

The mold & die **journal**

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Impressions Fakuma 2024 (Picture: P. E. Schall GmbH & Co. KG)

Fakuma 2026: A Multifaceted Programme for the Anniversary Event



The 30th Fakuma will once again be a celebration for the plastics industry from Monday the 12th through Friday the 16th of October, 2026. Exhibitors and expert visitors will celebrate the extraordinary success story of the international trade fair for plastics processing with a colourful array of world-class programme highlights that will serve as a backdrop for the event, i.e. presentations at the forum featuring the latest expert know-how, the first edition of the Fakuma Innovation Award ceremony, the next instalment of the round-table discussion, the return of the “Mould Your Dreams, Mould Your Future” careers campaign and, last but not least, the inaugural presentation of the Paul Eberhard Schall Medal.

The entire world of plastics – plus much more – is on the agenda for the 30th Fakuma international trade fair for plastics processing which will take place daily from 9 a.m. to 5 p.m. from Monday the 12th through Friday the 16th of October, 2026. The Friedrichshafen Exhibition Centre will host an enormous family celebration for five days to mark its anniversary. On the one hand, it will serve as a showcase for the entire world of plastics –

from injection moulding, forming and extrusion technology, as well as 3D printing, masterbatches and raw materials, right on up to tooling, process technology and recycling. On the other hand, it will provide a unique platform for communication, discussion, knowledge-sharing, awards and career planning.

You can find the whole text on page 16-18.

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10 Perfect sealing of inserts

Plastics processor Giuseppe Caruso, based in Germany, is unwilling to compromise when it comes to quality. To ensure perfect sealing and protect both metal inserts and the injection moulding tool, his company relies on HASCO's flexible sealing elements made from a special plastic.



38 Driving customer manufacturing performance: MAPAL combines turnkey expertise, tooling performance and tool management

Italian hydraulic manufacturer Benvenuti S.r.l. runs its modern manufacturing with MAPAL – relying on tooling, tool management and tailored turnkey solutions of the precision tooling specialist throughout. With this setup, production has been made so efficient that it is now set to be rolled out to other sites within the parent company Casappa S.p.A. and Casappa Hydraulics Shanghai China.



56 AI in CNC manufacturing

Artificial intelligence is evolving from a topic of the future to a practical tool for industrial manufacturing. In line with this, DMG MORI will be presenting a turn-mill showcase at Hannover Messe 2026 to demonstrate how AI can deliver substantial added value along the CNC process chain, from work preparation and machining to the analysis of energy and status data.

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ELMET sets the course for further growth: Markus Nuspl becomes CEO

Dr. Markus Nuspl, an experienced manager and proven industry expert, is taking over as CEO of ELMET. A mining engineer with a Ph.D., he brings more than 20 years of industry experience as well as extensive expertise in silicone processing, quality management, innovation, and corporate development. Most recently, he served as CEO of RICO Elastomere Projecting GmbH, where he was responsible for the company's strategic and operational development for several years. "In Dr. Nuspl, we have gained a leader who combines professional excellence, entrepreneurial thinking, and strong interpersonal skills. He knows our industry, understands the challenges our customers face, and shares our conviction that sustainable business success can only be achieved together with dedicated employees. We are very much looking forward to leading ELMET into the future alongside him," the owners agree.

Markus Nuspl has a clear vision for the coming years: sustainable and continuous growth based on long-term partnerships with customers, suppliers, and employees. This vision places people at the center,



From left to right: Moritz Manigatter, Paul Fattinger, Markus Nuspl (new managing director), Christian Reslhuber, Roman Adlesgruber, Christine Adlesgruber, Kurt Manigatter. Photo: ELMET

alongside the highest level of customer satisfaction, uncompromising quality, technological innovation, and the consistent improvement of efficiency and competitiveness. At the same time, the company aims to further strengthen its international market position and strategically drive diversification into various industries and regions.

"ELMET has outstanding employees, a strong technological foundation, and an excellent reputation

in the market. Together, we want to further build on these strengths. My goal is to combine innovation, quality, and economic success with a corporate culture in which responsibility is embraced, trust grows, and collaboration is put into practice." With Markus Nuspl at the helm, ELMET is setting the course for the company's next phase of development and consistently continuing on its path as an innovative partner for the international silicone industry.

Merger of the two companies, KEBO and Plastisud



KEBO AG (Neuhausen am Rheinfall, Switzerland), a leading manufacturer of high-precision injection molds for applications in the medical/pharmaceutical, laboratory, and thin-wall packaging sectors, will operate under the umbrella of the French Plastisud Group (Castelnaudary, France) in the future. The transaction was signed on June 22, 2026. Founded in 1979, KEBO is a pioneer in the development of high-precisi-

(Picture: KEBO)

on injection molds and innovative hot runner technology. With Gerold Keller and Daniel Bodenmann representing the second generation, the company has stood for the highest precision, quality, and customer focus for many years. The merger with Plastisud is intended to enable more efficient use of capacities in order to better serve rising customer demand, particularly in the rapidly growing diabetes and obesity market. By combining the two companies, the strengths in the areas of innovation, technology, and rapid scalability are to be realized even more effectively for customers.

KEBO will continue to operate as an independent company within the Plastisud Group. At the same time, the new majority owner is clearly committed to the Swiss location, which is to be further strengthened and expanded in a targeted manner. Within the Plastisud Group, KEBO will serve as the center of excellence for applications in the medical/pharmaceutical and laboratory industries.

Continuity is a key element of the transaction: the existing management team and the previous owners will remain on board to ensure a customer-focused transformation and collaboration.

For employees, customers, and suppliers, the merger will not change anything in day-to-day business. The existing points of contact will remain unchanged, and the KEBO team will continue on its successful path with the same reliability and customer focus.

"In Plastisud, we have found a partner for our family-owned company that shares our DNA and has the same high standards for quality and customer service. With this long-term succession plan, we are confident that KEBO will be able to further strengthen its strong position in the field of drug delivery devices," says Gerold Keller, current co-owner of KEBO.

Plastisud also sees significant strategic potential in the transaction: "KEBO is an ideal fit for the Plastisud Group. This strategic alignment opens up very attractive opportunities for us in the medical and pharmaceutical sectors, a business that complements our existing product and customer portfolio very well," says Laurent Buzzo, President and CEO of Plastisud.

With this merger, both owner-managed companies are laying the foundation for further growth, an even stronger market position, and the targeted expansion of their expertise and capacities in demanding and high-growth end markets.

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20 Years of ZAHORANSKY in the USA

ZAHORANSKY USA Inc. is celebrating its 20th anniversary. What began two decades ago through a partnership with a U.S. sales representative has grown into an independent subsidiary based in West Chicago, Illinois, serving customers throughout the United States and Canada. To mark the anniversary, the company hosted an Open House, highlighting the strong connection between the North American market and German engineering expertise. During its early years, ZAHORANSKY was represented in the North American market through a U.S. sales agent. A major milestone followed in October 2014, when the partnership evolved into an independent subsidiary. Since February 2015, ZAHORANSKY USA has operated from its current location in West Chicago, providing comprehensive support to customers across the United States and Canada – from consultation and machine commissioning to after-sales service. The location also played a remarkable role during the COVID-19 pandemic. As part of the U.S. government's Operation Warp Speed, ZAHORANSKY contributed to supplying production equipment



(Picture: ZAHORANSKY)

for components used in the distribution of newly developed vaccines. This was a compelling example of the team's ability to respond quickly and flexibly to extraordinary challenges.

Over the past decade, ZAHORANSKY USA has continuously strengthened its market position. Several Open House events have fostered direct dialogue with prospective customers and repeatedly led to new business relationships. At the same time, the subsidiary has strategically expanded its service and spare parts teams while optimizing internal processes. Throughout this development, the focus has remained on increasing customer satisfaction and ensuring

fast response times.

"Twenty years in the United States demonstrate how important local presence and close customer relationships are to our business. Our team on site combines ZAHORANSKY's innovative strength with a

deep understanding of the North American market," says Dr. Heinrich Sielemann, Chief Technology Officer of ZAHORANSKY, who traveled from Germany to attend the anniversary celebration.

To celebrate its 20th anniversary, ZAHORANSKY USA welcomed customers from across the United States to its Open House event, representing regions from the West Coast and the Midwest to the East Coast. The highlight of the event was a live demonstration of the Z.PUMA, showcasing the production of two different brush sizes. The demonstration impressively illustrated the machine's performance, flexibility, and versatility.

New Managing Director for Arburg Mexico

Arburg's Mexican Subsidiary Under New Leadership

On July 21, 2026, Julio Lopez took over as head of Arburg, S.A. de C.V. in Querétaro, Mexico. As Mexico navigates a dynamic



Julio Lopez has been the new Managing Director of Arburg's subsidiary in Mexico since July 21, 2026 (Picture: Arburg)

economic landscape, he will focus on turning challenges into opportunities. Thanks to long-standing, trusting customer relationships – including international partnerships – and a capable, experienced local Arburg team, he is well positioned to drive innovation, tap into new growth markets and further expand Arburg's presence and success in Mexico.

Julio Lopez is ideally qualified for his role at the helm of Arburg's Mexican

subsidiary: The 57-year-old studied mechanical engineering and also earned an academic degree in marketing.

Before joining Arburg, Julio Lopez held various positions at the Coesia Group, which specialises in highly innovative industrial and packaging solutions in mechanical engineering, including Managing Director in Mexico and Brazil and Chief Sales Officer for North America.

New Airmould starter package plus from WITTMANN

Internal gas pressure technology with plug & play convenience

With the Airmould starter package, WITTMANN simplifies the access to internal gas pressure technology. The new plus version now also includes the pressure generation unit.

Airmould internal gas pressure technology saves raw material, reduces the part weight and minimizes warpage, sink marks and shrinkage. In this way, the injection molding technology combines high surface quality with cost efficiency and sustainability.

To enable quick and easy startup of internal gas pressure technology, WITTMANN offers all necessary modules in a cost-effective package. Each Airmould starter package contains a central unit for 2 pressure control modules, an IoT-compliant pressure control module, the manual control unit and now also a pressure generator – a novelty in the Airmould starter package plus. All variants come with thorough application technology counselling by specialist engineers from WITTMANN. With the help of simulation and feasibility studies, the parts are examined thoroughly to determine whether they are suitable for internal gas pressure technology. Whenever a decision is made in favor of internal gas pressure, WITTMANN will take care of both the equipment's layout and its start-up. In this way, users will benefit from the WITTMANN application technology specialists' many years of experience and profound injection molding expertise. Existing production processes can also be adapted quickly and easily, since in many cases the molds can be used for Airmould without requiring any changes. Typical fields of application are automobile components such as handles, gardening equipment and technical components with bulges.

For Airmould internal gas pressure injection molding, nitrogen gas is injected into a partly or completely filled cavity. The pressurized gas forms a bubble at the center of the melt, which counteracts shrinkage contraction on the outside and thus eliminates sink marks. By reducing the quantity of plastic material and simultaneously enlarging the hollow space at the center, light-weight components can be produced effectively with short cycle

times and attractive surfaces.

Compatible with machines of all brands

To spread the benefit from internal gas pressure technology across many different fields of application, Airmould from WITTMANN offers extreme flexibility. The packages have a modular design. All technology modules

can be used via Euromap 62 on any injection molding machine regardless of its brand or model. When connected with an injection molding machine from WITTMANN, Airmould can be completely integrated into the work cell via Wittmann 4.0 and operated from the injection molding machine's display. WITTMANN's concept of "everything from a single source" even includes nitrogen generation. The N2easy nitrogen generators developed and manufactured by WITTMANN extract nitrogen gas from the ambient atmosphere and supply it simultaneously to several consumers. N2easy already pays off from a daily nitrogen consumption rate of just one gas bottle.



Just plug it in and get started: the Airmould starter package plus for internal gas pressure technology includes the pressure generator (Picture: WITTMANN)

WITTMANN Expert Day in September

Interested processors are invited to try out the potential of Airmould at the technical labs of the WITTMANN facilities. At the SKZ Center in Würzburg/Germany, WITTMANN injection molding machines with Airmould technology are also available for application technology testing and training.

Mark your calendar now for the WITTMANN Expert Day about foam injection molding and internal gas pressure technology on 10 September 2026 at WITTMANN in Meinerzhagen/Germany.

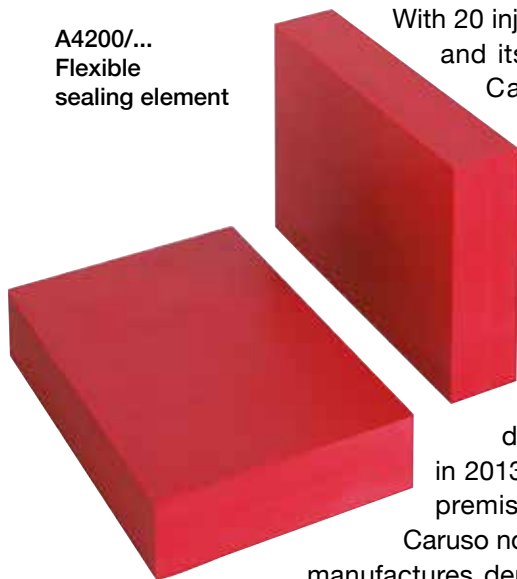
Information and registration: www.wittmann-group.com/ExpertDay

Plastics processor Caruso opts for flexible sealing elements from HASCO

Perfect sealing of inserts

Plastics processor Giuseppe Caruso, based in Germany, is unwilling to compromise when it comes to quality. To ensure perfect sealing and protect both metal inserts and the injection moulding tool, his company relies on HASCO's flexible sealing elements made from a special plastic.

A4200/...
Flexible
sealing element



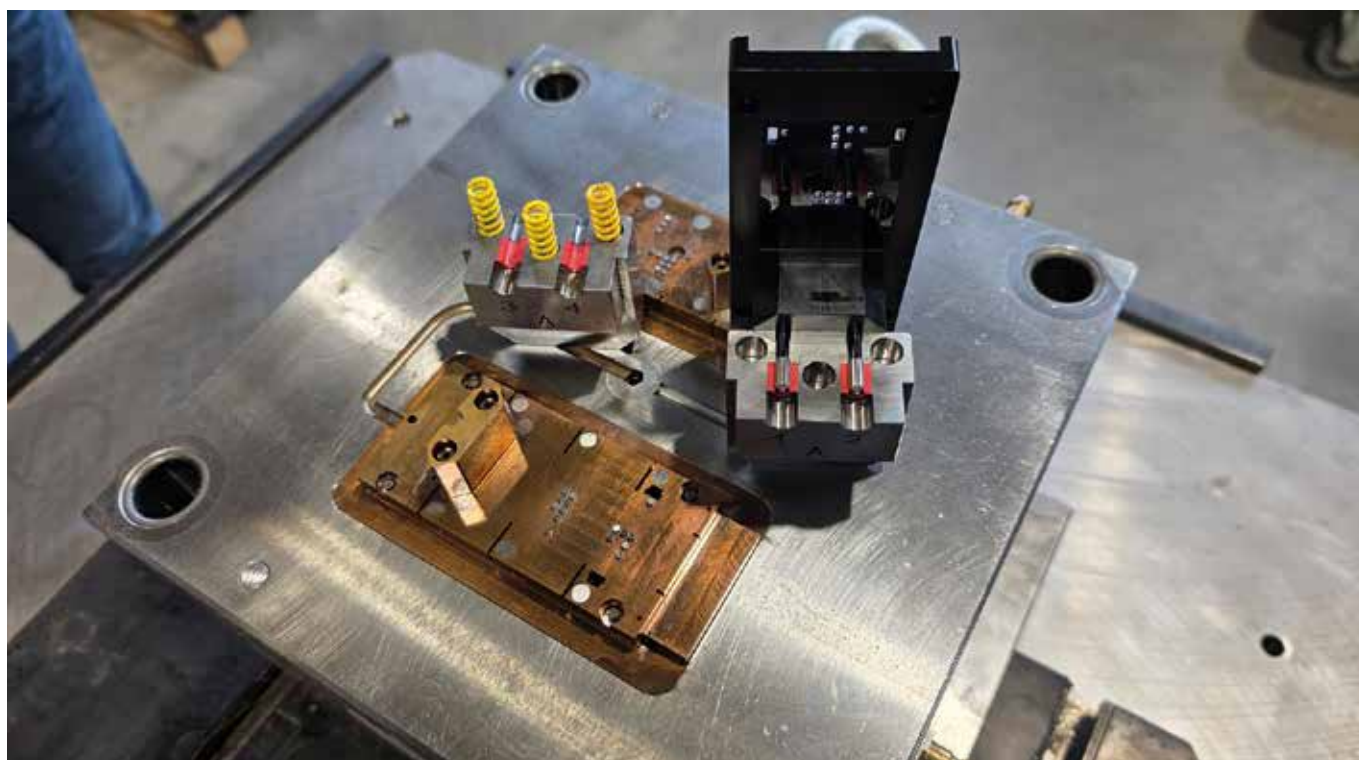
With 20 injection moulding machines and its own toolmaking centre, Caruso Kunststofftechnik, based in Meschede, Germany, is one of the largest plastics processing companies in the region. Giuseppe Caruso, a master craftsman and process engineer specialising in plastics and rubber technology, founded the company in Sundern in 2013 before moving to its own premises in Meschede in 2020.

Caruso now employs 25 people and manufactures demanding plastic components for a wide range of industries, including automotive, sanitary, public safety, electrical engineering, household appliances, caravans, cycle accessories, rehabilitation technology and many more.

Caruso's portfolio is distinguished by its comprehensive service, beginning with the design of the component, for example based on an existing part that is captured using modern 3D scanning technology. Once the injection-moulded component has been designed, a functional demonstration model can, if required, be produced using 3D printing. The mould is then designed and, as a rule, manufactured either in-house in Meschede or by highly qualified partner companies in China. "Especially when things need to move quickly, we rely on our partner companies," says Caruso.

For all moulding tools, the service also includes flow and warpage simulation of the plastic products to be manufactured. "We offer our customers every step from a single

A4200/... reliably protects sensitive inserts in the mould from damage



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Giuseppe Caruso (Caruso Kunststofftechnik) and Klaus Meier (HASCO) exchange their experiences on the use of the flexible sealing element A4200/... (Pictures: HASCO)

source, from prototype development through to the finished standard product manufactured by us," says Giuseppe Caruso. In its own toolmaking department, which originated from a former mould supplier that has been acquired, Caruso has always relied on HASCO components and services. These include common products such as ejectors, quick-action couplings and angled bolts, as well as complete mould bases. "One thing that is naturally always helpful," says Caruso, "is the expertise provided by HASCO. Whenever I have a problem, a phone call is enough and we immediately receive useful suggestions." One typical challenge involved finding an optimum solution for sealing metal inserts used in a plug-in power supply against melt leakage during overmoulding with flame-retardant polycarbonate in order to avoid flash. In addition, the insert components – in this case the electrical contact pins – had to be protected from damage caused by the jaws of the steel mould, while wear on the mould itself also needed to be minimised. "We quickly identified the flexible sealing element A4200/... from HASCO as the ideal solution," explains Klaus Meier, Technical Sales Representative at HASCO. The only plastic sealing element currently available on the market for the cavity area of

injection moulding tools is made from the patented MurSeal® material. This material was developed over several years in close cooperation with the former plastics institute in Lüdenscheid, the company Murtfeldt from Dortmund – a leading manufacturer of wear-resistant plastics – and users of metal encapsulation technology. Today, these flexible sealing elements A4200/... are offered exclusively by HASCO for injection moulding tools. Thanks to their long service life, they enable flash-free and damage-free overmoulding of metal inserts. The sealing elements can also be machined without difficulty, using methods similar to those employed for metal inserts. Carefully selected tolerances ensure

that the sealing element is deformed by the insert under the mould clamping force, creating a precise seal against the melt.

Thanks to the elimination of post-processing costs and a lower reject rate, unit costs can be significantly reduced.

The sealing elements are fixed into the mould like conventional inserts, are heat-resistant up to melt temperatures of approximately 280 °C, and can compensate for insert tolerances of up to 0.1 mm.

The A4200/... sealing elements are available as standard in a size of 50 × 80 mm and in thicknesses of 6, 10 or 15 mm. "Naturally, custom sizes are also available," says Klaus Meier.

Another application for the flexible sealing elements is the protection of lacquered or otherwise sensitive insert surfaces, which can easily become scratched during insertion into a steel moulding tool.

Giuseppe Caruso, who is proud that his company has not lost a single customer in almost 15 years but has continuously gained new ones, intends to continue relying on HASCO. "Our customers associate us with quality. They see us as problem-solvers," says Caruso. "And consistently delivering top quality is only possible within a strong network of partners such as HASCO."

Slot broaching for small diameters

Horn is expanding its slot broaching system with new type 117 inserts, which are suitable for internal diameters from 9 mm. The tool system is sustainable thanks to the low carbide content and has an advantageous price per cutting edge. Horn has developed a new carbide blank specifically for the 117 insert family. "Development of the new carbide blank required new approaches in production and metrology. Due to the small size of the inserts, we had to make significant adjustments in handling, fixture grinding and measuring systems," says Horn Product Manager Andreas Härle. The system is suitable for numerous broaching processes such as gear broaching, polygonal broaching and the broaching of keyways.

The new system has an advantage over solid carbide broaching tools. The tool shanks enable the broaching of longer or deeper grooves. Tool lengths are 20 mm, 30 mm and 40 mm. All types offer internal coolant supply directly to the cutting zone. The shank diameters of the tool holders are 16 mm and 20 mm. Horn also offers special holders for mounting in broaching units from various manufacturers. The standard inserts are available in numerous types.

The new broaching system has already demonstrated its capability during initial applications. One user previously achieved a tool life of 120 pieces when broaching a serration in a component made of hardened steel. By switching to the new Horn system, tool life increased to 1,040 parts, while maintaining the same cutting parameters. In addition to the significantly higher tool life, production costs fell due to the lower cost per cutting edge compared to that of the previously used carbide inserts.



(Picture: Paul Horn GmbH)

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The HC643FB tool from Hufschmied proved to be perfectly suited for finishing an additively manufactured workpiece made of Uddeholm Tyrax ESR (Picture: Hufschmied Zerspanungssysteme)

A new, additively manufactured injection mold proved difficult to rework. The hard machining tool previously preferred by the toolmaking department at Erich Rothe GmbH & Co. KG broke after just five minutes. The experiment with a new tool paid off: Using the HC643FB milling tool from Hufschmied Zerspanungssysteme, finishing the injection mold part made of Uddeholm Tyrax ESR proved to be a reliable solution.

Reducing cycle times in injection molding has always been an important optimization goal in plastics processing. "We tested various versions of the standard steel insert for the injection molding tool used to produce the reels on which the component tapes are delivered in electronics manufacturing. We then decided to try out conformal cooling," explains Bernd Gruber, Head of Toolmaking at Rothe. Gruber found a service provider who was able to manufacture his new design using the laser powder bed fusion (LPBF)

process and Uddeholm Tyrax ESR, a corrosion-resistant premium plastic mold steel with high ductility, wear resistance, and a hardness of 58 HRC. Additive-manufactured workpieces always show their layer-by-layer generation, and the rough surface must be reworked. This became a challenge in this case.

Alternative tool

"We followed the material supplier's specifications when finishing the blank, but the result was frustrating. The cutting edges of

the tool broke off after five minutes," recalls Max Hahn, the CNC technician who wanted to bring the blank into its final shape on a Micron HEM 500U. An offer from Hufschmied came at just the right time and provided the solution with a tool life of at least 18 hours. HC643FB is a 3D finishing cutter for hard machining above 40 HRC and up to 72 HRC. It has three unequally divided cutting edges and the contour of a flattened ball, which allows 35 percent more feed than a ball cutter. The tool consists of an ultra-fine-grain carbide substrate and has a special micro-edge geometry. The in-house 3 µm thick TL12 coating made of TiAlSi has a hardness of 3800 HV.



CNC technicians Max Hahn (left) and René Pfeuffer with the hard machining tool from Hufschmied (Picture: Erich Rothe GmbH & Co. KG)



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Perfect fit for this material

Hufschmied's hard machining tool proved to be the perfect choice for Voestalpine's special tool steel. "We examined one of the Hufschmied tools under a microscope after 15 hours of use, and it was like new," recalls Max Hahn. The service life was ultimately at least 18 hours. "We really appreciate that Hufschmied's hard machining tools give us this process reliability," says Bernd Gruber. Thomas Wohlfromm, technical consultant and sales representative at Hufschmied Zerspanungssysteme GmbH, is delighted with the regular orders now coming in from Rothe: "We are much better known for our tools for machining composite materials. So I am all the more pleased that we have encountered

a challenge here in connection with a hard material for additive manufacturing and have passed it with flying colors. Finishing such blanks is a task that many users will be encountering, and it is good to know that we already have the solution."



The new tool insert, which provides conformal cooling, after machining with the Hufschmied tool
(Picture: Erich Rothe GmbH & Co. KG)



Impressions Fakuma 2024 (Pictures: P. E. Schall GmbH & Co. KG)

Fakuma 2026: A Multifaceted Programme for the Anniversary Event



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sion, knowledge-sharing, awards and career planning.

