

Case study

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Automation in XXL

Fischer GmbH, a toolmaker from Geringswalde in Saxony, Germany, has recognized the advantages of GF Machining Solutions' Mikron HPM 1850U Milling solution, which helps the company to manufacture base plates for the largest tools using Automation.

Fischer Werkzeugbau, like many East German companies, looks back on an eventful German-German history. In GDR times, there was already a metalworking company situated where Fischer is now located, which manufactured woodworking tools, technical knives and saw chains for chainsaws. After the reunification, this company as a whole was not able to compete with similar companies from West Germany. For this reason, founder Hartmut Fischer decided to complete a management buyout: He transferred the toolmaking operations of the state-owned company to his private ownership. By doing this, Fischer saw potential for the continued existence of the department. "Our good fortune at the time was that we had a brand-new wire EDM machine from the Swiss company Agie, now GF Machining Solutions. People in the West were quite surprised that we had such a high-quality machine. That's how I was able to find customers in the West. From then on we grew, got more and more customers and took on more complex tasks. Even today, our wire-cutting and die-sinking EDM machines are still from GF because of their precision and reliability".

Today Fischer Werkzeugbau has over 80 employees and manufactures injection molding tools and punching tools. Customers who come to Fischer with the CAD data of a component receive an offer after only a few days and the tool itself can be ready around 8-10 weeks later.

"With internal design, production and testing facilities, we are vertically fully integrated—and that is something very special," explains Silvia Fischer, Managing Director at Fischer GmbH. "Our process is mapped in Siemens NX from design to CAM programming, which is very efficient: We design, manufacture and test the tool within a few weeks. We are very well equipped in all these areas, for example with eight own designers and our own 4000kN PME production press".

Automation in XXL format—in batch size 1

"Money is only earned when the machine is running", explains Hartmut Fischer. "That is why we switched to the Mikron HPM 1850U. The machine can be used for the five-axis simultaneous Milling of components—and it has another decisive benefit. While we already automated large parts of our other milling processes, the size and weight of the base plates kept us from automating in this area as well. This has now changed: The HPM allows us to clamp workpieces up to 1,250 mm by 1,000 mm on three exchangeable pallets".

The machine can switch between these automatically, which results in various advantages: No only do clamping and unloading run parallel to machining time—the machine mills while an

employee loads the pallets—but this solutions also enables unmanned shifts. Fischer applies a three-shift system with a reduced night shift. Thanks to Automation, full productivity is maintained even at night and when required on weekends. Hartmut Fischer is sure:

"Automation isn't only something for serial production, as many claim. We can't confirm that. The time saved during retooling, the unmanned shifts—it all pays off, even with batch size 1".

Ready for unmanned operation

"The Mikron HPM 1850U was designed as an automated machine through and through," explains GF sales engineer Frank Seifert. "This is already obvious when you look at the tool magazine. Different workpieces on the pallets often require different tools and space is needed so that these and any necessary sister tools can also be fed automatically. The Mikron HPM 1850U has a tool magazine with 238 positions. This allows Fischer to produce all combinations of parts automatically.

Perfect ergonomics even with heavy workpieces

The Mikron HPM 1850U is also easily accessible by crane, meaning that all pallets are always accessible for heavy workpieces. But a focus was also put on the operator: stairs or gratings were avoided, as were high platforms. The pallets in the two set-up stations can be hydraulically lowered to a comfortable working height and turned through 360 degrees. The lifting and lowering movements of the pallets are very well damped and do not interfere with the Milling process.

Solid frame

A special feature of the Mikron HPM 1850U is its design. Instead of a concrete bed cast on site, its one-piece cast iron frame stands on three legs. The effect is that of a tripod: the frame does not tilt. The machine has a high rigidity of its own and does not need to rely on the foundation for this.

"In the past, we used to have to tear down walls to install a new machine," recalls Hartmut Fischer. "Fortunately, since we have installed large doors in the new hall, this is no longer necessary. But I remember exactly how heavily such construction work restricted us back then. That's why it was a relief that no separate foundation had to be built for the Mikron machine. The frame construction avoids a lot of things: noise, pollution, and the constant communication with the craftsmen".

