ARTIS Monitoring and Control System

OFFERS THE LATEST IN HOBBING PRODUCTIVITY

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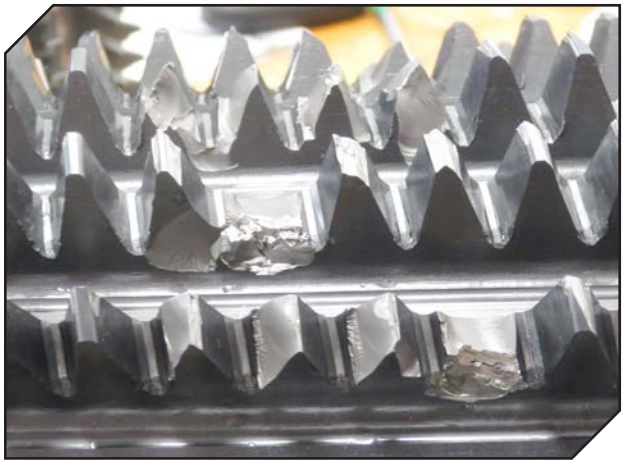
A modern six- or eight-speed automatic transmission can contain 25 or more precision gears, a fact that makes hobbing a prime target for productivity-improving technologies. For some perspective, a well-known transmission builder produces one million transmissions annually for two lines of luxury automobiles. The eight-speed gearbox contains four planet wheel sets containing a total of 25 gears in two sizes.



The larger gears are hobbed in 40 seconds while the smaller are produced in 4.3 seconds. Advances in tooling and machine technology have quadrupled the productivity of these operations in the last 10 years.

But that performance comes at a price. Today's hobbing tools are considerably more expensive than those of 10 years ago, so users need to optimize the process to achieve the greatest possible number of parts per tool before re-sharpening. Of equal or greater concern, however, is the need to avoid breaking these costly tools.

Traditionally, manufacturers have relied on "rule of thumb" guidelines and hob supplier's expected tool life recommendations to avoid catastrophic failures. But, this approach works by building in extremely conservative safety margins at the expense of productivity, and is paid for in unnecessary machine downtime for tool changes, unnecessary tool maintenance costs and parts not made.

The solution is a process monitoring system with the ability to detect and track tool wear, account for workpiece variations without generating false alarms and instantly stop the process in case of chip welding, damaged or broken teeth, or other conditions such as peeling coatings. Since an individual hob may be re-sharpened up to 15 times, and each re-sharpening changes its diameter and, therefore, its operating parameters, the monitoring system also needs to be self- calibrating to accommodate this factor.

Various attempts have been made to adapt existing process monitoring technologies to hobbing operations, but due to the complexity of the process none have been completely satisfactory. Based on a track record of successful monitoring solutions for other processes, ARTIS—a Marposs company— worked in cooperation with a major transmission builder to develop a hobbing-specific application that would allow the user to achieve maximum output along with maximum tool life.

The project began by collecting real-world data from operating hobbing machines in the customer's plant. The end result was an algorithm representing the life cycle of a hobbing tool that can be used to identify the optimum time to take it out of service for re-sharpening based on its actual condition.

ARTIS then created a system of machine-mounted sensors to monitor process parameters including spindle torque, spindle vibration, power consumption and a number of others depending on the specific application. Using these inputs the system then captures the exact signature of each operation in the process and automatically generates a "good" tolerance band for the process based on that signature.

While the concept of monitoring process inputs is not unique, the ARTIS system couples it with powerful software specifically designed to detect the exact kinds of anomalies produced by worn and/or damaged hobs. This data was generated during the in-plant monitoring project which revealed that normal wear, welded chips, peeling coatings and broken teeth all generated distinct signatures before and during the ultimate failure of the tool.

The software can identify and quantify each of these signatures to generate either an approaching end of life warning for normal wear, or an automatic machine stop in case of actual tool damage. In the case of normal wear, the ARTIS system notifies with ample time to schedule the downtime required to minimize the impact on production.