Fakuma Innovation Award Performance and Competence in Six Thematic Categories

Above all, Fakuma focuses attention on the future, and on solutions that will enable the industry to meet today's and tomorrow's challenges. And this is why trade fair promoters P. E. Schall, together with trade publication K ZEITUNG, are presenting the Fakuma Innovation Award. It's intended to furnish ground-breaking impetus for the plastics processing industry in technological, environmental as well as economic terms.

Companies are offered an international platform on which to present their latest innovations to an interested specialist audience, and to showcase their innovative strength. Entrants can submit their projects in one of the six categories including injection moulding, extrusion, recycling, tool and die making / thermoforming, compounding and materials, as well as plastic technology enablers (peripheral equipment). In this way, the competition reflects the entire value chain for plastics technology – from materials and processing methods, right on up to ancillary technologies. As an important condition of entry, it must be possible to showcase the submitted project live at Fakuma 2026 – as a production-ready product, as a working prototype or as a live demonstration of a technology. Participation is free of charge. Entries can be submitted online up through the 6th of September, 2026. All entries will be reviewed and assessed by an independent expert jury. The winners will be honoured at an award ceremony on the first day of the trade fair.

“Catalyst for Future Developments and Strategic Alignments”

What began in 1981 with 76 initial exhibitors has evolved into a major European platform for the plastics processing industry. That’s why Fakuma is one of the industry’s must-attend events in the trade fair calendar. “For years now, Fakuma has been one of the key tech-



nology platforms for the plastics industry,” emphasises Dr. Magnus Orth, head of materials development and the Technology Centre at Igus. “It unites practical relevance with technological depth. In particular I value the informal atmosphere and the opportunity to discuss and explore concrete solutions across the entire value chain – from materials and tooling, right on up to processes and applications. Fakuma is thus more than just a trade fair – it’s a catalyst for future developments and strategic alignments within the industry,” says Magnus Orth. For Prof. Dr.-Ing. Christian Bonten of the Institute of Plastics Technology (IKT), Fakuma is also “an integral part of my trade fair calendar and, particularly for us at the institute here in Stuttgart, the definitive industry hot-spot”, he emphasises. Fakuma is firmly established in the trade fair calendars of many industry players because it reliably delivers what they need: a down-to-earth overview of the current state of the art in plastics processing.



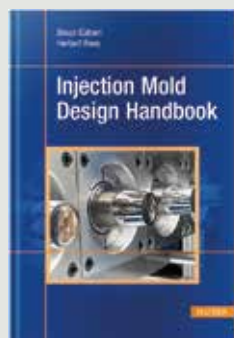
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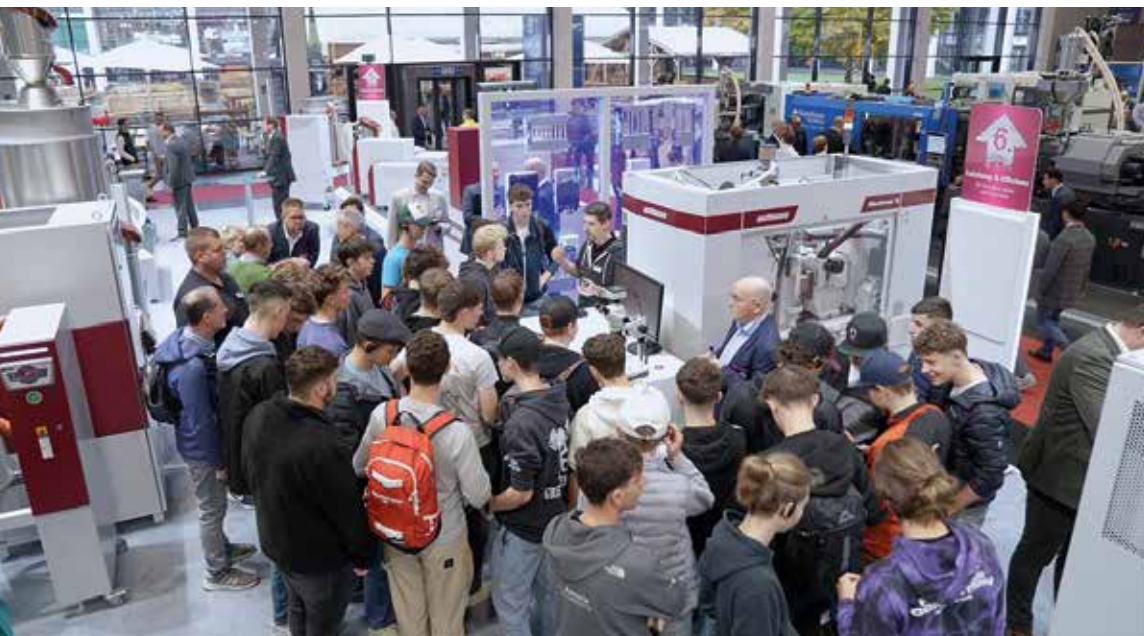
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horizons,” explains Bettina Schall, managing director of trade fair promoters P. E. Schall. “Career Friday brings talented individuals and companies together face-to-face in an authentic, pragmatic manner, on an equal footing. This allows visitors to discover just how exciting and progressive the plastics industry really is.” Dr. Christine Bunte, managing director of Plastics Europe Germany, is also impressed by this career initiative: “Seeing how closely the trade fair, the exhibitors and the as-

At the same time, the trade fair thrives on personal interaction – on catching up with long-standing colleagues as well as making new contacts.

“Mould Your Dreams, Mould Your Future” Careers Campaign Inspires Enthusiasm for the Future

Fakuma 2026 is also sending a strong signal regarding the recruitment of young talent. Trade fair promoters P. E. Schall, together with the trade fair advisory board and Plastics Europe Germany, will once again be hosting Career Friday on 16 October 2026 in keeping with the maxim “Mould Your Dreams, Mould Your Future”. Pupils, students young professionals are invited to experience the broad range of opportunities offered by the plastics industry first-hand – on site in Friedrichshafen. With its careers campaign, Fakuma has created a platform that specifically targets young people and provides them with practical insights into one of Europe’s most innovative industries. International exhibitors will hold exclusive events at their trade fair booths, offering insights into modern manufacturing technologies and outlining effective strategies for entering the industry. “We don’t just want to acquaint young people with various job profiles – we want to open up real career

sociations are working together to get even more young people excited about plastics is encouraging, and inspires optimism for the future.”

2026 Highlight: Presentation of the First “Paul Eberhard Schall Medal”

“We’re looking forward to a very special Fakuma anniversary event where professional networking, discussion and knowledge-sharing join forces with the exhibition to create a valuable all-round package,” says Bettina Schall. “Of course we’ll also look back at how it all began 45 years ago. But above all we’re looking to the future and focusing on solutions that will help us tackle the challenges currently faced by the industry.” For example, the third edition of the “Fakuma Round Table” discussion series will focus on the topic of “Building on Our Strengths – How is the European Plastics Industry Enhancing its Resilience?”. The presentation forum will provide suppliers as well as users with inspiring, forward-looking ideas. All in all, the trade fair’s extensive range of topics provides the plastics processing industry with vital support in remaining successful on the market. Last but not least, Fakuma 2026 has yet another surprise in store: “To mark this year’s anniversary edition of Fakuma, we, as the trade fair promoters, will present the Paul Eberhard Schall Medal for the first time to a company that has played a pioneering and influential role in the industry,” says Bettina Schall. “We want to acknowledge the company’s exceptional technological standing in the further development of plastics processing, as well as its close ties to our trade fair organisation.”

Exhibitors, expert visitors and interested guests are cordially invited to the 30th Fakuma in Friedrichshafen, taking place daily from 9 a.m. to 5 p.m. from Monday the 12th through Friday the 16th of October, 2026. Access to the exhibition venue is facilitated by AIR UNIQUON (airuniquon.com), which now offers flights to and from the compact Friedrichshafen Airport (FDH).

AI assistant for tool selection

Tungaloy Corporation introduces Gabby, an AI-powered assistant designed to help metalworking professionals quickly identify suitable tooling solutions through natural language interaction.

Selecting the right cutting tool often requires evaluating multiple variables, from workpiece materials and machining operations to cutting conditions and tool geometries. Accessing the right information quickly is essential for maintaining efficient and stable machining processes.

Conversational digital tools are beginning to change how machining knowledge is accessed and applied. Gabby was developed to simplify this process, allowing users to interact with technical information in a more intuitive way.

Describing machining needs in natural language

Gabby allows users to describe their machining requirements using natural language. By entering basic information such as the machining operation, workpiece material, or basic machining conditions, the system interprets the request and suggests relevant tooling solutions.

Through a unified conversational interface, Gabby supports a wide range of machining applications, including:

- Milling
- Hole making
- External turning
- Internal turning
- Grooving

This conversational approach enables users to interact with technical information more intuitively, helping reduce the time required



Gabby AI Assistant Interface 1 (Picture: Tungaloy)

to search catalogs or navigate complex product structures. Users can also refine requests through follow-up interactions, review catalog information, and explore alternative tooling solutions within the same conversation.

Gabby is available through Tungaloy's websites and the Tungaloy mobile application.

Expanding digital support for metalworking

The introduction of Gabby expands Tungaloy's digital ecosystem with a new AI assistant for tool selection, designed to simplify how users explore machining solutions and product information.

As part of Tungaloy's commitment to practical, efficiency-driven digital solutions for the metalworking industry, Gabby will continue evolving as new machining knowledge and application data expand its capabilities.

Note: Gabby provides general guidance based on available technical data. Final tool selection and machining conditions should always be verified independently according to specific production requirements.

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Unmanned high-mix, low-volume production



Iggy Rolando (GROB-WERKE, left) and Twan Bussers (Jansen Machining Technology) next to one of the new GROB G350 machines that is used for the automated production of high-end components

Jansen Machining Technology employs approximately 75 people and specialises in high-end precision machining. The focus is on customers who impose high demands on accuracy, cleanliness and short delivery times. Products range from small to medium-sized batches, often with complex geometries and tight tolerances. To serve these markets, investing in stable processes and reliable unmanned production is not an option but a prerequisite, according to Twan Bussers, former Managing Director of Jansen Machining Technology. Recently, he has taken on the role

Jansen Machining Technology in Valkenswaard, the Netherlands, has commissioned two horizontal five-axis machining centres from GROB. The two machines, type G350, are connected to a large-scale automation system from BMO Automation. With this production cell, the company is focusing on unmanned high-mix, low-volume production for demanding customers, including those in the semiconductor and optical industries.

of Director Technology for Machining within the Anvil Group, of which Jansen Machining Technology is a part.

150 production hours per week

“The demand for small batches of high-precision, complex components that must meet challenging tolerances and cleanliness requirements calls for a new way of producing. Especially in the high-tech markets such as the semiconductor industry we work for, requirements have increased enormously over the past ten years. At the same time, short

Jansen Machining Technology has invested in two horizontal five-axis machining centres from GROB in combination with an automation system from BMO Automation



delivery times and smaller batch sizes are requested, while margins are under pressure. We therefore aim to run machines in production for 150 hours per week, without producing for stock. To achieve this, you need reliable and accurate machining centres, and processes must be automated and optimised to the maximum extent. That is why we invested in the two five-axis machines from GROB in combination with a flexible automation solution from BMO," Bussers explains.

Horizontal five-axis machining with GROB

The initial reason for investing in the new production cell was capacity expansion. Due to changed circumstances, it also became a replacement project. A deliberate choice was made to switch to horizontal five-axis machining. "In vertical configurations, chip evacuation is not always optimal and chips often remain in pockets, which creates risks of damage to the workpiece and the tool. In an unmanned production environment, you want to avoid that at all costs. With horizontal machining, chips fall away from the working area, which increases process reliability."

During the purchasing process, two horizontal machines ultimately ended up on the shortlist after a long search. In the end, GROB was selected. "Within our company, someone already had experience working with GROB machines, which strengthened confidence in the brand. In addition, GROB's machine design played a decisive role in our choice. The robust machine construction and the positioning of the three linear axes minimise the distance between the guides and the cutting point, resulting in high stability," says Bussers. Iggy Rolando of GROB adds: "An important advantage for Jansen Technology is also the tunnel concept, in which the spindle can move completely within the machine enclosure. This allows even very large components, including when extremely long tools are used, to be machined safely and without collisions within the working area."

The G350 machines at Jansen are part of the universal machining centres in GROB's portfolio. The machine has been on the market for many years and has been continuously developed over time. The G350 has working ranges of 600 x 855 x 750 mm along the X, Y, and Z axes and is designed for workpieces weighing up to 400 kg and with a diameter of up to 720 mm.



Stability forms the basis for accuracy

The complete production cell was commissioned in July 2025, and the first workpieces were produced quickly. "We deploy the two GROB G350 machining centres for the production of the most critical workpieces. These include workpieces with tolerances within one hundredth of a millimetre across the entire work envelope, with some dimensions produced to an accuracy of a few micrometres.", emphasizes Bussers.

According to Bussers, this is precisely where GROB distinguishes itself in terms of stability and repeatability, which together form the basis for successful unmanned high-mix, low-volume production. To reproducibly achieve these high accuracies in an automated setting, not only do the mechanical and thermal stability of the G350 ensure optimal performance, but also the fully climate-controlled production environment and the coolant that is actively kept at temperature. "To be able to produce this level of accuracy reproducibly, the entire process must be under control.", explains Bussers.

Automation for high-mix, low-volume

Jansen Machining Technology has connected the two GROB machines to a large-scale automation system from BMO Automation. The cell combines pallet and product handling and is designed for maximum flexibility, allowing a wide variety of products to be produced intermixed.

The cell is equipped with a robot that, via a track system, handles pallets and workpieces between the various machines and stations. In addition to the two GROB machining centres, the cell also contains a cleaning bath to clean workpieces immediately after production and blow them dry to prevent build-up of coolant residues. It is also possible to automatically

The production cell is equipped with a robot that, via a track system, handles pallets and workpieces between the various machining machines and stations

The cell combines pallet and product handling and is designed for maximum flexibility, allowing a wide variety of products to be produced intermixed. "In theory, with a fully filled cell we could produce unmanned for several weeks."



rotate workpieces, so that the sixth side of the workpiece can also be produced unmanned. A key component for this is an electrically actuated clamping system that automatically adjusts itself to the dimensions of the workpiece. The cell is also prepared for the addition of a third machine, making future expansion relatively easy to realise.

"The integration of the two machining centres and the automation cell went flawlessly. GROB and BMO handled this project jointly and delivered it in working order. We are extremely satisfied with that, and it is of great added value to know that you can rely on it," says Bussers happily.

High utilisation rate and repeatability

An important objective of the investment was

achieving a high utilisation rate. For profitable automation, the cell must run at least 130 to 140 hours per week, according to Bussers. That is challenging in a high-mix, low-volume environment, but weeks have already been achieved in which these values are met. In practice, a weekend schedule starts on Friday afternoon, after which the machines continue producing unmanned until Monday morning. During the day, the focus is on setup, fine-tuning and logistics. "In theory, with a fully loaded cell we could produce unmanned for several weeks," Bussers says.

Anvil Group

Jansen Machining Technology is part of the Anvil Group. This group consists of several specialised manufacturing companies, including Job Precision, Rols, De Valk, Slagman, Contour Covering Technology and BKL Engineering. Together, they operate under the name Anvil Industries, with competencies in turning, milling, sheet metal, additive manufacturing and engineering.

The strategy of the Anvil Group is focused on scale and broadening the range of services towards customers. By bundling competencies, the group can take on more complex projects and play a larger role within customers' supply chains. Project-based collaboration across the various companies is becoming increasingly common. At the same time, there are concrete plans for international expansion towards Asia and North America. Manufacturing forms the foundation in this, supported by VADO, a long-term investor with a clear focus on continuity and technological development.

In addition to the two GROB machining centres, the cell also contains a cleaning bath to clean workpieces immediately after production and blow them dry to prevent build-up of coolant residues (Pictures: GROB-WERKE GmbH & Co. KG)



Efficient temperature in mould making

Efficient temperature regulation is a key factor for success in mould making, directly influencing component quality, cycle times and process stability. Meusburger offers a comprehensive and perfectly aligned range of temperature regulation components for this purpose, ranging from coupling technology and core cooling to hose lines and connections and other accessories. Thanks to its sophisticated in-house developments and the continuous availability of its products, the company ensures its customers the highest levels of process safety and flexibility.

High-quality coupling systems for a secure connection

The right coupling system is decisive for a reliable and fast changeover. Meusburger offers high-quality coupling systems and delivers them immediately from stock.

- » **Mono couplers:** A wide range of couplers covers a wide variety of temperature ranges and installation scenarios – from brass, the tried and trusted standard, to stainless steel and low-leakage variants for demanding cleanroom applications. Automatic safety hose couplers are also available for high-temperature applications. All couplers are fitted with high-quality, temperature-resistant seals that ensure a long service life. Thanks to a handy overview in the Meusburger portal, users can quickly find the right solution. Coupling systems in EU, USA, RPL-Stäubli and RMI-Stäubli variants, as well as low-leakage designs, are available directly from stock.
- » **Multi couplers:** For users looking to drastically reduce set-up times, Meusburger offers multi couplers. These not only enable quick mould changes but also prevent connection errors during set-up. Another key advantage: for large moulds, downtimes can be reduced by targeted preheating. Meusburger offers EU, USA or RMI-Stäubli system multi couplers.

Hose lines and connections without compromise

Reliable hose lines and connections are crucial for a secure flow of media. The Meusburger range includes hoses, manifolds and flow solutions for a variety of temperature and media requirements, making it the perfect complement to the coupler range.

Efficient core cooling

A wide range of solutions are available for

efficient core cooling, that enable precise temperature regulation and make a significant contribution to high component quality and short cycle times. Designers can choose the ideal solution for their application from an extensive range that encompasses baffles and spiral cores through to fountains. A particular highlight is the fountain E 21100, developed in-house by Meusburger.

Deflection elements and accessories

An extensive range of accessories completes the temperature regulation systems from Meusburger. These include sealing plugs with and without threads in brass and stainless steel, as well as threaded fittings for a wide range of applications. The range is complemented by sophisticated in-house developments such as special elbow fittings. The range also offers suitable solutions in the area of sealing technology – O-rings made from FKM or high temperature O-ring seals made from FKM Plus, each adjusted to the specific operating conditions.

You can find out more about selecting and using O-ring seals correctly in our blog: www.meusburger.com/o-ring-seals

Meusburger offers a comprehensive and perfectly aligned range of temperature regulation components, ranging from coupling technology and core cooling to hose lines and connections and other accessories (Picture: Meusburger)



Rethinking turnkey competence

How MAPAL uses holistic manufacturing solutions to speed up processes, reduce risks and secure the future

Turnkey solutions are becoming increasingly important in modern manufacturing. They constitute holistic concepts where the solution provider takes full responsibility for planning, implementing and optimising a production process.



Project analysis and process design: Based on feasibility and cycle time analyses, MAPAL works with the customer to develop the optimal machining process and define the appropriate clamping concept

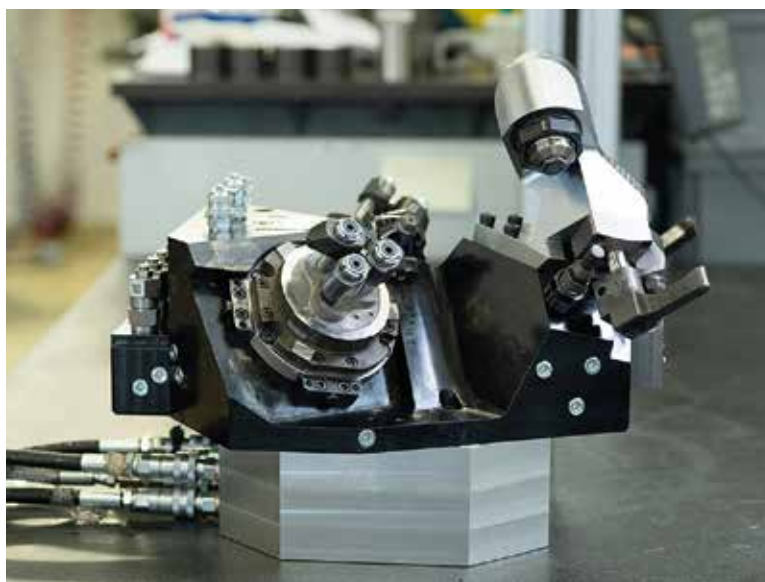
This not only involves the supply of individual components, but also the intelligent combination of machines, tools, fixtures and digital services. A sophisticated turnkey concept offers customers maximum efficiency and minimal interfaces, representing a very secure investment – especially in times of complex

requirements and increasing demands on quality. As a full-service provider, MAPAL fulfils these criteria without exception.

Comprehensive expertise from a single source

For Stephan Köstler, Senior Director Product & Service Management, the strength of MAPAL's approach lies in the fact that all important disciplines are integrated: from process analysis to tool and fixture design to simulation, programming and production support. Another distinguishing feature is MAPAL's capability to assume responsibility for entire processes, according to Köstler: "We don't just deliver components; we deliver production that runs."

The advantages for the customers are clear: less organisational complexity, lower risks and quicker production launch. Industries with high quality requirements, sophisticated components and tight tolerances profit the most: the automotive and e-mobility, fluid power technology, mechanical engineering and aerospace industries, for example.



MAPAL manufactures customised clamping fixtures in-house, covering everything from 3D and 2D design, through production and assembly, to dimensional and functional testing, collision analysis and comprehensive technical documentation

Turnkey solutions take effect quickly

By assuming responsibility for processes, customers have certainty for their planning and are provided with a basis for substantiated financial decisions. MAPAL provides the relevant return-of-investment key figures to the customer: much shorter ramp-up times, stable CpK values from day one, low tool and process costs through tools and cutting data that are optimally aligned to the process and each other, and clearly documented progress through all project phases. By means of reference projects, MAPAL can also show how quickly turnkey solutions take effect and costs are recouped.

From project analysis to production ramp-up

With its turnkey solutions, MAPAL offers a comprehensive service package for the development and implementation of complete machining processes – from the initial project analysis right through to series production. The aim is to optimally coordinate all process steps, thereby achieving high process reliability, maximum performance and cost-effective manufacturing processes.

Building on this, the machining process is designed using the most cost-effective machining technology, and the tools are supplied ready for use. Simulations, NC programme generation and collision checks ensure a high level of process stability even before the actual machining takes place.

As a central element of every turnkey project, MAPAL develops and manufactures the appropriate clamping fixtures. The entire implementation – from design and production through to delivery ready for use, including dimensional and functional testing, collision analysis and comprehensive technical documentation – is handled by a single source. This is underpinned by the company's in-house expertise and capacity in fixture manufacturing.

MAPAL also relies on a complete 3D simulation chain. The fixture is digitally embedded in the real machine environment, and all tools and NC programmes are checked for collisions. Detailed reports, 3D visualisations and close reviews with the customer ensure a smooth production ramp-up without any surprises.

(Pictures: ©MAPAL)



Digital development of the turnkey approach

With an eye to the future, MAPAL is expanding its turnkey approach with more digital services. In the research initiatives PRODaaS (already completed) and PRODaaS@SCALE, the specialists are working on intelligently feeding real-life process data back into planning. The goal: adaptive, transparent and even more efficient processes.

MAPAL defines the optimal tool technology and implements complete solutions ranging from design through to production and presetting, right up to the documented delivery of ready-to-assemble tool sets



MAPAL provides support with cycle time studies, NC programming, simulation and collision checking, and optimises parameters and programme structures specifically for a stable and cost-effective machining process



Process validation and production start-up: MAPAL supports the start of series production from CPP analysis through documented customer acceptance and series approval to training of operating personnel, as well as maintenance and support services

Development of algorithms and methods for an automated inverse thermal mould design

Authors:

D. Fritsche[‡],
Ch. Hopmann[‡]

[‡]Institute for Plastics
Processing (IKV) in
Industry and Craft
at RWTH Aachen
University

The injection mould represents a central element within injection moulding processes, where its internal cooling channel configuration critically influences both cost-efficiency and final part quality. The publicly funded Collaborative Research Centre 1120 (CRC1120) has conducted fundamental investigations aimed at enhancing forming process precision for twelve years. One focus was specifically on optimising and automating cooling channel design through an inverse approach.

In recent years, an optimisation routine has been developed that firstly optimises thermal balance within the mould; secondly, it translates this optimal heat flux distribution into practical layouts using manufacturable cooling channels. This work introduces several iterations of objective functions to define desired part states and guide gradient-based optimisation algorithms accordingly. Derivation of cooling channels is achieved via a dedicated algorithm capable of generating conformal or straight cooling channels that approximate complex iso-surfaces as complete channel layouts.

Application to complex geometries demonstrates both feasibility and effectiveness: simulated and measured warpage values are comparable or better to those obtained from manually designed conventional cooling channels. Employing the inverse thermal mould design method may reduce reliance on individual designer expertise, while yielding components exhibiting minimal warpage.

1.1 Introduction

The design of the cooling system has a crucial role in injection moulding by governing heat transfer from the melt to both the mould and tempering channels. A frequent issue during initial production runs is insufficient dimensional accuracy, which can render parts unsuitable for assembly or fail to meet visual standards [BHSS12, Sch23]. This problem primarily stems from local variations in material shrinkage during cooling and solidification [HMMM18].

Such variations may be caused by abrupt changes in wall thickness, local stiffness differences, or inadequate tempering, resulting not only in dimensional deviations but also in warpage. Distortion during the process is influenced by the interacting factors of the temperature evolution, part geometry, material shrinkage, process control and conditions [MF19].

