

Gleason

EXPANDS GMS SERIES INSPECTION CAPABILITIES

Dennis Traynor, Sales Manager, Gleason Metrology Systems

The world's leading gear manufacturers and their top suppliers are demanding greater system capability and utilization from their inspection systems. Just measuring gear geometry is no longer sufficient, now that accuracy requirements are at sub-micron levels, and other inspection criteria such as surface finish measurement and grind burn detection are becoming increasingly commonplace.

For Gleason, the solution is to simply expand the capabilities of the GMS Series of Analytical Gear Inspection Systems. With the GMS Series, Gleason already provides what high accuracy measurement systems require most: a stable, robust platform, able to position and control movement in both linear and rotational axes. As a result, new functions such as surface finish measurement, form measurement, grind burn detection and general prismatic (CMM) measurements are a natural extension of the GMS' inspection capabilities.

The reality is that our ability to control motion, combined with our robust system for measuring the complex geometries of gear tooth forms, offers an elegant solution: a multi-purpose system that eliminates the expense of multiple machines that take up valuable space and add redundant fixturing, programming calibration and maintenance cost.

Integration of Multi-Sensory Capabilities on the GMS.

When a gear (or any rotationally symmetrical workpiece) is set up for measurement on a Gleason GMS inspection machine, it is convenient to test for other quality characteristics called out on most part prints today, such as surface roughness. Though our machines had this feature in the late 1990s, it was limited. Digital probing systems were still in their infancy, not as versatile and reliable as they are today, and while we sold quite a few systems, the

integration was not as seamless as most had hoped.

Fast forward to today's motion control technology, systems integration techniques and capabilities, and market demand, and the picture of supporting the manufacturer's needs becomes much clearer. Today's systems utilize devices kinematically coupled to our motion control system, which allows the stylus to automatically:

- Rotate to the helix angle of the gear
- Move normal to the surface of the workpiece
- Deflect the probe at a constant force
- Gather data
- Determine roughness to whatever parameter required

All while not requiring manual intervention with the measurement or manipulation of the part. No special fixturing or material handling, outside of loading the part, is needed for comprehensive measurement. By the same token, because we understand it is not just surface finish, but also waviness that can affect gear behaviors, we have added the ability to analyze waviness parameters to the GMS series as well. All analysis is shown after measurement on screen, and is printed in additional pages in the inspection report.

In adding these capabilities to our machines, we realized that careful consideration must be given to a num-

ber of factors. Actual capacity of the gear metrology machine must be taken into account, as well as the design and integration of accurate sensors for surface roughness measurement and grind burn detection (Barkhausen noise analysis), in order to properly accommodate these added applications. In addition, a thorough review of parts requiring this testing must be conducted and factored into the design phase.

In 2011, Gleason Metrology Systems partnered with American Stress Technologies, a global supplier for Barkhausen noise analysis (BNA). Together, we devised a way to mount the Stresstech RollScan products on our machines and apply our motion control to follow the lead profile at various radial positions in order to create a

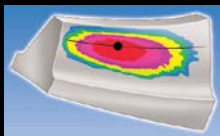




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full flank analysis for residual and compressive stresses induced by hard finishing processes. This type of testing is non-destructive, so that when the part tests as “accepted,” it can be used as a production workpiece, as compared to the more traditional nital etching process, which often renders the part unusable.

In large-gear production environments where the lot size is typically small (1–5 pieces), and materials and process times are expensive, cost savings are swiftly realized. Having this type of materials testing technology built into your gear inspection system really pays off when the parts are large and material handling, fixturing, and warranty costs all add up quickly. BNA also has the significant advantage that it is a great predictor of sub-surface defects in the microstructure of the material. It also is a valuable tool for assessing hardness, especially when compared to the older, destructive testing.

Powerful and User-Friendly.

GMS has devised a charting technique that is easy for the average operator to interpret. The illustrations below display typical Rollscan measurement results. If all the trace outputs are uniform, as in the first graph, it’s quite easy to see that tooth form is consistent and the material is uniform in respect to residual and compressive stresses. In contrast, the second graph shows measurement of a tooth form where certain traces are “spiked” in their signature, and some surface anomalies are present.

But on a closer look, you ask yourself, “Where?”