Another unique aspect of the system is the ability to detect and automatically compensate for tool diameter changes after re-sharpening. This is very important in a high-volume environment where individual tools may be used on different machines before and after re-sharpening. A smaller diameter tool changes the operation's power consumption, so the ability to detect diameter changes and re-calculate the optimum process signature without re-mastering the tool eliminates a great deal of machine downtime.

On the test machine, the ARTIS system resulted in a 17-percent increase in tool life without changing any of the process parameters. The increase represents the difference between tool changes based on "rules of thumb" or arbitrary part counts, and tool changes based on actual tool condition as reported by the monitoring system.

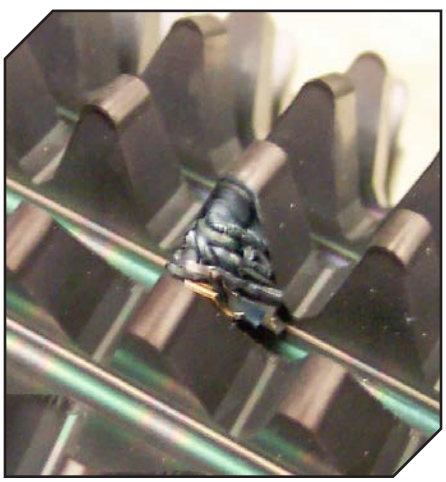
During the testing, this customer used the data generated to identify and optimize the coating used on the hobbing tools. While not a direct benefit of the ARTIS system per se, the coating selected on the basis of the process data delivered a 60 percent increase in tool life, an increase that almost certainly would not

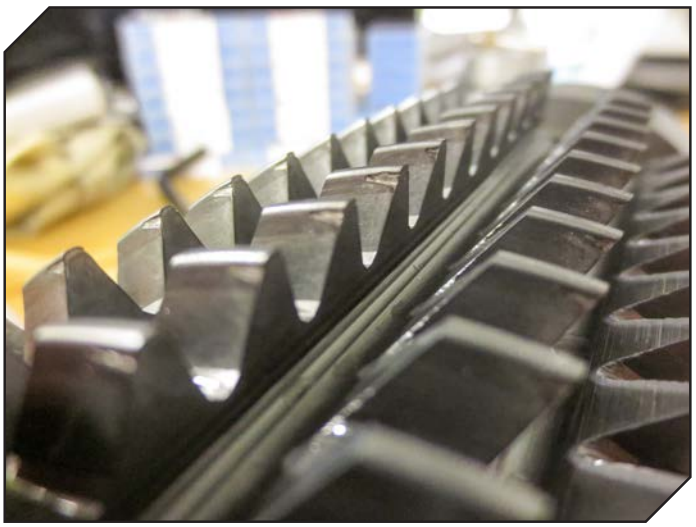
have happened had the data not been available.

In another application, a gear manufacturer reported that their ARTIS system, which had been running for some time without incident, suddenly began triggering alarms, but the hobs showed no signs of wear or damage when inspected. As the manufacturer was preparing to call for service on the ARTIS system, the hob head bearings failed and the machine was immediately taken out of production. The customer credits the ARTIS system for minimizing both repair cost and downtime by allowing them to react promptly to the bearing failure predicted by the repeated alarms.

It is important to note that the initial ARTIS system described here was developed in cooperation with a customer for a specific set of application parameters for gears with a module of 14 or less. Since that customer used only Siemens CNCs and Liebherr hobbing machines, the ARTIS application was developed for that specific combination.

Software with the ARTIS CTM-FP-Gear Hobbing option can be integrated into Siemens 840D controls and is also is available pre-installed in the control. The ability to automatically compensate for tool diameter changes after re-sharpening, and the adaptive control constraint of the feed rate where cycle time can be reduced automatically, are currently available only with Liebherr gear hobbing machine tools.





However, the ARTIS software has also been added to other control systems such as Fanuc via a dedicated PC and control interface. The Artis monitoring components can be applied to virtually any new or existing hobbing machine including those from Liebherr, Gleason Pfauter, Felsomat, MAG-Samutensili, Kashifuji and Mitsubishi, and many others.