Design constraints such as limited space or required connection dimensions often restrict geometric optimisation. Additionally, material shrinkage behaviour is largely dictated by physical properties and can only be adjusted within narrow limits. Thus, component quality depends both on operator expertise and significantly on mould design quality [BHSS12].

A thorough understanding of thermal balance within the injection mould is essential for efficient and precise production. The influence of thermal design begins immediately when the melt contacts the cooler mould. The cooling phase can comprise up to 70% of total cycle time [HM17, HMMM18, Zöl97], optimising this phase is critical for economic efficiency. However, the above explained interacting factors pose a challenge for the creation of the usually manually designed cooling channel system. As the design process is heavily based on experience and fluctuation

in human performance, the result is often subjective and does not fully cover local cooling requirements. Therefore, current research aims to develop rules, algorithms and methodologies to automatically create cooling channel systems in injection moulds based on theoretical knowledge.

1.2 Approaches for automatic and optimal thermal mould design

Publications and review papers show that a lot of work is performed recently in the field of automatic cooling channel generation and optimisation of the temperature balance within injection moulds [FKP21]. The developed methods of different research groups are clustered into five categories:

- Experimental based design [HHY16, HYLH16, LMLX16].
- Design and optimisation based on the conformal cooling line [ASL+10, WYW15].
- Optimisation using expert algorithms [LLLH12, LLM05].
- Modular / parametrical design of conformal cooling channels [AY07, AY11]
- Solid modelling based on topology optimisation [HF01, Shi19]

Currently, a lot of methods of the category 'optimisation using expert algorithms' require a broad knowledge for algorithms and processing. With the help of the discussed automated approaches, either a tempering system has to be specified (topology optimisation) or its automated derivation is based exclusively on geometric approaches (modular / parametrical design), so that an optimal solution cannot be found with certainty. The approach of this research work, the inverse thermal mould design, can be assigned to the category of expert algorithms. However, only few process conditions need to be prefixed. It avoids unnecessary preconditions that limit the solution and gives the user a lot of freedom in design and boundary conditions.

The industry started using automatisisation methods for cooling channel generation recently by adding it as tools to existing software or as a stand-alone product. Therefore, first steps can be seen realising the ideas from the scientific community and enabling a easier and faster application of these methods. Autodesk MoldFlow from Autodesk Inc., San Rafael, USA, added a feature for an automated and optimised conformal cooling channel layout generation to balance part quality and cycle time [KA24, KA25].

By employing a voxelised mesh and signed distance fields for obstacle avoidance, this system generates conformal cooling channels that follow part contours according to user-selected patterns. Using a boundary element method solver, cooling channels are adaptively positioned closer to hot, thick sections of the part and further from thinner areas, while maintaining required distances to features such as parting planes, inserts, ejector pins, and other channels. It allows users to define key parameters including the number of channels, their proximity to the part, placement within specific mould halves, and inlet/outlet locations.

Furthermore, Maya HTT, Montreal, Canada has a feature to optimise cooling channel placement [Bla25]. It is based on the inverse thermal mould design of Agazzi *et al.* and the project Collaborative Research Centre 1120 (CRC1120) this paper is based on [ALGS13, ALT16, ASL+10, ASLJ14, ASLJ13]. It also utilises the temperature history and the periodic thermal steady-state of the mould. One key feature is the very high calculation speed due of ca. 15 min for typical moulds due to meshing and solving on a graphics processing unit (GPU).

The topic requires a lot of multidisciplinary expertise and each research group approaches the problem starting from its own area of expertise, such as fluid mechanics, additive manufacturing, plastics processing and rheology. No current approach is usable for all moulded parts and processes. Only few of the influencing factors on the part's warpage is regarded and a tempering layout has to be available as a basic requirement or certain parameters have to be specified as design parameters. The approaches of the inverse thermal mould design (see Subsection 1.3) have the advantage, that no initial tempering channel layout is necessary and that the user cannot influence the result by his choice of starting conditions [ASLJ14, Hoh21, Nik18].

1.3 Inverse thermal mould design

The inverse thermal mould design developed in CRC1120 is a holistic methodology for a cooling system generation and therefore, consists of multiple steps (Figure 1.1) [Nik18, Hoh21, HFH22]. There is a preparation (B), optimisation (C) and channel derivation step (D). The part geometry is the base of this design routine. It is used for two preparation steps, the generation of an contour (B1) and a filling simulation (B2). The contour is an offset of

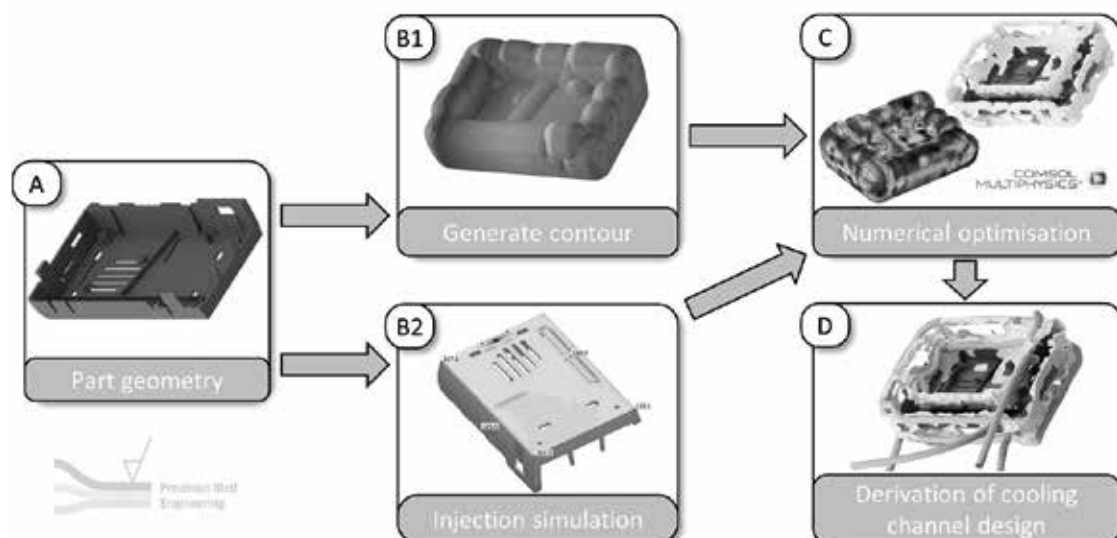
the part geometry and represents the mould steel around the cavity. Its surface is used in the numerical optimisation as the position for the optimisation variables. The influence of the offset on the optimisation result and a developed generation algorithm for adaptive offsets is elaborated further in Subsection 1.3.1. Parallel to this step an initial process simulation without a cooling channel layout is conducted. This supplies the optimisation step with the periodic steady state initial temperature distribution and the approximate pressure development. Previous work only used a homogenous melt temperature as initial condition [ASL+10]. However, with a temperature distribution the influence of the cooling of the melt during the filling phase on the resulting temperature distribution is taken into account, providing the optimisation step with more realistic initial conditions. The next step (C) is the numerical optimisation of the local temperature gradients between the offset surface and the part. It is the core step proposed by Agazzi *et al.* and therefore, it gives the methodology its name [ASL+10, ASLJ14]. Conventionally a cooling channel design is created which results in certain cooling rates and temperature distribution in the part. However, in the presented thermal mould design method it is inverse. The optimal condition is first calculated and the necessary cooling channels to create this optimal temperature gradient distribution are derived from the results afterwards. To calculate the optimum this step uses a gradient-based optimisation algorithm within a thermal simulation in COMSOL Multiphysics, COMSOL AB, Stockholm, Sweden. This algorithm calculates the optimum based on an objective function. The objective function dictates the conditions

which need to be fulfilled to reach an optimal cooling of the part. (see Subsection 1.3.2). The simulation calculates the cooling phase multiple times each time with a different temperature distribution on the contour's surface and consequently the local temperature gradients. After the improvement between each iteration decreases to a threshold the optimisation is stopped.

The iterative thermal simulations require accurate material models to calculate the real temperature development and cooling requirement of the part. Next to temperature dependent specific heat capacity and thermal conductivity of the plastic, a model of the density is needed. With the calculated temperature and the simulated pressure development of step B2 a model to describe the relation between pressure, specific volume and temperature (pVT) can be used to calculate the local density. For this purpose, a contentious cooling rate dependent pVT-model has been developed in CRC1120 to consider the significant influence of the cooling rate on the density in contrast to the conventional Tait or Schmidt model [AHWH20, WHR+20b, WHR+20a].

The resulting heat balance of the thermal optimisation is then used to create surfaces at the position the cooling channels are to be placed. Agazzi *et al.* calculate these positions by a isotherms in an area with negligible temperature oscillation. The optimal cooling position in CRC1120 are determined by comparing the calculated heat flux with the local absorption capacity of a hypothetical temperature control channel with a defined temperature. The position where the average local heat flux matches the heat flux of a cooling channel are displayed as iso-surfaces

Figure 1.1:
Procedure
for inverse
thermal cooling
channel design
methodology



[Nik18]. These are used to derive actual cooling channels (step D, Figure 1.1) around the cavity, which is further discussed in Subsection 1.3.3 and 1.3.4.

1.3.1 Influence of optimisation variables' position on optimal thermal balance

The temperature on each node of the contour surface can be changed by the optimisation algorithm to optimise the local heat flux. Depending on the geometry of the offset (Figure 1.1, B1) the distance between the part and the position of these optimisation variables varies. This geometric boundary conditions of the optimisation algorithm influence the resulting thermal balance within the mould. Consequently, the thermal optimisations show a dependency on different offset shapes due to the offset thickness and coalescence of concave geometries. The result of the objective function converges better with a smaller distance between the optimisation variables and the area that is optimised. This is because the optimisation algorithm has the ability to generate the desired temperature or heat flow more locally on the part. A U-profile with a small offset has variable temperature boundary conditions close to all of parts surface (Figure 1.2, a). However, with a bigger offset coalescence occurs and some areas have no boundary nodes next to it (Figure 1.2, b). The closest nodes at the top are now the only tool for the optimisation algorithm to achieve the local cooling demand in these remote areas. Due to different cooling demands in different areas a compromise is found by the optimisation algorithm, which results in a worse result of the objective function.

For an ideal optimisation the optimisation variables would be positioned right on top of the part's surface. However, without an offset around the part representing the mould steel no isosurfaces can be calculated and no cooling channels can be derived. Therefore, the offset need to be big enough to cover the volume for the potential channel positions and as small as possible to fulfil the local cooling demand with close optimisation variables. An algorithm is developed to achieve this goal. It generates an offset with an adaptive thickness for the inverse thermal mould design methodology considering the identified influences. The effect of coalescence is avoided by subtracting a medial axis from the offset and use this additional local surface as a position for the optimisation variables (Figure 1.4, c). The result is a

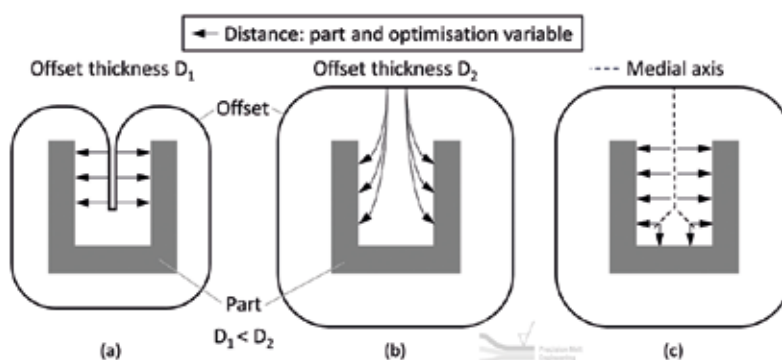


Figure 1.2: Influence of the offset thickness on the coalescence and the depiction of a medial axis in a U-profile

reproducible and adaptive offset that is automatically generated for complex geometry, and the objective function result improves by 43% in this example [HFHN22].

1.3.2 Objective function

In CRC1120 the initial objective function of Agazzi *et al.*, which homogenises the surface temperature is adapted and extended. One version adds a term that sums up and evaluates the homogeneity of the density over the moulded part, so that the pressure dependence of the specific volume can also be taken into account. The objective functional $Q(T_{c_0})$ at the initial tempering channel temperature T_{c_0} following is present in Equation (1.1) [Nik18]:

$$Q(T_{c_0}) = \sum_{i=0}^m \int_0^{t_c} \left(\frac{T_{ejec} - T_p(x_i, t; T_{c_0})}{\omega_i} \right)^2 dt + \sum_{j=0}^k \int_0^{t_c} \left(\frac{\bar{\rho}_p - \rho_p(x_j, t; T_{c_0})}{\omega_j} \right)^2 dt \quad (1.1)$$

T_{ejec} is the demoulding temperature, T_p is the local temperature on the part (at the node number $x_{i/j}$, the time t and the tempering channel temperature T_{c_0}), $\bar{\rho}_p$ the average global part density, ρ_p the local part density. The difference between demoulding and local temperature, respective average and local density are integrated over the cooling time t_c . By means of the run coordinate i or j , all network nodes of the defined evaluation area are run through and can be weighted differently via the factors $\omega_{i/j}$, which have been investigated and defined by a sensitivity study or can be chosen freely by the user. The evaluation of the two terms is done on different layers in the part. The temperature is evaluated on the part surface T_p to ensure the dimensional stability. The evaluation of the density is done on the inner offset T_{pi} , which encloses approximately 40% of the part volume.

A rework of the objective function adds a normalisation of the temperature and density difference to achieve unitless values of the same order of magnitude of ≈ 1 (Equation (1.2))[HH21b].

Thus, not one of the two terms dominates the result of the objective function and therefore the focus of the optimisation algorithm. In addition, a factor is added to compensate for the influence of mesh density, as complex features with more nodes have a greater influence on the objective function than simple surfaces with a larger area but fewer nodes. With this addition, each node is only included in the calculation with the proportion of its area $A_{elem,i/j}$ to the total area $A_{tot,1/2}$. The new additions are marked with bold symbols in Equation (1.2).

$$Q(T_{C_0}) = \sum_{i=0}^m \left(\frac{T_{ejec} - T_P(x_i, t; T_{C_0})}{T_{ejec} \cdot \omega_i} \right)^2 \frac{A_{elem,i}}{A_{tot,1}} + \sum_{j=0}^k \left(\frac{\bar{\rho}_P - \rho_P(x_j, t; T_{C_0})}{\bar{\rho}_P \cdot \omega_j} \right)^2 \frac{A_{elem,j}}{A_{tot,2}} \quad (1.2)$$

Later, a new version of the objective function is developed as the gradient based optimisation algorithm are not able to implement an integral in the objective function within the framework of time-dependent optimisation with many degrees of freedom [Dam20]. The density as a functional value is not optimally suited to describe the homogeneity of the morphology of the moulded part at a given point in time. As an evaluation of cooling over time conflicts with the other objectives of this methodology, another evaluation criterion has to be found that describes the homogeneity of the structure at a point in time. The cooling rate $\dot{T}$ can be considered as a possible criterion. Assuming similar pressures in the mould, the cooling rate is an influential factor in the formation of the microstructure during the cooling phase [MHMS14, SSKH13]. A cooling rate that is as homogeneous as possible over the moulded part during solidification can thus be an evaluation criterion for characterising the shrinkage potential. As it is possible to achieve a uniform degree of crystallisation by a homogeneous cooling condition at solidification time t_i the shrinkage potential can be equalised [MHMS14]. The shrinkage of amorphous materials is also influenced by the cooling rate and a homogenisation is expected to reduce warpage [WHS20]. Therefore, the transition time and the cooling rate are used in a new objective function Equation (1.3) [HFH22, Hoh21].

$$Q(T_{C_0}) = \sum_{i=0}^m \left(\frac{T_{ejec} - T_P(x_i, t; T_{C_0})}{T_{ejec}} \right)^2 \frac{A_{elem,i}}{A_{tot,1}} \cdot \omega_i + \sum_{j=0}^k \left(\left(\frac{\dot{T}(T_i) - \dot{T}(x_j; T_i)}{\dot{T}(T_i)} \right)^2 \left(\frac{\bar{t}_i - t_i(x_j; T_i)}{\bar{t}_i} \right)^2 \right) \frac{A_{elem,j}}{A_{tot,2}} \cdot \omega_j \quad (1.3)$$

Equation (1.3) utilises the development from Equation (1.1) and 1.2 excluding the sign effect with the squared terms, the influence of the mesh density and effect of different orders of magnitude from the three summands. The weight factors are placed outside the fraction to comprehend its influence easier. The changes compared to Equation (1.2) are printed bold.

The average cooling rate $\bar{T}$ and transition time $\bar{t}_i$ is used to normalise the difference in each numerator. Since the transition period depends on factors such as temperature, time and cooling rate, the cooling rate-dependent pvT-model implemented in thermal optimisation (see Section 1.3) is particularly important.

The inverse thermal mould design with the objective function from Equation (1.2) and Equation (1.3) is practically validated by applying the methodology on different part geometries, manufacturing mould inserts with the designed cooling channel layout and producing parts.

The parts' warpage is measured and compared to the warpage of parts produced with a conventional cooling channel layout designed by a professional mould maker [Hoh21, Wol19].

One validation is conducted with the part displayed in Figure 1.1. An optimal heat balance is calculated each with the objective function 1.2 and 1.3. The two optimised heat flux distributions are used to derive two conformal cooling channel layouts for this geometry of a single-board computer casing. A pair of mould inserts is produced for each layout, and the parts are injection moulded using these and a pair of inserts with conventional cooling channels designed by a mould maker. The parts are produced with different mould temperatures (WT), mass temperatures (MT) and injection rates (v) to compare the warpage compensation under different circumstances and relate it to the influence on the part warpage of process parameters. The parameter combinations are displayed in Figure 1.3. The used material is the acrylnitrilbutadien-styrol copolymer Bayblend T65XF by Covestro AG, Leverkusen.

Different dimensions of the parts are measured with the tactile coordinate measuring machine O-Inspect 442 by Carl Zeiss AG, Jena. The warpage is assessed by subtracting the shrinkage portion from one measurement by relating two measurements to each other. Figure 1.3 shows the wall collapse

by subtracting two width, which is a typical warpage behaviour for injection moulded box shaped parts [Hoh21]. The width in the middle (WM) is subtracted from the width at the edge. Both widths are supposed to have the same length. The results show an improvement in of the warpage by around 200 μm or 25% compared to the conventional design.

Also the cooling channels designed with objective function 1.3 results in a 40 to 110 μm lower warpage than the channels designed with objective function 1.2. The warpage can be compensated with the inverse thermal mould design and the further development of the objective function shows eminent benefits. However, some part features show no or no significant improvement. Therefore, the precision increase depends mainly on which effect is decisive for the warpage [HFH22, Hoh21]. The conventional temperature control system was designed by a professional mould maker, whereas the contour-based temperature control channels were designed by students in the working group based on the calculated areas. This shows that the methodology can provide crucial support to an inexperienced designer and achieve a result that is at least equivalent.

1.3.3 Conformal cooling channel derivation

The choice of boundary conditions, the exact formulation of the objective function, as well as the moulding offset significantly influence the result of the thermal optimisation. Based on the previous work, these steps can be clearly defined and a workflow can be specified that leads to reproducible results. However,

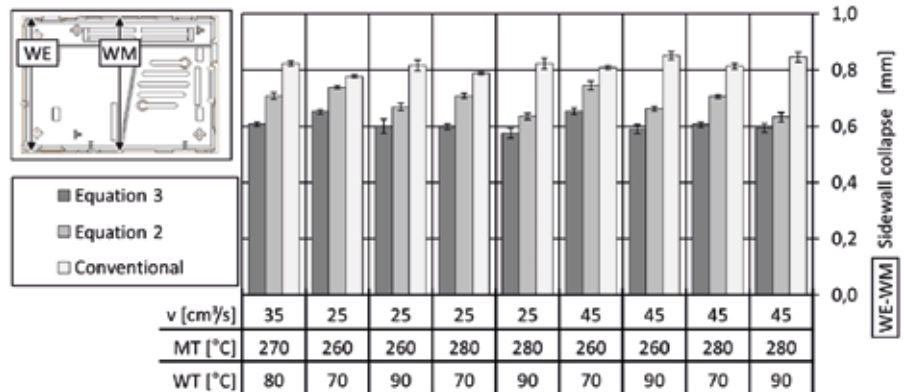


Figure 1.3: Comparison of warpage compensation results from different cooling channel layouts generated with different objective functions [Hoh21]

the following step of the methodology, the derivation of the cooling channels, is very dependent on the respective designer. This leads to a user dependence, which must be avoided in order to achieve an objective and reproducible design.

Any deviation of the channels from the iso-surfaces results in a different heat flow distribution than intended by the optimisation. For this reason, a script is being created that can automatically derive conformal cooling channels without user influence on [HH21a]. Based on the isosurfaces, cooling channel segments are generated close to those surfaces based on a geometric minimisation problem (Figure 1.4). In a next step, these segments need to be connected in an optimal way concerning fluid flow and path length. Path planning algorithms usually determine a path between a single start and end point, whereas in this case multiple combinations have to be evaluated. Thus, an algorithm is presented, which determines a reasonable sequence of the channel segments to be connected and ensures that the found cool-

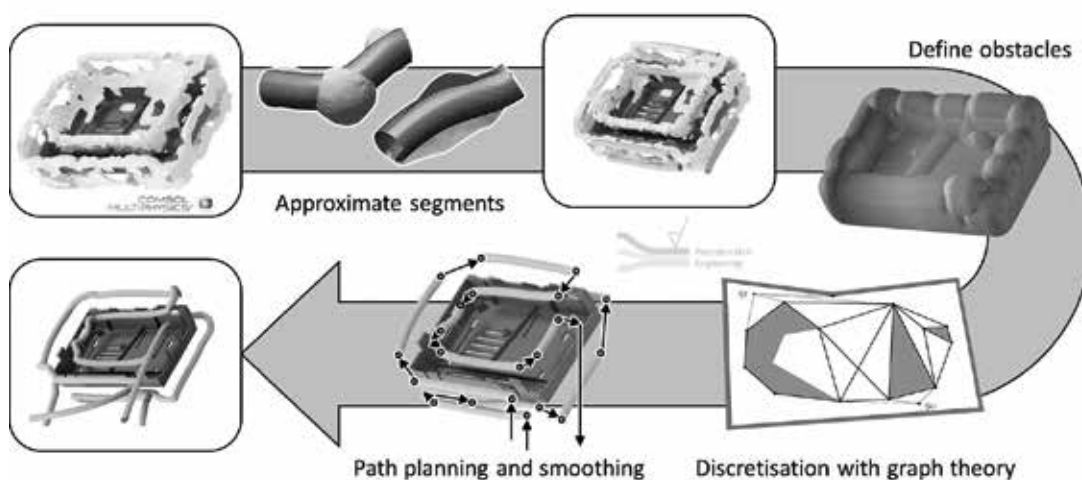


Figure 1.4: Procedure for automatic conformal cooling channel derivation

ing channel is collisionfree both to obstacles such as the cavity or parting plane of the injection mould and to itself.

Validation simulations with two different parts show that the results are comparable in time and performance to a manual design, but need less effort by the user [HH21a, HFH22, Hoh21].

1.3.4 Straight cooling channel derivation

The generation of conformal cooling channels has the potential to cover the complex isosurfaces better than conventional straight cooling channels due to their freedom of design.

However, the restriction of usable mould materials, challenges in operating or maintaining and the high manufacturing costs make conformal cooling channels often thermally and economically usually not viable. Drilled cooling channel system are still the common choice in the industry and the design is a major, time consuming step. Even though the design freedom for these systems is more limited and development is therefore less complex, the automation and optimisation of these cooling systems benefits industry due to their higher proportion of use compared to conformal cooling channels.

Therefore, an automatic generation of straight drilled cooling channels based on the isosurfaces is developed [FHSS25]. The algorithm employs random sample consensus (RANSAC) algorithms to simplify iso-surfaces and find intersection points for straight channels, balancing ideal thermal solutions with practical manufacturing constraints. The second part of the algorithm is able to adjust the cooling channel path towards the not simplified iso-surface based on the previously defined intersection points. Straight channel segments are placed so that they approximate the iso-surfaces locally as the target position and at the same time form a continuous system. During this minimisation of the distance between channel segments and the iso-surface obstacles like the parting plane, ejector pins and hot runners are regarded. One special boundary condition during this step is the accessibility of each channel segment by a drill. Once the start and end points have been defined, the optimisation process runs completely automatically and is therefore independent of the operator.

A simulative comparison between an automatically generated cooling channel design and one made by a mould manufacturer

shows very similar results in terms of temperature distribution and development as well as part warpage [FHSS25]. The differences are in the range of numerical fluctuations and uncertainties due to simplifications of the material model. The similarity can be caused, by the equal channel diameter and comparable coverage of the part, which results from the limited solution space due to obstacles. In general, the angles of the automatically generated cooling channels are not parallel or at right angles to the component, as is usually the case with manually created layouts.

