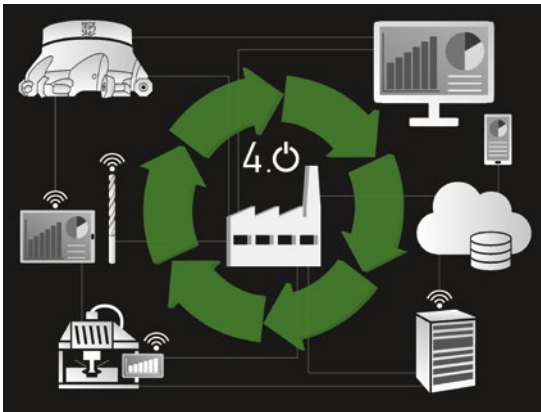


## Tech Now

### FACTORIES IN INDUSTRIE 4.0 DEMAND PRECISION TOOLS



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Smart factory combines all aspects of production.

Things are in the flux in metal processing, the operational area of precision tools. Innovative practical applications demonstrate the impact Industrie 4.0 is currently having on the development of tools and clamping devices.

By Nikolaus Fecht

Professor Dr. Diethard Thomas, Consultant at LMT Tool Systems GmbH in Oberkochen, sees Industrie 4.0 as “undoubtedly the greatest challenge currently facing industry in Germany.” For him, it is the country’s best chance of “continuing to assert ourselves against growing international competition in the future.” LMT Tools has faced up to this challenge and is developing efficient solutions that cover various modules for the cybernetworks

typical of Industrie 4.0, he says.

“Put simply, these cybernetworks are a huge jigsaw with lots of pieces, whose interfaces need to fit together and communicate with one another,” says the professor. “Some individual solutions for specific modules in precision tool technology have already reached market maturity, while others are still at the development stage. For some, it is still too early to publish specific results.”

#### More intelligent tools required

Intelligent cutting tools are essential if the cyber-physical production systems of an Industrie 4.0 factory are to be able to communicate with one another independently. “What makes a tool intelligent is the sensor technology needed to record relevant working data, such as usage time, milling cycles, forces and wear,” says Thomas. “In addition, this data needs to trigger control signals in order to regulate deviations between the actual and target values.” Actuator tools that can change their diameter would be an example here.

However, Thomas continues, it would also be possible to steer machine control, which changes parameters such as the cutting or feed speed with the help of an algorithm, in order to optimize time, cost, or quality. “The tool data is either located in a storage chip in the tool, which communicates with the machine control, or in the data cloud, with the respective tool being identified via QR code, for example,” he explains. According to Thomas, field data, settings, tool life, and service intervals can all be specified. Through movement impulses in the machine control, the cycles can be constantly recorded and compared with the maximum permissible processing cycles.

#### Manufacturing tools with 3D printing

Thomas considers the manufacture of components using generative processes – also known as 3D printing – a key module for Industrie 4.0. “It meets the main requirements in the manufacturing of complex components in small batch sizes, such as flexibility and speed, and simplifies the production process,” explains Thomas. The manufacture of precision tools also benefits from this additive production, he says. For example, single-part milling tools or the base bodies of insert tools or hobs can be manufactured generatively. “However, there is still a need for finishing the surface: such as smoothing and grinding after the heat treatment, when making tools from high-performance high speed steel,” says the expert.

But even 3D printing is just a single module in a large cybernetwork, which needs to communicate with the relevant data in other modules. To do this, the precision tool needs to be equipped with a certain amount of intelligence. In addition, it is important that a cybernetwork is able to control the use of the tool in the best possible way throughout its entire lifespan, including the subsequent grinding service, says Thomas.

### **Automated tool supply**

As part of the cybernetwork, LMT Tool Systems also offers an automated tool logistics system that supplies production with tools around the clock, without human input. "The consignment stock is defined by tailored target and reorder levels," reports the Consultant. Once this level is reached, the machine automatically triggers a requirement message to the LMT dispatcher, minimizing the effort the customer needs to put into tool dispatching. Data communication runs via the Internet or a self-contained router.

Thomas considers reporting another essential advantage. "The user is constantly up-to-date on current tool use, and knows whether the costs are getting out of control or are within acceptable limits." The system also takes care of reconditioning worn tools, he says. They are returned to the company's service box for fast and professional maintenance. Industrie 4.0 is also a key topic for Walter AG in Tübingen. Holger Langhans, Director of the Walter Multiply division, says: "It is all about information on products and tools in use and the machine parameters that have an impact on the processing of customer components." This requires information to be automatically exchanged between the interfaces of the tool issue machine, the presetting device, and the machine tool.

