



PRODUCTION50™

MOLDINO System Solutions Workshop

APPLICATION REPORT

MOLDINO's Production50™ optimizes processes, reduces costs, and shortens machining times through new manufacturing technologies.

In cooperation with

röders
TEC

MHT...

MOLDINO System Solutions Workshop

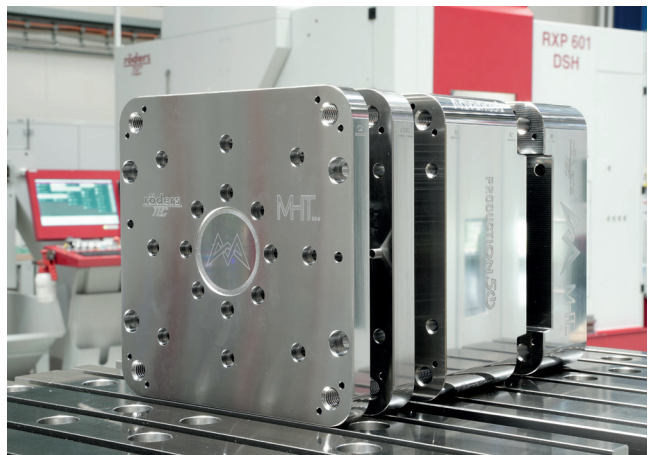
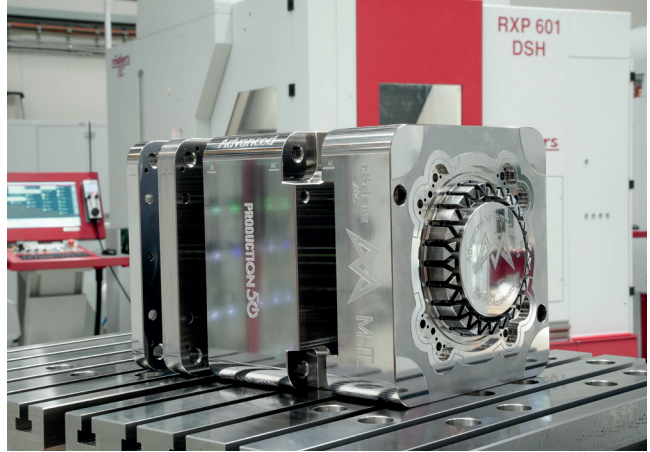
Systematically Achieving Better Results

What advantages do system solutions offer in mold and die making? How can they accelerate processes and reduce manufacturing costs? Focusing on ejector pin drilling for injection molds, these questions were addressed during a one-day workshop organized by MOLDINO and hosted at Röders in Soltau.

The mold and die industry has always faced one crisis or another, but this time the situation seems especially serious. The strategy now is therefore: pushing forward. This means making progress in areas such as customer orientation, technological leadership, lead times, and cost structure. To support this, Japanese precision cutting tool manufacturer MOLDINO Tool Engineering, Lower Saxony-based machine manufacturer Röders Tec, and MHT - known for their medium distributor - organized a one-day workshop titled “System Solutions for Mold and Die Making: Focus on Ejector Drilling”. The concept clearly struck a chord: with 60 participants, Röders’ large seminar room in Soltau was filled to capacity.

The agenda also included rib milling, hard milling (including as an alternative to surface flat-grinding), mirror finishing with solid carbide end mills, and innovative minimum quantity lubrication with MHT’s medium distributor. It was essentially a given, considering the venue, that the system component ‘high-precision machine tool’ - in this case the 5-axis RXP 601 DSH - would play a key role. The event also served as a follow-up to the successful Benchmark Workshop held in 2022 - also at Röders - which demonstrated how separate machining steps could be consolidated on a single machining center to optimize overall production efficiency.

A key point of interest was determining which areas should be hard-milled and which should be machined by sink EDM. Once again, the focus was on complete machining - but this time with an emphasis on system solutions.



Milled and drilled only:

The sample assembly, designed and pre-manufactured by Mark Rotzoll (MOLDINO), is shown from the perspective of both the mold insert and the ejector backing plate. In the center are the ejector retainer plate and the ejector guide plate.

Andreas Schadeck from MOLDINO explained why this topic was chosen: “An implemented system solution can not only offer significant technical and economic benefits within toolmaking itself but also create value beyond that.”