Another investigations conducted a practical validation by producing parts with a conventional cooling channel layout and one automatically generated one. The some measured angels of the part shows a higher deviation for the conventional design and for other angles the automatic design has a higher angle deviation and therefore higher warpage. Often the influence of the cooling channel layout on the warpage is smaller than the influence of the variation of the process parameters mould temperature, injection speed and cylinder temperature [Kön25]. It can be concluded that a first application of the automatic derivation of conventional cooling channels already shows a similar part precision as a manually designed layout and the performance can compete with the work of professionals.

1.4 Conclusions and outlook

Within the scope of the research work presented a comprehensive and holistic methodology for calculating the optimal heat flux distribution around components, implementing this by means of practical tools such as cooling channels was developed. This approach enables an objective, knowledge-based process for generating cooling channel layouts, utilising algorithms that automate much of the design procedure. Consequently, human influence and thus potential error can be eliminated.

This is achieved by defining the optimum cooling for injection moulded parts using an objective function, which was further developed throughout the entire project. This function minimises warpage and can be utilised by gradient-based optimisation algorithms. The resulting optimised cooling configuration homogenises part temperature, cooling rate, and freeze time, thereby promoting uniform shrinkage across the component. Further algorithms can derive actual conformal or

straight cooling channels from the complex shape of the optimised heat balance.

The generated cooling channels cause reduced warpage for some geometry features or achieve similar warpage results.

Current investigations focus on further refining this objective function by incorporating mechanical influences on part warpage factors not yet considered in previous work. Even thermally homogeneous parts may exhibit warpage owing either to asymmetrical relaxation of internal stresses imposed by geometric constraints within the mould or to anisotropic shrinkage caused by flow-induced fibre or molecular orientation.

In addition to the presented research, the inverse thermal mould design has also been adapted to optimise the local heat transfer coefficient or local heat source between part and mould. These parameters can be controlled with barrier coatings to change the thermal resistance or heating coatings to add a heat source [BHÖ+17, BÖL+15, BWH+20, BWKS20, FHK+21, HFK+24, HKF+23]. The thermal influence on part cooling from both methods can be adjusted with a higher thermal resolution than cooling channels as coatings are closer to the part.

These coatings can slow down the cooling rate in thin areas or edges which usually display cooling rates above average. Therefore, they can help achieve a temperature control layout that more closely approximates the theoretical optimum. Especially for the heating coatings in combination with conventional cooling channels a high warpage reduction can be achieved. A simulative study shows a reduction in warpage of up to 90% compared to a part produced without heating coatings [HZF+24]

Future research will also explore optimising local thermal conductivity using similar optimisation algorithms and objective functions, while introducing appropriate boundary conditions and discretisation steps. Adjusting thermal conductivity currently represents a more established industrial approach for achieving desired mould temperatures compared with surface coatings; consequently, its adoption in industrial applications appears particularly promising.

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Data availability statement

The data and materials for this publication are available on request at the following link: <http://hdl.handle.net/21.11102/3c870f58-ce49-48bb-aa16-ca4062b5c921>

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Symbols

Symbol	Unit	Description
$A_{elem,i/j}$	[mm ²]	Element surface area
$A_{tot}, 1/2$	[mm ²]	Total surface area
i	[-]	Index for nodes on part surface
j	[-]	Index for nodes on inner offset
Q	[-]	Objective function
T_{c0}	[K]	Initial tempering channel temperature
T_{eject}	[K]	Ejection temperature
T_p	[K]	Part temperature
t_c	[s]	Cooling time
t_t	[s]	Transition time
$\bar{t}_t$	[s]	Average transition time
$\dot{T}$	[K/s]	Cooling rate
$\bar{\dot{T}}$	[K/s]	Average cooling rate
$x_{i/j}$	[mm]	Node coordinates
$\bar{\rho p}$	[kg/m ³]	Average part
ρp	[kg/m ³]	Part density
$\omega_{i/j}$	[-]	Weight factor

Abbreviations

Notation	Description
CRC112	Collaborative Research Centre 1120
GPU	Graphics processing unit
IKV	Institute for Plastics Processing in Industry and Craft at RWTH Aachen University
pVT	Pressure, specific volume and temperature
RANSAC	Random sample consensus

smartFLOW Helix

Precise melt flow for stable injection moulding processes

In the demanding world of injection moulding, optimal melt flow in the hot runner system is a decisive factor in process stability, part quality and production costs. With smartFLOW Helix, Meusburger is expanding its hot runner portfolio with a solution specifically designed for valve gate applications. The technology optimises flow control in the nozzle area and helps users process challenging plastics reliably.



With smartFLOW Helix, Meusburger is expanding its hot runner portfolio with a solution specifically designed for valve gate applications (Pictures: Meusburger)

Precise flow control for homogeneous melt

smartFLOW Helix is based on the tried and trusted smartFLOW manifold technology and has been specifically developed for use in valve gate hot runner systems. At the core of the solution is a special flow geometry that generates a defined vortex – a helical flow – within the nozzle. This geometry homogenises the melt flow immediately before it enters the cavity. Differences in temperature and pressure within the melt are reduced, promoting uniform

filling. Particularly in the case of complex geometries or thin-walled items, optimised flow control helps to ensure stable filling of the mould.

Optimisation of valve gate applications

Valve gate systems

place high demands on flow control in the gate area. Conventional systems can, for example, lead to so-called 'pin shadows' in the injection area. The unique geometry of smartFLOW Helix eliminates these effects. The targeted mixing of the melt in the nozzle area promotes uniform material distribution, which minimises injection defects and improves the visual quality of the items.

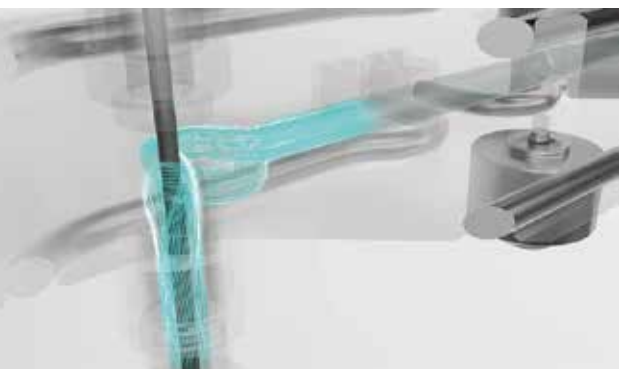
Rheologically designed flow channels and diffusion-welded manifolds

In addition to its specialised flow technology, Meusburger uses diffusion-welded hot runner manifolds, which ensure uniform melt flow thanks to their rheological design. This is optimally aligned with the flow properties of the plastics. Diffusion welding enables the creation of complex channel layouts with high dimensional accuracy and surface quality. This helps to reduce pressure losses and localised hotspots.

Added value for sophisticated applications

Meusburger recommends smartFLOW Helix particularly for frequent colour changes, applications with high visual quality requirements, multi-cavity moulds and technical plastics. Improved homogenisation of the melt helps to ensure consistent part quality and stable processes. The technology also offers advantages in standard applications: Consistent filling reduces the risk of unusable parts and improves process reliability in serial operation.

Further information and a video about the technology are available on the website: www.meusburger.com/smartFLOW



New generation of ball nose end mills

With the new KX system, HORN is launching a high-performance solution for the economical and reliable machining of ball bearing tracks. HORN developed the system specifically to meet the increasing demands for precision, flexibility and productivity in the production of constant velocity joints. The system covers a wide range of components and offers three sizes. Flexible machining strategies enable both soft and hard machining – from roughing and chamfering to finish milling. Customers can adapt the strategy precisely to their process requirements, ensuring a high level of cost-effectiveness.

With the KX system, HORN has considerably increased the performance of the tool system. Soft-cutting cutting heads with defined edge preparations enhance process reliability. Precise internal coolant positioning and a newly developed interface improve rigidity. Practical benchmarks confirm the performance: Users significantly increase cutting values and noticeably reduce cycle times. Depending on the component, they shorten the machining time by several seconds per workpiece and sustainably increase productivity.

Constant velocity joints are used in every car and are also known as homokinetic joints. Their purpose is to transmit uniform torque and angular speed from the drive shaft to a second shaft mounted at an angle to it. In other words, constant velocity joints transmit rotary motion uniformly to the next shaft. The joints are most widely used in vehicle construction for power transmission from the gearbox to the drive wheels. Constant velocity joints can transmit rotational movements at an angle of up to 50 degrees. In addition to fixed ball joints, sliding constant velocity joints are also used. They allow not only angular movement, but also axial movement so that power transmission is not interrupted when steering or during movement of the suspension.

At the heart of a homokinetic joint are the balls, which roll in precisely milled tracks. The ball tracks have a very tight manufacturing



With the new KX system, HORN is launching a high-performance solution for the economical and reliable machining of ball bearing tracks

tolerance and a high surface finish is essential. The tight tolerances and the manufacturing quality determine how long the service life of the joints will be. The form tolerances of the parameters are to within microns.



With the KX system, HORN has considerably increased the performance of the tool system. Soft-cutting cutting heads with defined edge preparations enhance process reliability. Precise internal coolant positioning and a newly developed interface improve rigidity

(Pictures: HORN/Sauermann)

MAPAL collaborates with Italian hydraulic manufacturer Benvenuti

Driving customer manufacturing performance: MAPAL combines turnkey expertise, tooling performance and tool management

Italian hydraulic manufacturer Benvenuti S.r.l. runs its modern manufacturing with MAPAL – relying on tooling, tool management and tailored turnkey solutions of the precision tooling specialist throughout. With this setup, production has been made so efficient that it is now set to be rolled out to other sites within the parent company Casappa S.p.A. and Casappa Hydraulics Shanghai China.



A well-established team for 20 years – the responsible team members at Benvenuti and MAPAL: Riccardo Benvenuti, Production Coordinator Benvenuti, Giuseppe D'Asaro, TMS Logistics Clerk MAPAL Italia, Sergio Masperi, Area Sales Manager MAPAL Italia, Roberto Bergamaschi, Operations & Supply Chain Director Casappa Group and CEO and member of the board at Benvenuti, Luca Benvenuti, Plant & Operations Manager Benvenuti, Matteo Benvenuti, Sales and Supply Chain Manager Benvenuti, Federico Neri, Technical Office Coordinator Benvenuti, Federico Vettore, TMS Commercial Clerk MAPAL Italia

Benvenuti S.r.l. was founded by the Benvenuti family in 1987 and produces high-precision mechanical components, mainly for the hydraulics, energy and industrial engineering sectors with around 70 employees. The company works closely with its customers to deliver tailored projects, from components to pre-assembled parts.

With its workforce of 70 employees, Benvenuti primarily produces hydraulic piston pumps, hydraulic gear motors, hydraulic blocks and heat exchangers in cast iron, steel, or aluminium. Lot sizes range from single prototypes through to series of 500 parts or more. In total, the company manufactures around 3,000

different components, across product families that differ in individual features. 57 horizontal machining centres operate around the clock in three shifts, seven days a week. Half of the machines are equipped with robotic cells, while the others are connected in groups to an FMS system for automatic loading and unloading. This means that each operator can oversee between three and five machines. “For us, being able to combine automated standalone machines and the FMS system are the key to maximum flexibility and makes us extremely competitive”, explains Production Coordinator Riccardo Benvenuti.

In 2023, Benvenuti was acquired by Casappa S.p.A., a global leading manufacturer of piston pumps, gear motors, filters, and hydraulic systems. Casappa is also an Italian family-owned company with 850 employees. Being internationally established, Casappa has production sites in China and India as well as a global sales network. “At the company headquarters in Parma, we have recently opened a modern logistics centre covering 10,000 square metres, from which we feed the production of the plant in the Parma headquarters and ship to our distribution centers worldwide and also directly to our European customers”, reports Roberto Bergamaschi, Group Operations & Supply Chain Director of the Casappa Group, as well as CEO and Board Member at Benvenuti.

The hydraulic components are mainly used in building and construction, material handling, agriculture and turf care and on-highway vehicles. The company produces more than 1 million parts each year. Alongside Casappa's focus on fluid power, the companies Ikron, from the filtration sector, and Tecnord, which

specialises in hydraulic controls, form part of a common holding company. They complement each other in the development and manufacturing of products for electro-hydraulics – a growing trend that will play an increasingly important role in the future.

20-year partnership with MAPAL

The collaboration between Benvenuti and MAPAL goes back to 2006, when the first fine boring tools were applied. “With these tools, we were able to significantly improve the production of our gear pumps”, reports Federico Neri, Technical Office Coordinator at Benvenuti. MAPAL’s fine boring solution expertise was also needed for the machining of specific cavities in extremely precise hydraulic components. Here, Benvenuti achieved the highest level of accuracy ever reached in such a process with MAPAL technology.

The collaboration really picked up pace in 2020, as Neri explains: “From that point on, we started to look not just at individual tools, but at the entire process with all the tools required.” MAPAL has defined a complete tooling range for Benvenuti, which includes drills, milling cutters and reamers made from solid carbide, many of which were specially designed for the customer. For aluminium machining, MAPAL PCD tools have been introduced, and tool holders are also supplied. With the integration of an Italian setting fixture manufacturer into the MAPAL Group in 2024, Benvenuti has also gained access to workpiece clamping equipment designed and supplied to meet high-productivity requirements. With its comprehensive offer portfolio, the manufacturer of tools, equipment, and services has become the preferred supplier and technology partner, with its know-how used to machine a large share of the components.

Complete Tool Management 4.0

Benvenuti took a huge step forward by introducing MAPAL’s tool management system. Alongside the UNIBASE-M tool dispensing



system, the setup includes two UNISET-V tool presetting machines. This allows Benvenuti to take full advantage of MAPAL’s complete Tool Management 4.0. “Tool management continually highlights opportunities for optimisation and has become a key focus at Benvenuti”, says Sergio Masperi, Area Sales Manager at MAPAL Italy.

By ensuring every tool is perfectly preset, Benvenuti is able to maintain consistently high quality and reliable production. The UNIBASE-M tool dispensing system, managed via the c-Com software, ensures that all the tools needed for production are always available. For Benvenuti, this is a major advantage – especially as, prior to the introduction of tool management, issues occasionally arose regarding availability and quality, and also in the management of tools from various manufacturers. “Since we started using the MAPAL system, we haven’t experienced any tool shortages at all in our production”, says Riccardo Benvenuti. With real-time analysis from c-Com, MAPAL specialists have full visibility of stock levels and usage at all times. Tools in the UNIBASE-M cabinets are restocked every three weeks on average, and tools which have reached the end of their service lives are picked up. Tool reconditioning and regrinding are mostly handled by MAPAL at its facility in Gessate, Italy.

State-of-the-art manufacturing at Benvenuti: with its machining centres – around 50 per cent of which are robot-assisted – the company is state-of-the-art when it comes to the custom machining of aluminium, cast and steel components

(l) Benvenuti relies on MAPAL’s turnkey expertise and sources for example for the automated production of aluminium pump covers not only tooling technology but also process design and clamping fixtures from its technology partner

(r) As part of its turnkey expertise, MAPAL supplies Benvenuti with a range of tools tailored precisely to the specific machining tasks



For the machining of aluminium components, Benvenuti relies on high-performance PCD tool technology from MAPAL



Turnkey solution with robot with automated loading

When it comes to new products or optimising ongoing production, Benvenuti and MAPAL work closely together. Step by step, the partners review each stage of the process, decide on the right technologies, and agree on the best way to carry out the project. This approach led to the development of an initial turnkey solution for the efficient and automated manufacturing of aluminium pump covers a number of years ago. Particular attention was also paid to the clamping fixture: A clamping fixture which rotates 90 degrees enables two components to be machined from six sides in a single setup.

With its turnkey solutions, MAPAL now offers a comprehensive range of services covering the end-to-end planning and implementation of manufacturing processes. From project

At Benvenuti, robotic cells and FMS integration enable a single operator to automatically load and unload multiple machines. As part of its turnkey expertise, MAPAL also supports Benvenuti in the reliable design of automated production processes



analysis and tool and fixture design through to commissioning and production support, every element is perfectly coordinated and tailored to the customer's requirements – all from a single source. The result is stable processes, high cutting data and low cost per part. For Benvenuti, MAPAL took on responsibility for the complete tooling package, including process design, while the machining programme was developed in-house. "It was a very complex project, with all elements needing to be precisely coordinated", says Riccardo Benvenuti, highlighting the benefits now achieved in production. It took eight months from initial quotation to the start of production, which was much quicker than expected.

Another turnkey project developed jointly involved prototype setting fixtures and dedicated tooling for machining oil pump covers for a new version of Casappa's piston pump.

For Benvenuti, the use of MAPAL's state-of-the-art setting and measuring technology is a key factor in ensuring high process and component quality



The machine was ready for operation in just two and a half months.

"We see our collaboration with MAPAL in a very positive light and are keen to complete more projects together", confirms Riccardo Benvenuti. MAPAL's ability to deliver complete turnkey projects – providing tools, clamping fixtures and all other process components all from a single source – has been met with strong demand. Benvenuti was among the first customers in Italy to adopt MAPAL's workpiece clamping solutions.

With the purchase of Benvenuti, in addition to an important competitive advantage, Casappa has improved business continuity by significantly reducing the risks of dependence on machining suppliers, bringing back into balance the make-buy ratio that had been unbalanced in favour of machining in-house in recent years of strong growth. The Board of Directors of Benvenuti confirmed the strategy of dedicating 60-70% of the installed production capacity to the other companies of the group (Casappa, Ikron and Tecnord) and the

remaining 30-40% to other important Italian companies with which it can develop a long-term relationship. As Roberto Bergamaschi announces, Benvenuti has drawn up a business plan that forecasts a growth in turnover of over 30% in the next two years compared to 2026 and which aims for 12 million euros in 2028. In addition to the introduction of the subsidiary Tecnord, the plan provides for the introduction of new customers in various sectors in addition to that of hydraulics for which the company has an exceptional specialisation. The next step in development after 2028 involves the evolution from a national supplier to an international player capable of making competitive business proposals to important European companies, proposing itself as prime contractor, also taking advantage of the Casappa group's network of suppliers of raw materials and surface treatments.

Investing in modern technology

To become more competitive in terms of costs and delivery times, the company has invested one million euros in TEM technology, i.e. thermal deburring, lapping, and continues to invest in automated CNC machining with the aim of having more than 60% of cells automated and the rest with FMS technology by 2028. Modern tooling and measuring technology are also a key focus, as Bergamaschi emphasises: "MAPAL is a very important strategic partner for us, supporting us in implementing tailored, automated solutions that enhance efficiency, quality and cost performance. This is a central pillar of our strategy, which is built on a strong and competitive position across a wide product portfolio. MAPAL is a key partner for us as a supplier – there's no question about it."

Bergamaschi now aims to leverage the positive experience gained with MAPAL's complete tooling solutions across other Casappa and Tecnord production sites. With this strategic decision, Benvenuti has entered into a close, long-term partnership with the tooling specialist – unlocking clear added value. "Casappa is not yet fully taking advantage of this added value, we're still building that up while with Tecnord we still have to define the objectives and a consequent programme for the introduction of MAPAL technology", says Bergamaschi. However, MAPAL tools and presetting systems are already in use at Casappa's plant in Shanghai. To ensure process reliability for components with particularly high functional and manufacturing requirements, machining processes evaluated and applied by Benvenuti



were transferred to China, including all the necessary tools.

MAPAL's global presence and international production could offer advantages to Casappa in its existing plants in China and India and also with regard to European and Asian machining suppliers which are supported by a team of dedicated technologists. They aim to introduce the best standards of processing and process control to guarantee both competitiveness and high quality standards. MAPAL has already established itself there and can support international sites with projects right through to sophisticated turnkey solutions – where close collaboration between all partners involved is key.



70 per cent of the components manufactured by Benvenuti are supplied internally to other companies within the Casappa Group (Picture: ©Casappa S.p.A.)



For Benvenuti, the use of MAPAL's state-of-the-art setting and measuring technology is a key factor in ensuring high process and component quality (Pictures: MAPAL Dr. Kress SE & Co. KG)

At the Sant'Ippolito di Fano site, around 70 employees at Benvenuti manufacture hydraulic piston pumps, hydraulic gear motors, hydraulic blocks, heat exchangers and other fluid technology components (Picture: ©Casappa S.p.A.)

Networking at New Heights

VDWF Brings Stamping Professionals Together



This time, the “Stanzer-Treff” took place at Wolfgang Loch’s facility in Idar-Oberstein (Picture: VDWF)

The event, organized by the Association of German Tool and Mold Makers (VDWF) and held on June 29 and 30, took place at the facilities of Wolfgang Loch, a manufacturer of stamped, drawn, and formed parts, as well as complex, ready-to-assemble welded and assembled components. The first day began with a presentation by Tebis board member Jens Lüdtker on the current situation in tool and mold manufacturing. The subsequent technical presentations delved deeper into specific topics such as software, continuous improvement processes, and organizational efficiency in tool and mold making.

Gliding and Soccer Night

A tour of the Loch facilities provided interesting insights into stamping and assembly technology before the group literally took to the skies: The participants traveled by bus to the nearby gliding field. There, they had the opportunity to be catapulted to 100 km/h

(left) In their presentations, several speakers painted a detailed picture of the current situation in the tool and mold making industry (Picture: Dr. Mario Schubert)

(right) During panel discussions, attendees exchanged views on the state of the industry and current topics (Picture: Dr. Mario Schubert)



Two days, around 60 participants from leading cutting and forming tool manufacturers, from zero to 100 in 3 seconds: The “VDWF Stanzer-Treff” in late June in Idar-Oberstein delivered substantial value through meaningful industry insights, dynamic cross-company networking, and an engaging agenda.

in just 3 seconds in a glider. A roughly 20-minute flight then rewarded them with a magnificent view. “The glider flight was a very special highlight,” reports VDWF Managing Director Ralf Dürrwächter. “Not only did we have perfect weather, but everyone was in fantastic spirits – an unforgettable experience!”

A group dinner provided another opportunity for professional discussion and networking. Before the group viewing of the Germany vs. Paraguay World Cup match, legendary referee Lutz Wagner sent his greetings via video call and shared his predictions for the game. Although the German national team was eliminated, the toolmakers in attendance agreed that the DACH region remained the technological world champion in their industry – they just needed to work together with policymakers to counter the distorted international price competition and maintain this position.

Practical Insights and Personal Exchange

On the second day of the event, participants first toured the toolmaking department at





VDWF Managing Director Ralf Dürrwächter (left) praised the consistently positive atmosphere among the participants and particularly highlighted the combination of technical input, practical insights, and personal exchanges (Picture: VDWF)



New Perspectives:
From the glider, some intrepid participants enjoyed magnificent views across the picturesque landscape of the Birkenfeld district (Picture: Daniel Oertel)



The first day concluded with everyone watching the German team's final World Cup match together (Picture: VDWF)

Wolfgang Loch, before continuing by bus to Fissler in Hoppstädten-Weiersbach. During a guided tour of the cookware manufacturer's plant, they got a close-up look at how high-

quality "made in Germany" products are manufactured.

Back at Wolfgang Loch's, a group barbecue brought the event to a close. "These kinds of informal gatherings are essential to an event like this –this is where the conversations take place that we often don't have time for in our day-to-day business," says Dürrwächter, explaining the "VDWF meeting space." And it is, according to Dürrwächter, precisely this that fosters cohesion within the industry.

Overall, it became clear just how much the event thrives on the combination of expert input, practical insights, and personal interaction. "The event once again brought together top-tier experts from across the industry, and the intensive exchange among peers makes this format something special year after year," Dürrwächter sums up, looking forward to the next "Stanzer-Treff". It will take place in 2027 at Vapic in the Black Forest.

(Pictures: VDWF)



During the tour of the Fissler factory in Hoppstädten-Weiersbach, participants were able to experience firsthand how high-quality cookware "made in Germany" is produced (Pictures: VDWF)



A brilliant collaboration

Precision mechanics, endless lines of code and a diamond tool with a perfect cutting edge – this symbiosis of different technologies enables the milling of a high-gloss bottle mould. Working in close collaboration, DMG MORI, OPEN MIND and HORN demonstrate an efficient milling process that eliminates the need for subsequent polishing of aluminium bottle moulds. They achieve this virtually perfect surface finish using a third-generation DMG MORI DMU 20 linear, a high-quality MCD diamond tool from Horn, and a special CNC program created using *hyperMILL* software. This interplay of modern technology and precise control ensures a high-quality, high-gloss bottle mould – an impressive example of innovative manufacturing.



With the DMU20 linear, DMG MORI offers the most accurate simultaneous 5-axis machining centre in its portfolio

Aluminium bottle moulds, also known as blow moulds, are specialised tools used in the manufacture of plastic bottles. The moulds must be manufactured with great precision in order to reproduce the desired bottle shape exactly. During the blow moulding process, a bottle preform, usually made of PET, is heat-

ed and inserted into the aluminium mould. Compressed air is then blown into the mould to inflate the bottle, so that the hot plastic material completely fills the inner wall of the mould and takes on the desired bottle shape. The dimensional accuracy and surface finish of the blow mould play a crucial role in the subsequent quality of the bottle. Any irregularity is reflected in the blown bottle. Consequently, following the milling stage, it was usually necessary to polish the blow moulds by hand, a time-consuming process.

