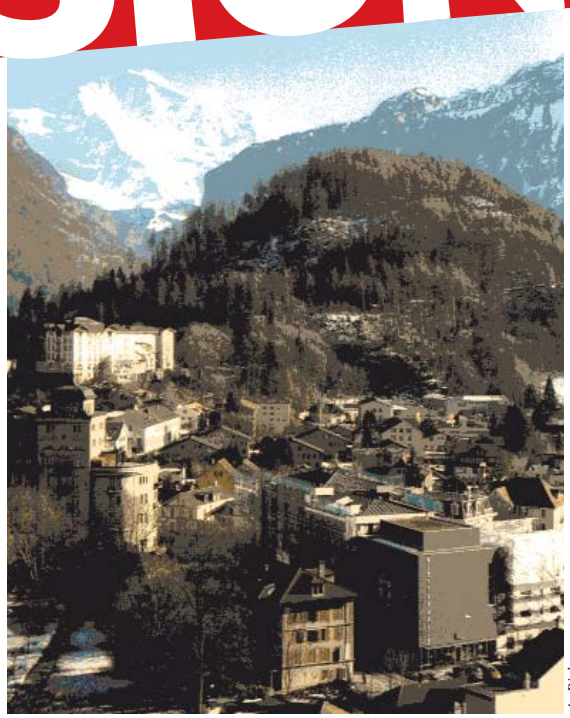
➤ BY ALAN RICHTER, EDITOR

SWISS PRECISION

The Schleifring Grinding Symposium 2005 presented the latest in grinding technology.



A. Richter

A scenic view of Interlaken, Switzerland, and the Alps.

"The grinding revolution is coming," predicted Rodger W. Pinney, president and CEO of United Grinding Technologies Inc., Miamisburg, Ohio, during the closing reception of the Schleifring Grinding Symposium 2005. (The Schleifring Group is UGT's parent company.) The symposium, which approximately 1,600 people attended, took place March 17-19 in Thun, Switzerland.

The event showcased the latest grinding technologies from brands within the Schleifring Group—Blohm, Ewag, Jung, Mägerle, Mikrosa, Schaudt, Studer and Walter—as well as grinding developments from other companies. (The symposium included technical presentations of Schleifring Group's machine tools in an exhibition hall in addition to the technical conference.) In addition to machines designed only for grinding, multitask machines, such as the Studer S242, which can grind and hard-turn chucks and shaft parts in one setup, were presented.

Technical Conference

The technical conference included 16 presentations. The topics ranged from high-speed stroke grinding to centerless grinding to combination machining to software developments.

In his presentation about high-speed stroke grinding, Christoph Zeppenfeld of RWTH Aachen, a technical university in Aachen, Germany, indicated there is renewed interest in the well-established technology, which generates thick, short chips. This is because today's efficient grinding machines are able to reduce the thermal component strain and pressurized internal stress on the workpiece that are inherent to high-speed stroke grinding. "The system is subject to tremendous loads and oscillation, so the machine must be stiff and provide damping and impulse decoupling," he said.

Zeppenfeld said the aerospace industry is driving the renewed interest in high-speed stroke grinding as parts made from gamma titanium aluminides are replacing those made of nickel-base alloys. This is because such parts are as strong as titanium ones and weigh less. However, the metallic and ceramic properties present in gamma titanium aluminides are poor heat conductors. This leads to thermal damage because energy accumulates near the workpiece surface.

With high-speed stroke grinding, the increased table feed reduces energy accumulation and residual stresses and increases surface finish quality. Zeppenfeld discussed research findings that can lead to practical results, where high-quality parts are ground quickly and wheel life is long.

"Gamma titanium aluminides have to be ground," he noted.

