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**Industry 4.0 requires more openness
Dialogue on digital challenges at the EMO Hannover**

***Frankfurt am Main, 12 June 2017. –*** *Despite fantastic digital opportunities, Prof. Dr.-Ing. Frank Barthelmä, Executive Director and Institute Manager of the German Society for Production Technology and Development* *(GFE – Gesellschaft für Fertigungstechnik und Entwicklung Schmalkalden e.V.) is certain of one thing: without more openness in the machine tool industry and in the user sectors involved, the digital Industry 4.0 concept is not going to pay off for small and mid-tier enterprises (SMEs) in particular. Reason enough for the Thuringian-born tool expert to use the EMO Hannover 2017 not only for acquiring information, but also for recruiting co-campaigners for digital networking.*

**Professor Barthelmä, how is the trend towards Industry 4.0 influencing metal-cutting applications?**

**Frank Barthelmä**: Industry 4.0 is influencing the process chain in two ways: firstly in terms of technology and engineering, and secondly in terms of the data flowing along it. When both of these interact to optimum effect, we obtain a textbook example for Industry 4.0. This applies in regard to quality and disturbance variables, but also and increasingly to predictable parameters such as tool paths and tool lifetimes, achievable surface qualities, and for maintenance intervals for machines and lines. Ideally, users receive all important information on the entire spectrum of process-related factors. What’s more, all data available can now be recorded and evaluated in real-time, and control loops created, so as to upgrade the efficiency of the processes and the quality of the products involved thanks to more transparent metal-cutting.

**Important role for sensors and actuators**

**How far are intelligent tools already the state of the art?**

**Frank Barthelmä**: If you remember: a bit more than ten years ago, there was an ongoing debate on whether or when a tool can be classed as intelligent. Nowadays, within the context of Industry 4.0 we are talking about intelligent holistic solutions, in which, of course, tool sensors and actuators play an important role. So when you say “state of the art”, you’re absolutely correct. Not only in terms of using increasingly miniaturised and more energy-efficient sensors or actuators in the tool itself, but also with a view to their utilisation in the overall system comprising the tool, the machine and its control system, and the application concerned.

**But how can the multiplicity of data now being acquired be evaluated to optimum effect?**

**Frank Barthelmä**: The answer to this is still in its infancy at many of our typical customers, the small and mid-tier companies. Many potential users of intelligent solutions of this kind, especially in these SMEs, are sometimes unable to assess what data they actually need in order to render their technology/IT fit for purpose, and to generate from these new production lines when needed. This extends to new business models that may prove necessary. Universities and large corporations are already well advanced in this respect, whereas many of the small and mid-tier companies are still in the exploratory phase. For meaningful analysis, moreover, a comprehensive data history is required, in order to correlate it with new key statistics: but what do we actually know about the technical wisdoms of our predecessors? So what we need here is even more collaboration between the academic and business communities when it comes to generating new ideas, models and above all new solutions. What I would like to see here, for instance, is more joint projects involving partners from the academic community and the industrial sector representing a highly disparate range of scientific disciplines, which elucidate these questions not least with the aid of live demonstrators, for example.

**Doesn’t that also mean that new network alliances have to be formed across the boundaries of sectoral and scientific specialisms – meaning collaboration between software analysts who understand nothing about metal-cutting, and metal-cutting experts who usually aren’t all that familiar with big-data analytics?**

**Frank Barthelmä**: Yes, but this is only going to work if the SMEs get involved at an early stage. The networks supported by the Federal Ministry of Economic Affairs, for instance, have proved well worthwhile in this context. For example, the GFE is currently a partner in the *SME 4.0 Competence Centre* of theIlmenau University of Applied Science, and in a model factory is addressing problems encountered with data generation and data transfer in connection with metal-cutting – for transfer especially in SMEs. The question involved here is this: how can I utilise a control loop in the machine so as to ensure that quality, efficiency and productivity can serve as controlling target variables?