ARTIS software is available for soft material applications on gears with module up to 100 and cutting times up to a few hours. All implementations are application specific. Better tools, more capable machines, and improved controls have quadrupled the productivity of the hobbing process in the last decade, just in time to meet the growing demand for precision gears in the transportation and other industries. Now, real-time monitoring and control systems are ready to help gear makers set even higher benchmarks for productivity and quality from the equipment that's already on their production floor.

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Sunnen

OFFERS SINGLE-STROKE HONING OPTIONS

Sunnen Products Company introduces a quantum improvement in a key manufacturing process for cast-iron, hydraulic valve bodies using a precision single stroke honing process that achieves cylindricity/straightness under two microns in bores up to 10 times longer than diameter. Developed in Europe to meet leak-free requirements for high-pressure hydraulic systems, the high-precision, single-stroke honing process is almost 200 percent more accurate than anything previously achievable for long, small-diameter, tandem bores, according to the manufacturer.

"European mobile equipment hydraulic systems established this cylindricity specification to reduce internal leaks and achieve higher valve performance," said Juerg Huber, managing director, Sunnen AG. "The precise fit between the sliding spool and valve body maintains the internal seal in this area. Precision cylindricity and straightness in this bore ensures uniform clearance between the moving parts from top to bottom in the valve, allowing free movement of the spool, without leakage around it."

Single-stroke honing is a single-pass process that sizes and finishes a bore with a series of progressively larger superabrasive tools adjusted to a preset diameter. Single-stroke honing tools rotate while passing through the bore one time and then withdrawing. The machine's servo-controlled stroking system provides flexibility with adjustable speed and various feed profiles, such as pecking, short stroke, dwell, etc.

The single-stroke honing tool consists of a tapered arbor with an expandable diamond-plated abrasive sleeve mated to it. The external profile of the sleeve is designed for the application. Single-pass honing is ideally suited for solid bore parts with L/D (length/diameter) of 1:1 or less. Parts with much larger length-to-bore ratio can be honed under certain circumstances. Bores that have interruptions allow better chip flushing and reduce the load on the abrasive sleeve. In the case of cast-iron valve bodies, bore length-to-diameter ratios of 10 or greater can be single-pass honed with great success.

"Single-pass honing is a stable, high-production process that can achieve one micron cylindricity in a short bore – one with L/D less than one – assuming the part has a sufficiently rigid wall," explained Huber. "However, as the bore length increases, it becomes more difficult to achieve good straightness and cylindricity. Among other reasons, the honing tool's sizing land tends to follow the bore. On cast-iron valve bodies with L/D of 10, the standard process has typically produced five microns cylindricity under optimum conditions. High-precision single- stroke honing takes this to two microns cylindricity or less. And with a tool life that can be 60,000 to 80,000 parts, the process is economical. A typical part suitable for this process might have a 16 mm bore, over 160 mm long, with 11 lands. This type of part can now be honed to less than two microns cylindricity, less than two microns straightness and one micron roundness."

The high-precision single-stroke process utilizes a combination of proprietary tool processing, tool holding, workpiece fixturing and process parameters, without any penalty on cycle time. It is already in use by manufacturers of hydraulic valves in Turkey, Italy, Germany, Switzerland, Brazil, Sweden and the United States.

Sunnen offers single-stroke honing on three different VSS-2 Series models that incorporate up to six spindles to progressively size and finish part bores. The machines are ideal for precision sizing of bores 3.9 - 50 mm (0.149 - 2.0") diameter in stamped parts, hydraulic valve bodies, gears and sprockets, parking pawls, rocker arms, turbocharger housings and similar parts. Ideal materials include cast iron, powdered metals, ceramic, glass, graphite and other free-cutting materials.

The VSS-2 Series 2 is available in three models – the 84 (eight-station, four-spindle), the 86 (eight-station, 6-spindle) and the 64 (six-station, four-spindle) – to meet various mid- to high- production needs. Spacing between spindles is 190 mm (7.48"). The 7.5 kW (10 hp) spindle drive provides a speed range of 100-2,500 rpm.