Milling instead of polishing

Surface finishes with a mirror-like shine and flatness to within microns: these are properties that can only be achieved through the process of ultra-precision machining or high-polish machining. The combination of the precision tool used, the appropriate cutting material, the machine employed and the correct programming ensures a perfect result. The surface produced is always a mirror



A 16 mm Horn end mill from the DS system was used for roughing



For semi-finishing, the team opted for a HORN ball-end mill having a diameter of 4 mm



image of the tool's cutting edge. Only an insert made of monocrystalline diamond (MCD) can be polished so finely – thanks to its internal structure and hardness – that a flawless surface is created during machining. It is astonishing that, despite all technological advances, polishing the cutting edge is still a manual process. Only the dexterity and expertise of specially trained staff determine the high-gloss result.

hyperMILL – CAD/CAM solution

The CAD/CAM software *hyperMILL* from OPEN MIND was chosen for programming, and for good reason: the solution offers innovative and powerful technologies for the manufacture of high-precision components with perfect surfaces down to 0.1 µm. Components such as the bottle-shaped part place particularly high demands on accuracy and surface finish. With *hyperMILL*, such complex geometries can be machined efficiently and reliably. Even in its standard version, the software includes special integrated functions that enable the highest surface finishes to be achieved. Manual polishing or grinding can be replaced or avoided entirely. The so-called True-Shape technology was used for finishing. It forms the basis for high-precision machining and ensures high accuracy and ideal point distribution within the toolpaths. They are calculated directly from the CAD surfaces, not from triangulated meshes. The result is clean, fluid machine move-

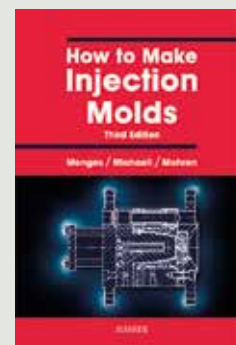
ments that ensure a homogeneous milled finish. True-Shape technology is available across a range of machining strategies and is ideal for components where the highest surface quality is required.

For the bottle shape, the *hyperMILL* experts opted for 5-axis radial machining on the new DMU 20 linear. One of the major challenges in this area is maintaining a uniform tool-path spacing across the entire component geometry. With this strategy, the axial inclination of the tool can be individually controlled and optimally adapted to the surface profile.

For a high level of safety

Safety plays a central role in milling – particularly for complex and high-precision components. *hyperMILL* VIRTUAL Machining provides state-of-the-art simulation and post-processor technology that generates, optimises and simulates the NC code, all within a single system, ensuring unrivalled consistency. Thanks to the digital twin, the virtual and real worlds correspond exactly, ensuring a high level of process

TECHNICAL BOOK



Georg Menges, Walter Michaeli, Paul Mohren
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How to Make Injection Molds

Economic success in the plastics processing industry depends on the quality, precision, and reliability of its most common tool: the injection mold. Consequently, misjudgments in design and mistakes in the manufacturing of molds can result in grave consequences.

This comprehensive handbook for the design and manufacture of injection molds covers all aspects of how to successfully make injection molds from a practical as well as from a theoretical point of view. It should serve as an indispensable reference for everyone engaged in mold making.

"...an example of how books should be written ... will be used by molders, mold designers and mold makers and will become a standard." (Polymer News)

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With a finishing allowance of 0.02 mm, the HORN MCD ball-end mill was used to perform high-polish milling on the bottle mould



reliability. Comprehensive analysis functions enable machining scenarios to be examined in detail. An Optimizer module ensures that, in the event that travel limits are exceeded, they are automatically adjusted to the machine's working envelope. The stored machine model is used to check the linear and rotary axes as well as the auxiliary axes.

HSC and ULTRASONIC machines from DMG MORI

For the milling of blow moulds, DMG MORI relies on the new DMU 20 linear and the third-generation ULTRASONIC 20 linear. The DMU 20 linear redefines high-performance machining: compact, precise and with impressive dynamics. Thanks to wear-free linear drives, a newly developed cast iron bed and optimised temperature management, the DMU 20 linear simultaneous 5-axis machining centre is the most precise milling centre in the machine manufacturer's portfolio. As standard, the HSK-32 spindle offers 42,000 rev/min and optionally up to

60,000 rev/min – for the finest machining and the highest surface finish in the sub-micron range – ideal for the production of the bottle mould.

With the optional integration of ULTRASONIC technology, the DMU 20 becomes the ULTRASONIC 20 and offers ultrasonic superimposition of amplitudes of up to 15 µm in the kilohertz range onto the tool rotation. The result: up to a 50% reduction in cutting forces, higher feed rates, improved surface finish and longer tool life – advantages that prove unbeatable, particularly when machining hard, brittle and advanced materials. The third generation of ULTRASONIC technology offers intelligent frequency tracking and

real-time power control, which ensures a constant amplitude during the process and thus optimises process stability.

Thanks to the new user interface featuring CELOS X and SINUMERIK ONE, users benefit from an intuitive, app-based control system with a 24-inch multi-touch display. It enables simple 3D workshop programming directly at the control or input of complex, CAM-generated toolpaths such

as for bottle moulds, maximising performance and future-proofing CNC machining.

Monocrystalline diamond

However, ultrasonic technology was not used for machining the aluminium blow mould. Instead, the technicians at DMG MORI utilised the machine's precision and dynamics to fully exploit the potential of the diamond tool. A single-edge MCD ball end mill was used for finishing the blow mould. The final grinding or polishing of the MCD cutting edge is akin to a craft. Much like the cutting of a gem-quality diamond, the finishing of a tool insert for high-polish machining is carried out by hand using a grinding collet. Air-bearing grinding tables with a solid granite worktop provide the ideal conditions for grinding the inserts. A microscope with 200x magnification is used for visual inspection. At this magnification, the insert edge must be absolutely free of nicks. The resulting insert has a maximum radius of 0.0002 mm. For grinding MCD ball end mills used in

high-polish machining of free-form surfaces, Horn developed a specialised machine capable of reliably grinding even the smallest radii.

Synthetic diamonds are primarily used in high-polish machining. Two different processes are employed to manufacture the synthetic stones. In the HPHT (High Pressure, High Temperature) process, the diamonds are formed under high pressure and extreme heat. In other words, in a manner almost identical to natural formation, but instead of taking millions of years, the process takes place within a few hours or days, depending on the desired size. In this process, pure graphite powder is converted into a diamond at a pressure of 60,000 bar and a temperature of 1,500 degrees Celsius. Diamonds produced by this process are characterised by a slightly yellowish colour, caused by the refraction of light by embedded nitrogen atoms. The maximum edge length of synthetic diamonds is 10 mm. Larger sizes are theoretically possible, but would not be economically viable.

High-purity MCC diamonds

Horn relies on the even purer MCC diamonds when equipping its MCD tools. These monocrystalline stones are produced using the CVD process. Various gases, mainly methane, serve as the carbon source; these are deposited during the process, allowing the diamond to grow. The diamonds are characterised by their crystal-clear colour or, depending on their thickness, a slightly brownish hue. A major advantage of this process is the edge length of the stones. Even long tool configurations with, for example, a 30 mm cutting edge length can be realised. Previously, natural diamonds had to be used for such tools, but these are problematic due to their high price, limited availability and natural inclusions.

A brilliant symbiosis of different technologies

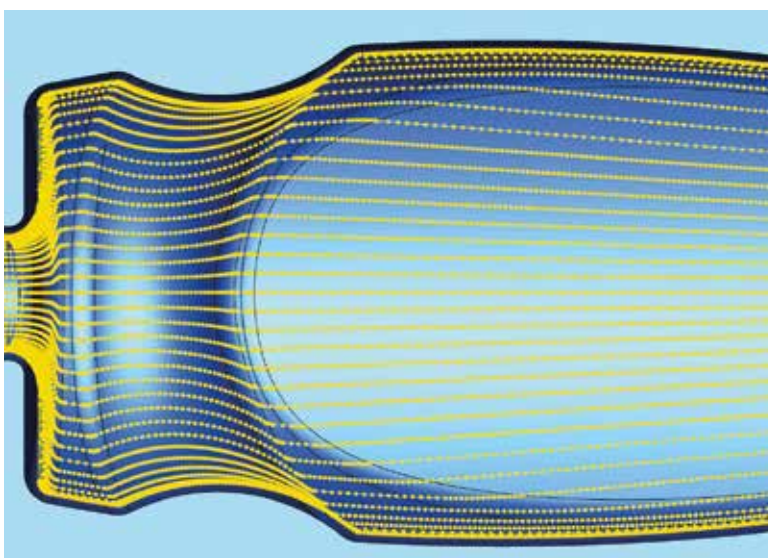
The close collaboration between DMG MORI, OPEN MIND and HORN impressively demonstrates how combined expertise and innovative technologies lead to exceptional



High-polish milling eliminates the need for polishing
(Pictures: HORN/Sauermann)

results. Together, the partners produce a high-precision bottle mould with a flawless surface. The perfect interplay of precise machine control, intelligent machining strategies and the craftsmanship of experienced specialists produces a result that sets new standards in both functionality and aesthetics. This partnership demonstrates how modern manufacturing becomes not only more efficient, but also more sustainable through interdisciplinary collaboration, whilst meeting the highest quality standards.

hyperMILL True Shape technology forms the basis for high-precision machining and ensures high accuracy and an ideal distribution of points within the toolpaths
(Picture: OPEN MIND)





A Faster Pace for Tooling

Kraftsman Tooling accelerates automotive mold production with 50% faster CNC programming and efficient electrode workflows

Since opening its doors in 2004, Kraftsman Tooling has served leading automotive manufacturers worldwide and built a reputation for excellence in the design and production of plastic injection molds.

Kraftsman Tooling produces approximately 50 molds annually

Recognized for its commitment to quality, precision, and reliability, the company has steadily grown as a trusted partner for customers with demanding production requirements and tight delivery schedules. Based in Pune, India, Kraftsman Tooling

employs 34 skilled toolmakers who produce approximately 50 molds annually. The company exports mold components and complete molds to countries such as France, Germany, Italy, and Portugal, and also performs mold design work for domestic and international customers.

The company implemented Cimatron in 2024 to take advantage of its integrated CAD/CAM platform, specialized 3-axis machining capabilities for mold cores and cavities, and tools for automated electrode creation. Its goal was to streamline operations, increase efficiency, and position the company to better meet the evolving demands of the automotive sector.



Cimatron brought mold and electrode design and machining together in one place, and there's no need to switch between CAD and CAM solutions because the software is fully integrated.

*George Joseph, managing director,
Kraftsman Tooling*



George Joseph,
managing director

The power of CAD/CAM integration

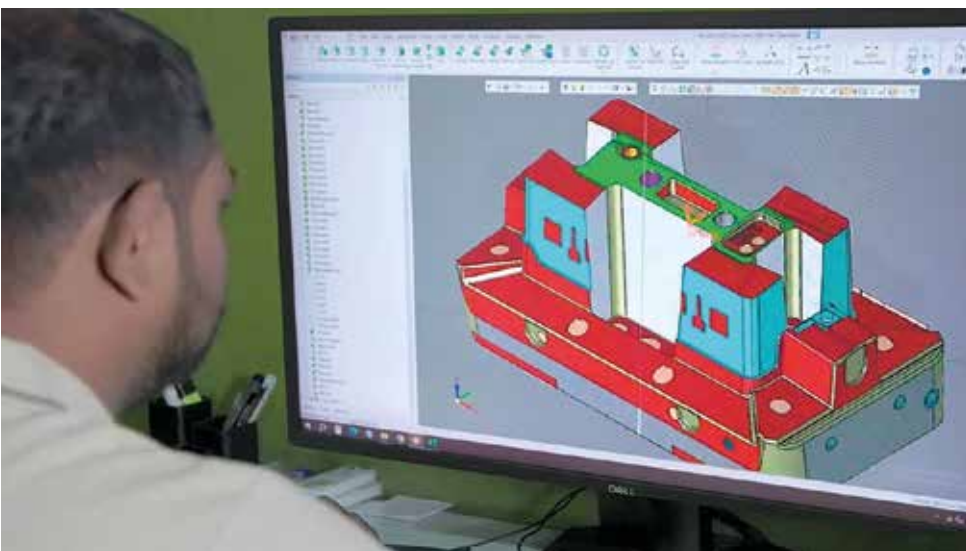
Prior to implementing Cimatron, Kraftsman Tooling dealt with operational challenges that limited its ability to scale efficiently. Its CAD and CAM processes were disconnected, requiring teams to switch between systems and manually transfer data. CNC programming workflows were time consuming and repetitive, and the electrode design process was fully manual — making it both error-prone and difficult to adapt quickly to design changes. These inefficiencies created bottlenecks at various stages across the process chain, from engineering through production. Communication gaps between design and manufacturing teams led to delays, particularly

when updates required re-calculating toolpaths or repeating labor-intensive processes. As customer expectations continued to rise, the need for a more streamlined, integrated approach became increasingly clear.

The program calculation speed in Cimatron is 50% faster than other software I've used.
Kuldip Pawar, CAM programmer, Kraftsman Tooling

Implementing Cimatron empowered the company to create more connected and efficient workflows at every step of production.

“Our CAD/CAM and electrode workflows were disjointed, which led to lost time and a higher risk of error,” said Managing Director George Joseph. “Cimatron brought mold and electrode design and machining together in one place, and there’s no need to switch between CAD and CAM solutions because the software is fully integrated. That saves a lot of time.” With a unified platform in place, the company eliminated many of the manual steps that previously slowed production. Cimatron’s custom post processors, feature detection capabilities, and associative toolpaths – which enable CNC toolpaths to automatically update when CAD designs change – have significantly improved programming accuracy and efficiency.



Programmer Kuldip Pawar designs with Cimatron CAD/CAM



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This seamless data flow is particularly valuable when electrode designs need to be modified. Instead of restarting processes or manually adjusting toolpaths, updates are implemented quickly and reliably, reducing downtime and minimizing the risk of error.

"The program calculation speed in Cimatron is 50% faster than other software I've used," said CAM Programmer Kuldip Pawar. "In other software, patching ribs, holes, or pockets is very time consuming. With Cimatron's 'cap internal island' feature, the same process can typically be completed in just one or two minutes."

Cimatron helped Kraftsman Tooling make further efficiency gains by enabling the creation of reusable process templates that can be easily applied to repeat jobs. This capability accelerates CNC programming and ensures consistency across projects, helping standardize operations and reduce variability in output.

As a result, Kraftsman Tooling achieved measurable performance improvements across its operations. CNC programming for repeat jobs is now 50% faster, while electrode design time has been reduced from hours to minutes. These gains have translated into shorter lead times, improved resource utilization, and greater overall efficiency on the shop floor.

"It makes us lean and pushes us to focus on where to cut costs — and that's where software like Cimatron comes in."

*George Joseph, managing director,
Kraftsman Tooling*

"There is now more consistent output with fewer manual errors, along with improved collaboration between design and manufac-

turing," Joseph said. "We have achieved significant time savings and process improvements that increase shop efficiency and help ensure faster delivery for more satisfied customers."

Beyond operational improvements, the ability to respond quickly to last-minute design changes has become a key competitive advantage. With more flexible workflows and automated processes, the team can accommodate customer requests without disrupting production schedules.

A roadmap for success

As the automotive industry continues to evolve, Kraftsman Tooling has increasingly focused on the Indian market, where tighter margins make efficiency and cost control even more critical. This shift has further reinforced the company's commitment to optimizing processes and investing in technologies that deliver measurable value.

"It makes us lean and pushes us to focus on where to cut costs — and that's where software like Cimatron comes in," Joseph said. "Using Cimatron for CAM programming and electrode design gives us more options and allows us to program much faster. Having tools tailored for electrode extraction ensures we can remain flexible and efficient, even with last-minute modifications."

Looking ahead, Kraftsman Tooling is well positioned for continued growth. In 2026, the company expanded its capabilities with the opening of a second toolroom in Palakkad, Kerala, increasing production capacity and strengthening its ability to serve both domestic and international customers.

As it continues to scale operations and adapt to changing market demands, Kraftsman Tooling views Cimatron as a reliable long-term partner. With ongoing advancements in CAD/CAM technology and a shared focus on efficiency and innovation, the company expects to achieve even greater productivity gains in the years to come.

(Pictures: Cimatron)

Meusburger presents new products, digital solutions and a behind-the-scenes look at manufacturing processes

From 12 to 16 October 2026 at Fakuma in Friedrichshafen, Meusburger will present new products, product expansions and digital solutions for mould, die, and jigs and fixtures construction. Visitors can find the standard parts manufacturer in hall A2 at stand 2313 + 2316. In the spotlight at the trade fair stand are high quality standard components, high-performance hot runner systems, solutions for cleanroom applications and digital tools for efficient design. In addition, Meusburger invites visitors to take part in company tours at its Wolfurt site during the trade fair, offering a first-hand look at its production processes.

High quality standard components for efficient projects

A key focus of the trade fair stand is the comprehensive range of plates and mould bases. The raw materials that have been heat-treated for stress relief guarantee maximum quality and precision, and thanks to a high proportion of in-house production and enormous storage capacities, Meusburger ensures very short lead times. The standard parts manufacturer will also present its comprehensive range of high-precision components. As well as guiding elements, the range includes ejectors, slide systems, centring units and locks and hot runner solutions. The coordinated components simplify mould and die design, reduce procurement costs and support efficient manufacturing.

Cleanroom solutions for the highest process reliability

In addition, the company will provide information about its product range for cleanroom applications and present its current campaign on this topic. The focus is on an optimally coordinated range of standard components and materials – from plates and components to hot runner systems. This positions Meusburger as a reliable supplier and full-range provider of cleanroom technology. The product solutions are designed to minimise particle sources, enabling clean, stable and uncompromisingly safe processes. High-quality materials and consistently high quality standards form the basis for use in demanding cleanroom applications and underline the company's commitment to quality.

Digital solutions for efficient design

A further key focus is digital services for designers. Visitors can take a look at the Meusburger portal and its configurators, which accelerate the design process and simplify routine tasks. A particular highlight is the Meusburger CAD tool. The software grants access to the entire standard parts library, supports the configuration of models including automatic consideration of necessary installation spaces, and is compatible with various CAD systems.

Practical example from series production

Meusburger, in collaboration with Jell GmbH & Co. KG, will be demonstrating how precision standard parts and application-specific hot runner systems perform in practice on an ENGEL injection moulding machine. High quality bag clips will be produced, the development of which was achieved in close cooperation from prototype to reliable series production. The application example demonstrates how coordinated mould technology and collaborative partnerships contribute to efficient production processes.

Company tour in Wolfurt

During Fakuma, Meusburger invites visitors to take a company tour at their headquarters in Wolfurt from Tuesday to Friday, 13 to 16 October 2026. Visitors gain a comprehensive look at the production, warehouse and manufacturing operations behind the extensive standard parts range. This offers an exciting opportunity to experience first-hand the manufacturing processes that have been optimised down to the last detail.



At Fakuma, Meusburger presents high quality standard components, high-performance hot runner systems, solutions for cleanroom applications and digital tools for efficient design (Picture: Meusburger)

Absolutely reliable

Unmanned production of precision components for medical technology

Together with CemeCon, tool manufacturer HPTec has developed the RQR 350 milling cutter with a diameter of only 3 millimeters and InoxaCon® coating. This tool for micro-machining in medical technology sector ensures high machining quality and especially long tool life. This makes it ideal for a stable, precisely reproducible manufacturing process that can be safely automated overnight.



The red-gold, TiAlSiN-based coating material InoxaCon® contributes significantly to the stability and tool life of the new RQR 350 milling tool from HPTec. It thus enables safe and efficient automated processes in the manufacture of surgical instruments

A steady hand is not everything: since surgical instruments are used directly in the human body, the requirements for their surface quality, burr-free finish, and dimensional accuracy are particularly critical. This is a matter of course that has also driven Bacher Medizintechnik GmbH for decades as a manufacturer of instruments for endoscopy and minimally invasive surgery. At the same time, cost-effectiveness is required in component manufacturing: When machining so-called jaw parts – functional instrument gripping heads for grasping or separating tissue – the Baden-Württemberg-based company therefore relies on manufacturing processes that run automatically for many hours.

Even in unmanned production, continuous in-process control carried out throughout the entire process. An integrated 3D measuring probe system and supplementary laser measurement continuously monitor the relevant geometries, thus ensuring that the required quality is maintained at all times,

even during automated night shifts.

Another important aspect is the performance of the machining tool: “In medical technology, there is no room for fluctuating quality,” explains Mate Bekavac, Head of CNC Manufacturing at Bacher Medizintechnik. “Especially with batches that run unmanned overnight, i.e., without the possibility of direct intervention, I have to be able to rely 100% on the tool working fail-safe right down to the last jaw. Additionally, I need to be sure that there is no scrap.”

The challenge: roughing with diameters up to three millimeters

The requirements profile for the partner HPTec was thus clearly defined – the tool manufacturer was to develop a roughing tool with a long tool life and persistently high sharpness for consistently stable and high-quality machining. A particular technical challenge was that only a very small tool diameter of no more than 3 millimeters was permitted. The required high-performance machining tool still had to absorb high forces and remove large amounts of material in a short time.

HPTec's first step toward a solution was to optimize the tool geometry: Within a short time, the developers succeeded in achieving a balanced ratio of core diameter, chip space, and cutting geometry, ensuring stability and efficient chip removal. The design is complemented by special roughing and finishing teeth. These produce short chips and, with the appropriate coating, achieve an extremely uniform surface finish even during the roughing process.

Optimal tool coating complements optimal tool geometry

A key performance factor of the new RQR 350 milling cutter is the HiPIMS coating from

CemeCon. During the joint development phase, the coating specialist and tool manufacturer HPTec designed a coating that gives the cutting edge outstanding sharpness and long-lasting performance. The basis for this is the very hard and temperature-stable InoxaCon® coating material based on TiAlSiN. Thanks to CemeCon's many years of experience with HiPIMS, the coating could be adapted to support the long-term stability of the tool, thereby significantly increasing its tool life.

"With the innovative micro milling cutter, we are already achieving excellent surface quality during roughing with a low allowance of maximum 0.05 millimeters, which allows us to carry out the subsequent finishing process with a very small engagement width," says Bekavac. "This significantly diminishes the cutting forces and thus the load on the finishing tool, reduces burr formation, and has a positive effect on the entire process."

Julian Reck, Key Account Manager at HPTec GmbH, adds: "Especially in micro and fine machining, it is crucial that the coating does not 'round off' the cutting edge. CemeCon has specified the HiPIMS coating for us in such a way that exactly that is achieved: high hardness, excellent adhesion, and a layer thickness and homogeneity that optimally complements the carbide substrate and tool geometry." As a result the tool life is many times longer than that of the competing tools previously used, offering additionally consistent machining quality throughout the entire tool life.

For Bacher Medizintechnik, the decisive advantage lies not only in this extended tool life, but above all in 100% reliable processes. Wear-related quality deterioration during unmanned production would result in unnoticed rejects – and thus high costs. "The new tool gives us the assurance that the jaw parts still have exactly the required quality even after many hours of automated production," says Bekavac.

Technical excellence and collaborative development open up new perspectives

The project clearly shows how close cooperation between users, tool manufacturers and coating specialists leads to measurable



Mate Bekavac, Head of CNC Production at Bacher Medizintechnik, Julian Reck, HPTec Key Account Manager, and Andreas Bacher from the management team at Bacher Medizintechnik (from left to right) are extremely satisfied with the performance of the newly developed tool with CemeCon's InoxaCon® coating (Pictures: CemeCon)

success. For HPTec, the tool developed in collaboration with CemeCon is also another important step into a strategic growth market. The company's many years of experience in the manufacturing of high-precision tools for the printed circuit board and dental industries – including as an OEM – could be seamlessly transferred to the demanding field of medical technology. The expertise gained – from precision engineering and reliable process stability to strict quality requirements – provided an ideal basis for developing innovative, robust solutions tailored precisely to the application in medical technology.

"For us, projects like this are more than just product development," emphasizes HPTec Sales and Marketing Manager Wolfgang Würtz. "They show how we can tap into new markets and expand our technological expertise in a targeted manner together with strong partners." The combination of optimized tool geometry, high-performance HiPIMS coating and close user integration makes this flagship project a good blueprint for further applications – even beyond medical technology: wherever precision, process reliability and cost-effectiveness must come together.

Aulbach Automation claims to be the market leader in deburring presses for large castings



Die clamping and changing technology for deburring square metre-sized mega and gigacasting components

Aulbach Automation abk, market leader in large casting deburring presses, has been relying on ROEMHELD for over a decade

Mega and gigacasting components measuring several square metres made of die-cast aluminium place extreme demands on deburring technology. Aulbach Automation abk Pressenbau, which claims to be the market leader in deburring presses for large castings, has been relying on die clamping and changing systems from ROEMHELD for over a decade.

In mega and gigacasting processes, single-piece structural components such as front or rear undercarriages and battery housings made of die-cast aluminium replace hundreds of individual components. This technology, used by Tesla and Volvo, for example, simplifies production, reduces weight and improves the rigidity of the components. At the same time, formats and weights place new demands on post-processing.. Aulbach Automation, based in Mömlingen in Lower Franconia, understands this. The

company, which has 70 employees, specialises in the manufacture of highly specialised deburring presses for the foundry industry. It has been working in the mega and gigacasting segment since 2021 and has already delivered 23 deburring presses for megacastings measuring over 3 x 2.5 metres by September 2025.

Partnership for over a decade

For over ten years, the company has been using die clamping and changing systems

from the ROEMHELD Group. It installs powered die changing systems, ball and roller bars, and die clamping elements from the Hessian specialist as standard on its large-format deburring presses.