He illustrated this through the example of ejector pins: the goal is not only to reduce machining and lead times as well as costs but also to consider process reliability and machining quality. *“Along the way, we have unlocked further advantages that positively impact actual injection molding production. This is a clear value-add for customers.”*

Schadeck, in his role as the Country Team Leader Germany – responsible for all direct sales in Germany – and with more than a quarter century experience in Mold-and-Die-Industry and Process Optimizing and Mark Rotzoll as the Head of the new Advanced Process Application Engineering Department of MOLDINO had both the luck to support many customers in Germany and with their deep understanding of the industry’s needs once again helped shape the workshop, with both being part of the five-member speaker team.

Röders: From Pewter Casting to Global Machine Manufacturing

To start the event, Managing Director Jürgen Röders described the company’s evolution from a pewter foundry founded over 200 years ago by Jaspar Röders into a manufacturer of precision machining centers operating in more than 50 countries and employing around 600 people today. The pewter foundry still exists, joined in 1985 by a cutting-edge blow-mold production facility.

The demands of this facility prompted the development of their own HSC machine. Machine production began in 1991 and soon became a success story. In toolmaking, 20 Röders machines currently mill and measure over 5,000 blow molds annually in fully automated 24/7 operation, all featuring polished-milled surfaces. *“This also serves as a test bed for new machine technologies,”* Röders noted.



Managing Director Jürgen Röders opened the workshop by introducing Röders GmbH and describing its development from a pewter foundry established more than 200 years ago to a high-end HSC machine manufacturer operating in over 50 countries.

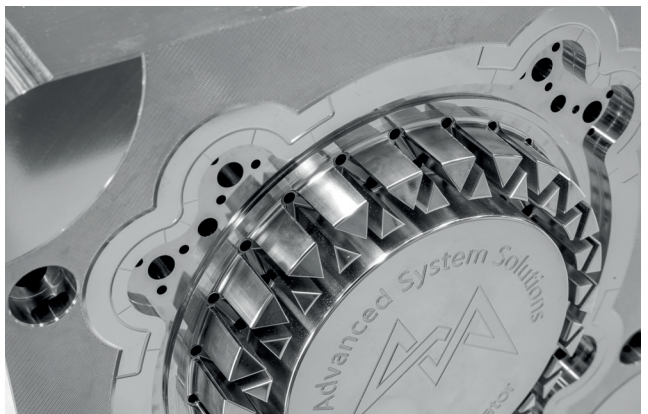
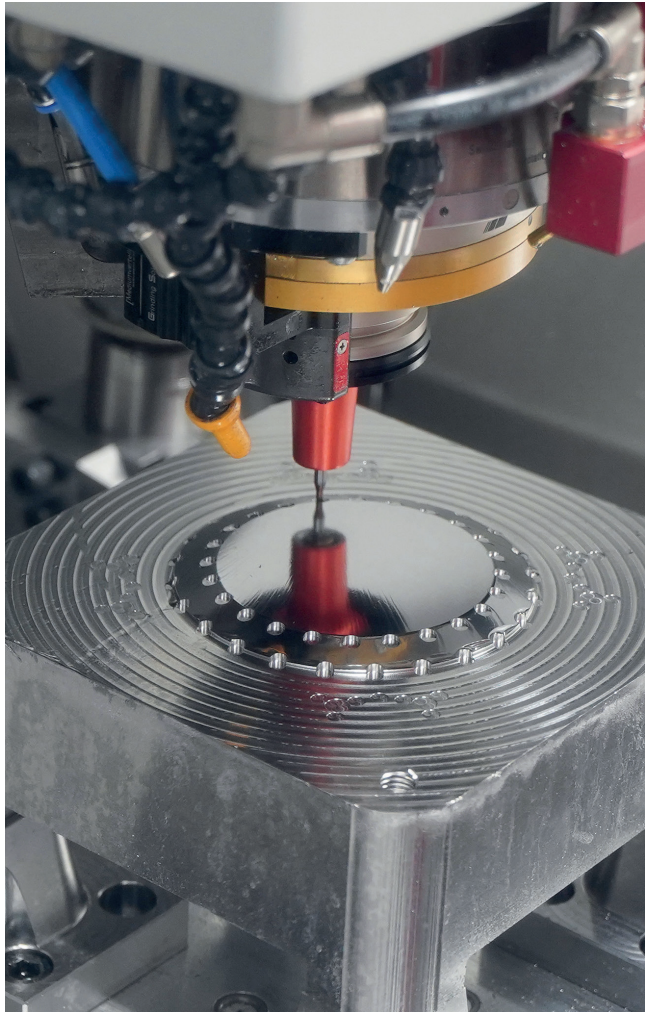
Specially Designed Assembly

