

## SNEAK PREVIEW

There's a bustle of activity as exhibitors prepare for America's most significant manufacturing trade show. The red carpets are ready, the lights are being tested, and the crowds are gathering with anticipation. Amid the excitement, Gear Technology has managed to sneak under the usher's ropes to provide you with this advance look at some of the gear-related products and technologies that will be featured at IMTS 2004.

#### New LMT-Fette Tool for Chamfering/ Deburring in the Hob Machine



LMT-Fette will introduce a new chamfering/deburring tool for use in hob machines, a new tool steel and two new coatings.

The new tool is called Chamfer Cut. It allows gear manufacturers to produce consistent chamfering and deburring of parallel-axis gears, both spur and helical.

Darryl Witte, product manager–gear tools, says Chamfer Cut will allow gear manufacturers to reduce the many hours that manual deburring takes and reduce high blired abamfar measures and their tools

costs associated with specialized chamfer machines and their tools.

The tool steel is PM35 tool steel. The functional coatings haven't been named yet. The steel can be used in wet and dry cutting applications with an operating speed range of up to 350 meters per minute. All three products are designed to maximize tool life in production gear cutting.

"We are pushing the envelope as to how fast and productive PM HSS materials can run," Witte says. "In some cases, our new PM35 HSS material is running quite close to cutting conditions once reserved for carbide."

Also, LMT-Fette will feature the increased capabilities of its HDR hobs. The hobs have been optimized for roughing and finishing operations to save time and cost. The hobs' range is now as fine as 6 DP.

The company will also feature shank-type tools with quick-change HSK hydraulic chucks for ease of set-up and increased accuracy on later-model hobbing machines. The idea behind the tools is to allow customers with multiple machines having different spindle clamping mechanisms to use common shank-type tooling.

"Previously," Witte says, "these tools would need to be bore-type hobs and have a greater chance to introduce runout to the tool or [would need] specialized tools for each machine."

Since IMTS '02, LMT-Fette has implemented a new business model to increase its attention to detail and its turnaround for providing tools, from concept to final delivery.

Witte says this model should provide many benefits to new and existing customers.

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#### Chromium: The Base of Balzers' New Tool Coating

Balzers Inc. will unveil a tool coating that can be used on hobs and features increased wear resistance. The coating, Balinit<sup>®</sup> Alcrona, is the first of the new G6 coating generation developed by Balzers.

Titanium has been the base of benchmark coatings such as TiAlN, TiCN or AlTiN. With Alcrona, Balzers has developed a coating based on chromium. The coating's formula is in its name; Alcrona is AlCrN, an aluminium chromium nitride.

Dennis T. Quinto, Balzers' technical director, calls Alcrona the "cornerstone" for its new generation of PVD coatings and says it'll open "a new productivity dimension in machining."

Quinto emphasizes Alcrona's wear resistance, which he calls "unrivalled" and which result from two main features, the coating's hot hardness and oxidation resistance.

As a Balinit coating, Alcrona is designed for dry and wet machining of unalloyed steels as well as steels of high strength and high hardness (up to 54 HRC).

Balzers is a leading global supplier of hard and lubricant PVD coat-

ings for improving the performance and service lives of precision parts, metalworking tools and plastics processing tools.

Balzers offers coating systems, turnkey production lines and contract coating services through its network of 57 coating centers in Europe, North and South America, and Asia.



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#### Euro-Tech: New Coatings on Chucks, Arbors, Master Gears

Euro-Tech Corp. will feature Wolfram carbide coatings on its Mytec chucks and arbors and feature a new generation of chamfered, coated master gears.

The carbide coating provides chucks and arbors with a sleeve hardness of 72 HRC to decrease wear and can be applied to the expansion

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#### IMTS COVERAGE

area only to decrease costs. According to Jerry Kowalsky, Euro-Tech's president, another advantage of the coating is extreme holding power with a minimum amount of expansion.

Made by Frenco GmbH, the Chaco master gears allow gear manufacturers to perform single- and doubleflank gear rolling inspection



as an integrated process in production.

Kowalsky says this integration saves time and money.

The coated master gears offer protection against wear and corrosion. They're also harder and provide manufacturing tolerances meeting the exacting demands placed on modern master gears. Tolerances were selected with DIN standards in mind.

