Finish Hobbing Crowned Helical Gears without Twist

A machine operator mounts a gear blank in a hobber. A few moments later, he removes the workpiece, a crowned helical gear that has been finished, deburred and chamfered—and that has no twist.

This combination of operations is possible using a new product available from LMT-Fette Inc. The product is a tool system that consists of a roughing hob, a set of deburring and chamfering tools, and a finishing hob, all mounted on one arbor.

The finishing hob is the tool that removes twist from gears. Called a "twist-free hob," the tool was designed for high-volume production of the same or similar gears. Jointly developed by the Liebherr Group and Fette, the tool can be made to hob external spur or helical gears without twist, also called profile bias.

Twist is a defect that can result in more gear noise and less load carrying capacity. The defect is caused by large tapers or crowning, especially on helical gears. Twist occurs on both spur and helical gears, but it's negligible on spurs.

In the past, twist was corrected via finishing operations. "This correction has been done in grinding for a while," says Reinhold Cordella, a regional sales manager for Liebherr Gear Technology Inc. in Saline, MI. Other finishing methods for removing twist included shaving and honing.

The twist-free hob, however, eliminates the defect via its modified profile and its diagonal movement across gear teeth. The hob's modification is a gradient change in its profile. This change is synchronized with diagonal hobbing so the tool can both finish hob and compensate for twist in the same operation.

In principle, the twist-free hob can be used on any hobber capable of diagonal hobbing, says Oliver Winkel, application engineer–gear cutting for Liebherr Verzahntechnik GmbH of Kempten, Germany.

During operation, the hob head swivels to different angles to rough hob, to deburr and chamfer and to finish hob, so the lead and helix angles are correct for the two hobs and the lead angle is also correct for the deburr-chamfer tools.

To speed up this process, the hobber should have a quicker-than-usual A-axis, Winkel says. He adds that hobbers can be retrofitted so the A-axis can achieve the necessary speed.

The tool system can accommodate its three tools via the twist-free hob. That tool is a shank-type hob with an integrated arbor. A roughing hob and a set of Fette's Chamfer Cut tools can then be mounted on the arbor.

The tools were combined on one arbor to increase production efficiency. They were also combined to save money on separate machines for deburring, chamfering, grinding or shaving and to save money on shaving tools and grinding wheels.

Manufactured by Fette, the twist-free hob tool system was introduced in September, at EMO Hannover in Germany, on a Liebherr hobbing machine with direct drive technology. A month later, Fette exhibited the tool system at Gear Expo 2005 in Detroit, MI.

The set of Chamfer Cut tools can be made to deburr and chamfer either external spur or helical gears. The tools deburr and chamfer the roots and side edges of gear tooth flanks. To use the tools, a hobber needs tool spindles able to turn in both directions and special software from the hobbing machine's manufacturer.

However, gear manufacturers need large shifting ranges on their hobbers to use the Chamfer Cut tools. The tools reduce shifting ranges, thereby reducing hob efficiency, so Winkel suggests hobbers with shift ranges of 180–300 mm. That way, the machines aren't as affected as ones with smaller ranges.

Like other roughing and finishing hobs, this tool system can save gear manufacturers' money compared with the cost of using a hob for both roughing and finishing in a two-pass hobbing process. The savings come from increased tool life for both the roughing and finishing hobs.

Specifically, the two hobs can be designed independently, so each has the optimal number of threads, number of gashes and specific tooth design. Consequently, the roughing hob can be designed for optimal cycle time without worrying about the workpiece's final profile quality. Also, the roughing hob has a longer life in production use than a combined roughing and finishing hob.

"The roughing tool can be used to normal wear points without having to stop production and recondition the tool when the quality of the finished profile would be in question," says Darryl Witte, product manager–gear tools for Fette's operation in Cleveland, OH.