For more information:
Sunnen Products Company
Phone: (314) 781-2100
www.sunnen.com

GWJ Technology

INTRODUCES *TBK 2014*

Software company GWJ Technology, headquartered in Braunschweig, Germany, recently introduced a completely new software generation of its *TBK* calculation software for gearboxes. *TBK* is standard calculation software for machine elements focusing on gear manufacturing. For more than 30 years, *TBK* software has been a widely accepted calculation software and is being successfully used by many engineers worldwide. The updated *TBK 2014* version offers a new and more modern look, but keeps the easy-to-use and intuitive interface. The software application comes with a completely new calculation technology, new calculation modules and numerous extension possibilities.

TBK 2014 is full of new features (e.g., calculation modules for bolted joints, bolts and pins, clamp connections, springs and timing belts) and refinements. Already existing modules have been improved significantly. For example, the calculation module for cylindrical gears provides a new dimensioning function. This functionality offers proposals for possible design variations. The module for involute splines supports not only DIN 5480, but also DIN 5482, ISO 4156, ANSI B92.1 and B92.2. *TBK 2014* allows a calculation with two or more bearings. Eigenfrequencies and critical speeds (bending and torsion) can be also determined. Powerful CAD plugins for different CAD systems are available in order to combine calculation and design as well as an output option for the 2-D DXF tooth form.

TBK 2014 software can be extended with the SystemManager add-on application. It allows for a fast and easy design of complete systems. By using the add-on, multi-stage cylindrical gears, planetary gear trains and bevel gear drives can be easily determined. Power-distributed transmissions and manual gearboxes with load spectra are supported as well. The calculation of eigenfrequencies of the complete system is also possible.

TBK 2014 provides a high level of comfort with a redo and undo function, automatical re-calculation, tool tips, user and project information, extensive user default settings, calculation reports in HTML and PDF format with individual report templates. The language of the software can be easily changed. In addition, a new and enhanced user manual with technical information and calculation examples is available.

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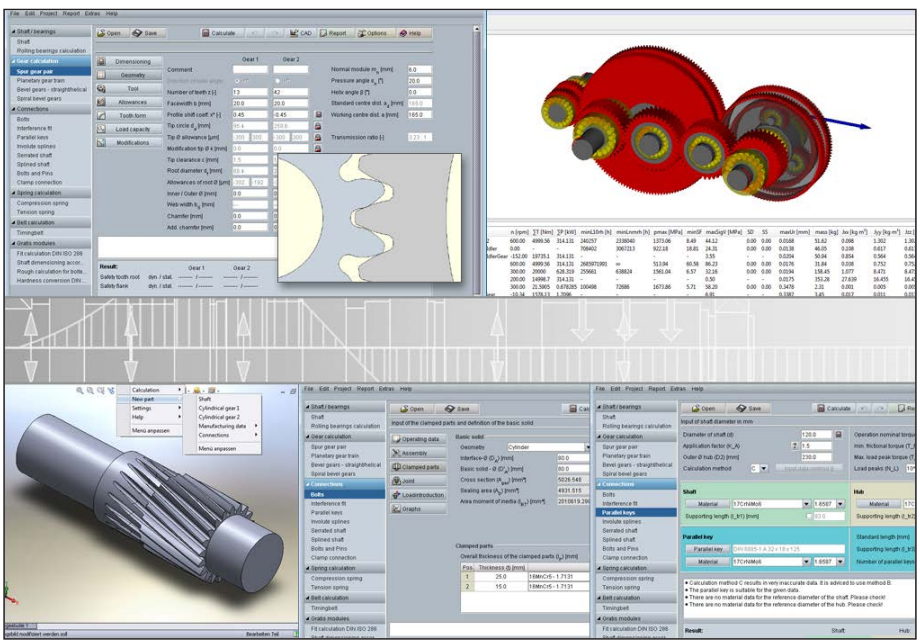


RUF US, Inc.