Euro-Tech represents a number of European-made gages and tooling products, such as arbors, chucks, drills, taps, measurement systems and accessories.

Mytec GmbH is a leading manufacturer of fully brazed, ruptureproof construction hydraulic expansion clamping tooling.

Frenco provides shop-floor measuring equipment in the gear and spline fields.

Euro-Tech Corp. (Booth E-2672) N48 W14170 Hampton Ave. Menomonee Falls, Wisconsin 53051 U.S.A. Phone: (262) 781-6777 • Fax: (262) 781-2822 E-mail: info@eurotechcorp.com • Internet: www.eurotechcorp.com

#### Saint-Gobain Rolls Out New Abrasive Wheels



Saint-Gobain Abrasives will unveil five new products: two lines of bonded abrasive wheels, two lines of superabrasive wheels, and a line of coated abrasive belts.

The two lines of bonded abrasives consist of the XGP line and Altos® creepfeed wheels. The XGP line is

designed to lower cost per part. Its products hold their forms better than other conventional fluting products. Less required dressing permits higher metal removal rates, longer wheel lives, tighter part tolerances, and lower grinding power, according to Barry Cole, Saint-Gobain Abrasives' manager-industrial marketing & marketing communications.

The Altos wheels use an extruded ceramic grain with high lengthto-diameter ratio. Cole says these wheels have a more consistent open structure for more effective coolant flow and better chip clearance and can reduce cycle times up to 50 percent and increase the number of parts produced per wheel by three to four times.

The superabrasive lines are T2 wheels, which are vitrified CBNs, and Univel DC wheels.

The T2 line is designed for high-volume, precision ID and OD grinding for a range of ferrous parts, including cast iron, steel, powder metals and high-nickel alloys. Applications range from automotive camshafts to fuel injectors and aerospace jet blades.

The new Univel DC wheels are designed to maximize productivity of CNC grinders and thereby lower total grinding and finishing costs. Cole says the wheels' bond has a cool cutting capacity, which allows the wheels to maintain their grain longer, increasing the number of parts per dress and total parts per wheel.

According to Cole, operators can increase infeed rates up to two times to reduce cycle time without loading the wheel or damaging the cutting tool.

The fifth new product is the Norax line® of coated abrasive belts.

These fine-grit products have abrasives and bonds that can be formed in 3-D structures. According to Cole, these structures offer multiple patterns that can increase life, increase cut rate, improve surface finish and improve stock removal efficiency.

"Norax products are uniquely suited for finishing high value-added robotic grinding applications, many of which are used to replace offhand manual finishing applications," he says.

Saint-Gobain Abrasives will feature its sensors and measurement abilities and how they can help customers.

Since IMTS '02, Saint-Gobain Abrasives has increased its ability to measure and analyze the grinding process to support customers.

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#### Bryant Grinder: Bringing in the New, Showing Off the Improved

Bryant Grinder, a division of Vermont Machine Tool, will unveil two new grinding machines, the UL2 and the B+. Both models include Fanuc linear motors and controls. Also, the B+ has extended travel, three inches along both the x- and z-axes.

The grinding ma-



chine manufacturer will feature two other machines, two newly designed Bryant grinders, and Bryant high speed motorized spindles and dressing systems.

In the past two years, Bryant has improved its existing technologies by including sensors and linear drive systems with its existing hydrostatic way system. Moreover, all new Bryant equipment with GE Fanuc controls will incorporate Ethernet capabilities for direct factory support for software and electrical diagnostics for troubleshooting and overall

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#### The Gearless Hydrostroke: Bourn & Koch's State-of-the-art Upgrade of the Classic Fellows Machine Will Be on Display at IMTS 2004.

#### by Dr. Bob Winfough, Engineering Manager, Bourn & Koch



The Gearless Gear Shaper<sup>™</sup>, also known as the new generation HS650, is an electro-mechanical machine that takes advantage of the heart of the Hydrostroke<sup>™</sup>, integrated with state-of-the-art CNC control, digital motors and drives and application of control system theory, structural dynamics, improved mechanical design and strategic use of materials. Also, a value engineering approach reduced the number of parts in the machine by more than 50%.