**How does analysing the metal-cutting parameters make metal-cutting easier – in terms of new materials, for instance?**

**Frank Barthelmä**: In the case of new materials, especially, it’s becoming progressively more important to close the loop in the control circuits with the aid of analytics. There is still quite a bit of work to be done on the path to purposeful evaluation. There is room for improvement, too, in the transparency of the results. Here I would propose a pre-competition platform, accessible to manufacturers and users alike. I would like to see a data pool, so that everyone doesn’t have to keep on re-inventing the wheel. As a role model, I would cite a front-ranking tool manufacturer who at the “Schmalkalden Tool Conference” in November of last year promised to be more proactive than previously in terms of data disclosure. It should be noted that it’s worthwhile for a manufacturer if users learn which of his tools are best suited for efficiently machining new materials. Here, too, the GFE is making its own contribution with the *SME 4.0 Competence Centre.*

**Is there a current highlight from your work?**

**Frank Barthelmä**: Yes. The EU’s “Dyna-Tool – Enhanced Efficiency in Metal-Cutting Applications” project, supported by the German Engineering Federation’s Precision Tool Association and the research institute Forschungskuratorium Maschinenbau e.V., is tasked with investigating how vibration-stable metal-cutting processes can be designed using sensor technology in the tools and the tool holders. For this purpose, the GFE has within the framework of the project developed a sensor-integrated tool for hard machining, which thanks to direct integration in the machine’s control enables the process to be controlled well-nigh in real-time. The Dyna-Tool consortium has succeeded in putting more transparency into the metal-cutting process, so that it can be kept within defined limits for low vibrations, but at the same time is able to exploit its performative potentials to the full. What’s more, we are currently examining the integration of high-resolution metrological devices in the tool, including an interface with the control system, so as to use this to create a real-time control loop. Anyone interested can learn more about this and other projects at the EMO Hannover and its forum entitled “Innovative Solutions for Industry 4.0” hosted by the German Engineering Federation’s Precision Tool Association.

**And what does the EMO Hannover 2017 mean for you in general; where is your informational focus?**

**Frank Barthelmä**: I’m primarily interested in examples of best practice, not least in order to see where we still need to take action. In addition, I want to talk to other advocates of these ideas on more transparency, so as to already encourage them to practise mutual feedback or to give a presentation at a separate forum. I shall thus be attempting at the EMO Hannover, within the context of my networking activities, to gain additional co-campaigners for more openness and transparency in the sector.

*7,364 characters.*

*The interview was conducted by Nikolaus Fecht, specialist journalist from Gelsenkirchen*

**At a glance**

What: Forum *Innovative Solutions for Industry 4.0*

When: 18 - 23 September 2017, EMO Hannover

Where Hall 4

Organisation: German Engineering Federation’s Precision Tool Association, <http://pwz.vdma.org>

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**Status report: the EMO Hannover 2017 shows the tool industry on its way to I4.0**

For Dr. Niklas Kramer, Director Product and Industry Segment Management (Sales Area Central Europe) at Sandvik Coromant, there are three reasons why Industry 4.0 is influencing the world of metal-cutting. “Firstly, it focuses attention on the value-adding processes involved, since resource-gobbling activities around the actual production process can hopefully be automated to an increasing extent using I4.0,” reports Dr. Kramer. “Secondly, metal-cutting is a very empirically based field. The more we succeed in gaining insights either on the basis of data or by means of statistical methods, the better we shall be able to design and optimise metal-cutting processes.” Moreover, he continues, the sector (this is his third point) is nowadays exhibiting a major gap between metal-cutting research and practical applications. A modest plus in terms of system intelligence would be helpful here, whether it’s an I4.0 machine or a process monitoring system, for example, enabling better decisions to be made faster, and deviations to be detected earlier.

**Networking at the EMO Hannover**

Acquiring the metal-cutting parameters also facilitates machining – e.g. with a view to new materials. “Often they are not very amenable to metal-cutting because the empirical knowledge and the research results are not available, or we first of all have to try out the old solutions before we develop any new ones,” explains Dr. Kramer. “I believe that if we could bring together the global first tentative steps involving a new material at a single location, we would have significantly steeper learning curves. One aspect we’re generally focusing on in the context of Industry 4.0 is rapid response based on simply edited data.” Sandvik Coromant will on this subject be showcasing at the EMO Hannover 2017 design enhancements of the CoroPlus platform, which offers its users networked solutions for increased process dependability and savings in terms of design and planning. To quote Dr. Kramer: “Since 2016, quite a bit has been firmed up and design-enhanced, so we’re hoping that this time, like at the last fair, we’ll once again be able to elicit an enthusiastic response.”

