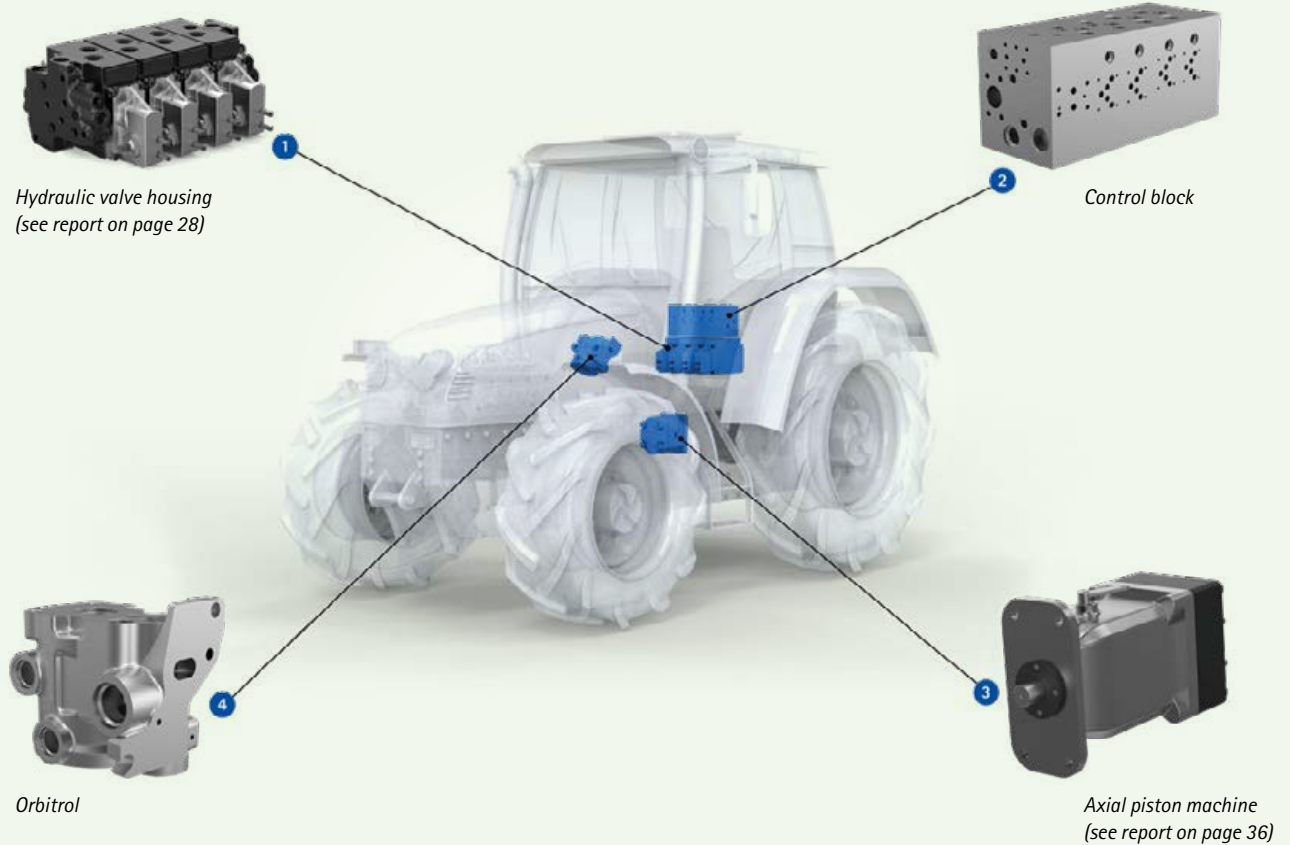
movement, control and regulation of fluids", explains Jochen Schmidt. Components in this division typically also feature functional properties that are associated with high requirements for the manufacturing process. In addition to machining these specific components, MAPAL also offers complete solutions for the entire part. Just as in hydraulics and pneumatics, MAPAL also has a wealth of experience in machining components for process engineering. →

*"The customers' needs
fit our MAPAL DNA."*

*Jochen Schmidt, Global Head of Segment
Management General Machining*



FOCUS COMPONENTS IN THE FLUID POWER TECHNOLOGY SEGMENT



The market segment fluid power technology focuses on the areas hydraulics, ...



pneumatics ...



Based on the applications already implemented for existing customers, MAPAL has developed specific solutions for fluid power technology. They reflect many customer and component requirements. Clear best practice examples each deal with specific production situations. MAPAL designs the tools for these in a way that always results in the most cost-efficient process. That not only includes completing pre-machining and semi-finishing swiftly, but also keeping an eye on downstream processes and closely monitoring the further development of the parts. "The requirements for fluid power parts have increased significantly in recent years", Jochen Schmidt highlights. "On the one hand, sustainability plays a role, which is reflected in efficiency increases, for example in mobile machines, and the even greater prevention of leaks through en-

hanced precision. On the other hand, increased levels of accuracy are required for valves that have to function optimally both in machines in cold storage and in very hot areas in order to be able to meet all operating conditions. As a technology partner, we pursue these developments together with our customers."

A TECHNOLOGY PARTNER WITH A BROAD PORTFOLIO AND GLOBAL PRESENCE

MAPAL can contribute its full product portfolio in the fluid power technology sector for the benefit of its customers. From the milling cutter and solid carbide drill, the boring tool and the multi-bladed reamer to the fine boring tool, the technology partner's full range of products is used for safe and reliable component machin-

ing. Due to the high level of part variance and large variety of workpiece materials, the flexible actuating technology has also proven itself and is very popular on the market.

With its application solutions, MAPAL takes into account different production volumes, part complexities and precision specifications. In doing so, it addresses the specific needs of global corporations as well as medium-sized enterprises in the field of fluid power. A particularly close technology partnership also enables tool management with individually adaptable service packages. Once the part has been designed, the tool manufacturer supports companies' production worldwide from its subsidiaries around the globe. ■



