



Success Story

Maximum precision and fast machining

Automotive supplier Hirschvogel uses the *hyperMILL*® MAXX Machining performance package to speed up programming and milling operations.



The Hirschvogel Umformtechnik GmbH plant in Denklingen...

...is at the heart of the Hirschvogel Automotive Group; a family owned company that was founded in 1938 under the name 'Hammerwerk Hirschvogel OHG'. The Hirschvogel Automotive Group, which emerged from this earlier industrial forge, has five plants in Europe (four of these are in Germany) plus production sites in the US, China and India. In 2015, the company achieved sales of at least Euro 931 million with automotive manufacturers and suppliers. The aim for 2018 is to cross the billion Euro threshold. Around 3,100 employees of the 4,500-strong workforce are based in Germany. The focus is on highly complex parts that are manufactured in large quantities. The parts are used mainly in powertrain, chassis frames, engines, gears as well as diesel and fuel injection. A growing share of sales is generated by the further refinement of the components that are produced.

> www.hirschvogel.com

Maintaining maximum precision whilst working much more efficiently is something the Hirschvogel Automotive Group has been able to achieve using the *hyperMILL*® CAM program from OPEN MIND. The amount of programming required has dropped dramatically and there has been a double-digit percentage reduction in machining times. One important side effect is that there is much less stress on tools and machines.

For a company to be successful in the automotive industry, its products must meet the highest quality standards, be delivered reliably and be manufactured extremely economically. The Hirschvogel Automotive Group has achieved this success with a wide range of renowned automotive manufacturers and suppliers throughout the world. Sales of parts for powertrain, chassis frames, engines, gears as well as diesel and fuel injection are continuously increasing at such a rate that the billion Euro threshold should be reached soon.

Around half of the revenue is generated by Hirschvogel Umformtechnik GmbH, which is the main plant located in Denklingen, Upper Bavaria in Germany. Parts with a total weight of 1,000 tonnes are produced there on a daily basis using hot, warm and cold forming processes and rotary swaging op-

erations. Without a high degree of technical expertise in the area of tool making, it would not be possible to ensure the required quality of the products. This is why Hirschvogel itself manufactures all the tools that come into contact with its products.

Based on the motto 'To stand still is to regress', the team that is headed by Robert Haug, Head of Planning and NC Programming at the Hirschvogel tool making department in Denklingen, is constantly working to

Robert Haug (third from the right), his team and Andreas Leser (right) OPEN MIND's Sales Director for Germany



“Thanks to the *hyperMILL*® MAXX Machining performance package, machining times and the load on the machine and tools have been reduced.”

Robert Haug, Head of Planning and NC Programming at the Hirschvogel tool making department in Denklingen



improve the quality and processes. This way of thinking has already resulted in several awards for the department. For example, in 2010 the company was overall winner of the renowned ‘Excellence in Production and Toolmaker of the Year 2010’ competition, which is an initiative of the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University and the Fraunhofer Institute for Production Technology IPT.

Faster programming – gentle milling

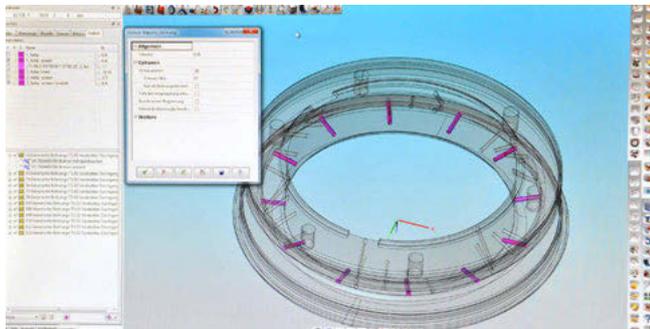
Haug and his colleagues have taken a great step forward by switching over to *hyperMILL*® CAM from OPEN MIND. Thanks to the introduction of the *hyperMILL*® MAXX Machining perfor-

mance package, the time required for programming the milling machines for many components has decreased, machining times and the load on the machine and tools have been reduced and new manufacturing options have arisen in the 5-axis machining area.

Precision in the single-figure micron range is an absolute must for the team of around 250 tool makers in Denklingen. According to them, this was also a minimum requirement when plans were put in place in 2013 to switch from the previous CAM system in the milling area to a more powerful solution.

Although 13 programs were considered initially, the company eventually opted for *hyperMILL*® from OPEN MIND. It was the significantly reduced programming times that swayed the decision as tool making always involves small batch sizes. The time required for programming is of great importance. Around 200,000 tools are produced year after year in Denklingen and the batch size fluctuates between one and 24. The average batch size is three. Approximately one third is new tools that require new milling programs to be developed. The tools weigh between 100 grams and 12 tonnes and are manufactured, among other things, on 32 milling centres, 17 of these are 5-axis machines.