Moreover, the finishing hob can be optimized to create a quality profile and can be made of alternate material to increase hob life. As Witte says: "The finishing tool far exceeds existing production amounts per sharpening as that tool is no longer cutting the root or roughing the gear."

Also, the tool system can solve problems that some gear manufacturers have with carbide hobs used for both roughing and finishing because of their limited stock removal and their rate of breakage due to the roughing process.

The tool system can be made with any combination of the three tools, and the finishing hob can be made with or without the twist-free feature.

For more information:
LMT-Fette Inc.
18013 Cleveland Parkway, Suite 180
Cleveland, OH 44135
Phone: (216) 377-6130
Fax: (216) 377-0787
E-mail: *lmtfette@lmtfette.com*
Internet: *www.lmtfette.com*

Zero-Max Debuts Keyless Shaft Locking Bushings

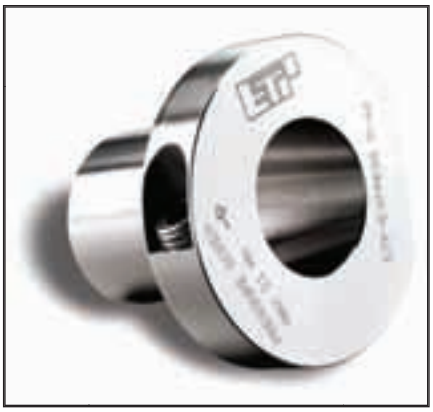
The ETP Express keyless shaft locking bushings provide fast and frequent mounting/dismounting capabilities with one radial screw.

According to the company's press release, the design saves space and provides accurate mounting without axial movement of the ETP bushing along the shaft. Designed to position and lock all types of gears, pulleys, sprockets and other components in a power transmission system, ETP Express bushings help

provide runout control to reduce vibration and noise.

Zero-Max says the ETP Express design provides a tight connection between the shaft and mounted components. When tightened, the product's radial screw compresses a pressure medium within the double-walled sleeves that expands and creates a solid connection between the shaft and the mounting member. Uniform surface pressure prevents damage to surfaces and enables the use of shafts without keyways.

Providing concentricity to 0.001" T.I.R., these bushings handle torque ranges from 40–6,400 ft.-lbs. The only tool required to torque, mount and lock bushings into place is an Allen wrench.



For more information:
Zero-Max Inc.
13200 Sixth Ave. North
Plymouth, MN 55441-5509
Phone: (800) 533-1731
Internet: *www.zero-max.com*

Boston Gear Reducer Designed for Conveyors

A new Series 700 conveyor flange adapter (CFA) is specially designed for increased control and lower maintenance cost on material handling conveyors. The CFA 7000 is a direct-mount worm gear speed reducer that works with a drive-train and can simplify equipment design.

According to the company's press release, this product replaces the heavier chain drive mounted on many material handling conveyors and includes fewer moving parts.

The adapter is interchangeable with standard two- and four-bolt mounted bearings and attaches to existing side rails.

The patent is pending on this series, but numerous educational items are available.

For more information:
Boston Gear
Phone: (888) 999-9860
Internet: *www.bostongear.com*

Absolute Machine Tools Designs VMC for High Speed Mold Machining

The Super Hi-Net SHV-1000 vertical machining center from Absolute Machine Tools features Schneeberger roller-type linear ways on all axes, large diameter pretensioned ballscrews and an integral spindle for finishing.

According to the company's press release, the machine's heavy Meehanite castings ensure the machining center has the strength and vibration damping required to produce excellent surface finishes and extend cutting tool life.

The Y axis features four ways for support and accuracy. The Z axis is a ram-type head with no counterbalance for increased acceleration and smooth operation. Rapid rates are 944"/min. in all axes. The machine's 24,000 rpm HSK-63A spindle delivers 31 hp and 53 ft.-lbs. of torque for medium roughing and fine finishing. For more cutting torque, an 18,000 rpm HSK-63A spindle with 85 ft.-lbs. of torque at 2,400 rpm is also available.