OFFERS GEAR GRINDERS VALUE IN BRIQUETTING SYSTEMS

Gear and other grinding operations are finding the value they thought was lost in their grinding sludge. The bonuses of increased operational efficiencies and safer working conditions are realized once companies start using a briquetting system.

Corrugated Replacements, Inc., a developer of machine replacement parts for the corrugated board, steel, poultry and satellite industries, and Horsburgh-Scott, a provider of industrial gears and custom gear drives for steel, aluminum, tire, rubber plants and wind turbines, are just two of the many companies who looked to RUF Briquetting Systems to help squeeze value out of product they previously viewed as lost.

Just one year ago, managing monthly expenses of time, money and resources dealing with swarf produced in the grinding process was a reality for Corrugated Replacements. Before purchasing a briquetting system, dirty swarf was stored in barrels on the production floor, and then disposed of by a costly hazardous waste removal company. With the briquetting system, things have changed. "We were able to turn something that was a 100 percent expenditure process into a profitable revenue stream and reuse reclaimed coolant," said Corrugated Replacements plant and engineering manager Scott Wallis. "It has been a win-win for our business."

Similarly, the Horsburgh-Scott production process was positively impacted after the installation of a briquetting system in February of this year. "The briquetter has helped our operation reclaim more than 1,650 gallons of oil from our swarf," said Horsburgh-Scott manufacturing engineer Luciana Talpa. "The RUF machine works amazingly; it simplified the business and will pay for itself in less than a year."

Horsburgh-Scott's grinding sludge contained 63 percent oil by weight. The briquetting process is able to reclaim nearly all of the oil from this saturated grinding sludge. The reclaimed oil is then reused, reducing the amount of new oil purchases needed for their gear grinding process.

Reducing oil and coolant loss is just part of the added efficiency of the briquetting system. Both companies have also reduced or eliminated hazardous waste costs, turning it into a revenue stream by selling the briquettes as scrap to steel mills. Although it was not part of the initial goal, by improving operation efficiency and reducing expenses for wasted material and swarf, briquetting and reclaiming product has made for a safer work environment.

"The barrels where swarf was previously stored, waiting for disposal, created a heat safety issue," said Wallis. "Not only did we regain a significant amount of floor space, but we also eliminated the need to store hazardous waste."

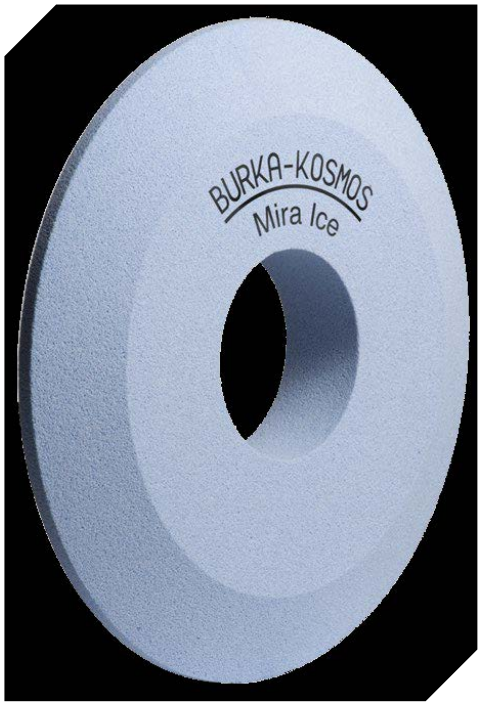
These two companies, along with others in the metal grinding industry, have improved efficiency, safety, productivity and developed a new revenue stream, simply by recycling their own product through the briquetting process.