To realistically demonstrate various machining scenarios, Rotzoll designed a 200 × 200 × 236 mm assembly using 3D CAD specifically for the event. It included the typical components of an injection mold - ejector support plate, ejector clamping plate, ejector guide plate, and core insert (ejector side) - for example, for producing a motor cover. Except for the corrosion-resistant 1.2083 ESR (50+2 HRC) ejector guide plate, all components were made of hardened hot-work steel 1.2343 ESR (52+2 HRC).

Rotzoll had fully manufactured the assembly prior to the workshop. A second core insert, clamped on the RXP 601 DSH, was used in the live demonstration to show rib milling (roughing), complete ejector drilling, and engraving.

Surface Milling to Final Dimension with Polishing Quality

The core insert was clearly the focal point of the day. The first topic addressed its side surfaces - the fitting surfaces - whose production is anything but trivial. These areas demand high standards in dimensional accuracy, squareness/parallelism, and surface finish. *"After hardening, the five or six sides are normally machined on a flat grinding machine,"* Schadeck explained. This adds an additional process step that is difficult to automate and therefore almost always requires substantial manual labor with corresponding production costs. *"With a system solution, we want to demonstrate the alternative of milling."*



Without polishing to final dimension: mirror milling of the cover on the machine and the finished result.



The 4- and 6-flute polygon end mills from the EHHRE series are available in diameters ranging from 0.5 to 12 mm. The applied TH3 coating enables the machining of hardened steels up to 68 HRC.

For this reason, Rotzoll milled the side surfaces of the core insert using a face-milling strategy - in this case, 3-axis. *"For long distances I would use zigzag milling without lifting movements, if a particularly high surface quality is required, one-way-milling is more sufficient,"* he recommended. For roughing, semi-finishing, and finishing, Rotzoll selected MOLDINO's EHHRE polygon end mill. The result was a precision level equivalent to high-end flat-grinding - with significantly less effort - and the process runs entirely unmanned.

Rotzoll used the same EHHRE end mill for surface machining of the ejector guide plate and contour machining of the cover. The cover served to demonstrate that mirror finishing is possible not only with expensive diamond tools such as MCD or PCD, but also with coated solid carbide tools. As with the side surfaces, the process began with roughing and semi-finishing - this time using a 3D spiral milling strategy. *"For final mirror finishing, I set a surface tolerance of 0.1 μm and tilted the toric tool by 0.1° to the surface normal,"* Rotzoll explained. This kept the angle to the surface constant, ensuring a consistent contact point with no back-cutting. *"We finished for four hours with the EHHRE end mill, and the cutting edges still looked good afterward."* This proves that mirror finishing to final dimension with solid carbide end mills is not only possible, but also reliable and economical.

Material choice is crucial for mirror surfaces, which is why Rotzoll selected ESR (electroslag remelted) steel for the example part - its high homogeneity enables premium-quality high-gloss finishes. *"In addition to the CAM system, milling strategy, and cooling option, spindle and cutting tool runout accuracy is critical for mirror finishing,"* Rotzoll emphasized. *"A runout error of 2 μm is already a major problem."* Machine precision and dynamics also play a key role.

High Demands on the Machine

Demands that the RXP 601 DSH meets with ease. *“Our machines are extremely rigid, vibration-stable, feature sophisticated thermal management, and remain absolutely zero-point stable even after long machining times,”* stressed Dr. Oliver Gossel, Head of Sales at Röders.

In his workshop session, he discussed the latest RMS6 control generation developed in-house. Feed rate planning aligns precisely with the dynamic capabilities of the machine axes. Spline interpolation has also been optimized to create ideal toolpaths - a fundamental requirement for producing mirror surfaces.

This is complemented by the ultra-fast 32 kHz control loops used in Soltau - marketed by Röders as Race-cut. These detect and correct control deviations extremely quickly. As a result, the machine can operate with high jerk (rate of change of acceleration), reducing machining time. The increasing deviations that typically accompany higher jerk are recognized and compensated instantly without impacting surface quality.

“When machining complex geometries, high jerk is far more important than high maximum acceleration - which typically cannot be reached anyway,” explained Gossel.