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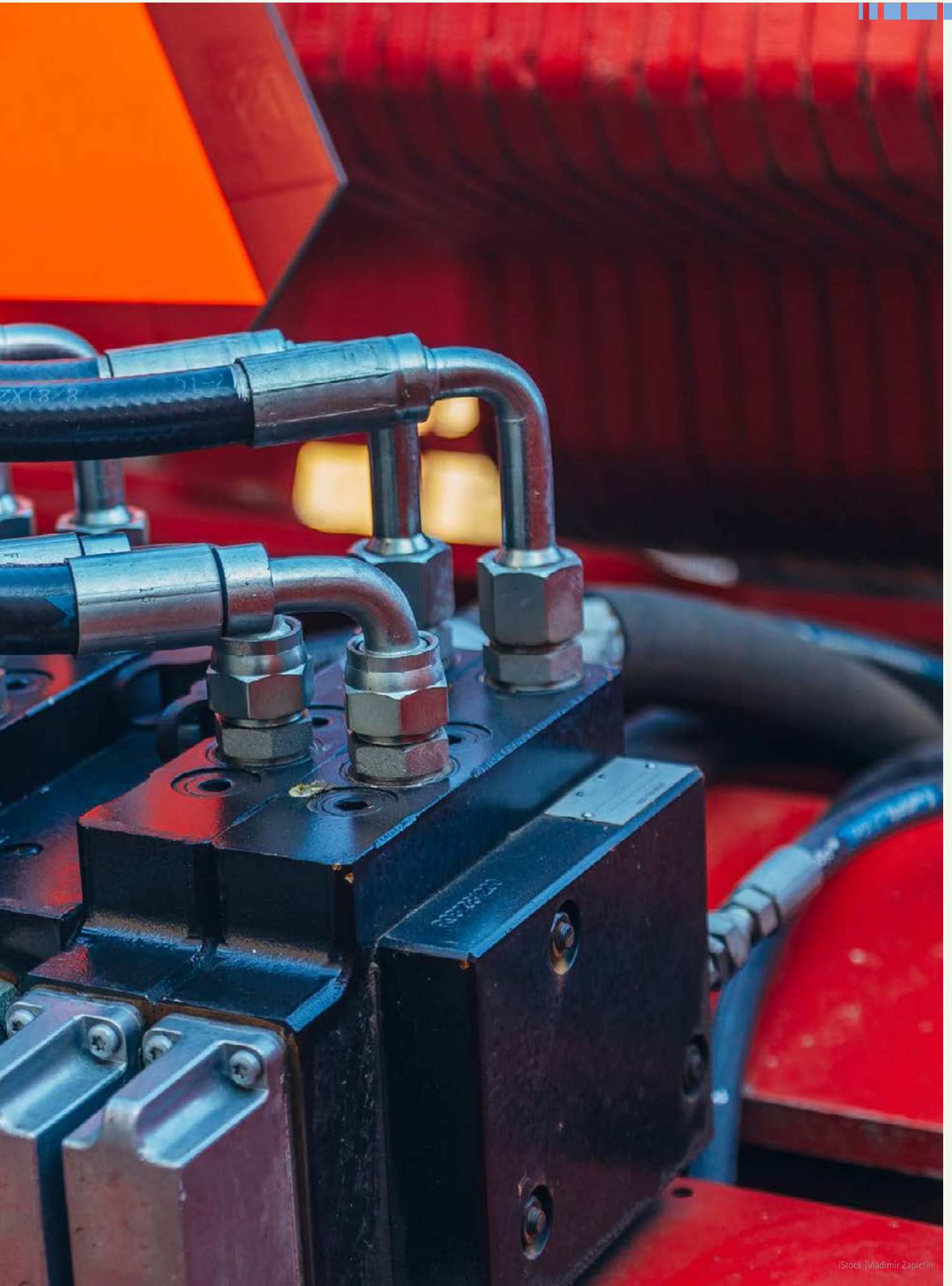
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and process engineering.

Highly economical machining of hydraulic valve housings

**PRECISION SOLUTIONS
THAT MEET A
VARIETY OF
REQUIREMENTS**





Manufacturing hydraulic valve housings is the supreme discipline in the world of fluid power technology. As a technology partner, MAPAL supports customers with regard to complete process design. The experts pay particular attention to the cost drivers here, which can often be found in functionally relevant bores. Based on the respective honing procedure, the part requirements and lot sizes, MAPAL designs the perfect machining strategy in dialogue with the customers.



The production of hydraulic valve housings is the supreme discipline in the world of fluid technology. Great attention is paid to the quality of the main bore.

Based on the applications already implemented for existing customers, MAPAL has developed specific solutions. They reflect many customer and component requirements. After all, when it comes to spool bores, MAPAL's expertise has been in demand for years. The gap dimension with the spool depends on the accuracy of this bore so that the hydraulic oil can only flow in the required direction without leaking. This is very narrowly defined in modern hydraulic valves. The roundness, cylindrical form, straightness and surface finish of this bore are therefore crucial.

Clear best practice examples each deal with specific production situations. MAPAL designs the tools for these in a way that always results in the most cost-efficient process. That includes completing pre-machining and semi-finishing swiftly – all while keeping an eye on subsequent processes further down the line, such as honing.

APPLICATION SOLUTIONS FOR EVERY SITUATION

The first of the solutions presented for the machining of a hydraulic valve housing is rather unusual for MAPAL, as it does not include a fine boring tool for finishing. After piloting, boring and circular milling of the spool bore, in this instance, a multi-bladed reamer performs the final machining step before honing. With the tool se-

lection, MAPAL shows that finding the optimal solution for the customer is the main drive. The concept is particularly suitable for smaller and medium quantities.

If large quantities and high levels of accuracy are sought in series production, the second application solution is the right blueprint. The key difference is the fine boring tool used for fine machining. It meets the high standards for spool bore and compensator bore production. The EasyAdjust-System and guide pads offer reliable fine machining with easy handling. As the customer's technology partner, MAPAL agrees with them the extent to which a concluding honing process can be scaled down or even omitted.

If the part needs to be machined on two sides due to its tolerances, the third solution comes into play. For piloting and boring, MAPAL uses a multi-stage boring tool with radial and tangential indexable inserts. It handles pre-machining of the spool bore and completion of contours in one step. A solid carbide profiling tool processes control edges in a defined way and without macroscopic flaws. The following fine boring tool with adjustable indexable inserts and guide pads eliminates the axial offset caused by machining on two sides. This could not be achieved to this level of quality with a multi-bladed reamer.

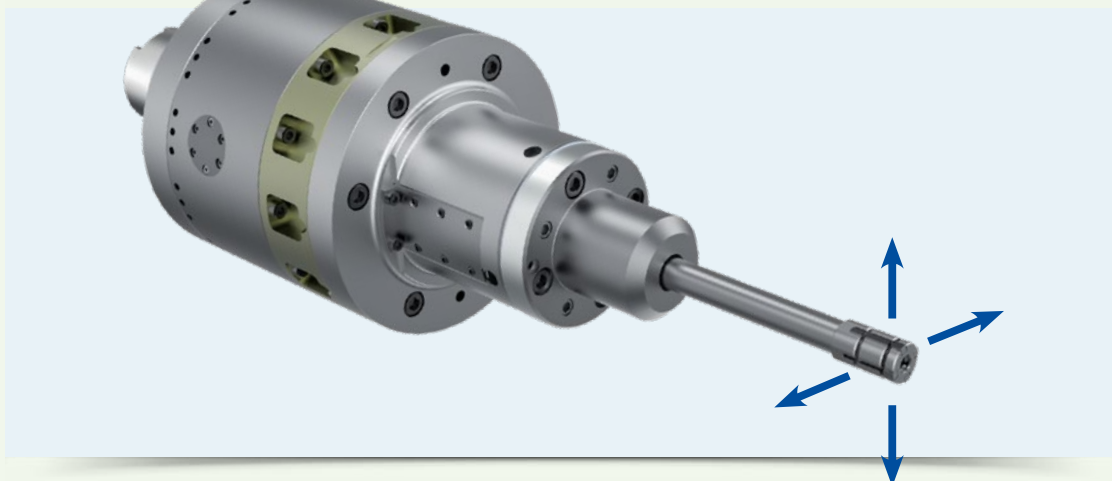
Application solution 4 introduces into fluid power technology the kind of flexibility that is primarily required for small series and prototype building. The mechatronic tool system TOOLTRONIC makes it possible to perform the honing process via an additional axle on the machining centre. This allows all machining to take place in one clamping setup on one machine. Machining with TOOLTRONIC achieves high surface quality and dimensional accuracy with the tightest manufacturing tolerances and high flexibility. Burr-free, rounded transitions are also created and there are no re-clamping errors that could occur while re-tooling on the honing machine. When bore machining small quantities, a classic single-bladed reamer from the standard range can be used instead of a custom tool. In this case, fast availability and lower tool costs compensate for the slightly longer machining time. ■



Machining solution for the series production of valve housings in large quantities. The fine boring tool with the EasyAdjust-System and guide pads offers reliable fine machining with easy handling.



If machining must be done on two sides due to valve housing tolerances, MAPAL recommends a three-stage process for the spool bore.



Honing with the mechatronic TOOLTRONIC tool system stands for the tightest manufacturing tolerances and great savings potential in prototype construction as well as in small and medium series.