For more information:
Absolute Machine Tools Inc.
7420 Industrial Parkway
Lorain, OH 44053
Phone: (440) 960-6911
Internet: *www.absolutemachine.com*

Scot Forge Installs World's Largest Hydraulic Press

The new 5,500-ton forging press installed at Scot Forge is the world's largest two-column, open die hydraulic press, according to the company's press release.

The press expands Scot Forge's ability to produce carbon and alloy forgings in diverse part configurations up to 80,000 lbs., including parts with hub projections, flanges and webbing. The press can provide heavier and more intricate forgings than previously available from materials with higher deformation properties, including stainless, titanium, aluminum and nickel.

In addition, reverse extrusion processes are now available for the production of hollow parts with thinner walls and closed-end cylinders. Aided by new computer modeling software and the press' large forging window, Scot Forge has increased its ability to forge close-to-net-shape parts. The new software provides accurate forging simulations resulting in optimum forge process plans and precise tool design while the 14' x 15' forging window allows for the use of larger tooling.

The press joins six other open die presses, six hammers and four ring mills.

For more information:
Scot Forge
8001 Winn Rd.
Spring Grove, IL 60081
Phone: (800) 587-1000
Internet: *www.scotforge.com*

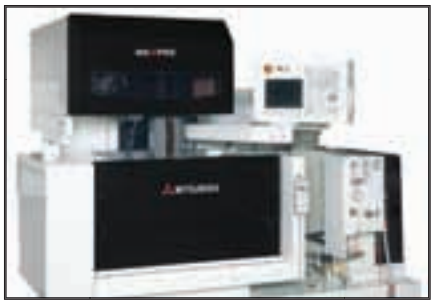
Toyoda Machinery's Latest in Grinding and Horizontal Machining

Toyoda Machinery's grinder and its horizontal machining center will be on display at the company's booth at Westec Expo & Conference, held March 27–30 in Los Angeles (see events coverage on page 59 for details).

The SelectG is a universal grinder designed for flexible, precise and small-lot work. The wheelhead rotates from 90° to 60° to accommodate a straight or angle wheel. According to the company's press release, this rotation simplifies changeover from straight to angle grinding wheel. Single machine capabilities are expanded without the necessity of a full CNC-controlled wheelhead or second dedicated grinder.

The FH-S horizontal machining center increases throughput by pairing high spindle speeds with faster, non-cutting operations. According to Toyoda's press release, this accelerates cycle times by about 30%. Its modular design allows flexible configurations in various manufacturing environments. The FH-S high gain spindle can reach full speed in 2.3 seconds and is designed for quick acceleration and deceleration.

For more information:
Toyoda Machinery USA
316 University Dr.
Arlington Heights, IL 60004
Phone: (847) 253-0340



Mitsubishi EDM Technology To Be Featured at Westec

Among the assortment of products and machinery displayed at Mitsubishi's booth at the Westec show is the MD+PRO wire machine from Mitsubishi EDM, which includes a full servo B-axis indexing option to introduce two new EDM processes: 1) indexing and 2) turning and burning.

According to the company's press release, the FA-S Series incorporates key features from other product lines. The V machine's V500 ultra high speed power supply combined with its fine finish power supply and non-isolated workpiece table provide considerable speed and surface finish. A PM4 control works with the inverter-driven flushing system, providing 20–30% faster cutting speeds in poor flush conditions.

Finally, Roku-Roku's HC-658 high speed vertical machining center combines high speed machining of mold steels and a multi-purpose design that provides improved graphite-machining capability.

"We have transitioned along with the EDM industry from the days of thriving tool and die shops into more demanding and highly specialized part production markets of today," says vice president Nicolas Giannotte. "Only EDM technology can achieve the precision and accuracies demanded by markets such as medical, aerospace and power generation."

For more information:
Mitsubishi EDM/Roku-Roku
Phone: (773) 271-2100