The 5-axis RXP 601 DSH in Röders' application center, on which the majority of the sample assembly was also manufactured in advance.

Rib Milling – In Hardened Materials Only up to $10 \times D$

When producing ribs or slots, choosing milling over EDM is not always straightforward, Schadeck noted. Milling can offer advantages over EDM - but not in all cases. Important decision factors are material hardness, draft angles, and aspect ratio (depth-to-diameter). At 56 HRC, his recommendation for cylindrical cutting tools is to mill only up to $10 \times D$ ($12 \times D$ for tapered tools; more only in exceptional cases). In softer materials, non-tapered regions can safely reach $15 \times D$.

If milling is chosen, another challenge arises: none of the known coolant methods - air, external emulsion, MQL, or through-spindle coolant - ensure equally effective cooling, lubrication, and chip evacuation, all of which are critical for rib milling. To avoid problems like deflection, back-cutting, or even tool breakage, the MHT medium distributor was used - just as it was for all machining steps of the assembly.



Through the medium distributor from MHT (Merz & Haag), either pure compressed air, compressed air with a small amount of oil, or hydrocarbon medium (MV-2) is blown onto the cutting tool via a special nozzle system, ensuring optimal cooling and reliable chip evacuation.



The 4-flute rib milling cutting tools from the ETR/ETRP series are available in diameters ranging from 1 to 3 mm and usable lengths from 3 to $50 \times D$. The applied TH coating enables the machining of hardened steels up to 65 HRC.

Herbert Merz, Managing Director of MHT, explained how it works: *“The medium distributor operates with compressed air up to 6 bar, to which between 2 and 10 ml/h of lubricant is added depending on the application.”* The oil-free medium evaporates quickly, leaving almost no residue - an important condition for automation. *“The system sprays the aerosol onto the cutting tool shank via a ring of stationary nozzles, directing it straight to the cutting edges,”* Merz explained. It can be used for nearly all materials suitable for milling or drilling. Key advantages include significantly extended tool life and reduced contamination. Röders has also embraced these benefits, offering the system as an option on their machines - including the one used during the workshop.

Plunge Milling Better than Z-Constant

For rib roughing, Rotzoll tried something new: *“If I tilt the tool axis by 1° during centerline roughing, I can increase depth of cut and achieve better chip evacuation with higher feed rates.”* A particularly interesting method for semi-finishing and finishing was plunge milling. This technique allows removal of just a few microns at constant feed with minimal deflection and excellent performance - something impossible with Z-constant milling. *“This results in surfaces of exceptional dimensional accuracy, with milling marks aligned in the demolding direction,”* Rotzoll noted. Not all CAM systems support this method.



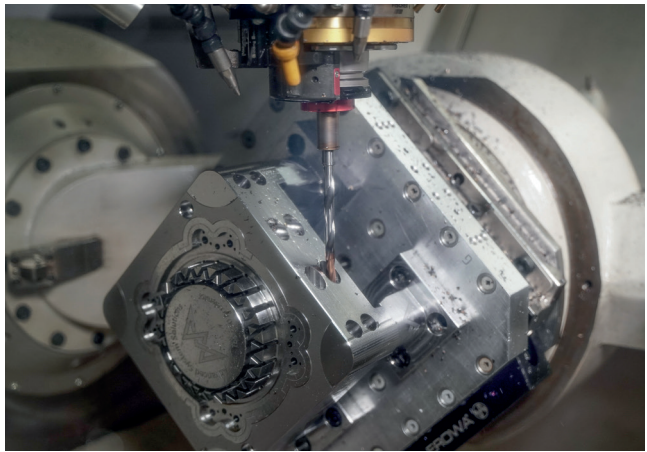
The hard-drill series NSBH is available in diameters from 2 to 12 mm and in usable lengths from 5 to 30×D. The applied ATH coating enables drilling in hardened steels up to 60 HRC with an H7 tolerance.

Ejector Drilling with a Special Running Chamber

Alongside surface flat-grinding alternatives, the second system solution presented was ejector drilling - featuring a running chamber developed by Rotzoll and patent pending by MOLDINO.

“Using a special drilling strategy followed by milling a running chamber and lead-in taper, we significantly improved the mountability of ejector pins,” Schadeck reported.