MAPAL offers great tool expertise for fluid power technology

CONTROLLING, REGULATING AND MOVING FLUIDS

Image source: © Konradin / Rindle



The SFB-Group relies on fine bore machining with MAPAL tools.

Fluid power technology ensures that excavators move, loads are lifted and tunnel drilling machines turn. For over 80 years, the SFB-Group has been one of the most successful suppliers in this sector. A collaborative partnership exists between tool manufacturer MAPAL and SFB, with the aim of continuously improving both product quality and productivity.

"The rich variety of control blocks and hydraulic valves is as big as the number of applications where they can be deployed", says Bruno Hanselka, General Manager of Schwäbische Formdrehteile (SFB) GmbH. "Our aim is to provide the optimal solution for every application."

The SFB-Group, with its main factory in Babenhausen, has been offering turnkey solutions for fluid power technology for over 80 years. "We deliver fully mounted and hydraulically tested systems, which our clients can install in their assemblies just in sequence", according to Hanselka. SFB's clients include all large manufacturers of mobile and industrial hydraulic products.

The turnkey components are deployed, for example, in axial piston pumps in snow groomers, excavators and loaders, in fuel injection pumps in large diesel units, pressure separators in demolition trucks, regulatory systems in forklifts, air-pressure valves of lifting transport systems, level control systems for buses and trucks, in bottling plants, transfer lines in the automotive industry, tunnel drilling machines, lifting systems for bridges, ABS systems, and in high-speed actuators in aviation. "In principle, you will find our products everywhere that fluid is controlled, moved and regulated", Hanselka sums up.

In total, around 700 employees work for the SFB-Group at four sites with 27,000 square metres of manufacturing space. "We have concentrated all the core expertise and know-how of the SFB-Group in one site at our main factory in Babenhausen", Hanselka explains. "The three other sites, on the other hand, are specialised in certain areas."

SFB Polska is dedicated entirely to assembly, Agromet (also in Poland) manufactures agricultural transmissions and sells these under its own brand, and AMO-tec in Erkheim, Germany, is a specialist in CNC precision parts. →



From left: Jochen Schmidt (Global Head of Segment Management General Machining, MAPAL), Christian Linse (Head of Sales and Marketing, SFB-Group), Ralf Wessel (Head of Purchasing, SFB-Group), Bruno Hanselka (General Manager, SFB-Group), Christian Schmid, Area Sales Manager MAPAL) and Florian Kutzner (Technical Consultant MAPAL).





Image source: © Konradin / Rindle

1,600 TYPES OF VALVES

Due to SFB's claim of offering turnkey solutions from a single source, a very wide range of varieties and considerable in-house production depth can be found at the manufacturing facilities in Babenhausen. "We offer around 1,600 kinds of hydraulic valves, for example", explains Ralf Wessel, Head of Purchasing at SFB. There is also a broad variety of lot sizes. "We see ourselves as a solution provider and therefore already offer our clients support during product development", says Wessel. That includes manufacturing everything from sample parts, prototypes and pre-production parts to series production. This explains the wide range of lot sizes from 1 all the way to series production with 200,000 parts.

PROCESS DESIGN FOR FLUID POWER

"Optimal process design is an important part of our service", says Wessel. "We already support our clients here in the development phase with our many years of manufacturing expertise. In addition, we can call on the tool experts from MAPAL at any time." The collaborative partnership with MAPAL is especially valuable for product relaunches.

"We are a good match in terms of our fundamental orientation", Jochen Schmidt, Market Segment Manager for General Machining at MAPAL, is pleased to report. "Because we offer our clients turnkey solutions that are ideally suited to their application, too." In addition, MAPAL offers a wide range of tools optimised for the requirements of

fluid power technology. A focus here is on tools for the main bore machining of hydraulic parts. "The gap dimension with the spool depends on the accuracy of the spool bore. The roundness, cylindrical form, straightness and surface finish are therefore crucial for this bore", Schmidt says.

"During tool design for piloting, boring, semi-finish machining and the final honing, we pay particular attention to economical machining as well as component requirements and lot sizes", explains Schmidt. Special emphasis is put on the elaborate honing process. "We can often already produce very exact cylindrical forms alone with our fine boring tools with guide pads so the final honing effort can be reduced or even eliminated", Schmidt is pleased to report.

1 The SFB Group's fleet of machines is optimally designed for precise machining with a very high degree of variation.

2 Fine boring tools with guide pads achieve very exact cylindrical forms and reduce the amount of subsequent machining.

3 A high degree of precision is vital when machining parts for fluid power technology.

4 The SFB-Group manufactures turnkey, hydraulically checked valve blocks.

5 Tool design always aims to machine parts as efficiently as possible.

In addition to the bore machining, the tool experts also contribute tool clamping technology solutions and indexable insert tools for face, shoulder, groove and shell-end face milling as well as high-feed cutting.

ALUMINIUM PART FOR LEVEL CONTROL SYSTEMS

The collaborative partnership between the two family companies is particularly beneficial for more complex projects. "We have been working with MAPAL for around 20 years now. The tools have always delivered as promised with regard to performance", Wessel recalls. "When we had to machine an aluminium part very precisely for a level control system for automotive engineering for the first time ten years ago, we turned to the MAPAL experts."

"In that project, we took care of the entire tool planning for the complete machining of the workpiece", says Christian Schmid, Area Sales Manager at MAPAL. The tools experts not only supply their own tools for this purpose but

also tools from other companies, if necessary. The goal is to machine the part as efficiently as possible. MAPAL's high degree of competence in fine boring, regardless of the material, was crucial here. In the meanwhile, the SFB Group has a wide variety of MAPAL tools in action for aluminium machining.

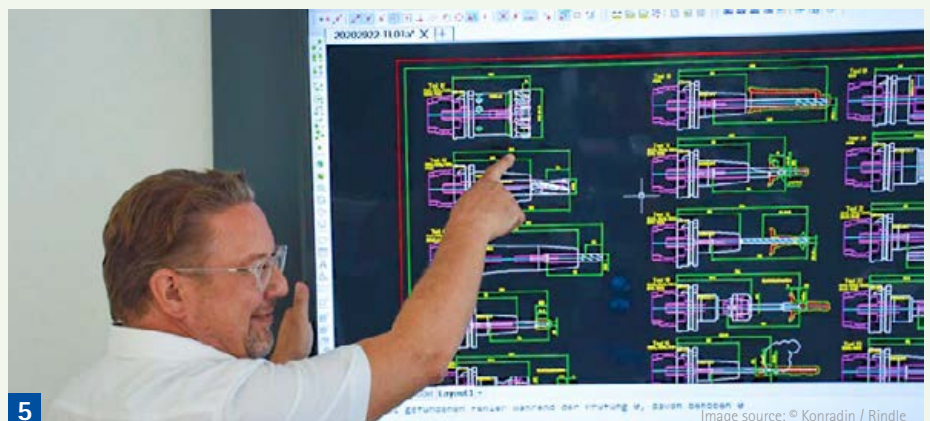
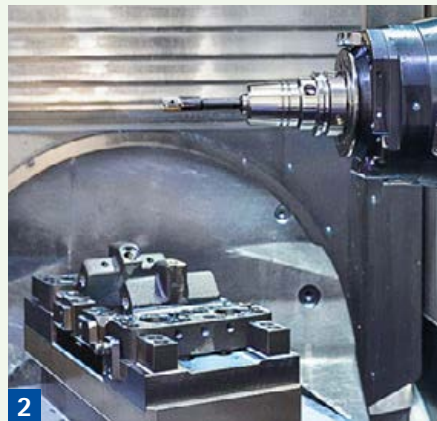
PROCESS DEVELOPMENT

Of course, the collaboration on a part does not end with the initial design of the machining process. At regular intervals, the machining is examined from all sides to make the process even more economical. Florian Kutzner, Technical Consultant at MAPAL, always brings the latest tool developments along to such appointments.

