Gear Grinding Gets Integrated at IMTS

Matthew Jaster, Associate Editor

More than 100,000 visitors arrived to IMTS in Chicago from September 10–15, making it the strongest showing for the manufacturing technology trade show in over a decade. For those focused on gear manufacturing, the North Hall's Gear Generation Pavilion was a great place to get a head start on the competition. In just a few short steps, an eager attendee could seek out the latest grinding wheel solutions, view demonstrations of faster machine tool set-up changes and witness gear accuracy with much less noise. Machine integration was the topic of choice throughout the four halls with a focus on tooling, machine upgrades and energy efficiency.

"Attendees and customers were looking for expert partners," said Bill Miller, vice president of sales at Kapp Technologies. "Several were acutely aware they needed to add gear grinding capability. We met with a company that does not currently grind and is being considered for a huge contract involving grinding. Still another had a need to modernize their internal tooth grinding capability."

"Customers are looking for technologically cutting edge solutions at a competitive price. But above all else they're looking for process flexibility," said Enrico Landi at Samputensili S.p.A. "For us, this means providing them with advanced solutions that ensure the highest accuracy and functionality over the years without becoming obsolete over a short period of time."

"Our customers are seeking any features or capabilities that provide quality, productivity, flexibility and total cost ownership. The specific features and capabilities to facilitate these improvements will vary by supplier, process and machine type," said Al Finegan, director, marketing at Gleason.

"Customers were looking for possibilities to improve their grinding times without sacrificing gear quality. Further discussions centered on how to reduce the tool costs per part. Finally, for manufacturing of high-end gears, the possibility to grind twist-free or with special twist was what our customers were looking for," said Andreas Mehr, technology development engineer, at Liebherr.

At the Reishauer booth, Dennis Richmond, vice president said, "Most manufacturers I spoke to were looking for total process responsibility from a single source, meaning one supplier for the machine, dressing tool, grinding wheel, process parameters and tool management."

The G 250 from Samputensili has been developed for top-quality and efficient mass production of gears with outside diameters up to 250 mm and shafts with lengths up to 500 mm (courtesy of Star SU).

A Strong Single Platform

Faster setup times, higher productivity and maximizing machine utilization are concepts that were often discussed during IMTS.

"It's apparent that gear grinding technology is following the path of integrating multiple processes into a single machine platform," said Kapp's Miller. "It is not easy to do this well and even harder for attendees to evaluate."

"At Samputensili we address the needs of two very different sectors: the automotive field and job shops," Landi said. "Automotive customers are constantly striving to improve productivity and process integration, whereas job shops especially focus on process flexibility. Guaranteeing flexibility means continuously investing in research and

On the LCS 500 gear grinding machine, Liebherr displayed a type of error-proofing called *Collision Control* which many attendees found valuable (courtesy of Liebherr).

development, accurate project flexibility and quality workmanship."

Finegan at Gleason believes machine integration and multifunctional capabilities are long-term trends that will be the focus for the foreseeable future. "Customers are seeking profile grinding, continuous (threaded wheel) grinding, and other combinations of both on the same machine. In addition, on-machine gear inspection, wobble compensation, digressive infeed, adaptive grinding and other features and capabilities, all which positively affect quality, productivity, flexibility and total cost of ownership," Finegan said.

Kapp's ZX 1000 features a large ductile iron bed and torque motor for high load capacity (photo by David Ropinski).

Höfler is well known as a supplier of form grinders and showcased its first grinder for the threaded gear grinding method during IMTS. Both form grinding and threaded wheel grinding can be utilized on the Rapid 1250 W, giving it an advantage in the machine integration process. Additionally, the Helix 400 SK boasts the ability to utilize two different grinding wheels in one setup. This is a significant advantage for customers demanding high quality levels with two different gears.