The demonstration workpiece contained 76 ejectors ranging from 2.5 to 5 mm in diameter, tolerance H7. Rotzoll developed a dedicated drilling cycle for this. *“With the MOLDINO NSBH drill, it’s possible to produce several hundred ejector holes in H7 quality reliably and repeatably - even in automated operation,”* Rotzoll explained. Nearly any cooling method is possible except air. The cycle is already integrated in Röders controls and in HyperMill (OpenMind), with more CAM systems to follow.



Shown here is the hard drilling of the cooling.

Rotzoll also used the cycle for hard-drilling cooling channels, demonstrating feasibility with suitable cooling. However, he openly acknowledged that drilling in the soft state is generally more economical when possible.

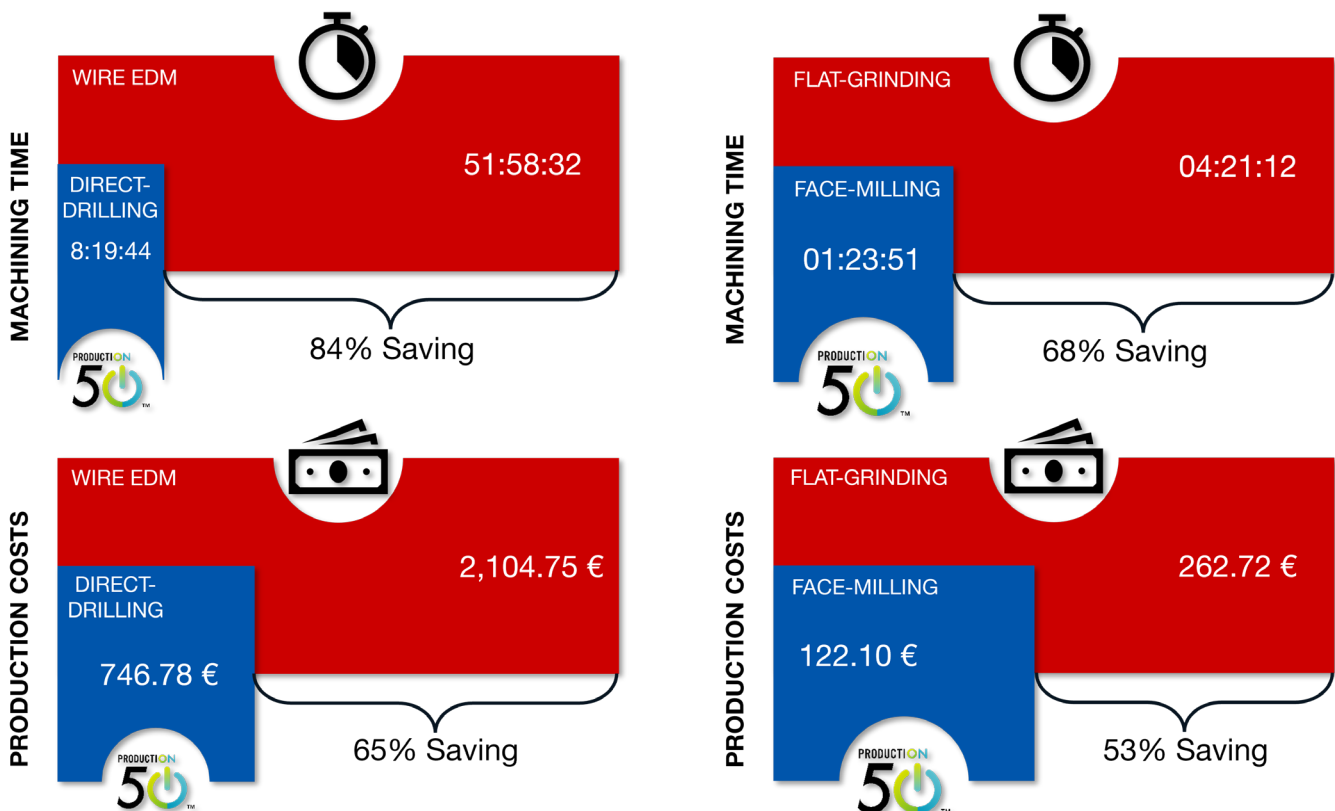
But back to the ejector holes. Each ejector bore consisted of four elements: guide hole, running chamber, clearance hole, and lead-in taper. Machining took place from both the backside and the contour side of the mold insert. Both began with helical milling and subsequent drilling. The taper was milled from the backside and the guide chamber from the contour side - again using 5-axis plunge milling.