"We are in continuous contact with SFB-Group employees. In this way, we try to lend a hand and provide advice to the team for all their machining needs", Kutzner says. "With our custom tools, we can also offer very efficient solutions to machine large quantities. In fluid power ap-

plications in particular, certain bore machining processes reoccur regularly." Custom tools are built for these applications, which can complete multiple machining tasks in a single step.

"We really appreciate the realignment at MAPAL that placed fluid power technology back in the spotlight. It is of course advantageous to work together with a turnkey solution provider", Wessel is pleased to say. "MAPAL's tools for fine boring, for cast machining and their PCD tools for aluminium machining in particular are indispensable." ■



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IN FOCUS: THE AXIAL PISTON MACHINE

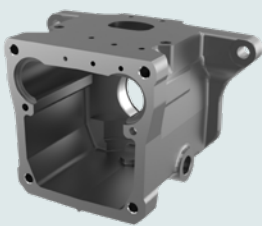
MAPAL has carefully examined critical components of the fluid power technology industry and their complete machining. One example of this is the axial piston machine. Its series production and the machining of its different components pose a variety of challenges both for processing as well as the individual tools. MAPAL experts have developed a solution that reduces machining time for cylinder block alone by 19 percent for a client.

Both axial piston pumps and axial piston motors are meant by axial piston machines. While they are technically identical, they usually perform different tasks in closed and open hydraulic circuits. Both convert hydraulic and mechanical energy. Axial piston machines are used in modern forage harvesters, for example. They are readily used both in such tractors as well as in heavy road and building construction machinery and mining. "Manufacturers of axial piston machines produce them in mid to large series", says Tobias Stolz, Component Manager for General Machining at MAPAL. A high degree of accuracy is required to machine the units' individual parts. MAPAL is an expert in combining high quantities and precision. They have thus been able to improve processes considerably and save costs for clients in the fluid power sector. MAPAL also already has all the products in its portfolio required to completely machine the individual components. Thus, the axial piston machine was an obvious choice for MAPAL as a component to focus on. The experts developed a model process, which they have successfully put into practice (with individual adjustments) for clients.

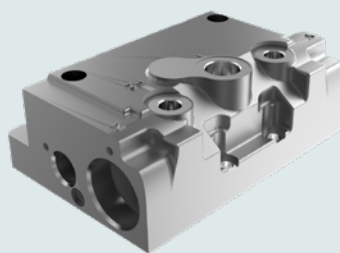
The axial piston machine is made up of the components housing, adjustment unit, port plate housing and cylinder block. When machining the housing made of EN-GJL-250, which provides the unit with protection, the machining of the oil leak countersink is central. For this, MAPAL recommends a modular boring tool, which is particularly economical due to the TTD replaceable head drill and indexable inserts. Milling cutters from the NeoMill range are used to machine the housing's different surfaces. "This is a special feature that we can offer MAPAL customers", Stolz says, referring to the combination of specially designed custom tools and economical standard tools.

Standard tools are used for the most part to machine the adjustment unit made of EN-GJS-400-15, the axial piston machine's control instrument. MAPAL recommends solid carbide drills from the MEGA-Step-Drill family for the threaded bores. In addition, FixReam reamers and HPR replaceable head reamers are used for the fine machining of various bores.

The third component, the port plate housing, is the axial piston machine's connection plate and thus the pressure and suction connection to further parts in the hydraulic circuit. It is usually made of EN-GJL-250 or EN-GJS-400-15. Interrupted cuts and partially thin-walled component segments pose challenges during machining. "We machine some of the bearing seats and rotor bores with multi-stage, specially designed boring tools with indexable inserts, thus ensuring high-quality bores even in difficult conditions", says Stolz. As for the last component, he boasts: "If there is a highlight when it comes to machining axial piston machines, then it definitely has to be the cylinder block." This is the heart of the axial piston machine and is made either of steel (C45 or 42CrMoS4) or spheroidal cast iron (EN-GJS-500-7 or EN-GJL-400-15). Through the movement of the pistons and the oil this sets in motion, this component performs the machine's main function. For it to work, the piston bores, amongst other things, often have to be machined with the pressed-in liners and pressure and suction kidneys.



Pump housing



Adjustment unit



Port plate housing



"One customer was struggling with high costs for manufacturing cylinder blocks", Stolz reports of a particular use case. A great deal of effort was required to ensure the defined surfaces, which had to be between $R_z = 27$ and $37 \mu\text{m}$, as well as the high quality of liners with tolerances for roundness, straightness and parallel alignment of $3 \mu\text{m}$. MAPAL experts developed an economical process together with the customer with which machining time was reduced by 19 percent per part in total.

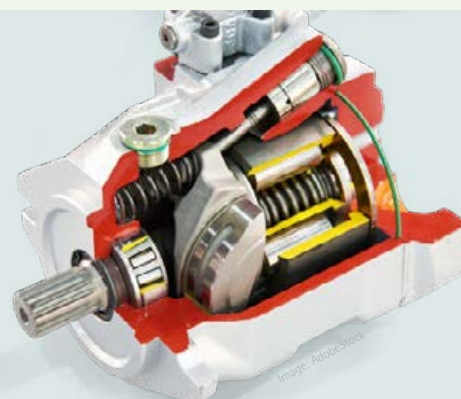
The customer machines the pressure and suction kidney with the OptiMill-Uni-Pocket solid carbide milling cutter as part of this new pro-

cess. This supports the boring process by way of inclined plunging. The machining of these inlets and outlets therefore does not require any other tools. The step drill with Tritan-Drill geometry offers similar benefits when pre-machining the piston bores. The spot face that is normally required is dispensed with. Thanks to the sharp cutting edges, the bottom of the bore also does not have to be deburred. The multi-stage MAPAL fine boring tool ensures optimal quality before the brass bush is pressed in. It is not only very precise during machining but also particularly economical thanks to the HX insert's six cutting edges. These three tools alone reduce machining time by 19 percent compared to the previous

method. And this shows once again: "We offer our customers economical processing solutions to their machining challenges – for all functionally relevant parts in the fluid power industry", Stolz summarises. ■



cylinder block



Axial piston machine

c-Com at thyssenkrupp Presta AG Schönebeck GmbH

MORE TRANSPARENCY ONE STEP AT A TIME

As an automotive supplier, thyssenkrupp is one of the world's leading suppliers of steering systems. At its Schönebeck site near Magdeburg, 1.5 million parts are produced every year. The production volume is to increase significantly thanks to new steering systems for electric cars. In order to keep track of the tools involved, the manufacturer is using Lifecycle Management from c-Com.



When c-Com was introduced at thyssenkrupp Presta Schönebeck, the initial focus was on serialised tools like these hobs, which are very important to the process chain as key tools. Every single one of these tools has its technical data attached on the platform.

The company's headquarters are located in Eschen/Liechtenstein, where the company was established as a pressing and stamping plant in 1941, producing small parts at first. At the beginning of the 60s, the company entered the automotive supplier business and has developed into a producer of steering columns, steering gears and complete electro-mechanical steering systems over the years. Presta AG has belonged to the thyssenkrupp company group since 1991.

The company accompanies the trends in the rapidly changing automotive industry towards electric mobility as well as automated and, in the next level, autonomous driving with its technology competence. A worldwide ultramodern production network set up in recent years caters to the vehicle platforms of almost all internationally renowned OEMs. However, the product portfolio of the steering division is not dependent on a vehicle's drive type. The division has been able to more than double its turnover over the last

ten years by expanding its product portfolio and through new customer projects.