For more information:
RUF US, Inc.
Phone: (440) 779-2747
www.ruf-briquetter.com

Burka-Kosmos

OFFERS NEW GEAR GRINDING WHEEL

The Mira Ice product line of gear grinding wheels was developed in order to meet the requirements of profile grinding larger gears. A new approach in the development of this grinding wheel enables results to be achieved in terms of economic efficiency and cool grinding that were previously unheard of in the profile grinding of gears. The Mira Ice grinding wheel has been further optimized on the basis of the leading product line from Burka-Kosmos. The use of new grain qualities and the new high-strength bond system guarantees particularly cool grinding. Longer cycle times between dressing and shorter grinding times significantly reduce the processing costs per gear. During testing against the Burka-Kosmos SK23 ceramic grinding wheel stock removal volume was increased by almost 400 percent on a 3.6 diametral pitch gear. This increase, along with the need for fewer dressing cycles, resulted in a 30 percent reduction in total machining time.



For more information:
JRM International, Inc.
Phone: (815) 282-9330
www.jrminternational.com

Mitutoyo America

MICROMETERS IMPROVE MEASUREMENT CAPABILITIES

Mitutoyo America is now offering enhanced versions of its popular Mitutoyo IP65 Coolant Proof and MDC-Lite Micrometer line with exclusive, newly developed Absolute sensor technology. This patented electromagnetic sensor offers improved measurement dependability by increasing resistance to harsh workshop conditions. This re-launch of a product line that has become a global industry standard is an exciting development for Mitutoyo and offers improved performance and reliability to its customers.

Highlighted features of the new Mitutoyo IP65 Coolant Proof and MDC-Lite Micrometers include the new electromagnetic Absolute sensor which provides improved resistance to environmental conditions such as dirt, oil and water that can cause false readings; a function lock system to prevent inadvertent setting changes; new ratchet thimble models that improve one-hand operability and an anti-slip finish for an improved grip while taking measurements. The micrometers will offer long battery life - 2.4 years under normal operation and SPC output models will be fully compatible with existing Mitutoyo data management accessories. These new micrometers will replace previous IP65 Coolant Proof and MDC-Lite models and will be introduced at the same prices as the models they will replace.

For more information:
Mitutoyo America Corporation
Phone: (888) 648-8869
www.mitutoyo.com

GF Machining Solutions

INTRODUCES MODULAR AUTOMATION SYSTEM

GF Machining Solutions has announced the System 3R Transformer, a modular automation system designed to integrate with a wide variety of technologies. With Transformer, manufacturers can begin by simply automating a single machine and then easily expand to include up to 12 machines within the cell.

A Transformer cell accommodates a wide range of machining technologies and allows components from different manufacturers to be included within the same call. This open architecture approach allows end users to create an automation cell where each individual component decision is optimized, as opposed to having choice constrained by compatibility.

GF Machining Solutions offers wide range of System 3R tooling systems that allow palletization of workpieces and electrodes of a tremendous range of sizes. The Transformer system can handle all of these, as well as different tooling systems, allowing it to be incorporated into production systems with existing tooling systems.

For maximum flexibility, Transformer offers additional in-process accessories that can easily be integrated into a cell, including:

- Multiple loading station that can be used without stopping production
- Draining station for emptying workpiece cavities after machining processes
- Washing machine to clean workpieces
- Coordinate measuring machine (CMM) for pre-setting and/or part inspection

[www.geartechnology.com]

The Transformer system provides user-friendly cell management software whereby all production data is entered in a structured manner or imported through a data exchange interface for major enterprise resource planning (ERP) systems. The software then controls every aspect of the cell, from automatically loading jobs to machines to recording and monitoring cycle times for each job. The core of the system is an efficient database that uses chip identification of the pallets to ensure that correct data is used for every part in the cell.