Gear Grinding Tech

The emphasis on innovation at IMTS had exhibitors showing off their latest grinding capabilities with booth demonstrations, video displays and application and design engineers on-hand to answer questions. Here are a few gear grinding highlights from the show:

Mitsubishi Heavy Industries featured the ZE40A, a universal gear grinding machine capable of numerically controlled (NC) high-precision machining of post-heat treatment gears. The ZE40A was designed for both table and grinding spindles and offers gear accuracy within its diameter capacity of 400 mm.

"Liebherr's new fast dressing process on the LFG 1250 profile grinding machine, especially the second dressing spindle offering up to two times faster dressing times, was of great interest to our customers," said Mehr. "A further time saving option on this machine is the possibility to grind with a high speed axial feed rate of 18,000 mm/min. With this value the LFG is ready for the future, when new abrasives will achieve higher Q-prime (Q'w) values."

On the LCS 500 gear grinding machine, Liebherr displayed a type of error-proofing called *Collision Control* which many attendees found valuable. "This software feature reduces or eliminates damage between the tooling and other machine components like clamping fixtures, etc. Also the workpiece is saved from harm. Heavy and expensive machine crashes, often caused by mistakes in programming or manual jogging of axes, are avoidable with this Liebherr-developed system," Mehr adds. All CNC-axes can be controlled with the *Collision Control* software. This software is not only available for Liebherr gear-grinding machines, but also offered on Liebherr

gear hobbling and shaping machines as well.

The RZ 60 on hand at IMTS in the Reishauer booth was optimized for automotive applications. The machine's structure was based on the larger RZ 260 model, allowing for aggressive grinding parameters without negative effects on workpiece quality. "The RZ 60 was being loaded by the Felsomat FSC 600 loader," Richmond said. "We were grinding a 23-tooth pinion in just under 12 seconds floor to floor; do the math, that's five parts per minute!" High spindle speeds (3,000 rpm) make it possible to spin the grinding oil off the part during the turret rotation when the grinding operation is completed. All axis movements have been optimized to reduce unproductive cycle segments. With the assistance of the FSC 600 loader, the RZ 60 can exploit high productivity and operate autonomously without operator intervention and the system can be integrated into the Reishauer and Felsomat FlexLine.

At Kapp Technologies, Miller noted that customers were drawn to the technology of generating grinding that the company showcased. "Our new KX100 Dynamic drew huge interest for the integrated loading and setup time savings," Miller said. Additionally, the company featured the KX 500 Flex incorporating an indexing table with a direct-drive work spindle, tailstock support and dressing spindles. The ZX 1000 was also on the show floor, boasting a large ductile iron bed and torque motor for high load capacity.

Using video and other media, Gleason promoted both its bevel and cylindrical gear grinders including its wobble compensation technology that addresses the time consuming step of manually aligning the workpiece. Gleason wobble compensation technology allows customers to maintain and in some cases improve the quality of their grinding operations while simultaneously improving production throughput. This improves the quality, enhances operator performance and reduces overall fixture costs.

Improving its existing sales and service activities in North America has been a priority for Höfler. Ralf-George Eitel, CEO of Höfler America Corp., emphasized as much during the exhibition.

Kapp's ZX 1000 shares common machine elements and software with the KX 500, and comes standard with the same process flexibility for profile or generating grinding (photo by Dave Ropinski).

"Höfler customers benefit from the continuous engineering and sales support that we provide, particularly when flexibility is a priority. Our engineers travel and assist with customers long after a machine has been sold."

At the Star SU booth, Landi said that Samputensili registered positive feedback for its vertical grinding machine, the G 250. The G 250 has been especially developed for very low cycle times and for top-quality and efficient mass production of gears with outside diameters up to 250 mm and shafts with lengths up to 500 mm. The secret behind the machine's efficiency is the dual work spindle concept, which eliminates non-productive auxiliary times almost completely. By means of the dual work spindles, the loading/unloading process of a workpiece is carried out in masked time, while simultaneously the manufacturing process proceeds on another workpiece. The G 250 can equally use form and worm grinding wheels, both in ceramic and in electroplated CBN.