The site of thyssenkrupp Presta in Schönebeck manufactures components for the company's global network. Parts are produced here for various types of steering, such as ball-type linear drives and input shafts, as well as new types of steering for electric cars. As there are many variants for all types of steering, the variety of parts is increasing accordingly. Individual parts such as pinions and input shafts as well as preassembled parts are sent from Schönebeck for final assembly to different sites, above all in China, Europe, USA and Mexico. The steering systems are then assembled there and sent to car manufacturers.

A wide variety of machinery is available to the 800 employees in Schönebeck. This includes forging machines used to produce pinions. Grinding machines, lathes and milling centres



are used for mechanical machining. The assembly area for constructing the ball-type linear drive and input shafts has a particularly high degree of automation.

4,500 DIFFERENT TOOLS

"We call on almost the entire tool portfolio available on the market to manufacture our parts", reports Heiko S., Tool Management Head at thyssenkrupp Presta Schönebeck GmbH. Around 4,500 different tools are deployed in total. Almost half of them are cutting tools. Already today, it is a challenge to maintain an overview of the tools used during production. Due to the envisioned increase of production figures, not

least because of new major customer from the electric mobility sector, the purchase of 48 new machines is planned. Even more tools will be involved in manufacturing as a result.

As the administrative effort to manually track tools was extremely high and prone to error, the company sought professional support in data management for its inhouse tool management. A comparison of different systems showed that few could deal with thyssenkrupp Presta Schönebeck's large portfolio of various tools. About two years ago, the Lifecycle Management from c-Com was introduced in a pilot project in order to keep track of the hobbing

tools deployed in manufacturing and to perform an inventory range analysis. "Lifecycle Management offers a central platform for orchestrating the tool processes across company boundaries", explains Markus Deininger, Project Manager at c-Com. "With the help of the digital twin, all relevant tool and process data are made available and continuously updated for all authorised process participants. In this way, we ensure that tool data is updated comprehensively without interruption. The customer has a detailed and up-to-date overview of the inventory at their disposal whenever needed." An important aspect influencing thyssenkrupp Presta Schönebeck's decision was the fact that the c-Com platform



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1 The Schönebeck site of the thyssenkrupp Presta AG acts as component manufacturer for the global network of the automotive supplier specialized in steering. Over 800 employees work here.

2 Since c-Com was introduced, employees no longer just take tools out of the warehouse. They now also simultaneously allocate them to a certain machining operation. As Roberto R., machine setter in the milling area, demonstrates, tools used in production are booked back into the system just as easily.

3 The machines in Schönebeck are used to machine parts for various types of steering like ball-type linear drives and input shafts. The factory supplies parts to the company's sites worldwide.



can be expanded with other products like the Digital Tool Management.

The hobbing tools were not picked by chance as the starting point, explains Lars B., Technical Head at thyssenkrupp Presta Schönebeck: "The hobbing tools posed the most difficulties during maintenance." The steering experts have many different hobs in operation. They may be in the warehouse, at the prep stations or on one of the machines where they are regularly used. Some are scheduled for regrinding or being procured. Furthermore, the hobbing tools used can be reground a differing number of times. Information about their current state is important for estimating inventory range. To make matters worse, employees would check out new tools and then put them back without documenting the remaining tool life.

ARE THERE ENOUGH TOOLS?

The manufacturers at Schönebeck must deal with fluctuating production figures. Demand from industry can rise or sink. "We constantly have to ask ourselves whether we have enough tools in circulation to deal with higher production volumes", the Technical Head relates. Mini-

mum quantities are recorded in the existing SAP system and values may not fall below these. In addition, Excel lists were used to account for special tools that require regrinding, for example. Often, more tools were ordered than necessary – just in case. "Managing tool data on many files in various systems was an enormous administrative task for us, and it still did not deliver precise data", Heiko S. states.

c-Com improved this significantly. Hobbing tools are so-called serialised tool. Deininger explains what this means: "A serialised tool is uniquely identifiable due to the material number assigned only to it. Through the serialisation, we can attach all technical data to the tool's digital twin in our platform. You thus know the tool's condition and exactly where it is. This is useful for key tools that are very important for the process chain."

Heiko S. can now follow every single tool in Lifecycle Management and sees how much longer the worker can use it, when it has to be reground and when the hob has to be reordered. The Tool Assistant app makes it easy for the employees to assign a tool to a specific task. When the tool is no longer fit for production, the employee re-

moves it from the system. The condition has to be selected and recorded – i.e., was the tool removed because it was broken or worn out? Only very few entries must be made in the app for this. The tool is then automatically prepared for shipment to be reground.

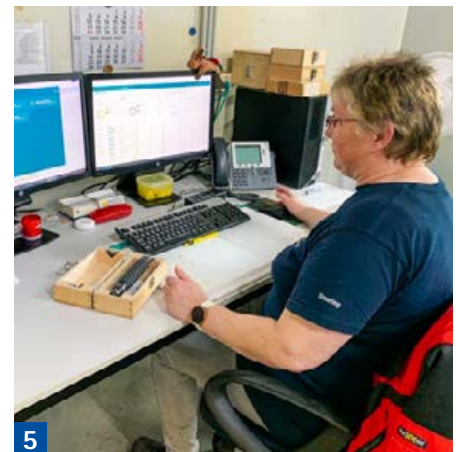
The regrinding partner also has access to c-Com and the pertinent information, so they know which tool to expect and how many parts it has machined. Upon return delivery, a note is made as to what tooth length has been ground and how often the tool can still be used. Many parts of the system are automated to provide the customer with the best data quality possible.

Jana S. is an employee in the big tool warehouse and works with c-Com every day to book goods movements internally as well as for external suppliers. She enters the tools in the system and gathers all the relevant data. Shipment for regrinding used to entail handwritten lists with 20 to 30 items. Nowadays, the job is done with a few mouse clicks. She used to have to search the factory for tools, so she really appreciates the tracking capabilities: "It's a big relief to know where every single hobbing tool is now."

4 Jana S. manages the well-stocked tool warehouse. thyssenkrupp Presta Schönebeck uses around 4,500 different tools. About half of them are cutting tools.



5



5 As a tool warehouse employee, Jana S. works with c-Com every day to track tools internally and externally. She enters the tools in the system and gathers all the relevant data. A shipment for regrinding is readied with just a few clicks.

6 Over 300 hobs in 40 different variations are managed by c-Com. In this way, manufacturing has been made transparent and incurring tool costs can be allocated correctly to the different machines.



7 Cooperated closely to align c-Com to thyssenkrupp Presta Schönebeck's needs: Markus Deininger, (Project Manager c-Com, left) und Heiko S. (Team Lead Tools at thyssenkrupp Presta Schönebeck GmbH).

TOOL EXPENDITURES MADE TRANSPARENT

The new transparency also enables more precise calculation, Lars B. relates: "We now see exactly how much we spend on each product. This was not known to us in this level of detail before. We booked most goods to machines, and it wasn't clear which product caused an expenditure. Now we can anticipate costs." The difference is sometimes considerable. Where tool costs of 18 cents were calculated for certain parts, in reality a mere 2 cents were spent.

"We can show that c-Com has achieved savings of 85 percent compared to the previously assumed costs", comments Markus Deininger. Based on the analysis, thyssenkrupp Presta Schönebeck has significantly reduced its tool inventory of hobs. Information regarding the condition of individual tools and allocation to certain machining operations allow the workers to identify unusually high wear and tear early on and to figure out the cause. "In this way, we can react promptly before faults lead to production downtime", Lars B. reports.

