Die Welt der Metallbearbeitung
The world of metalworking

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PRESS RELEASE

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Digital photonic production is more than welding and cutting

Breakthrough for series production by the EMO Hannover 2013

Frankfurt am Main, 26 September 2012 – "The age of digital photonic production has dawned", says a gratified Prof. Reinhart Poprawe, Director of the Fraunhofer Institute for Laser Technology (ILT) in Aachen, Germany. The new era of high-performance optical technologies fits in well with the general trend towards "Intelligence in Production", the motto of the EMO Hannover 2013.

What will qualified laser experts be looking for at the world's premier trade fair for the metalworking sector? "For us, the fair is an important indicator for the possible use of lasers in machine tools", says Peter Abels, Group Leader for "Process Sensor Technology and Systems Engineering" at the Fraunhofer ILT. Here, quite a lot may happen in terms of easy-to-integrate laser technology before the autumn of 2013.

Basically, there are one or more radiation sources for every material and for wellnigh every application. "One important factor is the absorption of the material concerned", explains the laser expert. "For instance, users can machine steels or plastics very effectively with a CO_2 laser, while fibre, disk or diode lasers are also suitable for metals like aluminium and copper." The fibre-guided laser systems are well suited for automation and integration into machine tools, because they

are much less complicated to handle than a classical CO_2 unit.

Integration into machine tools

The laser has long since established itself in numerous sectors (such as automaking, aircraft manufacture or shipbuilding): in series production operations, it has been proving its worth for decades now in welding and cutting applications. As applications for the laser, Abels also sees tempering, component polishing, and the structuring of surfaces. “These functions would be easy to integrate into machine tools”, he says.

But there are good chances, too, for premiering series-production use of generative processes, which experts like Professor Poprawe group together under the heading of digital photonic production. What’s involved here is laser additive manufacturing (LAM), using a laser to create components from powder layer by layer. The pioneers here include companies from the aerospace sector, which with processes like laser metal deposition (LMD) and selective laser melting (SLM) repair and manufacture components. “This generative technique may soon be adopted for series production”, explains Abels. “This would be a major step forward for laser technology, since then individualised components could be series-manufactured too.”

He sees a total of three possible utilisation scenarios for the laser: the bandwidth ranges from stand-alone solutions (individual use), integration into existing machines and systems all the way through to digital photonic production. “The generative processes are still very much in their infancy”, observes Abels. “I could well imagine here that we arrive at a combination of selective laser sintering, for example, with other processes.” He also regards a hybrid machine as conceivable, one that uses a conventional process (such as turning) to produce a rough base body, on which a generative laser process like SLM then builds up specialised components layer by layer with a higher degree of precision.

Accelerating trend towards tailored materials

This means: the machine tool first ablates material by metal-cutting, and then adds material again layer by layer in a laser-based process. But the reverse sequence is also an option. To quote Abels: “Research projects are already

engaged in layer-by-layer creation of customised hybrid materials, consisting of plastic and metal, for example. These tailored materials can then be conventionally machined."

Digital photonic production has long since been much more than a pipedream. The Fraunhofer ILT, for instance, has addressed this subject in the Fraunhofer Innovation Cluster called "Integrative production technology (IPT) for energy-efficient turbomachinery – TurPro". In an alliance with Rolls-Royce Germany and a partnership with the Fraunhofer IPT, a laser-based process has been created in Aachen for manufacturing and maintaining components of aircraft engines (blisk: blade integrated disk).

Laser metal deposition: series production premiered

With laser metal deposition (LMD), the researchers in Aachen have succeeded in significantly reducing the production costs of blisks in comparison to conventional processes. Specifically: LMD reduced material consumption by up to 60 per cent, and the overall production time by around 30 per cent. For developing this resource-economical process, the team of researchers headed by Dr. Ingomar Kelbassa at the Fraunhofer ILT, were awarded second place in the rankings for the 2011 Ferchau Innovation Prize. Users from the aviation sector expect to begin series production of blisks with LMD shortly. To quote Abels: "So I'm confident that our institute will help to move things a whole lot further forward, especially in the field of digital photonic production – not least due to the interest being expressed by the automotive industry and other sectors."

But an auspicious future is being predicted not only in Europe: there are numerous indications that digital photonic production is also conquering the USA. Thanks not least to the densely meshed network of the Fraunhofer Institute, which works closely together with the University of Michigan, Wayne State University, Detroit, and other prestigious universities in the USA for researching and developing the field of laser technology. The goal of this cooperation is encapsulated on the website: "The paramount philosophy here is to put in place a German-American alliance based on mutually harmonised give and take.

Author: Nikolaus Fecht, specialist journalist from Gelsenkirchen

Background
Fraunhofer Institute for Laser Technology ILT
With around 370 staff and 11,000 m² of floor space, the Fraunhofer Institute for Laser Technology (ILT) ranks among the world's premier contract R&D institutes in the field of laser development and laser applications. Its core competences include developing new laser beam sources and components, laser measuring and testing technology, and laser production engineering. This includes cutting, ablation, drilling, welding and soldering, plus surface finishing, micro-production and rapid manufacturing.

EMO Hannover 2013 – the world's premier trade fair for the metalworking sector
From 16 to 21 September 2013, international manufacturers of production technology will be spotlighting "Intelligence in Production" at the EMO Hannover 2013. 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 2011, fair attracted more than 2,000 exhibitors, and around 140,000 trade visitors from more than 100 different countries. EMO is a registered trademark of the European Committee for Cooperation of the Machine Tool Industry CECIMO.

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