The new generation HS650 vertical shaper integrates all of this technology to provide a modern, robust solution for shaping gears. See Table 1 for a physical description of the machine.

#### Stroke Axis: The Hydrostroke Edge

Key Hydrostroke technology has been integrated into this new generation shaper. The Hydrostroke advantage—the quick return action that made the older generations of machines so productive—is still at the heart of the new machine. However, the new generation HS650 integrates positioning, stroke and return ratio settings into a single axis, which allows for simplified end-user setup and increased programming flexibility.

A linkage attached to a rotating shaft drove previous generations of the Hydrostroke spindle. This arrangement made it difficult to estimate true cutting performance. The new arrangement allows the Hydrostroke to be led by a linear actuator. This actuator is a high-force linear motor provided as a complete package from the CNC provider.

Another benefit of the Hydrostroke is concentric force loading on the spindle, providing less wear and damage to spindle support bushings. The Hydrostroke also allows for direct measurement of the cutting pressure by reading the load sensor, which itself is used to adaptively control the supply pressure for energy efficiency.

The new design is compatible with previous tooling, including the 50-8, FS630-200 and similar models.

#### **CNC Guide**

The new Gearless Gear Shaper provides a gearless CNC guide as well. To date, CNC guide technology hasn't allowed gear shapers to be used for high production. The technology can't pro-

duce helical gears at a rate as high as a dedicated mechanical guide system. The CNC guide of the Gearless Gear Shaper has been designed to match the high stroking speed of the Hydrostroke with a high-performance rotary action, which helps maximize productivity.

The Gearless Gear Shaper can also meet high production demands by using dedicated mechanical guides that can be integrated to get maximum utilization for full production requirements. Having the capability to utilize both the CNC guide and rigid guides allows the high-production manufacturer to do proof-ofconcept work on new gears, satisfy early production requirements and specify the final helix requirements in the design cycle. This allows a strategic overlap between the end of previous production and the ramp-up of new product. This also allows smaller volume production shops to use the CNC guide exclusively.

A high-precision, high-stiffness bearing—allowing the hightorque digital integral motor to rotate the spindle to perform highspeed helical motions—supports the Hydrostroke cutter spindle. The arrangement takes advantage of common components on previous generations of Fellows machines, making spare parts more readily available and minimizing the customers' inventory and spares costs.

#### Oriented Stiffness, Simplified Back-Off<sup>™</sup> and CNC Roll-Over<sup>™</sup>

The Gearless Gear Shaper is also a cam-less gear shaper. On previous generations of machines, back-off cams, bearings and spring tension required substantial maintenance cost and caused setup difficulties. The HS650 was designed to simplify the operation, maintenance, assembly and manufacture while providing increased capability. As a result, cams, rotary bearings and spring tension required in most gear shapers have been eliminated. The new arrangement provides stiffness in the proper orientation to allow the required rotations without the use of bearings or expensive, hard-to-maintain cams. Additionally, the orthogonal directions provide increased stiffness in the direction required to

#### Table 1—The Gearless Gear Shaper, Model HS650-200 from Bourn & Koch

Capacities	Metric (mm)	Inch (in.)
Nominal Pitch Diameter External	650	25.6
Internal Rated Pitch	635	25
Spur Helical	12.7 MOD 12.7 MOD	2 DP 2 DP
Max. Gear Face Width Max. Helix Angle	200 40 De	8.0 eq.
Min. Center Distance Max. Center Distance	-10 700	-0.39 27.6
Max. Part Swing Max. Strokes per Minute	1,000 500 s	39.4
Ninx. Otrokes per Winate	0000	pin
Length	5,334	210
Height	3,125	123
vveight (kg/ib)	13,600	30,000

oppose cutting forces.

When switching from an internal gear to an external one, there is no need to reverse or "roll over" the cam. This is now handled entirely by the CNC program. The user has only to program a negative motion by adding a minus sign.

Constructed with an oriented stiffness design, the axis is attached to a high-force linear actuator. The design allows for a large force amplifier, enabling extremely high force to oppose the potentially large cutting load.