RED BARS MEAN BOTTLENECKS

Based on target figures for parts to be produced, the Tool Planning module presents information about how long required tool will last, taking all the possible regrinding processes into account. This inventory range analysis is meant to prevent bottlenecks even when production is ramped up. Tool Planning is a big help for Heiko S.: "I can now find all the information I need for my job at a glance. Red bars show me areas I have to examine because there could be a disparity between inventory and need for the products we are manufacturing." The dashboard also shows the tool costs and consumption on particular machines.

The pilot project with the hobbing tools was a big success for Lars B.. "The investment in c-Com has definitely paid off", the Technical Head assures. "The warehouse was intransparent in some places. The reduction of inventory brings us enormous benefits because storage costs are ultimately losses."

In the next step, c-Com is to be employed for the non-serialised tools. The company is unable to allocate them to particular machining operations for the simple reason that worn-out indexable inserts and drills are often just thrown out without recording their tool life. Whenever a tool is checked out in c-Com, a record is made regarding the machine and part the tool is used for. It is also possible to see in retrospect how many parts the tool produced. When procuring new machines, thyssenkrupp Presta Schönebeck wants to ensure that they already have the software to exchange information with c-Com via an interface. ■



"The investment in c-Com has definitely paid off", Lars B., Technical Head at thyssenkrupp Presta Schönebeck, assures. "The reduction of inventory brings us enormous benefits because storage costs are ultimately lost costs."

SME Aerospace Malaysia puts MAPAL tools to good use

TITANIUM PARTS IN HALF THE TIME

The aircraft component structural supplier SME Aerospace approached MAPAL Malaysia with the request for an improved machining time for a titanium part. The latest generation of titanium tools and an improved machining strategy made it possible to achieve a time saving of over three hours per part.

In Kuala Lumpur, SME Aerospace (SMEA) manufactures parts for major aircraft manufacturers, including Boeing and Airbus. The company does not produce prototypes but has focused entirely on the series production of parts. With typical lot sizes close to the hundreds, more than a million parts of very different sizes are produced each year. The company employs around 800 people in Malaysia and is very well positioned with modern machinery to achieve the required performance in manufacturing.

The cost pressure felt by businesses around the world has also hit the supplier in Malaysia. Most of the workpieces are made of aluminium. SME Aerospace can machine structural parts up to four metres in size on its machines.

At the moment, the supplier only produces few titanium parts, but wants to expand this area. For this, SMEA seeks to increase productivity in titanium machining in order to achieve a higher output on the machines. The company turned to MAPAL Malaysia to machine a special part. MAPAL's Asian subsidiary has been up and running since 2008 and is also located in the greater Kuala Lumpur area. The subsidiary is managed by Kang Hum Lim. Most of the 17 employees have been with the company for a long time and are very knowledgeable.

The subsidiary offers MAPAL's entire range of products and services, plus comprehensive technical support. In addition to sales, there is also an on-site manufacturing unit for solid carbide tools and a regrinding service. They

work together with local companies for coating. Many of MAPAL Malaysia's customers come from the automotive sector, but the aerospace industry is also playing an increasingly important role. MAPAL Malaysia could draw from the experience of Senior Sales and Application Engineer Kien Keng Mak for this project. Before joining MAPAL, he was employed for many years by a company that manufactures structural parts for the aerospace industry. For the new project with SME Aerospace, his programming skills on the Catia CAD/CAM system were particularly useful, as it correctly implemented the specified contours of the aerospace part to be milled from the solid on the machine.

PART FOR THE AIRBUS A320

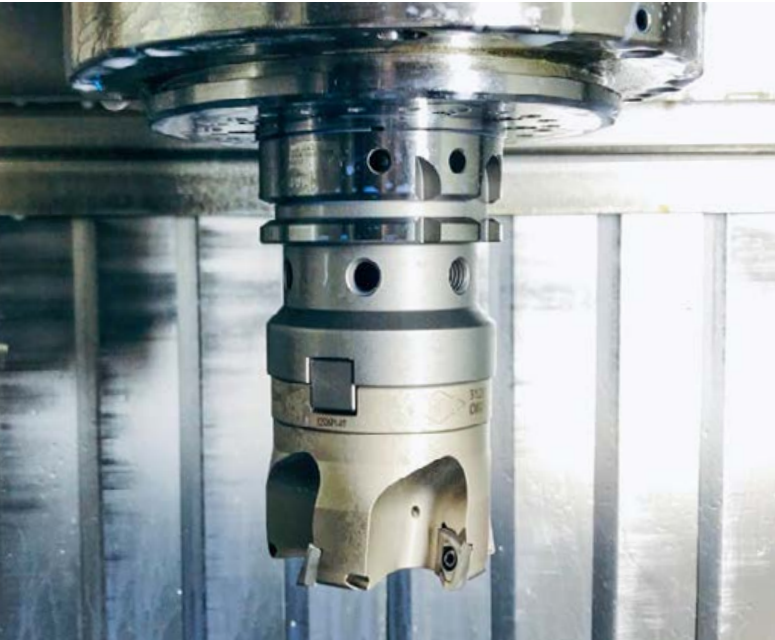
The part for which SME Aerospace brought MAPAL Malaysia on board is a component for an Airbus A320. SMEA has already been producing about 40 parts per month for their customer for several years. At first glance, the part, which measures approximately 85 x 70 x 100 mm, looks like a brake caliper, and its machining is quite demanding with its sloping surfaces, various radii and transitions. To mill the part out of a titanium block, SMEA previously used solid carbide tools and tools with indexable inserts in a simple design. The manufacturer could not be satisfied with the processing time of 6:38 hours, and so SMEA evaluated another tool supplier.

MAPAL Malaysia selected suitable tools and worked out a rough machining strategy. The technicians relied on the current tool portfo-

lio for titanium machining, but also brought custom tools into play. Using the respective stored cutting data, they ran a simulation and calculated an expected machining time of 3:34 hours.

The Malaysian subsidiary then approached the titanium specialists at MAPAL's headquarters in Aalen with this concept. There, they were amazed at the predicted time savings of almost 50 percent. To verify the design, the TET-CAM team with Test Engineer Andreas Rotenberger simulated the machining process again, with a particular focus on roughing, which made up about 65 percent of the cycle time. In cooperation with the R&D department, machining strategies with solid carbide custom tools were developed and perfectly implemented in the CAD/CAM system Catia by MAPAL Malaysia. "This worked very well thanks to the excellent, open communication of all those involved", Rotenberger emphasises. "In this way, the specified contours of the part could be machined exactly from the solid."

"We can only get the greatest possible customer benefit by running a simulation. Our TET-CAM team is the key to these kinds of projects", acknowledges Jens Ilg, who supports aerospace customers at MAPAL as Business Development Manager. "The team knows what the machine can do, what the machining should look like and how powerful our tools are." In the end, the values from Kuala Lumpur and Aalen were very similar.



MAPAL selected indexable insert milling cutters for the surfaces in the first clamping setup. The indexable inserts can be recycled in Malaysia, which minimises the number of tools that have to be sent to Germany for regrinding.



The project team with employees from SME Aerospace and MAPAL in Malaysia (from left): Noramin Nazar Shah, Mohd Farid, Kang Hum Lim, Omar Joizzuddin, Markus Beerhalter, Muhammad Faizal, Sumitro Setianto, Wan Zulkifli and Kien Keng Mak.

SIMPLER LOGISTICS THANKS TO INDEXABLE INSERTS

In Aalen, the tool concept was refined a little more, which further reduced the cycle time. For the tools, the manufacturer now also specified tool lives. Where possible, the solid carbide tools originally intended for roughing were replaced by tools with indexable inserts. This made it possible to minimise the number of tools that have to be sent to Germany for regrinding because of their complicated geometry. Indexable inserts can be recycled on site in Malaysia. This considerably increases sustainability in series production.