"In our view, there are many reasons to choose these products: their precision, short delivery times, reliability, durability, excellent coordination of the elements with each other and also impressive service," explains André Pfeifer, Technical Project Manager at Aulbach Automation.

Greater process reliability and improved occupational safety

The advantages of automated die changing include reduced set-up times and increased process reliability. The focus is on the quality of the changing process. If dies are positioned inaccurately or clamped incorrectly, they can easily be damaged or faulty components can be produced. In the worst case, this can lead to costly production interruptions.

In addition, the operator benefits from improved ergonomics and greater safety when working on the press.

Clamping forces up to 412 kN

Hydraulic double-acting swivel clamping elements are used on the press table. Despite their compact design, they achieve clamping forces between 60 and 412 kilonewtons and can compensate for clamping edge tolerances of ± 1.5 millimetres. During a stroke phase, the clamping piston simultaneously performs a 45-degree rotation – this enables the dies to be retracted safely and without interference edges.

The release, switchover and clamping positions are monitored inductively; the swivel mechanism is additionally protected by a spring-loaded overload protection device and a manual emergency control. 90-degree swivel clamps with comparable features are used on the press ram.

The tolerances of the clamping solution are in the range of a few tenths of a millimetre. All clamping elements are driven cen-



André Pfeifer (left) and Ulrich Krimm in front of an SP30 deburring press with a clamping area of 3.6 x 3.2 metres and a pressing force of 400 tonnes

trally by a ROEMHELD hydraulic unit, which automatically activates an energy-saving standby mode during production interruptions.

The ROEMHELD clamping technology in the press ram and press table ensures that even large-format, heavy dies are always reliably fixed and held in position – crucial for process reliability and repeat accuracy in megacasting. To facilitate the insertion and removal of heavy dies, ROEMHELD transport rails are also integrated into the table surface.

Double-acting hydraulic swivel clamping elements are used on the press table. Their design means that there are no interfering edges that hinder the insertion of the dies. Transport rails are also integrated into the table surface to facilitate the insertion and removal of heavy dies (Pictures: ROEMHELD)





The IMOCA ocean-going yacht “DMG MORI Global One” is a symbol of precision under extreme conditions. The swivel keel’s high-load bearing requires a complex titanium component that is manufactured using a complete turn-mill machining process

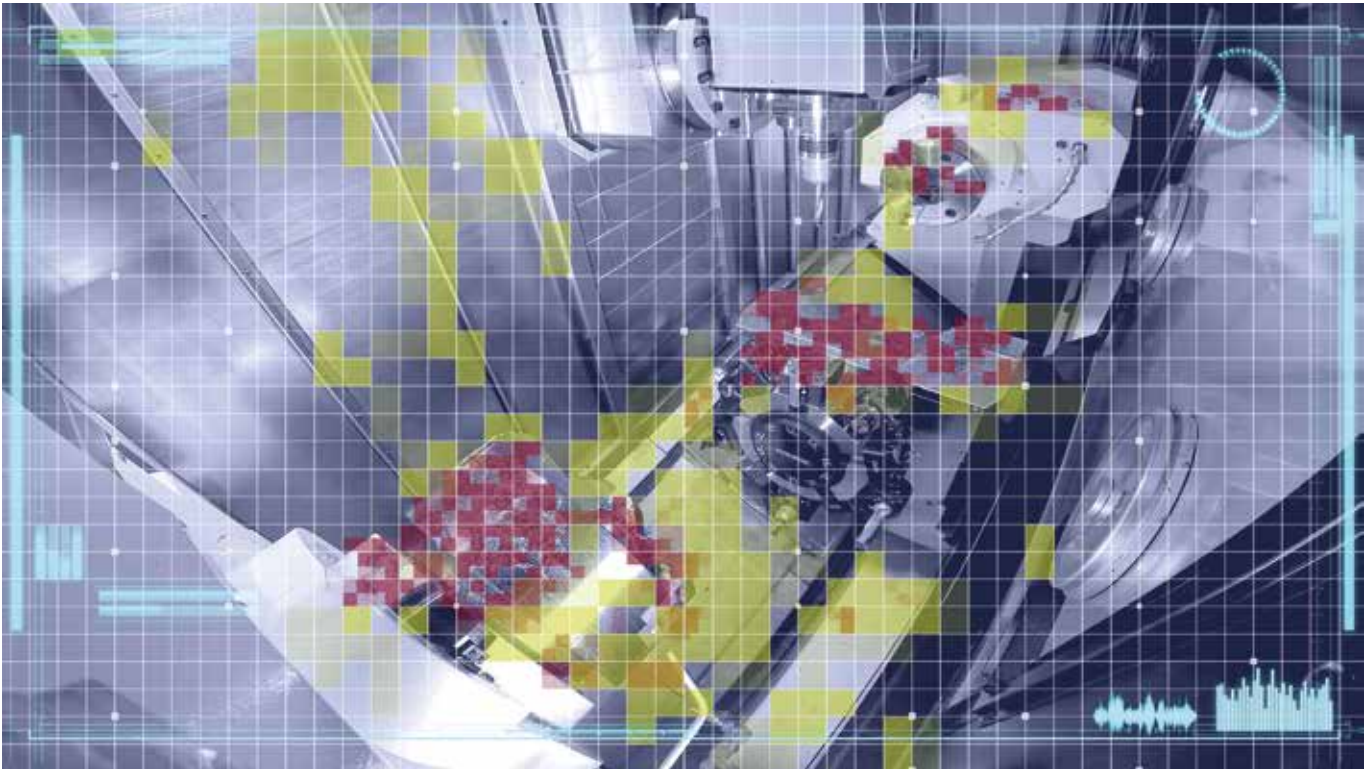
AI meets Turn-Mill: DMG MORI presents intelligent CNC process chain from digital work preparation to energy analysis

AI in CNC manufacturing

Artificial intelligence is evolving from a topic of the future to a practical tool for industrial manufacturing. In line with this, DMG MORI will be presenting a turn-mill showcase at Hannover Messe 2026 to demonstrate how AI can deliver substantial added value along the CNC process chain, from work preparation and machining to the analysis of energy and status data.



The titanium component shown here comes from the offshore racing yacht DMG MORI Global One, specifically from the rear bearing of the pivoting keel. The bearing plate combines complex geometries with high demands on precision and material machining. This precision component is manufactured using AI technology on a turn-mill center in a single integrated process



High-performance titanium components

When the IMOCA ocean-going yacht "DMG MORI Global One" cuts through waves and gusts on the ocean at high speed, reliability is not optional but a prerequisite for success. There are no second chances when it comes to materials, components, and manufacturing. This is especially true for the highly stressed bearings of the swiveling keel. The showcase therefore focuses on a rear keel bearing made of titanium—a practical example of complex structural components, such as those required in aerospace, medical technology, and energy plant construction.

Precision and complex geometries

Titanium is considered a challenging material due to its strength, toughness, and high heat generation during machining. The component itself also requires maximum precision. At the same time, the geometry of the bearing plate of the "keel bearing" requires numerous machining steps. In a single clamping: Turning, drilling, and simultaneous 5-axis milling – supplemented by in-process measurement technology. Complete turn-mill machining operations of this kind are examples of increasing complexity and the necessary perspective on a consistent process chain.

Digital work preparation

Accordingly, optimization begins here in the

work preparation stage: AI-based CAM systems support the analysis of geometry and the creation of machining strategies, while 3D simulations ensure collision-free tool paths, taking machine models into account. This reduces iteration loops between CAM, simulation, and machine, and allows robust machining processes to be achieved more quickly.

Tool management in perfection

A stable turn-mill process also begins with tool management. An AI-supported tool search in the CAM system helps users quickly identify suitable tools and complete holders. Directly on the machine, the Tool Visualizer then creates additional transparency about the tool status: Contactless tool measurement in the work area, automatic offset creation, and wear and damage detection, including 3D model generation, help to reduce setup costs and increase process reliability. In addition, the CELOS X Widget Easy Tool Monitor 2.0 helps to keep track of tool monitoring data.

AI assistance in processing and quality in the process

During machining, machine and process signals such as spindle load, vibrations, or feed behavior are continuously recorded and evaluated. The CELOS X Widget MPC (Machine Protection Control) monitors the process and detects unusual process conditions at an early stage in order to identify critical situations in

Especially in complex turn-mill processes, "AI Chip Removal" from DMG MORI provides intelligent monitoring of chip formation, thereby contributing to robust and trouble-free complete machining



The Tool Visualizer from DMG MORI measures tools non-contact within the work-space and visualizes them as a digital model. This allows for the early detection of wear or damage and improves process reliability

matic wake-up and warm-up functions, and detect air leaks at an early stage.

From virtual representation to mastery of manufacturing complexity in the process

The Turn-Mill Showcase at Hannover Messe is impressive proof of the status quo of AI use in CNC manufacturing. The example also underscores the forward-looking aspirations of the Machining Transformation (MX) strategy – from work preparation,

process integration, and automation to Green Transformation (GX). With the consistent collection of planning, process, quality, and energy data, an increasingly detailed digital image of real manufacturing is gradually developing.

Highlights

- **AI along the CNC process chain:** Turn-Mill Showcase demonstrates digital process integration from digital work preparation to energy analysis
- **Complete machining of a titanium keel bearing:** Practical example of sophisticated structural components from aerospace,

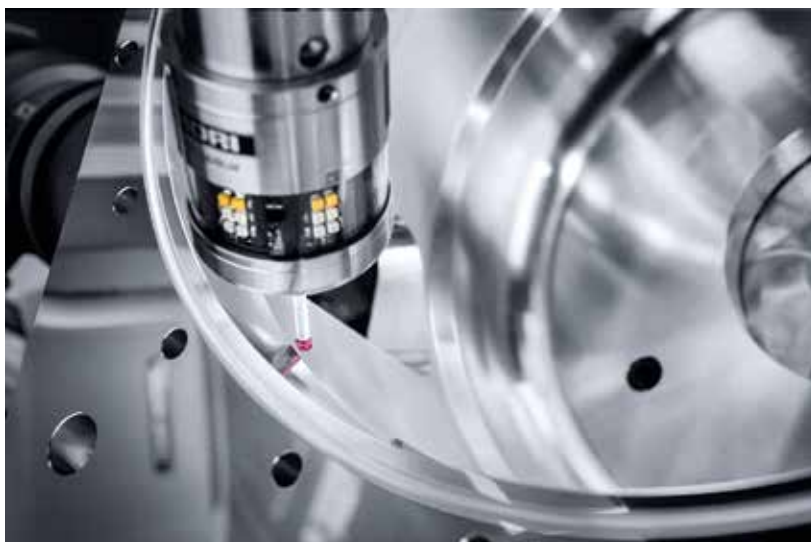
good time and protect machines and tools. In addition, the AI Chip Removal demonstrates the automatic detection and removal of critical chip accumulations through defined cleaning movements – to reduce interruptions and stabilize machining.

In-process measurement technology is a key component of quality assurance: measurement cycles directly in the machine check geometries and functional surfaces during machining. Thermal effects or changes in workpiece tension can cause dimensional deviations, especially with titanium. Measurements during the process enable early corrections and integrate quality directly into the workflow.

Energy and status data

In addition to productivity and quality, resource consumption is also becoming increasingly important. Three CELOS X apps monitor and reduce energy consumption, track energy costs and CO₂ emissions in real time, save energy through auto-

In-process measurement from DMG MORI integrates manufacturing and quality assurance into a closed-loop digital workflow: Real-time measurement data from the machine's working area provides the foundation for transparent and reproducible machining results





The NTX 2500 2. Generation from DMG MORI enables complete turn-mill machining of the titanium component. Turning, drilling, simultaneous 5-axis milling, and in-process measurement, along with AI-based CELOS X widgets and technology cycles, work together to ensure a manufacturing process that is both stable and highly precise (Pictures: DMG MORI)

medical technology, and Energy plant construction

- **AI assistance in processing:** Technology cycles such as MPC and AI Chip Removal support stable and robust machining processes
- **Integrated quality assurance:** In-process measurement technology and Tool Visualizer increase transparency and process reliability
- **Machining Transformation (MX):** Consistent data usage as the basis for digital process chains

AI in the process

• Digital work preparation

AI-based workflows support analysis and implementation: Programmers are supported with specific suggestions, and tool paths are virtually checked taking into account the machine model.

• Tool-Management:

AI-supported tool search in the CAM system speeds up the selection of suitable tools and complete tool sets. In the process itself, the Tool Visualizer creates transparency about the tool condition through contactless measurement in the working space, including offset creation, wear/damage detection, and 3D model generation; the CELOS X widget "Easy Tool Monitoring" supports an overview of tool status and service life.

• Machining (AI assistance):

Process signals such as spindle load, vi-

brations, and feed behavior are recorded and evaluated. MPC (Machine Protection Control) detects unusual process conditions at an early stage and protects the machine and tool; AI Chip Removal detects critical chip accumulations and automatically removes them using defined cleaning movements.

• Quality in the process:

In-process measurement technology checks geometries and functional surfaces during machining. This allows influences such as thermal effects, tool drift, or stress changes to be detected early on and compensated for by making corrections to the machining process – quality is integrated directly into the process.

• Energy and status data:

Continuous data collection shows energy requirements for each machining step and highlights non-productive times as resource drivers. Three CELOS X apps monitor and reduce energy consumption, track energy costs and CO₂ emissions in real time, save energy through automatic shutdowns, and detect air leaks at an early stage.

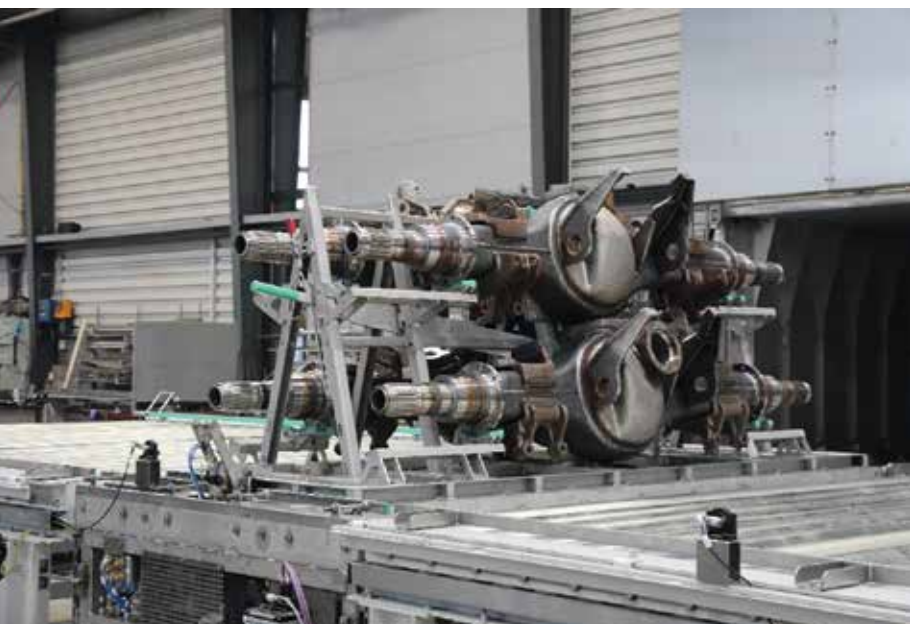
• Availability:

Preventive maintenance uses condition data to identify maintenance requirements at an early stage and make maintenance planable – with a focus on axes and spindles to increase plant availability and reduce unplanned downtime.

Industrial Parts Cleaning as the Key to Successful Remanufacturing

Preserving value instead of producing new parts: Industrial parts cleaning provides the basis for economically scalable remanufacturing and supports sustainable production

Reusing high-quality components after their first service life conserves resources and can significantly reduce costs compared with manufacturing new parts. However, whether remanufacturing is technically reliable and economically viable is often determined as early as the industrial parts-cleaning stage. Only clean surfaces allow the condition of a component to be assessed reliably and provide the basis for all subsequent inspection, machining and assembly processes. Automated cleaning and coating-removal processes provide the process reliability required for this.



Efficient cleaning of truck axles

Clean surfaces as the prerequisite for reliable decisions

Cracks, corrosion, dimensional deviations or material damage can only be detected when the surface is fully accessible. Subsequent processes such as coating, machining or assembly also require defined cleanliness levels. Industrial parts cleaning is the gatekeeper of the industrial circular economy. It determines whether a used part can become a safe and reliable component of a new product. This also makes it a decisive factor in the economic viability of the entire remanufacturing process. Only when cleaning results are reproducible can inspection, machining and assembly processes be reliably standardised and scaled economically.

Cleaning engine components in washing baskets

This process reliability is achieved through automated or semi-automated cleaning and coating-removal processes. They ensure reproducible results, reduce manual work and lower the risk of rejects. This makes remanufacturing economically viable even at industrial production volumes.

BvL Oberflächentechnik GmbH develops customer-specific system concepts for this purpose. Depending on the component, contamination and inspection requirements, aqueous cleaning processes, workpiece carriers, media treatment and drying are precisely



coordinated. The technologies used include spray and flood processes, ultrasonics, high-pressure water technology, and combined pre-cleaning and final-cleaning stages. The following practical examples show how reproducible cleaning processes can be implemented for a wide range of remanufacturing applications.

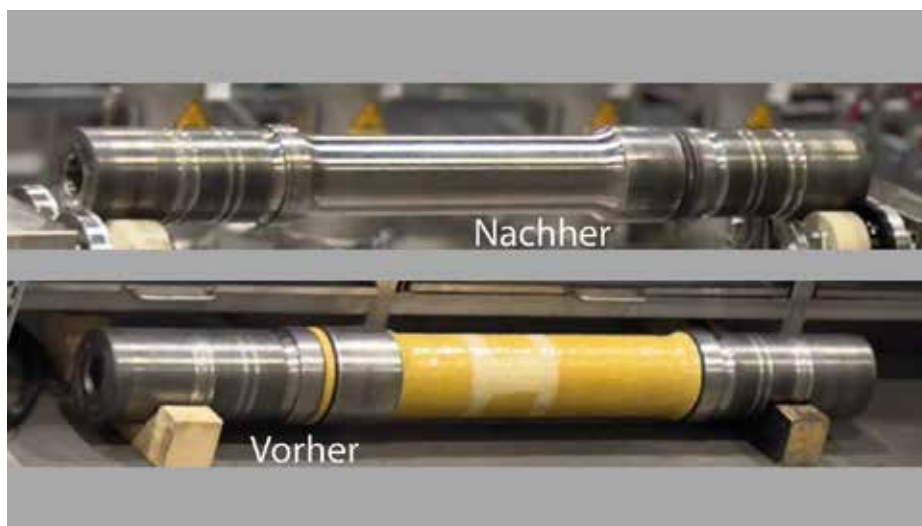
Engine remanufacturing: a highly automated, reproducible coating-removal and cleaning process

Crankcases, cylinder heads, turbochargers and other engine components combine complex geometries with oil, grease, soot, carbon deposits, paint layers and corrosion. A European remanufacturing specialist therefore relies on a customer-specific BvL system that automatically cleans and removes coatings from grey cast-iron parts weighing up to several tonnes using high-pressure water. The components are secured on dedicated workpiece carriers. A robot guides the water jet tool precisely along exterior surfaces, bores and internal areas; additional workpiece rotation reduces spray shadows. Low-pressure pre-cleaning and final-cleaning stages complement the process. This replaces labour-intensive manual operations and creates consistent conditions for visual inspection, crack testing, dimensional inspection, and the assessment of sealing and functional surfaces. With high contamination loads, adequately sized tanks, oil separators, coarse and fine filtration, and coordinated media management ensure long bath service lives. Stable processes reduce rework, rejects and unplanned bath changes.

BvL cleaning systems are used for passenger-car engines as well as components for commercial vehicles, large engines for gas-fired power plants, and applications in the maritime industry. The range of systems extends from cleaning smaller engine components to cleaning large-format components such as parts for truck and marine engines, as well as axle and drive components. The cleaning process, system concept and process control are individually tailored to the component, contamination and production sequence.

Process-reliable cleaning and coating removal for rail maintenance

In the rail industry, bogies, wheelset components, traction motors, bearings and ancillary components are exposed to brake dust, sand, grease, corrosion and lubricants. Before sche-



duled inspections and refurbishment, these residues must be removed reliably without affecting sensitive bearing seats, sealing systems or electrical areas. BvL develops customer-specific cleaning systems for this purpose, delivering reproducible results even at high volumes and short cycle times.

A current project demonstrates the importance of coating removal particularly clearly: An impact-protection coating on wheelset axles is removed using a fully automated BvL Geyser

Bare-metal surface of wheelset axles for subsequent ultrasonic and magnetic particle testing in rail maintenance



Fully automated BvL Geyser cleaning and coating-removal system with robot-guided high-pressure water technology



Cleaning and drying plastic parts in bulk in a washing basket
(Pictures: BvL Oberflächen-technik GmbH)

high-pressure coating-removal system. The robot-guided high-pressure water technology is non-abrasive and gentle on the surface. Jet guidance, workpiece rotation and feed rate are coordinated so that the coating is removed completely and reproducibly without unnecessarily altering the surface condition. This gives the wheelset axle a bare-metal surface for subsequent ultrasonic and magnetic particle testing.

For this cleaning and coating-removal system, particular emphasis was placed on operating efficiency. An energy and media concept specially developed by BvL enables low water consumption, reduces operating costs and ensures compliance with stringent environmental requirements in rail operations.

The circular economy also works for small parts

Small plastic components can also be reused directly after application-specific cleaning. In a project for the toy industry, large quantities of loose parts are cleaned in baskets to remove skin oils, dust and foreign matter. Combined flood and spray processes with rotating or

swivelling baskets gently wash around the parts and limit mechanical stress.

Drying requires particular attention because plastic stores little residual heat and moisture can easily remain in cavities or between small parts. Individually designed system technology provides a reproducible process that enables the components to be reused directly.

Parts cleaning as the basis of the industrial circular economy

Current projects show that cleaning and coating removal are becoming more highly automated, monitored more precisely, and more closely integrated with inspection and refurbishment processes. This turns a repair process that is difficult to predict into a controlled industrial process.

Industrial parts cleaning extends the service life of high-value components, reduces waste and helps conserve resources and cut CO₂ emissions. For companies seeking to scale remanufacturing, it is therefore not a secondary function but a fundamental prerequisite for quality, safety and sustainable value creation.

Trade fairs: AMB and InnoTrans

BvL will exhibit at AMB in Stuttgart from 15 to 19 September 2026 in Hall 5, Stand C84, and at InnoTrans in Berlin from 22 to 25 September 2026 in Hall 6.2, Stand 430.

Further information:

<https://www.bvl-cleaning.com/en/>

Shortinfo BvL

Company information:

BvL Oberflächentechnik GmbH is one of Germany's largest suppliers of aqueous industrial cleaning systems. As a system partner, BvL provides tailored customer solutions - from small, compact washing systems and filtration and automation solutions to complex, customer-specific large-scale projects with process monitoring, always complemented by reliable service. As part of a long-established family business with roots dating back to 1860, the owner families - now in the fifth generation - stand for technical excellence, innovation and absolute reliability. The company currently employs around 170 people. BvL has a strong position in export markets and a comprehensive sales and service network in 20 countries.

Walter presents new Xtra-tec®S3 milling cutter series

Maximum stability for deep cuts and high chip volumes

With the new Xtra-tec®S3 series, Walter AG is expanding its indexable insert milling cutter range with a completely new line of milling cutters, thereby responding to market demands: greater cutting depths, higher feed rates, and maximum stability – even under difficult cutting conditions or with unstable workpieces. The name S3 stands for the line's three core advantages: Stability, Supply, and Selection. As the first tool in the series, the new M6420 high-feed milling cutter already meets these requirements to perfection: Its innovative, patent-pending new chip space design enables reliable chip evacuation even with high chip volumes. This allows large amounts of chips to be safely evacuated, particularly during roughing of a wide variety of ISO materials.

Higher rigidity for low-vibration cuts

The stability of the new series is achieved through an innovative, patent-pending, vibration-damping chip-flute design. The cutter body itself has up to 30% higher rigidity (according to FEM analysis), which in turn extends tool life. High cutting forces acting on the cutter body, particularly during high-feed milling strategies, are effectively minimized. In combination with the large contact and support surfaces of the M6420, feeds of up to 3 mm per tooth can also be reliably achieved.

Maximum cooling for efficient chip evacuation

Another decisive factor for the performance and long tool life is the optimized coolant supply: With up to three coolant channels per insert

seat, the milling cutter makes maximum use of the coolant volume available from the machine without any loss of pressure. The targeted supply increases the coolant volume by 48 percent, which lowers the temperature at the cutting edge while ensuring efficient chip removal – especially at high feed rates and large cutting depths.

Intuitive handling and increased cost-effectiveness

To simplify handling in everyday production, Walter relies on a user-friendly, intuitive selection system for the S3 series based on a self-explanatory nomenclature of insert geometries: L5 (= Light-cutting geometry), M5 (= Medium geometry), and R5 (= Roughing geometry). The easy identification via the initial letters improves handling. With four cutting edges per insert and wear-resistant Tiger-tec®Gold grades, Walter further increases cost-effectiveness.