Costs Reduced by at Least Half

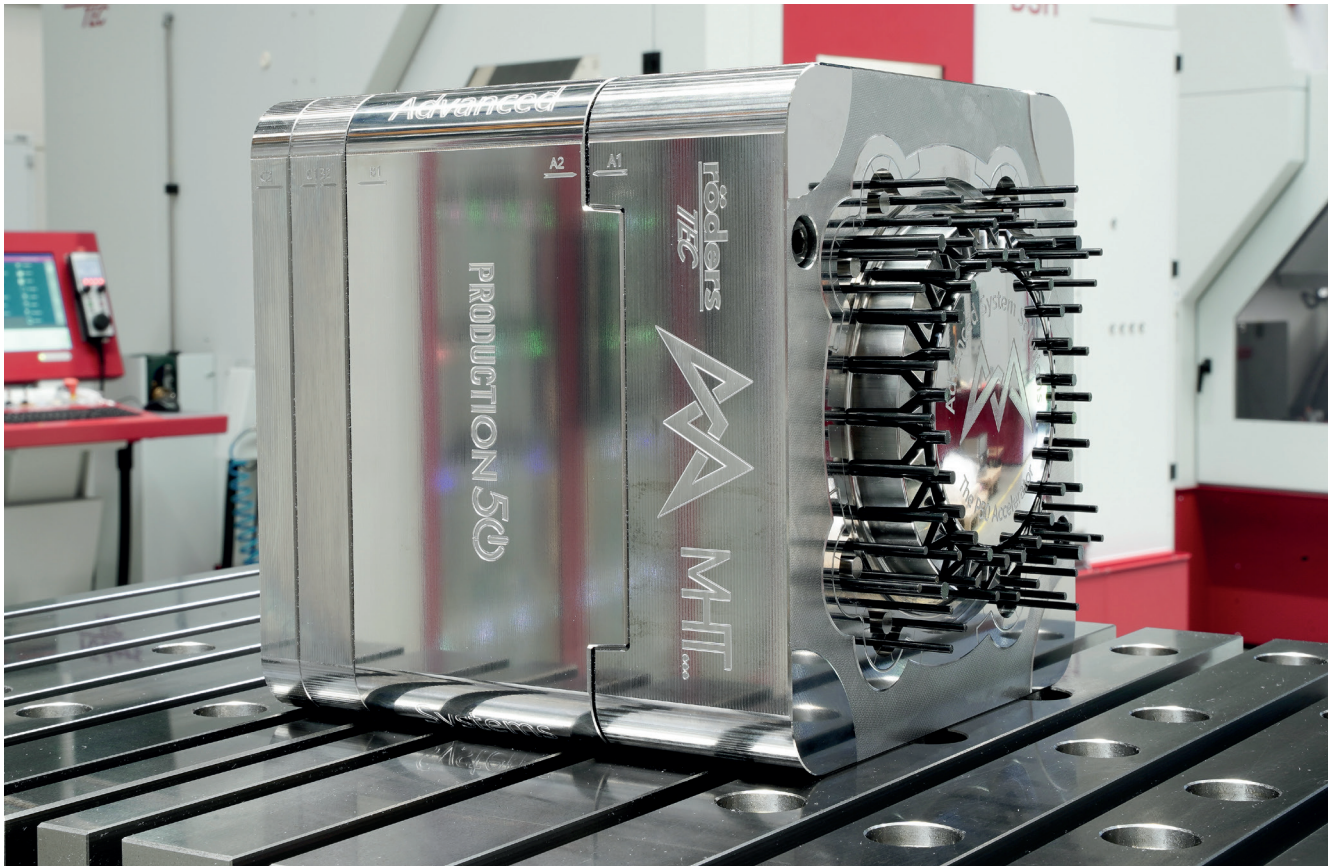
Schadeck concluded with results from MOLDINO's Production50 (P50) method, which analyzes customers' production processes to identify improvements and quantify the economic impact of new workflows. *"Compared to flat-grinding the side surfaces, the time and cost savings achieved through milling are considerable,"* says Schadeck. *"The end result shows that by milling the side surfaces rather than flat-grinding, we can save over 60% in time and over 50% in costs."* Another factor is that flat-grinding is very difficult to automate.