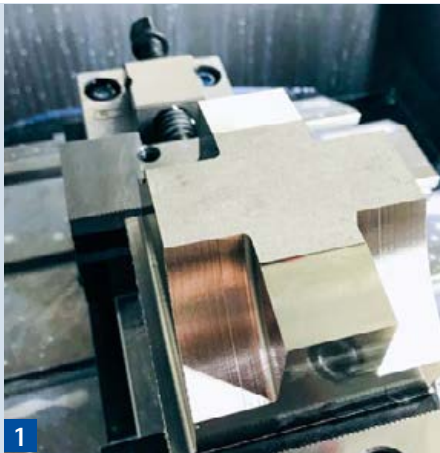
In order to reduce the machining time of the part by the predicted 50 percent for the customer, MAPAL did not stop at replacing the previously used tools with high-tech tools for titanium. Instead, the specialists analysed the

entire process and used clever programming tricks, tool features and machining strategies. The decision was made to machine in three clamping setups in order to prevent the part from deforming during milling. MAPAL Malaysia has designed the clamping fixtures for this itself. The matching chucks also came from MAPAL. They ensure that the coolant supply reaches the cutting edges perfectly and that there is reliable chip removal. Both are very important in titanium machining to avoid rapid tool wear. To be on the safe side, an external cooling system was included in addition to the internal coolant supply.

The MAPAL specialists completed the package deal for SMEA by programming the part directly on the customer's computer, with the data of the machine on which the machining was to take place – a DMC 65 monoBlock.

RELIABLY HITTING THE TARGET IN THREE CLAMPING SETUPS

In the first clamping setup, the surfaces are milled and a dovetail is attached. The OptiMill-Tro-Titan is used for trochoidal milling of the pocket and is responsible for most of the cycle time savings. The side edge and various radii are machined with a raised head cutter and a taper milling cutter, each in a special design, in one clamping setup. Cutting angles, substrates and coatings are based on the knowledge MAPAL has gained in developing its standard tools for titanium. While tools with indexable inserts are used wherever possible for roughing, solid carbide tools are predominantly used for finishing in order to achieve clean surfaces. "We found a good combination of solid carbide and indexable insert technology for this project", Ilg comments.



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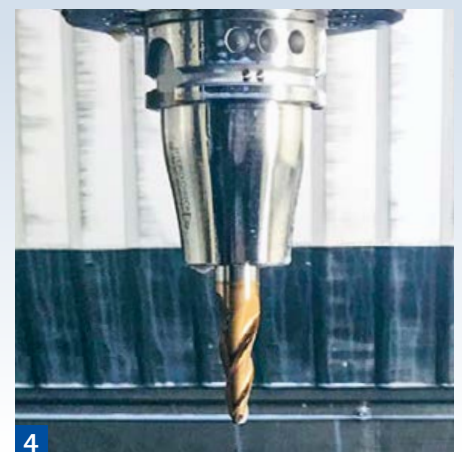


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3

- 1 In order to mill out the pockets, among other things, the part was rotated by 180 degrees and swivelled around the A and C axes.
- 2 A powerful duo for machining lateral margin and various radii: A specially designed raised head cutter and the hydraulic chuck UNIQ Mill Chuck.
- 3 High-efficiency pocket milling: The OptiMill-Tro-Titan trochoidal solid carbide milling cutter.
- 4 A taper milling cutter, which MAPAL designed as a custom tool for SME Aerospace, ensures clean radii, smooth transitions and perfect surfaces.



4

To ensure that nothing went wrong in the end, Global Project Engineer Markus Beerhalter supported the MAPAL Malaysia team during the commissioning. "Markus has been with MAPAL for many years, knows tool applications and is very well connected", says Ilg. Beerhalter was able to contribute his expertise in titanium machining on site. "With titanium, the noise during machining sounds very different", he reports. "This is why, when optimising the cutting values, we also include the sound of the machining. Vibrations or poor cooling have a very negative effect on the tool life and the quality of the part. When employees use titanium tools for the first time, they find it a difficult to recognise this because the cutting values differ considerably from machining other materials." Nevertheless, dummy material was used for commissioning to ensure that the five-axes machining runs without hindrances and that

there really are no tool restrictions in the way. Series production could then start without producing rejects with the expensive raw material.

The machining time was finally reduced to 3:20 hours, which is an additional 14 minutes below the time agreed. SME Aerospace is very satisfied with this result as well as the support from MAPAL. Next, a very similar part is already being discussed, namely a stopper for aileron reversing. ■



Working well together in Kuala Lumpur (from left): Suhaimi Bin Saeh (Machine Operator SMEA), Markus Beerhalter (Global Project Engineer MAPAL) and Kien Keng Mak (Senior Sales and Application Engineer MAPAL Malaysia).