**Cloud instead of a physical tool ID**

Similar developments are also taking shape in Tübingen at Hartmetall-Werkzeugfabrik Paul Horn GmbH. “In future, tool data will be acquired over the entire life-cycle,” says Markus Kannwischer, Head of Engineering and a member of the board. “This applies particularly to tools that are resharpened or retrofitted.” In these cases, all relevant geometric data shall then be transferred to the cloud; a physical tool ID is thus superfluous.

The tools are changing too: there’s an accelerating trend towards sensor technology, that in the tool, in the vicinity of the blade, acquires, processes and transmits measured values. From these data, algorithms are then tasked with drawing conclusions on machining parameters and regulating the control systems accordingly. To quote Markus Kannwischer: “Ideally, it will no longer be necessary to enter feed and setting values in the control system; rather, the tool itself will continuously send information on its condition and the control system will take appropriate action.”

**Real trials are not passé**

But the virtual future is not rendering real trials superfluous. For example, the machinability of new materials will still have to be determined by actual trials, despite simulations and analytical methods. However, the number of trials can be restricted because a better data basis is available. Generally, though, a solid basis of data will allow a tighter process window when running in workpieces involving familiar materials.

**Background**

**GFE**

The German Society for Production Technology and Development (GFE – Gesellschaft für Fertigungstechnik und Entwicklung Schmalkalden e.V.) scrutinises the entire process. It develops, improves and implements processes, products and systems, from the initial conception all the way through to small-series production. The focus here is always on the tool and its machining technology. The member of the CIRP, the International Academy for Production Engineering, has in the past 25 years successfully completed more than 1,000 research and development projects for companies. What’s more, the GFE has submitted more than 60 patents.

<http://www.gfe-net.de>

**Project Dyna-Tool**

The focus in this EU project has been on optimising milling processes for machining complex-shaped steel workpieces with a view to productivity and efficiency, process stability and reliability, plus workpiece quality. Participants in the project from the research community are: IFQ (Otto-von-Guericke University, Magdeburg), ISF (Dortmund University of Applied Science), GFE Schmalkalden, IFT (Vienna University of Applied Science), and KU Leuven (Belgium). These were complemented by users and manufacturers of high-precision tools.

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**EMO Hannover 2017 – the world’s premier trade fair for the metalworking sector**

From 18 to 23 September 2017, international manufacturers of production technology will be spotlighting “Connecting systems for intelligent production” at the EMO Hannover 2017. The world’s premier trade fair for the metalworking industry will be showcasing the entire bandwidth of today’s most sophisticated metalworking technology, which is the heart of every industrial production process. The fair will be presenting the latest machines, plus efficient technical solutions, product-supportive services, sustainability in the production process, and much, much more. The principal focus of the EMO Hannover is on metal-cutting and forming machine tools, production systems, high-precision tools, automated material flows, computer technology, industrial electronics and accessories. The trade visitors to the EMO come from all major sectors of industry, such as machinery and plant manufacturers, the automotive industry and its component suppliers, the aerospace sector, precision mechanics and optics, shipbuilding, medical technology, tool and die manufacture, steel and lightweight construction. The EMO Hannover is the world’s most important international meeting point for production technology specialists from all over the planet. In 2013, the fair attracted more than 2,130 exhibitors, and around 143,000 trade visitors from more than 100 different countries. EMO is a registered trademark of the European Association of the Machine Tool Industries CECIMO.

You will find texts and images relating to the EMO Hannover 2017 on the internet at

[www.emo-hannover.de/de/presse/pressemitteilungen/pressemitteilungen/pressemitteilungen.xhtml](http://www.emo-hannover.de/de/presse/pressemitteilungen/pressemitteilungen/pressemitteilungen.xhtml)

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