#### **C-Axis Table Construction**

The machine's table was also redesigned to accommodate a high torque digital motor assembly integrated with a high precision rotary encoder, providing up to 250 times the rotational accuracy when compared with traditional worm and worm wheel setups. Combined with the CNC guide axis, which is more than 100 times more precise than the corresponding worm, this will provide for more precise location of the cutting edge. Other advantages of the new design include no backlash, no worms and no worm wheels, while maintaining the previous features of throughthe-spindle chip evacuation and an internal work clamp cylinder.

#### **Vertical Positioning Axis**

The HS650 has been designed with a gantry twin ball screw arrangement to allow the user to reposition the cutter spindle via the CNC part program. The motion range is 300 mm long and allows the user to move the cutter spindle slide housing up and down to accommodate different gear locations along a shaft or perhaps multiple gears on the same shaft when integrated with a tool change.

#### **In-Feed Axis**

The in-feed axis has been constructed to allow quick access to parts through a standard ball screw transmission with a direct coupled servo motor. The axis has been constructed in a manner to allow the addition of an extension riser and also for manual introduction of cutter rub movement.

#### **Overall Machine Improvements**

#### **General Machine**

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#### capability.

"We've made technological changes with linear motion and control," says Craig B. Barrett, Bryant's president and CEO, "and sensors embedded into the machine which can predict machine failure or machine problems prior to failure.

"We have also reduced overall price of all our Bryant product lines."

Bryant Grinder provides grinding machines designed for high productivity and precision and offers remanufactured machine tools.

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#### A New Alliance: Kapp-Koepfer

The Kapp Group will join Koepfer America LLC in presenting for the first time a Koepfer-Kapp machine for hard finishing external spur and helical gears up to 120 mm in diameter.



The jointly developed machine fills

the gap between skiving on gear hobbing machines and generating grinding on specially designed gear grinding machines, says Tom Lang, Kapp Technologies' vice president and general manager.

Based on Koepfer's model 200 gear hobber, the machine has a high-speed grinding spindle and can perform continuous generating grinding and single index form grinding. The machine uses Kapp nondressable tools, with Koepfer's automation and magazine systems completing the new system.

Also, responding to customer requests, Kapp developed a new gear grinding machine able to perform continuous generating grinding and single index form grinding.

Kapp Technologies will introduce this new machine, the KX300P, at McCormick Place.

"This dual capability makes this machine perfect for job shops that run low volumes or prototypes using the form grinding process," Lang says, "or serial production facilities that produce hundreds or even thousands of parts."

The KX300P can be automated and fitted with integrated inspection.

Kapp will feature plated grinding tools and announce their increased availability, too. Kapp has increased capacity at its manufacturing facility, allowing it to expand its delivery of CBN products from just Kapp equipment owners to the entire gear industry.

Since IMTS '02, Kapp has added grinding with globoidal CBN grinding worms to its offerings and extended its Coroning<sup>®</sup> process by coroning without crossed axis angle for finishing shoulder gears and similar parts with limited geometric characteristics.

It's also continued to upgrade its machines to Siemens 840D control systems so all Niles ZP and ZE series machines now use this control, complete with Siemens digital drive technology. All new Kapp KX and CX series machines also use the 840D, direct drive tool and work spindles, and Siemens digital axis drives.

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#### IMTS COVERAGE

Kapp Technologies manufactures gear grinding machines, including profile and worm grinding machines and honing machines. It also manufactures grinding tools, such as grinding wheels and worms and honing tools.

Kapp Technologies (Booth B-6931) 2870 Wilderness Place Boulder, Colorado 80301 U.S.A. Phone: 303-447-1130 Fax: 303-447-1131 E-mail: sales@kapp-usa.com Internet: www.kapp-usa.com

#### New Software, New Models: M&M Expands Capabilities

M&M Precision Systems Corp. will display its new eDRO data interface system with one of its Dimension Over Pins gages.

eDRO collects data in real time for today's networked process control requirements using Ethernet, RS-232 or serial connections or a removable memory media.

"The system offers the ability to configure part-specific tolerances, machine-specific data trends, calibration routines and display pass/fail results to the operator," says Douglas Beerck, M&M's general manager.