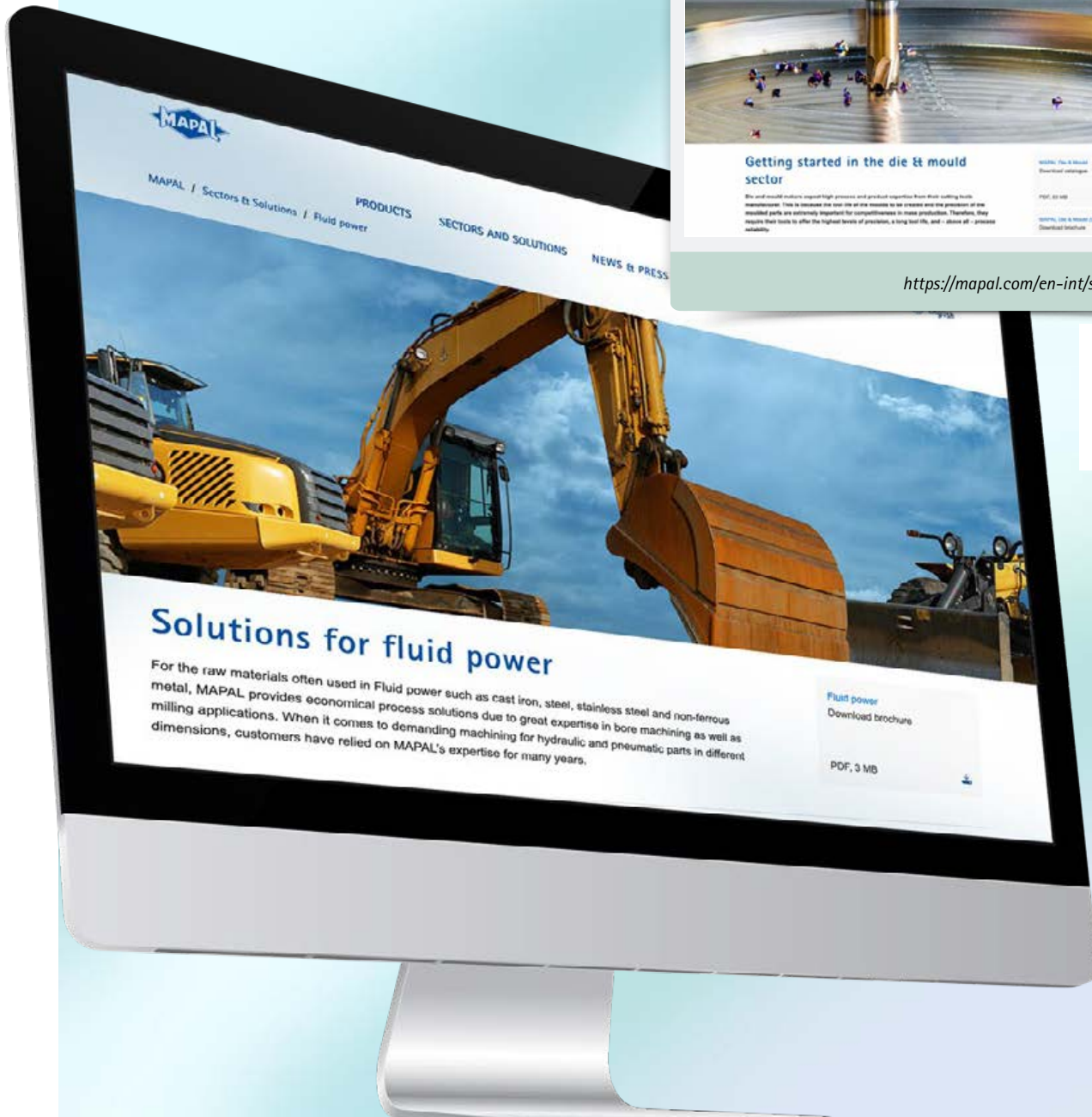


Fine-tuning the process on the machine (from left): Kien Keng Mak (Senior Sales and Application Engineer MAPAL Malaysia), Markus Beerhalter (Global Project Engineer MAPAL), Kang Hum Lim (Managing Director MAPAL Malaysia), Dian Winaryanto and Inan Akub (both machine operators at SMEA).

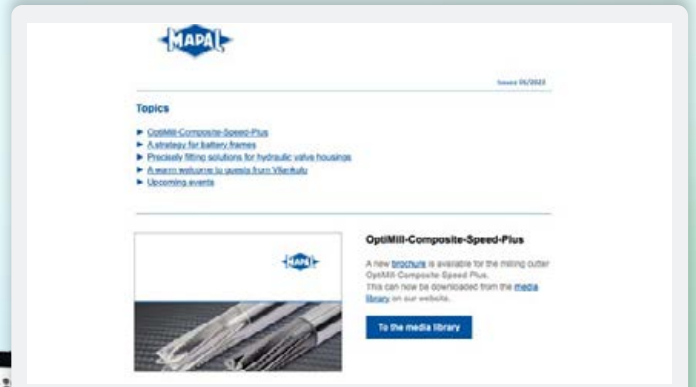
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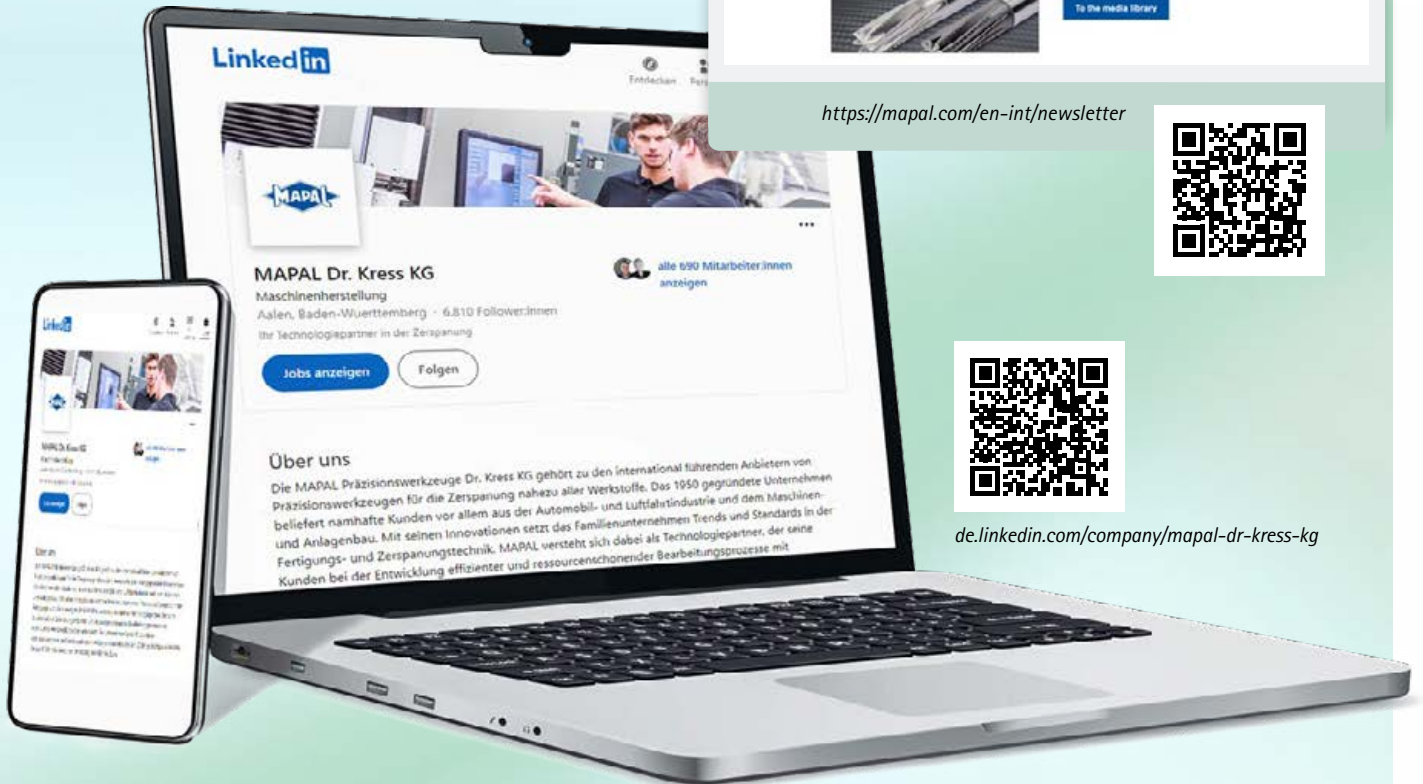


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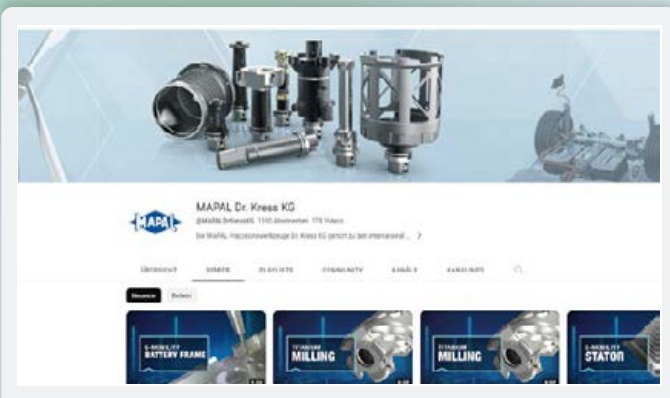


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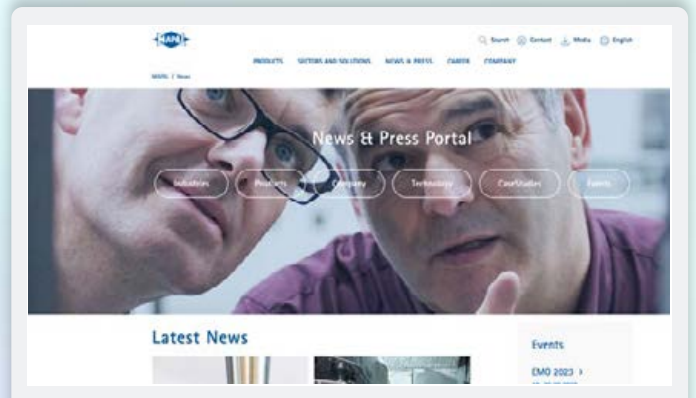
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