Market Trends for 2013

Though Miller notes that investments seem to pause during major elections, he believes the gear manufacturing market is in a good place. "Most forecasts point to a strong aerospace market. Other than wind energy and mining, our customer base seems to be operating at a strong and sustainable level."

"Customers from mining, heavy equipment, energy and automotive were present at our booth," says Scott Yoders, vice president sales at Liebherr. "A highlight feature for coarse-pitch gearing was the automation of heavy parts. For example, on the LCS 500, a ring loader with high payload capacity was shown. This ring-loader design is actually installed and in production for gear applications up to 800 mm and 1,000 kg."

"In today's uncertain and tumultuous global economy, where markets experience strong growths as well as sudden halts, we need flexible products, i.e. products that can be easily configured according to the particular needs of that application," said Landi. "Thanks to the flexibility of our grinding machines, we can supply any manufacturer of gears, shafts, screws and rotors, no matter what market they are active in."

Richmond at Reishauer added, "Automotive and tier one suppliers will continue to use a lot of our manufacturing capacity in the near term; these projects can have multiyear impacts from initial concept to installation and implementation."

Several machine demonstrations during IMTS solidified what the manufacturing industry is trying to accomplish regarding machine integration: Smaller equipment that handles multiple operations, easier setup changes and simpler operations and maintenance procedures. Add to the mix strong service and training support and you've found the blueprint for future success in gear grinding. "Customers are struggling to find trained personnel," Miller said. "Setup time is a huge variable of equipment utilization and that focus will continue. Equipment reliability, expert training and support are perennial requirements."

"Our customers attach an ever increasing importance to process automation," said Landi at Samputensili, "which is and will be a strategic feature in gear grinding for years to come."

Sidebar: IMTS Impressions

Now that gear industry suppliers have returned from the trade show circuit, *Gear Technology* was curious what they thought about IMTS 2012:

"We were very pleased with the traffic in our booth and it was evident early on in the week that attendance for this year's show had jumped significantly over 2010," said Mark Parillo, director of marketing at Star SU. "The general pulse of our visitors was very positive leaving us with many reasons to be encouraged heading out of IMTS and into the coming year."

"IMTS was well attended and the weather always seems to cooperate to make this a significant week," said Bill Miller, vice president of sales at Kapp Technologies. "I can only assume the other gear pavilion exhibitors were also satisfied, although our booth activity didn't permit even a short tour."

"We found IMTS 2012 to be generally positive and upbeat, although it seemed like overall attendance dwindled as

The MHI ZE40A was designed for both table and grinding spindles and offers gear accuracy within its diameter capacity of 400 mm (courtesy of Mitsubishi).

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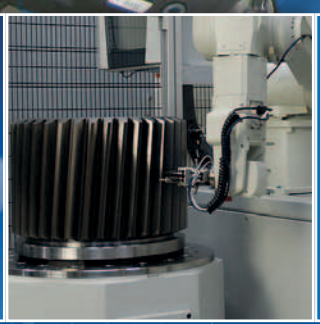

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the week wore on," said Al Finegan, director of marketing at Gleason. "The gear pavilion included most of the major suppliers of gear manufacturing technology, but it continues to shrink through industry consolidation and cooperative relationships."

Total registration for the six-day event was 100,200, which is a 21.6 percent increase over 2010, marking the largest show-to-show increase ever for IMTS. Additive manufacturing, multi-spindle machines and multi-tasking machines were stars on the show floor. The productivity improvements and accuracy showcased by dozens of exhibitors with new offerings in multi-spindle and multi-tasking machines and automation drew serious attention.

"The energy level among visitors and exhibitors was at an all-time high," said Peter Eelman, IMTS vice president – exhibitions and communications. "The most exciting take-away from IMTS 2012 is what it says about the prospects for manufacturing over the next year. The overall activity and buzz indicates that we are entering a period of sustained growth that will fuel economic prosperity and job creation. Visitors came to find solutions and innovative approaches to their manufacturing challenges."

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