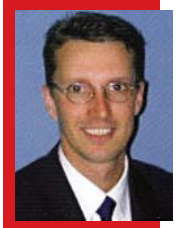
Another established grinding process that's not commonly used is centerless grinding. To shed some light on this productive but complex process, Dr. Dirk Friedrich of RWTH Aachen, presented "Centerless grinding has to be more

flexible!" With its long setup times and difficulty in maintaining workpiece roundness because the geometry among the control wheel, workpiece and grinding wheel changes as material is removed and the grinding wheel wears, Friedrich said operators need to learn to compensate for problems. "Operators go by empirical knowledge, and at some point everything works well or it falls apart."

As previously mentioned, grinding wasn't the only metal-removal process presented at the conference. During his "Procedural combination hard turning and grinding" presentation, Dr. Klaus Weinert, professor at ISF University in Dortmund's Department of Machining Technology, Switzerland, noted that, compared to grinding, turning of hardened workpieces (about 60 HRC) is more advantageous because the process is more flexible, is performed on simpler and lower-cost machines, can be done without coolant and achieves a higher metal-removal rate. "Why bother with grinding at all?" he asked.

However, Weinert said a big disadvantage to turning is the time needed for tool changes and the negative impact on the workpiece as a result of changes in the cutting force pattern. Grinding is a highly reliable process that imparts fine surface finishes. "Leverage the advantages of both—not one or the other," he recommended.

With the primary objective of producing parts at the lowest possible cost per part, Weinert suggested hard turning for removing a high volume of material and grinding for removing the heat-affected zone created when turning or imparting a high-quality finish. He added that part geometry affects the decision about whether to grind and hard-turn in a single setup. As the workpiece length increases, grinding is quicker, and turning becomes more advantageous as the workpiece diameter increases. This is because two grinding passes might be needed for larger diameters.



RWTH Aachen's Dr. Dirk Friedrich calls centerless grinding a complex yet productive process.

Dr. Klaus Weinert, professor at ISF University, emphasizes leveraging the advantages of both hard turning and grinding.

RWTH Aachen's Christoph Zeppenfeld recommends high-speed stroke grinding for grinding parts made of titanium aluminides.

Walter Maschinenbau's Christian Dilger states that "what you see is what you grind" with ToolStudio simulation software.

Fritz Studer's Wolfgang Labus emphasizes the importance of being able to integrate a grinding machine's CNC with a PC using StuderWIN software.

Software Developments

In addition to information about the machining "hardware" needed to boost productivity and reduce cost per part, a couple of sessions focused on advances in grinding software.

Christian Dilger of Walter Maschinenbau GmbH, Germany, spoke about the company's ToolStudio simulation software for tool grinding. It lets the end user experience WYSIWYG—what you see is what you grind.

The software has a multitiered interface, enabling three different experience levels to use it: machine operator, tool designer and programmer. Although the latter is able to tailor the software to meet specific needs, it's important to also provide a less-complicated interface. "The software must be easy to use due to the lower skill level of operators," Dilger said.

StuderWIN is another software development discussed at the conference. In his presentation, Wolfgang Labus of Fritz Studer AG, Switzerland, said the software was developed to create an easier and less cluttered operating mode for controlling a grinding machine, which might have five software programs, five operating systems, seven display screens and five CPUs. With the modularly structured, Windows XP-based software, fewer cables and lines are needed for data input and output.

Labus said the benefits of StuderWIN are that it enables integration of the StuderGRIND software package, reduces the number of hardware components, provides for a more flexible machine setup, offers visualization of the grinding process and integrates a PC with the CNC. Whether the CNC is from GE Fanuc, Siemens or another company, it is concealed beneath the system's standard interface and is of secondary importance for the operation of the grinder.

Labus added that the software needs to be developed further. "To date, we're unable to achieve the performance in the real world that was achieved in the office."

Of course, the symposium wouldn't have been complete without the two evening "gala" events. The festivities included plenty of delicious food and refreshing drink, performances both nights by a musical trio playing unique percussion instruments and an acrobatic/dance ensemble, as well as enjoyable company and insightful conversation. △