The feature and macro technology provided in *hyperMILL*® allows the Hirschvogel tool-making department to automate operations that were previously carried out manually.



Maximum precision: The Hirschvogel tool making department manufactures components weighing between 100 grams and 12 tonnes with levels of precision that enter the single-figure micrometre range.



Five minutes instead of one and a half hours

NC programmer Günter Fasching gives an example of how his work has got faster: “In the past, I developed a 5-axis NC program for a tothing stamp; I had to wait for about one and a half hours for the milling paths to be calculated. With *hyperMILL*®, the paths are calculated in about five minutes. Even on a laptop, it only takes ten minutes.”

The CAM team in Denklingen has also been able to reduce programming times by using the 5-axis-optimised rest material roughing function. Based on a preceding operation, this cycle automatically generates high-speed cutting (HSC) that is optimised and collision-checked for rest material machining. A further advantage of indexed 5-axis machining is that shorter tools can be used. This guarantees greater stability and performance. This strategy also allows hard-to-reach areas and cavities to be machined particularly efficiently.

According to NC programmer Thomas Karg, it was necessary in the past, when programming rest material roughing, to work forward manually, tilt angle by tilt angle while watching out for various restrictions. Now, if you choose the ‘Indexing’ function, you can define the tilt angles for the B and C axes easily and quickly using two methods. The ‘Planes’ option allows you generate the tilt angle from the plane normal. In ‘3D mode’, the tilt angles are created automatically within a defined range

of angles. All connecting paths between the tilt angles are optimised and fully checked for collisions. “Machining is also much faster,” emphasises Karg. As the fourth and fifth axes are implemented via the tilt angles, the milling program only has to manage three axes. “We were particularly impressed by the extremely short programming and calculation times as well as the machine and tool-friendly machining,” explains Haug.

Drill hole recognition reduces the number of manual operations

The outstanding feature and macro technology also helps to greatly accelerate the work carried out by the Hirschvogel programmers. *hyperMILL*® uses geometrical information from the CAD system, so features such as holes and pockets are processed in the CAM package. The recurring machining strategies that are typical for a feature are combined with tools and technology data, defined as macros and stored in the macro database. This way, machining sequences can be assigned quickly and easily to the appropriate geometries and programming parts can be generated conveniently at the click of a mouse.

The feature and macro technology provided by *hyperMILL*® offers enormous potential to reduce programming times. A practical example: To generate inclined drill holes in a workpiece, the milling tools must first mill the surface and create an entry hole so that the drilling tool can be positioned at a right angle. In the previously used CAM system, each of these milling operations had to be programmed manually. Thanks to drill feature recognition, this programming is now largely automated. The amount of time this saves is huge, reports Fasching. “In the past, I needed more than a day to program a workpiece with 100 drill holes. Now, I only need two hours.”

Spindle load reduced by 70 per cent

Roughing during electrode manufacturing is also drastically accelerated. The Hirschvogel tool makers estimate that an average time saving of between 10 and 20 per cent can be achieved with the high-performance cutting strategies of the *hyperMILL*® MAXX Machining package. How can this optimisation potential be achieved? It’s very simple: HPC machining takes place in spiral and trochoidal toolpaths. Dynamic feed rate adjustment according to the actual cutting conditions ensures that milling is always performed with the highest possible feed rate. This results in optimal milling paths with maximum material removal and the shortest possible machining times. High-speed roughing of both prismatic and curved component surfaces is supported. Innovative algorithms ensure that a constant chip