For more information:
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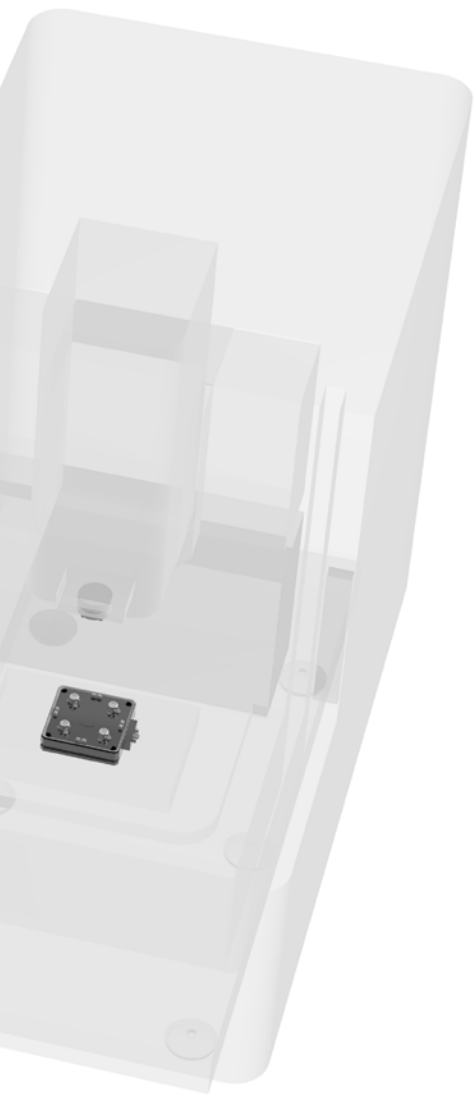
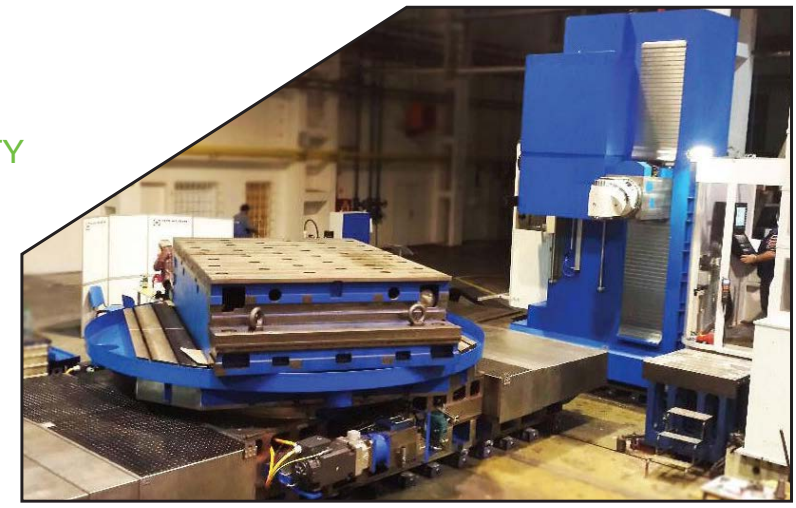


Havlik Gear

EXPANDS PLANT CAPACITY AND ABILITY



Havlik Gear, a Renaissance Power Systems company, announces the addition of a TSO FUQ 150-VR6 CNC machine to expand plant capacity and ability. The multipurpose CNC floor type mill has an impressive 60 metric ton table capacity. The custom designed hydrostatic table has a maximum rotational speed of 80 rpm. In addition to general purpose heavy duty turning and milling, large gears can be rough cut and finish cut using one of four custom machining heads that best suit the application.

Additionally, the new machine will increase the company's gear cutting capacity from eight meters to 12 meters, allowing it to undertake some of the largest gearing projects in the world. Products such as multi-segment ball mill, kiln, or SAG mill gears, as well as riding rings or mill heads, can be supplied on a turn-key or subcontract basis to best meet customer needs.

The addition of the new CNC machine also will allow Havlik to provide vertical lathe capability as the machine doubles as a large vertical lathe, able to swing 12 meters in diameter. It also will provide the ability to support subcontract large diameter turning, which will be a major focus for the company moving forward. "Not only will this new machine – one of only 2 or 3 in the world – allow Havlik to take on large gearing projects, but it also will increase capacity as many products can be more efficiently produced, including gearbox housings, press frames and components, compressor components and more," said Mark Readinger, president and CEO of Renaissance Power Systems. Havlik Gear, an ISO9001:2000 certified company, has been a leader in gear manufacturing since 1886.

For more information:
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www.renaissancepowersystems.com