High accuracy

The sheet metal parts to be produced with Fischer tools have high precision requirements for very complex contours. As they need to be manufactured in the tool across several stages, the required dimensional accuracy increases considerably. The tolerance chain begins in the base plate. In order to manufacture it precisely, an appropriate machine is required. This is exactly what GF Machining Solutions offers: The CNC Milling machine HPM 1850U was able to fully meet the quality expectations in the plate area over 1,000 mm.

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"A very precise machine has to be stiff," explains Frank Seifert. "This is because it's absolutely necessary to avoid expansion and torsion during the machining process". These occur in every machining center as a result of mechanical loads and thermal influences. How far a body expands depends largely on its size and shape. The designers at GF Machining Solutions have created an extremely rigid, low-torsion machine design with a well thought-out machine concept.

GF Machining Solutions meets this challenge with, among other things, a one-piece machine bed. Two levels and a guide distance of over 800 mm in the X axis guarantee absolute torsional rigidity and stability during roughing. This is particularly important when heavy workpieces cannot be clamped centrally on the rotary table and the table is turned. The symmetrical design and a jacket-cooled Spindle ensure that no thermally induced inaccuracies occur. The expansions therefore have almost no influence on the position of the tool in the X and Y axes—and in the Z axis, they are suppressed by the constant temperature.

A further measure is the use of particularly precisely manufactured bearings in the axes. This allows an arrangement as locating/locating bearing as opposed to a fixed/loose bearing. The preload resolves this remaining redundancy, which in turn increases the rigidity. As a result, a repeatability precision of 6 µm X, 5 µm Y and 4 µm Z is achieved despite the size of the machine. A positive side effect of the increased rigidity is the optimum cutting values of the tools.

Million-fold production

The Mikron HPM 1850U from GF Machining Solutions enables the production of large, yet precise individual parts from batch size 1 and is therefore used for base plates. The advantage lies in Automation. With tools from Fischer GmbH, punchers can produce millions of components for our daily lives—making automated mass production a cornerstone of our prosperity.

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Picture caption:

The Mikron HPM 1850U's five simultaneous axes offer a travel range of 1,850 mm x 1,400 mm x 905 mm, 360° in the rotary table and a swivel range from -20° to +120°. Despite this, the positioning accuracy is sometimes even significantly better than 10 µm.



The swivel axis of the Mikron HPM 1850U also allows optimum access to the workpiece from the side. A high surface quality is achieved even during simultaneous machining. The Step-Tec Spindle offers full torque even at low speeds.



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From left to right: Frank Seifert, Silvia Fischer and Hartmut Fischer in front of the Mikron HPM 1850U.



The Mikron HPM 1850U has a tool magazine with 238 positions. This means that sufficient tools and the sometimes necessary sister tools can be stored, even if the individual pallets have different requirements.



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After reunification, a wire EDM machine from GF Machining Solutions played a key role in enabling Hartmut Fischer to build his company. Today, Fischer GmbH still uses EDM machines from GF Machining Solutions.



An employee uses a crane to swivel the base plate onto a changing pallet while the Mikron HPM 1850U continues working. No stairs or gratings are needed.



Profile of GF Machining Solutions

GF Machining Solutions is the world's leading provider of machine tools, diverse technical solutions and services to manufacturers of precision molds and tooling and of tight-tolerance, precision-machined components. The key segments we serve include the aerospace, automotive, medical, energy, information and communications technology (ICT) and electronics industries. Our extensive portfolio ranges from Electrical Discharge Machining (EDM) solutions, three- and five-axis Milling machines and Spindles, 3D Laser texturing machines, Additive Manufacturing and machines for Laser micromachining to solutions for Tooling, Automation, Software and Digitalization—all backed by unrivaled Customer Services and support. GF Machining Solutions is a globally acting Division of the Georg Fischer Group (Switzerland) and maintains a presence at 50 locations worldwide. Its 3,358 employees generated sales of CHF 972 million in 2019. More information can be found at www.gf.ms.com