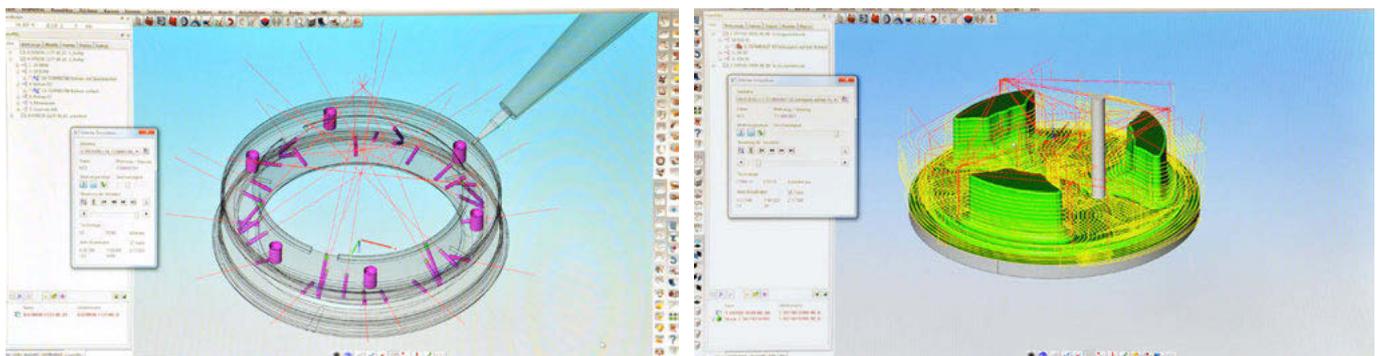
“*hyperMILL*® allows us to safely simulate our manufacturing processes with the corresponding clamping setups starting with the stock model. While this internal machine simulation is running, we can process other tasks on the computer. This way, we only experience a small loss of performance,” explains NC programmer Thomas Karg.

volume is always removed by each tooth of the milling tool. This delivers high utilisation rates without exposing the tool to undue stress, resulting in roughing speeds that are significantly higher than before. The machining strategy increases the speed and tool life. Stress on the tool and machine is reduced at the same time.

Hirschvogel operates a relatively small machine with a high-speed spindle that machines graphite electrodes. “With our old CAM system, we reached the maximum load limit of the spindle. Thanks to the HPC strategies provided by the *hyperMILL*® MAXX Machining power package, we’re now only at 20 to 30 percent of the maximum load,” reports Kröner. The NC programmer emphasises: “This not only prolongs the machine life, it also prolongs the life of our tools. In the past, we had to replace them after only two or three parts. Now they can easily withstand a complete job consisting of ten parts.”

Hirschvogel has also been able to attain substantial improvements with the 3D Z-level finishing function. In this strategy, machining takes place in continuous helix movements. This

Internal machine simulation: The manufacturing processes with the corresponding clamping setups can be safely simulated in *hyperMILL*® starting with the stock model.



allows the best possible surface quality to be achieved with a reduced machine load and in the shortest time possible. “An optimal surface quality is vitally important to us,” emphasises Haug.

OPEN MIND experts provide fast and flexible support

Haug and his team also appreciate the fact that OPEN MIND experts are always on hand and respond quickly and flexibly to requests for support. An important point for Martin Kröner and his colleagues is that: “The staff working on the support hotline speak German. Our experiences have been quite different in the past.” Haug and his team also value the close relationship with the CAM software manufacturer. This is another huge bonus: “Whenever we need help and support, the experts from OPEN MIND visit us at our factory and always provide us with quick solutions,” says Haug. And that’s not all: “With OPEN MIND, we’ve found a partner that really helps us get

ahead.” Here, he’s also referring to the way in which his team is working together with OPEN MIND to forge ahead with further optimisations.

One example of this is the joint development of the postprocessor for a new, 5-axis start hole drilling machine that Hirschvogel is custom manufacturing. This should automate the generation of flushing or ventilation holes in the tools. It is a partnership from which both parties benefit. This is also evident from the number of *hyperMILL*® licences that are in use. Back in spring 2014, the company started off with three test licences. Today, the CAM system is used at nine programming workstations at the main plant in Denklingen. In addition, three licences are in use at the aluminium forming production site in Marksuhl, Germany. Hirschvogel Automotive Components in China also recently started working with two *hyperMILL*® licences. ■

About OPEN MIND Technologies AG

OPEN MIND is one of the world’s most sought-after developers of powerful CAM solutions for machine and controller-independent programming.

OPEN MIND develops optimized CAM solutions that include a high number of innovative features not available elsewhere to deliver significantly higher performance in both programming and machining. Strategies such as 2.5D, 3D as well as 5-axis milling/mill turning, and machining operations like HSC and HPC are efficiently built into the *hyperMILL*® CAM system. *hyperMILL*® provides the maximum possible benefits to customers thanks to its full compatibility with all current CAD solutions and extensive programming automation.

OPEN MIND strives to be the best and most innovative CAD/CAM manufacturer in the world, helping it become one of the top five in the CAM industry according to the NC Market Analysis Report 2017 compiled by CIMdata. The CAD/CAM solutions of OPEN MIND fulfil the highest demands in the automotive, tool and mold manufacturing, production machining, medical, job shops, energy and aerospace industries. OPEN MIND is represented in all key markets in Asia, Europe and America, and is a Mensch und Maschine company.



We push machining to the limit

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