The innovative tool design of the M6420 enables reliable chip removal as well as high cutting depths and productivity across a wide range of materials (Picture: © Walter)



Its new control generation

Easy to operate, efficient sawing

*Author:
Fabian Reiß,
Marketing,
KASTO
Maschinenbau
GmbH & Co. KG,
Achern, Germany*

Manufacturing companies face significant challenges such as rising efficiency requirements and a growing shortage of qualified personnel. KASTO addresses these issues with a new control generation for its sawing machines. This innovative system combines a modern operating concept with practical features, allowing both experienced operators and first-time users to operate the machines quickly, safely, and productively.



Well-designed dashboard and quick navigation

The core element of the new control system is a well-structured dashboard that visually presents key metrics, including runtimes, downtimes, current job orders, and machine status. Operators can quickly see which job orders are currently running, re-sort job orders flexibly, and toggle between different views even during an ongoing cut. The interface includes function windows that can be used simultaneously, along with context-sensitive help, which reduces the number of clicks needed and significantly speeds up operations.

The new dashboard for the KASTO saw control system provides a clear overview of machine status, job orders, and runtimes and downtimes

The specialist in metal sawing technology has completely overhauled its saw control system. “From the very beginning, it was important for us to actively involve the employees who work at our customers’ sites on a daily basis,” says Sönke Krebber, a member of the Board of Directors for Research & Development at KASTO. “Working closely with our service and commissioning experts allowed us to create a control system that is tailored for practical use, simplifying many operational steps for operators in their everyday tasks.” The new control system will be implemented in the KASTOwin series and will later be extended to other saw models. The optimised software architecture will provide significantly shorter loading times, quicker response to inputs, and improved machine availability.

Safe access thanks to the Simple Mode

The key feature of the new control system is the Simple Mode. This mode simplifies the display to focus only on the essential information and guides novice users safely through the sawing process. Different user roles ensure that operators, supervisors, and maintenance personnel receive only the information relevant to their specific tasks. Additionally, users can customise individual settings, such as language, units of measurement, and preferred assessments, which greatly simplifies the initial training process.

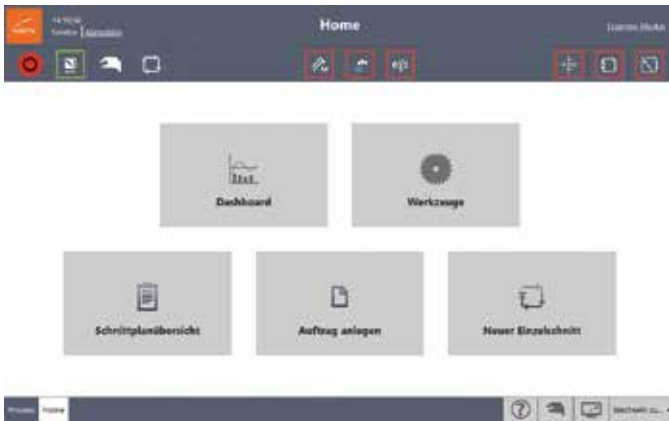
Highly efficient functions for repeat tasks

The material library offers a selection of pre-filled material data. Users can retrieve previously entered material data at any time. These features help reduce data entry time for future job orders.

A cutting plan facilitates the quick and intuitive creation of multiple sawing job orders, accommodating varying cut lengths and complexities. Each cutting plan is assigned to a specific item, ensuring clear organisation and traceability throughout the production process.

“Tried and tested at Günther + Schramm, shift supervisor Angelo Faraci (right) says, “We couldn’t imagine working without the new control generation now.”





Additionally, individual process parameters can be set for each sawing job order, allowing for precise customisation to meet specific requirements and maximise efficiency. When used in conjunction with the “Optisaw Light” software module, the cutting plan reaches its full potential. This solution automatically assigns all saw job orders to the available bars, considering the desired cut lengths while optimising the sequence and placement of cuts. This intelligent optimisation minimises waste and enhances material efficiency, resulting in lower material costs and promoting a more sustainable and resource-efficient production process.

The function package now includes a new cycle stop feature. This feature allows job orders to be paused at specific points and resumed exactly where they left off. Any interruptions are clearly displayed, and users can continue from the pause point without the need to re-enter any data.

Transparent diagnostics and analysis

The new control generation allows for precise fault diagnosis in the event of a malfunction. It clearly identifies whether the issue is mechanical or electrical—whether it originates from the base machine, or infeed or outfeed systems. This capability eliminates the need for time-consuming troubleshooting. Additionally, comprehensive analysis functions offer transparency regarding runtimes, downtimes, and the condition of the saw band. This information is crucial for effective shift planning and ensures smooth, operator-free operation.

Tested and proven in a real production environment

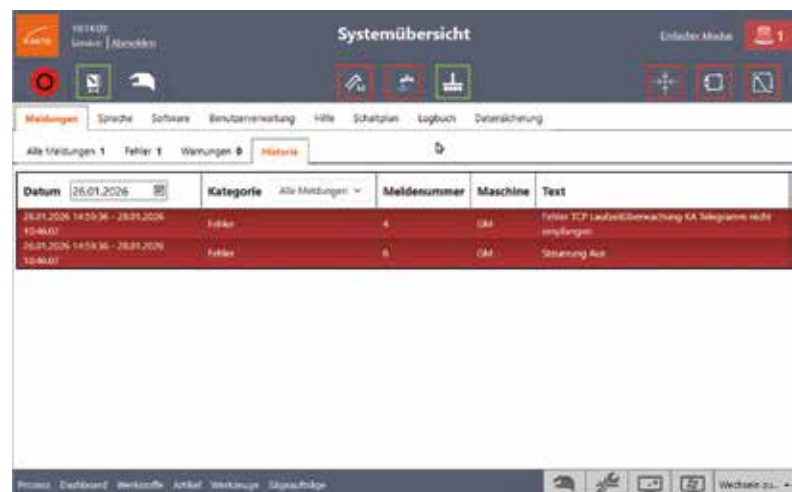
Before introduction to the market, the new control system underwent thorough daily testing at Günther + Schramm’s facility in Königsbrunn. This system completely replaced an

existing saw. The southern German systems service provider operates over 100 saws and produces more than ten million cut sections each year. “We couldn’t imagine working without the new control system now,” says Angelo Faraci, one of the shift supervisors and operators of the machine equipped with this new control generation. “When you operate three to four machines simultaneously, you need to be able to count on the saws. Every shift runs on a precise schedule – we must process all job orders quickly, reliably, and with just a few clicks.”

The successful field test confirms that the new control system is perfect for everyday use and significantly enhances the sawing process.

(l) Simple Mode simplifies the display to show only essential functions and supports safe, guided operation of the saw

(r) The material library and cutting plans reduce setup times and enable the automated processing of repeat job orders



The integrated diagnostic and analysis functions offer clear information regarding malfunction causes, runtimes, and maintenance conditions



The new control system enables users to easily toggle between views and functions even while sawing is in progress (Pictures: KASTO Maschinenbau GmbH & Co. KG)

AMB 2026: Collaborative processes drive automation

Spotlight on automation: Patrick Schwarzkopf (VDMA) on collaborative processes, AI and SME automation with No-Code



Live demonstrations on collaborative robotic solutions will be returning to AMB 2026

When manufacturing companies look to make their processes more efficient and flexible, their focus turns to automation solutions – particularly when work involves an increasing collaboration of man and machine. AMB 2026 will be actively exploring this focus topic and demonstrating how collaborative processes are developing in machining production. In our interview with Patrick Schwarzkopf, Managing Director of the VDMA Robotics + Automation Association, he addresses the current key drivers and shares his thoughts on the developments businesses now need to keep an eye on.

Automation as one of the three key themes: Collaborative processes are gaining significance

AMB: The robotics and automation industry is expecting a 5 percent drop in turnover in 2026 – and yet manufacturing companies are still feeling the pressure to automate. Why is now the right time for collaborative processes, and what is driving businesses to take this step?

Patrick Schwarzkopf: We are indeed seeing a clear reluctance to invest – for a number of reasons, such as geopolitical turbulence or the more familiar regional factors. And yet, despite this, the trend for automation is still going strong. Demographic change will be further exacerbated in the coming years and

we need to automate operations in order to support the remaining skilled employees. This is the only way to remain competitive. The interaction between man and machine will be crucial. The rapid development of artificial intelligence (AI), particularly the generative and “physical” AI, is opening up new opportunities, such as through the use of Agentic AI systems or the significantly simpler operation and programming of automation solutions.

AMB: When it comes to automation, the focus was always on large-scale production; these days robotic solutions are also a realistic alternative for small batch production. How far has this development come and what does a smaller company specifically need in order to implement automated processes?

Patrick Schwarzkopf: Automation is currently making great strides in the small and medium-sized enterprises. There have been major technological developments in recent years, and this significantly lowered the entry barrier for SMEs. The “low volume, high mix” scenarios are typical: employees need to be able to program quickly, simply and without major effort. There are currently plenty of No-Code approaches available for this, which require no previous knowledge of programming languages. Automation processes can be created using the drag-and-drop function of a graphical user interface. Robot paths can be taught by demonstration and saved at the touch of a button. The big manufacturers have long offered suitable solutions tailored to SMEs. Pragmatic setups will often suffice – for example, when productivity leaps due to robots working overnight. The hurdle is often less to do with technology and more with the expectation that automation is fundamentally too complicated or too expensive. This falls short of the mark, because the solutions are there – and clear to see at trade fairs such as AMB. Guidance is provided here by Go4Robotics, for example, an online platform of the International Federation of Robotics (IFR).



Patrick Schwarzkopf, Managing Director of the VDMA Robotics + Automation Association (Picture: VDMA)

AMB: If programming and operation are becoming simpler, then we are also closer to a direct collaboration between man and machine. Humans and robots are increasingly working side by side without any safety fence – feasible only through the use of AI-supported sensors. What has specifically changed on the shop floor and how do businesses need to rethink processes and personnel?

Patrick Schwarzkopf: Collaborative robots or “Cobots” are already well established. In many applications, however, it is more of a “co-existence”, working together without safety fences and therefore a genuine, direct interaction. A new level of close collaboration can currently be seen in humanoid robotics. AI is making great strides here: we’re talking about interpretation of the environment and appropriate, independent operation. There is still plenty of research needed, and yet humanoid robots are increasingly leaving the research laboratories for initial test applications in the industry. There’s still a long way to go before it’s ready for application across the board – at the same time, though, humanoid robotics is facilitating a closer interaction between man and machine, such as through the opportunity to talk to robots.

AMB: Many of these developments are best evaluated live. AMB will be combining the entire spectrum of metal cutting under one roof this September in Stuttgart – from manufacturers and users to those involved in research. What can this unique constellation do to promote collaborative automation on a wider scale – and why is a visit to AMB indispensable for anyone involved in metal cutting and thinking about automation?

Patrick Schwarzkopf: Taking a look at the figures, the relevance of this event is clear: according to the IFR, “machine tending” – i.e. the automated insertion and removal of parts at processing machines – is one of the main applications of robotics. Within a decade, the number of new robots installed annually for handling applications at machine tools increased from 14,500 units (2015) to 19,000 units (2024). For 2025, preliminary IFR figures are indicating further growth in the double-digit percentage range. The use of Cobots has also increased significantly in recent years: in 2024, there were around 65,000 collaborative robots installed around the world –

this corresponds to 12 percent of all industrial robots. The largest growth can be seen in the mobile robotics facilitating the flexible networking of machinery – via mobile manipulators, for example, which are mobile platforms with a robotic arm. There is hardly an event that can top the trade fair when it comes to receiving such a compact, industry-specific overview: visitors have the chance to experience automation for the metal cutting industry first-hand at AMB.

AMB: Thank you for talking to us, Mr. Schwarzkopf.

Focus on automation at AMB 2026 in the Oskar Lapp Halle (Hall 6)

Automation will be on display in nearly all the halls of AMB 2026 – from manufacturers of machine tools with automation systems to solutions for tool and clamping technology, for example for automated machine setup. The spotlight will be on “Automation and Handling Technology” in the Oskar Lapp Halle (Hall 6). Here, exhibitors such as FANUC, KUKA, Cellro, RoboJob, Wassermann Technologie and many more will be demonstrating their latest solutions for production and process management. The remaining list of participants in the Exhibitor Directory is just as impressive, with visitors promised insights into how robotics, collaborative automation, Industry 4.0 concepts and IIoT are shaping the machining process and inspiring new approaches.



Robotic application in use at AMB 2024



A collaborative robot controlled via tablet at AMB 2024 (Pictures: Messe Stuttgart)



Bar peeling



Thread rolling



New steel

Premium solutions for demanding applications

Boehlerit will present at Hall 1, Booth 1H10 a wide range of new products for industrial manufacturing. The focus will be on innovative tooling solutions for machining metals and composite materials, advanced wear protection technologies, and the company's role as an independent development and technology partner to the international tooling industry.

A particular highlight is the new grade generation for steel turning applications. With the grades BCP05T, BCP15T, BCP25T, BCP35T, and BCP40T, Boehlerit is launching a completely newly developed product family. New carbide substrates, state-of-the-art coating technologies, and optimized chip-flow geometries ensure longer tool life, reliable wear detection, and consistently high machining performance. The grades BCP05T to BCP25T are designed for stable machining conditions and high cutting speeds, while BCP35T and BCP40T stand out for their exceptional toughness and deliver outstanding performance in interrupted cuts and demanding machining environments.

(Pictures:
Boehlerit GmbH &
Co. KG)



Railway wheel machining



Sawtec brazed



THETAtec 25N Feed

The grades BCP05T to BCP25T are designed for stable machining conditions and high cutting speeds, while BCP35T and BCP40T stand out for their exceptional toughness and deliver outstanding performance in interrupted cuts and demanding machining environments.

Boehlerit is also introducing an important innovation in milling. The company's high-feed portfolio is being expanded with the new THETAtec 25N Feed milling system. Based on a negative insert design, the tool concept combines the advantages of modern high-feed machining with eight truly usable cutting edges. Users benefit from higher material removal rates, improved cost efficiency, and excellent process reliability, even in challenging applications.

With the new thread rolling systems from Wagner, Boehlerit is

strategically expanding its portfolio. These systems enable cost-effective thread production with outstanding surface quality, excellent strength properties, and high process reliability. A wide range of configurations allows the tools to be optimally adapted to different manufacturing requirements.

For high-precision sawing applications, Boehlerit is also presenting Sawtec Brazed. The brazed design permanently joins the saw teeth to the saw blade, ensuring high stability, excellent cutting quality, and long tool life, even under extreme operating conditions.

In addition, Boehlerit continues to advance its portfolio in the field of bar peeling. As a full-service provider, the company offers customized tooling systems ranging from peeling heads, holders, and cassettes to solutions for bar end machining and wire scarfing. New indexable insert grades for machining carbon steels, together with the nanotechnology-optimized universal grade BCP25P and the grades BCP10P and BCP15P, deliver significant performance improvements for modern materials and applications.

The portfolio is further complemented by specially developed tooling solutions for reprofiling worn contact surfaces on railway wheels, as well as Boehlerit's extensive expertise in heavy-duty machining. With these latest product innovations, the company reinforces its commitment to providing customers worldwide with powerful, cost-effective, and future-oriented manufacturing solutions from a single source.

Horn brings the shop floor to AMB 2026

When AMB 2026 opens its doors in Stuttgart, the international metalworking industry will once again take centre stage. In even-numbered years, the exhibition ranks among the industry's most important meeting places. It brings together products, technologies, services, training and personal exchange. For users, manufacturers and decision-makers, it offers a concise overview of the latest developments in machining and manufacturing technology.

Paul Horn GmbH is using the AMB not only to showcase precision tools, but also to demonstrate them in real-world machining scenarios. The company is exhibiting in Hall 1, Stand J10, across an area of around 500 square metres. Three machines in operation demonstrate HORN's expertise. Standard products, bespoke solutions and innovations are all featured. HORN brings the shop floor to the exhibition – visible, tangible and practical.

S274 tool system

A new product at the stand is the expansion of the S274 tool system. Horn is further expanding the system with new sintered chip-forming geometries for parting-off and turning. The new types improve chip control, increase process reliability and support cost-effective machining on Swiss-type lathes. For grooving and parting off, Horn is supplementing the precision-sintered chip-forming geometry .1A with narrow grooving widths of 0.8 mm and 0.6 mm. This enables users to reduce material loss whilst ensuring reliable chip formation.

The inserts are available as type RS274 and as the RE274 type with a pressed-in threaded insert for RH274 clamping holders. Horn offers them in the carbide grades TH35 and IG35. In addition, the new chip-forming geometries .NF and .PR have been introduced. The .NF geometry is designed for grooving and sliding-head turning, whilst the .PR geometry is designed for reverse turning. Both geometries cover feed rates ranging from 0.02 to 0.1 mm/rev and are suitable for a variety of materials.

Defence and Aerospace

Alongside these product solutions, AMB 2026 will feature further specialist themes, including Defence and Aerospace. The Saturday of the trade fair also plays a special role for HORN: the company is taking part in the parent-child rally. The aim is to inspire young people to take an interest in mechanical engineering and manufacturing technology and to make it easier for them to gain access to industrial practice.

"In even-numbered years, the AMB in Stuttgart is Europe's leading trade fair for metal cutting," says Markus Horn, Managing Director of Paul Horn GmbH. "I am convinced that the trip to Stuttgart is well worth it and that our customers and guests will take home clear added value. Solutions, innovations and dialogue on an equal footing form the basis for this. Please visit us in Hall 1, stand J10. We look forward to seeing you."



The new geometries are primarily aimed at users of Swiss-type lathes (Pictures: HORN/ Sauermann)



At the AMB, Horn brings the expertise of its precision tools to life. The company is bringing the shop floor to the exhibition in Hall 1, stand J10, across an area of around 500 square metres

GROB at AMB 2026

Machine, automation, and digitalization solutions

Under the motto “GREAT IN PERFORMANCE – Powerful, highly dynamic, and precise – meet the new GP1350 live!”, GROB will present several innovations in the areas of universal machines, automation, and digitalization at AMB 2026 in Stuttgart (September 15–19, Hall 10 | Booth C12). Across more than 600 square meters of exhibition space, the company will showcase solutions for the cost-effective production of a wide variety of parts – from single-part manufacturing to highly automated series production.



**GP1350 5-axis
portal milling
machining center**

The centerpiece of the trade show presentation is the new GP1350, which is being unveiled for the first time at an external trade show. In addition, GROB will present the GRC-M60 robot cell, a new automation solution, as well as digital applications that make manufacturing processes more transparent and efficient.



“The AMB offers us the opportunity to speak directly with our customers about current manufacturing requirements while simultaneously demonstrating new technologies under real-world conditions,” explains Christian Müller, CSO of GROB-WERKE. “Visitors to our booth can experience how machines, automation, and digitalization work together seamlessly.”

GP1350 5-axis portal milling machining center for machining large parts

With the GP1350, GROB is expanding its universal machine portfolio with a new 5-axis portal milling machining center. Thanks to its stable, vibration-damping gantry design, the GP1350 is particularly well-suited for applications requiring the high-precision machining of large components. The 5-axis technology enables the production of complex geometries in clamping, thereby contributing to shorter turnaround times.

“With the GP1350, we are responding to the growing demand for high-performance solutions for large parts,” says Christian Müller. “At the same time, our customers benefit from GROB’s well-known strengths in the areas of precision, dynamics, and process reliability.”

Modular GRC-M60 robot cell expands GROB’s automation portfolio

In the field of automation, GROB is unveiling the new GRC-M60 robot cell for the first time. It complements the company’s modular automation ecosystem and opens up additional possibilities for the automated production of a wide variety of parts. Thanks to its modular design, the GRC-M60 can be



Roboterzelle
GRC-M60

flexibly adapted to different production requirements. Companies can use it to both expand existing production lines and implement new automation concepts.

“Many of our customers are looking for solutions that can be easily integrated into existing production environments,” explains Müller. “This is exactly where the GRC-M60 comes in.”

Digitalization from planning to tool management

Another focus of the trade show presentation is digitalization. GROB demonstrates how manufacturing processes can be digitally mapped and controlled using the COSERA

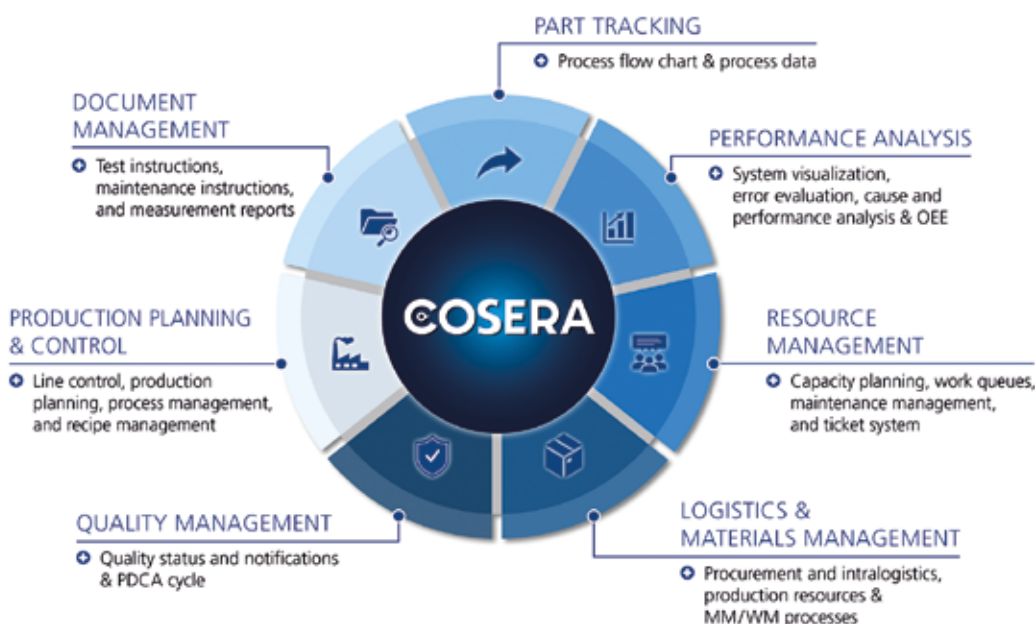
MES system and a fully integrated tool management system.

The goal is to make relevant production data available where it is needed while simultaneously increasing transparency throughout the entire manufacturing process. Visitors will gain insight into how digital solutions can help monitor processes, use resources efficiently, and prevent idle states.

Additional technologies and areas of expertise on site

In addition to the trade show premieres, GROB will also provide information on service, customer training, additive manufacturing, and e-mobility. The trade show presentation will be complemented by the introduction of various Centers of Excellence, including Aerospace & Defence and Semiconductor. With the innovations and technologies on display, GROB will demonstrate at AMB 2026 how modern manufacturing solutions can be integrated—from the machine itself through automation to digital process support.

(Pictures:
GROB-WERKE)



CAM and MES for More Efficient Manufacturing



OPEN MIND is showcasing a series of complex workpieces produced using *hyperMILL®* as illustrative examples at AMB. Here is a propeller hub

hyperMILL® TURNING Solutions: accurate simulation and reliable collision detection for complex turret configuration (Pictures: OPEN MIND)

Among the new features in *hyperMILL®* is 2D hole machining, also known as contour planing. This is supported by both machining strategies and simulation to enable scratch-free surface finishes. It is suitable, for example, for sealing surfaces in battery manufacturing. Also on display at AMB are enhancements to the *hyperMILL®* TURNING Solutions, which simplify the programming of turning programs and ensure support for new, complex turret-type turning during collision checking.

Deburring Feature Package

Burrs in hard-to-reach areas have often required significant effort during manual post-processing. With three efficient strategies for hole brushing, hole deburring, and component edge deburring, *hyperMILL®* of-

fers a comprehensive solution. All strategies can be executed as both 3-axis and 5-axis machining and ensure burr-free part edges directly on the machine.

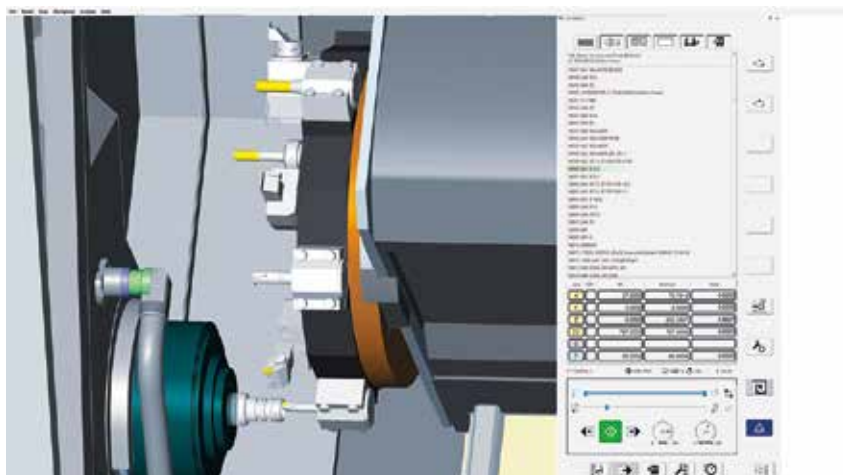
hyperMILL® INTELLIGENCE

Under the term “*hyperMILL®* INTELLIGENCE,” OPEN MIND presents its concept for effectively combining human expertise, smart automation, digital optimization, and artificial intelligence. In CAM programming, rule-based automation, proven logic, and access to company-specific knowledge deliver consistent, transparent results. OPEN MIND also uses AI to analyze data, identify patterns, and make existing expertise available more quickly.