The situation looked even more favorable with the system ejector pin hole drilling. *"Here, the time saving is even more pronounced, namely 84%, based on all ejector pins. The same applies to costs, which are just over a third of those for wire EDM when using milling,"* says Schadeck, summarizing the differences. That equates to a 65% cost saving.

"We saw today how significantly faster processes and the elimination of queue times can drastically reduce process costs," Schadeck summarized. With the skilled labor shortage intensifying, automation becomes even more important: *"The system solutions presented today can greatly enhance the effectiveness of automation."*

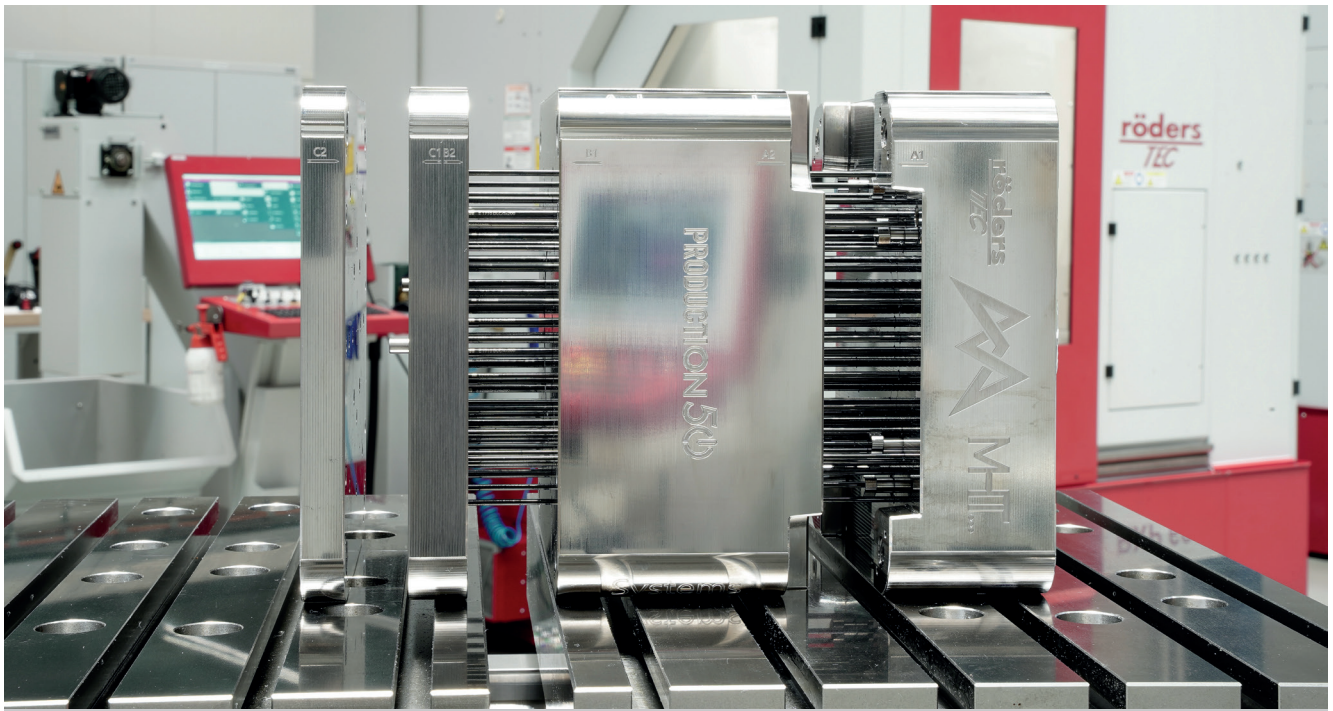


Comparison of the reductions in machining times and production costs achieved through Production50 across the various manufacturing technologies.



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The sample assembly, designed and manufactured by Mark Rotzoll, is shown here from the perspective of the mold insert. In the center are the ejector retainer plate and the ejector guide plate.



Shown here is how the 76 ejector pins transition from the ejector backing plate, through the ejector retainer plate, and into the mold insert. The ejector backing plate, which has not yet been bolted in place, is positioned on the far left.



View of the ejector side, showing the ribbing, several of the total 76 ejector holes machined to H7 quality, as well as the mirror-milled cover area. The labeling and logo were engraved using a chamfer cutter from the DN2HC series.



During the workshop, customers were able to see the functionality of the fully assembled workpiece group for themselves and manually slide it open and closed.

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