Also, Sigma and MicroTop CNC gear analyzers will display new software features, such as new non-gear inspection capabilities for people who want a more universal solution to four-axis measuring requirements.

M&M will also feature CNC gear analyzers and tabletop roll testers, as well as information on its fully automatic and semi-automatic gear roll testers, DOP gages, spline gages and master gears.

Since IMTS '02, M&M has improved its existing products by adding two new models to its Sigma series of CNC gear inspection systems. The Sigma 10 and Sigma 15 systems measure gears with diameters up to 1 meter and 1.5 meters, respectively.

Responding to customers, M&M obtained A2LA certification for its gear certification laboratory.

Also since IMTS '02, M&M has added a line of automatic and

semi-automatic gear roll testers. And M&M's new eDRO system has its own microprocessor, so it can be obtained as a standalone unit for interfacing to a variety of gages and micrometers.

M&M manufactures specialized inspection and gear manufacturing process control systems for all types of gears.



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#### IMTS COVERAGE

#### First Time in America: Reishauer's New Gear Grinder

Exhibited for the first time in the United States will be a twin spindle gear grinding machine, new from Reishauer Corp.

Model RZ 150's work spindles are direct driven with digital servo motors. The machine itself takes up 54 square feet of floor space.

Dennis Richmond, Reishauer's vice president, says this footprint makes the RZ 150 "one of the most compact gear grinding machines on the market today."

Reishauer will also exhibit a variety of diamond and CBN tools used in manufacturing gears.

Since IMTS '02, Reishauer has made technical improvements to its products, but it also increased productivity and quality by developing other ways of hard finishing gears. According to Richmond, these ways essentially change the thought process used to grind gears.

"The use of such 'tools' as multi-start grinding wheels, our cool



cutting meth-od and LNS (low noise shifting) have allowed us to make dramatic gains," Richmond says.

Reishauer sells gear and thread grinding machines and diamond tools. It also provides new and used machine tools.

Reishauer Corp. (Booth B-7005) 1525 Holmes Road, Elgin, Illinois 60123 U.S.A. Phone: (847) 888-3828 Fax: (847) 888-0343 E-mail: *reishauer@reishauer-us.com* Internet: *www.reishauer.com* 

## Credit Where Credit is Due

The article titled "A Model of the Pumping Action Between the Teeth of High Speed Spur and Helical Gears," which ran in *Gear Technology's* May/June 2004 issue, was previously published in VDI-Berichte NR.1665, 2002.

The article called "Evaluation of Bending Strength of Carburized Gears," also in *Gear Technology's* May/June 2004 issue, was previously published at the JSME International Conference on Motion and Power Transmissions held November 15–17, 2001, in Fukuoka, Japan.

#### Combining Turning and Grinding: United Grinding's New Machine

Among 11 displayed grinding machines, United Grinding Technologies Inc. will have a new machine of interest to gear industry professionals, the Studer Schaudt Stratos M, which combines grinding and hard turning in one platform.



Dave Barber, United Grinding's marketing manager, says combining processes into one machine is a due to customers' needing to produce parts in a lean environment where one machine completes multiple tasks.

"Done in one' is the catch phrase of the past two years," Barber says, "and the products of United Grinding address this need."

The Stratos M features a vertically mounted spindle that also acts as a loader. The first operation is "hard turning," in which the machine can be configured with up to three turning tools on separate posts or up to 8 turning tools in an indexable turret. The turret can also be specified with live tooling, allowing for light milling operations.

The second operation is grinding, both ID and OD. First, a part's ID features are ground, followed by OD features. Automatic dressing is mounted to the right of the spindle, for easy access.

Also, United Grinding will display the first Studer Autoloader, which can be integrated with most of Studer's line of cylindrical grinders.

Since exhibiting at IMTS '02, United Grinding has improved overall productivity by adding linear motor technology to the table of surface and profile grinders, developing integrated loaders, and improving the software that drives the controls.

"Basically, customers are not in a great need for increased capacity," Barber says. "Instead they need improvements to productivity to compete in the world market."

United Grinding produces grinding machines, specializing in precision Swiss and German machine tools that meet grinding needs, from tool and cutter, surface, profile, and creepfeed grinding to all types of cylindrical and non-cylindrical grinding.

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