### **Identifying tools uniquely**

Walter is taking a step towards Industrie 4.0 by expanding its identification system for tools. The Tübingen-based company labels its tools with a machine-readable Data Matrix code. Similar to a serial number, this allows the tool to be uniquely identified. Together with the tool management system, the code makes tool management significantly simpler, says Langhans. The identification system combines tool management and production control. Once the ID number has been scanned, the user can trace exactly how the workpieces were produced and which tools and parameters were used. This means that weak points can be spotted early and process quality improved in a smart way. Two applications are currently in use by a first pilot customer. "Further pilot projects will follow this year, as well as additional functions," says Langhans.

### **The road to smart factory**

This year will also see the opening of the new Technology Center, which is equipped with five machine tools and new technologies – from turning milling to five-axis processing and high speed machining. The new center has a fully-equipped tool room for presetting, a tool warehouse, and an area for shrinking tools. "The goal is to transform this Technology Center into a smart (digital) factory and to make the latest developments tangible for our customers," explains Langhans. "Customers will be able to try out the scope of the identification system for themselves, monitor and optimize machines in real time, and get to know a wide range of apps."

### **Compatible high-performance standard**

But Industrie 4.0 also hinges on standardization. Haimer GmbH in Igenhausen is taking a step in this direction with a new interface for hard metal tool heads, which they will present at Metav 2016. Haimer licenses the system to other manufacturers in order to establish a compatible high-performance standard for screw-in mills.

"The key strengths of this interface are its stability, the tool service life, and the productivity," explains Managing Director Andreas Haimer. "The system's vibration dampening increases the tool service life significantly. It is already clear that the huge amount we have invested in this development will pay off." It is hoped that the new interface will do away with time-consuming presetting processes. In addition, the user can replace the tool directly in the machine, says Haimer.

### **Machines communicating autonomously**

The latest mega trends are also an attractive challenge for the manufacturers of clamping devices. "We are supporting Industrie 4.0 particularly with newly-developed clamping devices that can communicate with the machine tool," says Manuel Nau, Head of Sales Key Account Industry at Andreas Maier GmbH & Co. KG Schloss- und Werkzeugfabrik (AMF) in Fellbach. "We are seeing a clear trend for innovative solutions in which machines are able to communicate autonomously with the components."

Zero point clamping technology is particularly affected by this development. Using a zero point clamping system, a workpiece carrier in the form of a pallet, or the workpiece itself, can be clamped directly onto various processing machines with a deviation of just a few thousandths of a millimeter. “The advantage of zero point clamping technology is that the user can save up to 80 percent of the time for workpiece mounting.”

### **Intelligent clamping system**

This technology is frequently used when pallet replacement is automated. However, the trend towards Industrie 4.0 can only work if the clamping system is able to exchange data with the control of the machine tool. “Our clamping modules and systems comply with the latest standards and machine directives in this regard,” explains the Head of Sales. “Today, we can request all individual states related to the zero point clamping modules regularly, reliably and directly.” This means that the system can check whether important conditions, such as the status request of the “clamped” zero point clamping system or the correct position of the pallet at the start of the production process, have been met, he continues.

AMF has developed many intelligent clamping systems since 2014, with them seeing “excellent sales” according to Nau. Automation components and zero point clamping technology will be key focuses for AMF at Metav 2016 in Düsseldorf. “Just a short time ago, it was not yet possible to automate handling as comprehensively as this,” says Nau, looking back. “One of our highlights is a recent project in which we successfully equipped a turnmill center at a large German automotive parts supplier with our zero point clamping technology.” This type of machine presents a particular challenge, because the machine with its rapidly-rotating workpiece table (top speed more than 2,000 rpm) can also process components in a turning modus. There are still very few zero point systems that meet the requirements of this type of processing with such a high turning speed. “Our clamping system is one of these zero point clamping systems currently available on the market that can be used in a turnmill center like this,” explains Nau. ■

### **Further Information**

[VDMA Precision Tools](#) | [AMF](#) | [Haimer](#) | [LMT tools](#) | [Walter](#)

### **Contact**

Alfred Graf Zedtwitz, Spokesman for the Precision Tools Association, Manager VDMA Die and Mold, Business Management and Economics, E-Mail: [alfred.zedtwitz@vdma.org](mailto:alfred.zedtwitz@vdma.org)