Tool Management in MES and CAM

Also on show will be Hummingbird MES. This modular suite consists of four main components: planning and control, machine data acquisition (MDE), CAM/CNC integration, and tool logistics. Thanks to the seamless integration of OPEN MIND’s CAD/CAM suite and MES, tool management also offers significant advantages. Centralized tool management saves time and money by streamlining work and making tool data available company-wide.

At its booth at AMB, OPEN MIND will present a selection of workpieces machined with *hyperMILL®* from various industries as practical examples.



MAPAL at AMB 2026

Making production processes more productive and easier to manage

From 15 to 19 September 2026, MAPAL will be exhibiting at the AMB in Stuttgart in Hall 1, Stand C11, across an area of 390 m², showcasing product innovations, its comprehensive turnkey offer and specific machining solutions for strategic components from its key sectors.

The precision tool manufacturer's innovations for 2026/2027 are making customers' production processes more productive and easier to manage, whilst setting new industry benchmarks. "Today, users expect manufacturing solutions that ensure both cost-effectiveness and process reliability, whilst also allowing for flexible adaptation to different requirements," says Jacek Kruszynski, Chief Technology Officer at MAPAL. "At AMB, we will present innovations that meet these requirements and take the opportunity to engage directly with customers and partners." Among the highlights of the product innovations is the new EA-Performance-System for fine boring. For the first time, MAPAL presents a solution for setting fine boring tools even in the challenging diameter range of 10 to 19 mm using just one adjustment screw. Users benefit from the reduced setting effort and at the same time highest precision and process reliability.

The second generation of the MEGA-Deep-Drill-Alu also sets new standards. The new deep drill has been developed for the reliable machining of large drilling depths in aluminium and combines an optimised geometry, a high-performance cooling system and a tailored cutting material concept. This enables the flexible and reliable machining of various aluminium alloys.

Component-focused manufacturing solutions

As technology partner, MAPAL provides its customers with bespoke support, right through to comprehensive turnkey solutions. MAPAL assumes full responsibility for the entire process, from process analysis and design, through the supply of tools and setting fixtures, to simulation, programming and production support. Visitors to the stand can find out how MAPAL delivers



complete project planning, right through to a process ready for production, within twelve to 14 weeks.

As always, MAPAL's trade fair presence focuses on the customer, their individual production portfolio and the machining requirements for their components. MAPAL will showcase representative solutions for applications in the automotive industry, general machining and the aerospace sector, creating a basis for in-depth discussions with visitors.

MAPAL is once again using the AMB as one of the industry's most important platforms to showcase the further development of its service portfolio and its key focus areas in the individual market segments. At the same time, the trade fair provides an opportunity to gather practical insights and discuss the future direction of modern manufacturing processes with customers and partners.

Second generation with a new overall concept: The MEGA-Deep-Drill-Alu will be available in the standard range from September 2026 in length versions from 15xD to 40xD and, depending on the respective length, in diameters from 3 to 16 mm

Simple to set, precise to machine: the new EA Performance System for fine boring from MAPAL significantly reduces setting effort in the diameter range from 10 to 19 mm and achieves maximum precision with just one adjustment element for diameter setting



(Pictures: ©MAPAL)

Machining centres and automation solutions from a single source

With two fully automated systems and a mill-turn machining centre, HERMLE relies on proven tradition – coupled with the latest innovation. All models will be exhibited in GEN2 design, each with interesting machining examples. At the special “Technology Development” stand, hardware and software components, digitalisation projects and milling/machining cycles, as well as components from our training expertise, will be showcased. Everything can be seen in Hall 7 at Stand C 31 of Maschinenfabrik Berthold HERMLE AG from Gosheim.

Introduction to the exhibits

The 5-axis machining centre C 12 GEN2 from the high-performance series with the robot system RS 05-2.

The RS 05-2 robot system handles workpieces weighing up to 10 kg while at the same time storing a large number of individual parts in a wide variety of storage modules. An aluminium rocking horse is being machined. The 5-axis machining centre C 32 GEN2 from the high-performance series with the robot system RS 1 GEN2. HERMLE AG is now taking automation to a new level with the GEN2 version of the RS 1 robot system. Almost all components of the previous RS 1 system have been enhanced and optimised to meet customer requirements.

HERMLE expands its automation portfolio: Robot system RS 1 now available in the GEN2 version

With the transfer of the robot system RS 1 to the GEN2 platform, Maschinenfabrik Berthold HERMLE AG is consistently expanding its automation portfolio. Following the RS 2, the compact RS 1 has now also been brought up to the latest technical standards.

The system is designed specifically for users

involved in high-variety manufacturing who face increasing demands in terms of unattended operating times, flexibility and process reliability.

Combined cell for pallet and workpiece automation

The RS 1 GEN2 is designed as an integrated automation cell for handling pallets, workpiece carriers and individual parts. The focus is on flexible use across a range of manufacturing scenarios – from single-part production through to small and medium-sized production runs.

A defining feature is the combination of:

- automated pallet handling
- integrated parts handling
- setup during production

High system availability is achieved through automatic gripper and clamping device changes, as well as the ability to implement different machining strategies in parallel.

Scalable system architecture

A key feature of the RS 1 GEN2 is its modular and scalable architecture. The system can:

- be operated with one or two machines
- be upgraded at a later date from single-machine to dual-machine operation

The RS 1 GEN2 robot system with two adapted C 32 five-axis machining centres



- be supplemented with additional peripherals such as rack modules, measuring machines, washing equipment or AGV systems

It can be connected to various HERMLE machining centres, enabling flexible cell configurations to be implemented.

Compact design with excellent accessibility

With a footprint of approx. 12 m² (4.25 x 3.00 m), the RS 1 GEN2 is one of the most compact solutions in its class. Despite the small footprint, access to the working areas of the machine remains completely unobstructed – in both single-machine and dual-machine operation.

The almost entirely glazed safety enclosure improves visibility of the process while also supporting the safety concept during manual interventions.

Centralised handling system with a high load capacity

At the heart of the system is a centrally positioned 6-axis robot which has a maximum load capacity of 60 kg. Thanks to its positioning on the system platform, it reaches all the relevant stations:

- Machine working areas (up to two)
- Rack modules
- Setup stations
- Transfer stations

This enables short travel distances, high dynamics and stable cycle times.

Smart rack system with dynamic assignment

The rack system is based on a software-supported, adaptive storage strategy. Workpieces and pallets are sorted automatically and in a space-optimised manner without any fixed assignment ("chaotic storage").

The advantages:

- maximum use of the available storage space
- reduced setup times
- no manual rack configuration

The number of available rack modules is adapted to the specific system configuration.

Integrated measurement technology for reliable loading

The setup station system is fitted with a laser monitoring system which checks the height and width of workpieces before they are stored. This ensures that only validated components enter the automated material flow.

At the same time, the control identifies avail-



able storage capacity and, for every active transport operation, checks whether there might be a more suitable storage location.

A wide range of gripper and clamping systems

An extensive portfolio is available to accommodate different component geometries and manufacturing strategies:

- Electric gripper ELRG
- Standard and hybrid grippers
- Single and double grippers
- NSR grippers for pallets up to 60 kg
- Automatic clamping jaw change for vises

This makes it possible to combine both pallet and single-part processes within one cell – even in parallel on separate machines.

Adaptive control software

The system control handles the complete coordination of the processes:

- Order management
- Material flow control
- Status monitoring
- Dynamic prioritisation

In the event of faults, such as a tool breakage, the system implements automatic contingency strategies and continues with alternative machining jobs. An integrated preview helps the operator to plan several days ahead.

The result: High flexibility in a minimal space

With the RS 1 GEN2, HERMLE is launching a compact, highly modular automation solution for demanding manufacturing environments. Particularly worth highlighting are:

- high flexibility when components change
- scalable machine connection
- smart storage and control concept
- compact design with full functionality

The system is therefore specifically designed for companies which need to automate their production cost-effectively while at the

The RS 1 GEN2 robot system with adapted C 32 five-axis machining centres

same time responding flexibly to changing requirements.

HERMLE C 22 MT – Highly integrated complete machining for demanding manufacturing tasks

With the launch of the C 22 MT, Maschinenfabrik Berthold HERMLE AG is expanding its portfolio of 5-axis machining centres to include a mill-turn solution designed specifically for process integration. The machine is based on the tried-and-tested C22 platform but has been specifically further developed for combined milling rotational machining, thereby meeting the growing demands for precision, flexibility and cost-effectiveness in machining.

The focus of this development is on the full integration of several manufacturing technologies into a single machine. In addition to the conventional simultaneous 5axis milling process, the C 22 MT also enables turning operations and can be expanded to include grinding technologies and power skiving. This makes it possible, in particular, to efficiently rough-machine rotationally symmetrical component geometries in turning mode and then finish them to a high degree of precision without having to re-clamp them.

This continuous process chain within a clamping setup has a direct impact on component quality. By eliminating reclamping and reference errors, the achievable form and position tolerances increase significantly, while at the same time process reliability is improved. At the same time, this results in significant time savings, as setup operations are reduced and machining strategies can be optimally combined.

From an economic perspective, the C 22 MT

is primarily designed to reduce unit costs. Combining several machining steps results in shorter throughput times and improved utilisation of the resources employed. At the same time, the need for additional machine capacity and floor space is reduced, as process steps which were previously carried out separately on different machines are now combined within a single system. This high level of integration also supports sustainable manufacturing concepts by reducing energy and material consumption.

In terms of design, the C 22 MT is based on a specially further-developed swivelling rotary table from the SRT 320 MT series which has been systematically engineered to meet the requirements of combined machining processes. In addition to a redesigned Aaxis housing and an optimised Caxis bearing, the system features high-performance clamping technology and a water-cooled axis structure for thermal stabilisation. These measures ensure high rigidity and positioning accuracy even under torsional loads.

In terms of performance, the machine covers a wide range of applications. Workpieces with a diameter of up to 320 mm can be machined; workpiece weights of up to 300 kg are permitted in milling mode and up to 150 kg in turning mode. The integrated motor spindle achieves speeds of up to 20,000 rpm, while the machining table speed in turning mode is up to 1,500 rpm, depending on the control. The available clamping torque of 400 Nm also allows for the machining of challenging materials and geometries.

A key feature of the C 22 MT is the seamless integration of clamping and automation solutions. The HERMLE pallet clamping system (PCS) is integrated directly into the machining table and requires no additional clamping plates. This reduces not only the overall height but also improves the overall rigidity of the system. At the same time, the integrated clamping status monitoring system ensures a high level of process reliability during automated operation.

The machine is also designed to accommodate a range of automation solutions. In addition to the HS flex handling system, robot systems such as the RS 05-2, the RS 1 or the RS 2 can also be adapted in future. This allows the system to be used flexibly in low-labour or fully automated production environments. Particular attention was paid to safety features in mill-turn technology. The safety enclosure is therefore fitted with laminated safety panes

**Machining
centre C 22 MT
(mill-turn)**

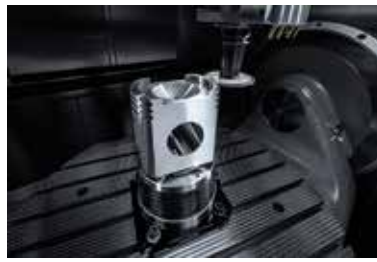


and a specially designed cabin top to protect the operator in particular.

Even in the area of peripherals and the machine environment, the design has been adapted to the specific requirements of mill-turn machining. Due to the shape and volume of the chips produced, a specially designed hinged belt conveyor is used. In addition, an ICS system with integrated bed flushing ensures reliable chip removal and stable process conditions. Optimised accessibility and adapted safety enclosure designs also ensure good maintenance and service conditions.

With the C 22 MT, HERMLE is strategically positioning itself in the highly competitive market for modern mill-turn centres. By combining high precision, exceptional rigidity and comprehensive technological integration, the machine is particularly suited to applications in the aerospace and medical technology sectors, as well as in tool and mould making.

The planned market launch is scheduled for the period 2026 to 2027, with the first presentations due to take place at leading



Grinding



Power skiving



Impeller machining milling and turning



Milling rotational machining

international trade fairs. HERMLE is therefore continuing its course of technological development and offering users a future-proof platform to meet the growing demands for flexible and cost-effective complete machining.

(Pictures:
HERMLE AG)



Hall Plan
AMB 2026

Productivity starts with the process

Clamping and automation solutions for consistent machining

At AMB 2026, SCHUNK will demonstrate productivity throughout the entire process chain – from workpiece and tool clamping, to automated machine loading and unloading. Visitors will experience how consistent sequences, short setup times and high repeat accuracy can make existing machine capacities more cost-effective.



At AMB, SCHUNK will showcase ways to boost productivity throughout the entire process chain, from workpiece and tool clamping to automated machine loading and unloading

The AMB in Stuttgart covers the entire spectrum of metalworking: As the leading trade show, it showcases every area of machining in one location – from machine tools to precision tools and measurement technology, all the way to software, digitization, and automation. In this environment, SCHUNK positions itself as a partner for productive manufacturing that can be reliably designed and developed to be future-proof. “The AMB is all about efficiency in production: less setup time, fewer manual interventions, and more stable runtime. To that end, we showcase clamping levers throughout the machining

process: from individual clamping concepts to high-performance comprehensive solutions,” says Markus Michelberger, Head of Sales Clamping Technology at SCHUNK in Mengen. A holistic understanding of the process and the optimal interplay between machining and automation are crucial here.

Live application: pneumatics and electrical systems working in perfect harmony

SCHUNK demonstrates how end-to-end automation works in practice using a live application. An AMR (autonomous mobile robot) equipped with a robotic arm handles the transfer between the setup station and the machine tool, integrating the relevant steps into a seamlessly coordinated process. The focus is on the coordinated interaction between VERO-S pneumatic and electric quick-change pallet modules. Pneumatics demonstrates its strengths in applications requiring high forces, dynamic performance and direct machine integration. Electric modules offer advantages in any application where autonomy, mobility and flexible logistics are crucial without a compressed air supply. This illustrates how both technologies can be integrated into a productive, end-to-end system without any disruption, thereby reducing throughput times and increasing efficiency throughout the entire process. VERO-S quick-change pallet modules are a key component for precise production with optimized setup times. When combined in SCHUNK tombstones, they can also be quickly and easily unlocked as a series of modules. To go along with this, SCHUNK is introducing a new accessory at AMB: the VERO-S taper aligning hook. This retrofittable fail-safe mechanism provides protection when loading

The new VERO-S taper aligning hook improves process reliability when loading and unloading tombstones



and unloading the tombstones and increases process reliability.

Workpiece clamping: versatile turning and milling

Versatile and secure workpiece clamping is also essential for consistent machining processes – especially for small batch sizes and high part variability. That's what the ROTA THW3 2+2 4-jaw power chuck is designed for. With centrally balanced workpiece clamping, a wide range of workpiece geometries, from round to irregular shapes, can be clamped quickly and flexibly. The fully sealed chuck provides consistent clamping forces and ensures consistently high workpiece quality. Users also benefit from long maintenance intervals. In combination with SCHUNK's extensive jaw range, this offers versatile customization options regarding material and geometry.

Tool clamping along the workpiece

The toolholder mounting is also a key factor in machining quality and process stability. For this purpose, SCHUNK offers a product portfolio that is consistently tailored to meet requirements for precision, surface quality, stability, and accessibility. The complete range, from mechanical toolholders to low-vibration precision toolholders and intelligent process optimization, covers every machining task, meeting the tolerance requirements, quality specifications, and interfering contours. The new Tool Guard intermediate sleeves provide additional stability during heavy-duty machining and can be used in SCHUNK toolholders as well as all standard hydraulic expansion chucks. The integrated pull-out protection increases radial stiffness and reduces bending forces on the tool shank, ensuring reliable machining results even with dynamic milling strategies.

Customized solutions for challenging tasks and industries

The type of clamping system required is determined by the specific manufacturing task. This is exactly where SCHUNK Engineering comes in. When standard solutions are pushed to their limits by workpieces, geometries, or specific process requirements, SCHUNK develops custom-fit clamping solutions, ranging from customized modules to functional assemblies. This is based on a broad portfolio of components and systems, a deep understanding of applications,



and a structured engineering process.

This expertise becomes especially evident in an industry context. SCHUNK combines engineering expertise with proven standard and system solutions for a variety of industries. In the aerospace sector, VERO-S Aviation is known for its flexible and low-distortion clamping of setup-intensive structural components. Its compensating system reduces clamping stresses and setup effort. In addition, when used in combination with SCHUNK vibration-dampening toolholders, it ensures high surface quality and dimensional accuracy. For infrastructure applications, the MAGNOS rail clamping system demonstrates how rails, separator switches, and components for rail vehicles can be used for secure, maintenance-free and process-stable clamping for the milling process. The examples show how application-oriented solutions are developed—depending on the specific requirements—from the standard portfolio, modular systems, or custom engineering.

When used in combination with a hydraulic expansion toolholder, Tool Guard intermediate sleeves provide greater radial rigidity during machining due to their integrated pull-out protection

VERO-S Aviation clamping units allow for flexible clamping of structural components that require extensive setup, with minimal deformation (Pictures: SCHUNK SE & Co. KG)

SCHUNK at AMB 2026: Hall 1 | Booth 1H30



DN Solutions and HELLER Showcase Joint Manufacturing Expertise at AMB 2026

Modern machining technologies and integrated automation solutions

Under the motto “When Precision Connects, Intelligence Emerges.”, DN Solutions and HELLER will present their combined expertise in advanced manufacturing at AMB 2026 in Stuttgart. The joint exhibition focuses on integrated manufacturing solutions that combine machine tools, automation, digitalization, and AI-driven technologies to support future-ready production.

5-axis machining centres HF 5500 Mill-Turn



The booth will feature live machining demonstrations highlighting advanced machining technologies and integrated automation solutions. DN Solutions will present the DVF 5000 equipped with the AWC automation system, as well as the DNX 2100 SB integrated with RoboJob automation. The portfolio is complemented by the SMX 3100 S, DNM 5700, and PUMA 5100 LYB, covering applications from complex multitasking machine to standard production and heavy-duty turning. HELLER will showcase the HF 5500 Mill-Turn for high-precision 5-axis complete machining and the F 6000 Mill-Turn for demanding production applications.

Smart Manufacturing is another key focus. DN Solutions will highlight AI-based solutions, digital monitoring and analytics, and consulting services designed to improve quality, service, and production optimization. By connecting machines, data, and digital services, manufacturers gain deeper process insights while increasing productivity and efficiency.

Within the HELLER Technology Area, visitors can explore application expertise, digital production optimization, and intelligent support solutions, including the AI-based chatbot “Ask.me.” Additional exhibits include service concepts for maximizing machine availability, scalable automation concepts, digital twins, the HELLER Services Interface, and the myHELLER customer platform.

Workpiece examples from various industries demonstrate how the combined expertise of DN Solutions and HELLER supports efficient, flexible, and high-quality manufacturing – from prototype production and single-part machining to high-volume series production.

DN Solutions and HELLER at AMB 2026, Hall 10, Booth 10A31/32, Stuttgart

5-axis machining centre F 6000 Mill-Turn
(Pictures: Heller)



LMT Tools Provides Customer Support for Adam Rollsysteme GmbH

By serving the existing customers of the insolvent Adam Rollsysteme GmbH, LMT Tools ensures a continuous supply for its customers. Combined expertise, stable delivery capabilities, and application-specific support create reliability in a challenging market environment.

LMT Tools has taken over the support of existing customers of the insolvent Adam Rollsysteme GmbH, based in Güster. This does not involve a takeover of Adam Rollsysteme GmbH. Going forward, LMT Fette, a member of the LMT Tools family and the market leader in rolling systems, will ensure the supply of products from its own portfolio. For customers, this means that components, roll heads, and thread rolls will continue to be available. At the same time, they gain access to the group's full range of services, including its global network and regional sales force. This ensures not only that suitable product solutions are available, but also that customers have personal contacts in their region and technical support directly on-site at the machine. Stefan Möller, Head of the Rolling Systems Product Line at LMT Tools, explains: "Even during difficult economic times, ensuring a secure supply for our customers was particularly important to us. That is why we provided quick and straightforward assistance even during Adam Rollsysteme's preliminary insolvency proceedings. By acting swiftly, we were able to help ensure business continuity and reliably meet customer needs. We will continue to support our customers in the future with our service portfolio and technical expertise."

LMT Tools Reports Positive Results from the PWS-Integration

A year ago, LMT Tools integrated the expertise and know-how of PWS Präzisionswerkzeuge GmbH from Schmöln, thereby strategically expanding the product and service portfolio of its gear cutting specialist, LMT Fette. With the acquisition of machinery, equipment, and experienced specialists, tool reconditioning at the Schwarzenbek location was significantly expanded in terms of both quality and quantity. At the same time, key industrial expertise in eastern Thuringia was preserved, stabilized, and integrated into the structures of LMT Tools. Since then, customers have benefited from a broader range of solutions, consolidated technical expertise, proven quality, and reliable

support through the regional sales force as well as on-site application engineering. "We are proud to have successfully integrated the products, machinery, and, above all, our new colleagues in such a short time. The positive feedback from our customers reinforces our decision to integrate parts of PWS into LMT Fette," emphasizes André Bollow, Head of the Gear Cutting Product Line at LMT Tools.

Customer Requirements as the Benchmark for New Solutions

LMT Tools will continue to focus on targeted skills development, technological strength, and a strong commitment to meeting its customers' needs. "We are constantly working on new products, technologies, and solutions to enhance performance in the field and improve our customers' profitability. That is our benchmark – today and in the future," said Raphael Lienau, site manager at LMT Tools in Schwarzenbek.

Visit LMT Tools at AMB 2026 in Hall 3, Booth D20, from September 15 to 19.



A tangential rolling head has two thread rolling wheels that are moved laterally against the work-piece. The thread is formed as the head moves in a direction tangential to the work-piece



In radial rolling, the thread is formed by the axial movement of the rollers against the work-piece, independent of the feed rate. It is formed within a single rotation of the rollers



Axial rolling heads have three thread rolling rolls and can produce threads of any length within a diameter range of 3.5 to 100 mm (Pictures: LMT Tools)

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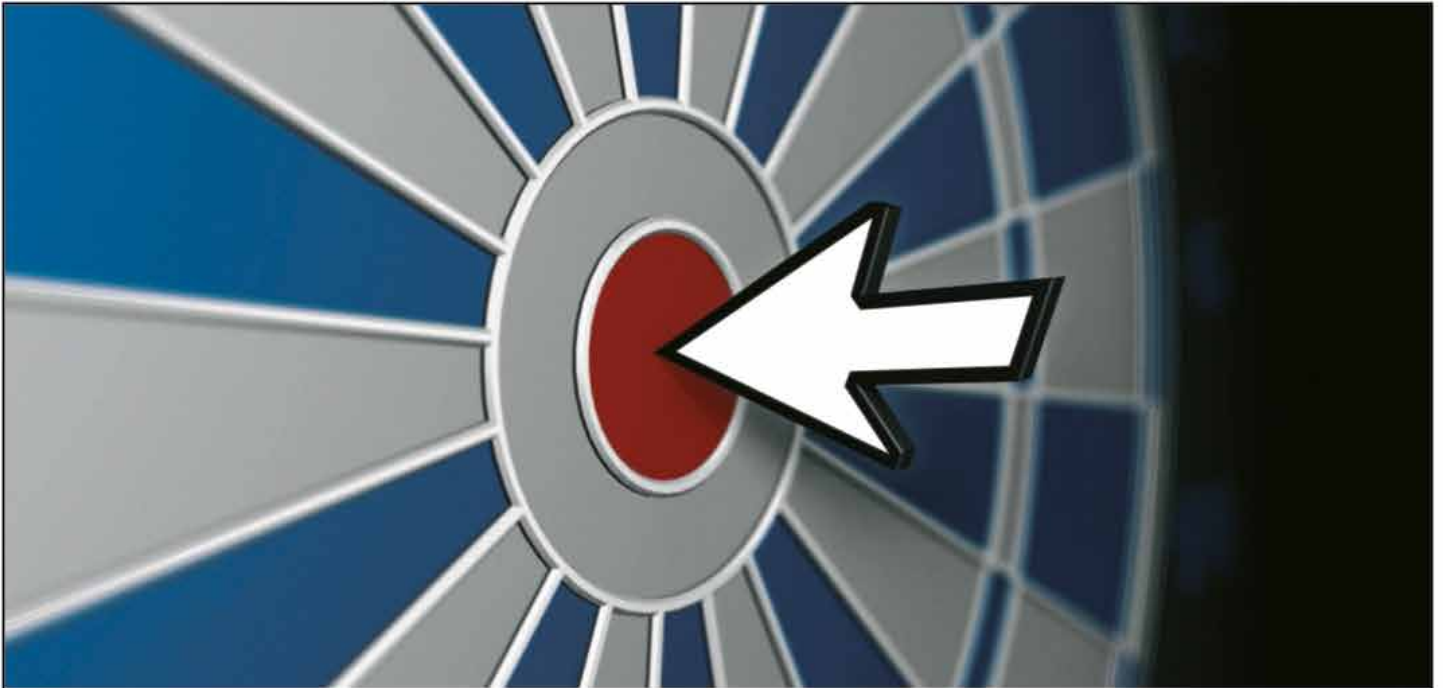
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