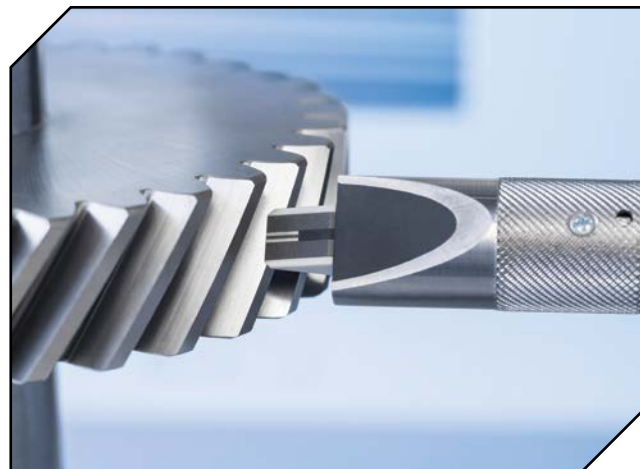


With GMS’ new software, we have extrapolated those output signals to create an easily understandable graph that shows, at a glance, where the material defects occur. The rectangle represents the tooth surface area. The graph’s horizontal or X axis shows the measurable tooth surface in the lead direction of the part. (Not all of the tooth surface can be measured, as the sensor must stay fully on the tooth surface.) The sensor, in this case, covers a surface area equivalent to the small blue square shown on the right. The vertical or Y axis depicts the radial depth or number of scans that were taken along the lead direction. (Again, this measurement does not go into the root or to the very edge of the tooth tip.)

As with all metrology systems, certain limitations may exist and consulting with our applications department is the best way to determine which machine and software combination will best fit your particular applications. An important consideration is the fact that GMS isn’t just for gears: all rotationally symmetrical workpieces are also candidates for these technologies.

CAD-Based Inspection is Now a Reality

A third addition to GMS inspection machine functionalities is a CAD-based inspection package. Geometric analysis is no longer confined to the tooth form, though admittedly this is still quite complex, given the number of profile and lead modifications used today to make gear sets perform to design intentions. More and more gear sets are designed in CAD, and as part of assemblies that require measurement at various stages of assembly.



Recognizing this, Gleason now offers CAD-based inspection to complement our other inspection packages. We’ve integrated the capability to measure non-gear features into our measurement platform. Programming in conjunction with popular CAD models (e.g., *Step*, *IGES*, *CatiaV4*, (.mod .model .exp .dlv .cat *CatiaV5*) *CATPart*, *CATProduct*, *Parasolid*, *ProE*, *Unigraphics*, *VDA*, *SoldWorks*, *STL*, *Cadds Fils VRML*) are supported.

This opens the doors to exciting new opportunities for GMS to support manufacturers of non-gear parts who require high-accuracy inspection on any rotationally symmetrical workpiece where the rotation of the part is integral to the inspection and not just handled as an indexing axis to present the part to the measurement probe.

The modular structure of our CAD inspection system allows users to purchase basic and advanced versions, with upgrade costs well below industry standards. Users can easily enhance system capabilities as they learn, or as their needs change.

Gleason is planning the formal release of this new feature at EMO and Gear Expo in September, 2013. Both exhibitions will have live demonstrations of all the aforementioned inspections on actual workpieces.

For more information:

Gleason Corporation
 Phone: (585) 473-1000
sales-americas@gleason.com
www.gleason.com

Ingersoll

SELECTS LIEBHERR LC1200 FOR TECH CENTER

Ingersoll Cutting Tools has selected a Liebherr LC1200 gear hobbing machine for installation in its Rockford, IL Technical Center (ICTC). The LC1200 will demonstrate the productivity of Ingersoll's indexable carbide tools for gear machining. Indexable carbide insert (ICI) cutting tools, including Ingersoll's innovative two-start hobs and single-index gashing tools, offer more cutting edges, permit higher cutting speeds, and therefore greater cutting capacity for large module gears. The Liebherr LC1200 has special design features for ICI applications. Its rigid structure, 900 mm table diameter, and 45 kW (60 hp) spindle drive provide a suitable platform for large cutting tools, permitting high metal removal rates. Liebherr's new FK 3.3 hob head can handle tools up to 450 mm diameter, 540 mm length, and gears up to module 27 mm. Liebherr also offers a form-milling head for internal gear applications.

In the Spring of 2012, Ingersoll Cutting Tools completed construction of its new Technology Center on the campus of its Rockford, IL headquarters. The new Tech Center is equipped with state-of-the-art machines from select machine tool partners for turning, milling, hole-making, and now gear machining. The Tech Center will be used primarily for training seminars, testing, and product demonstrations.

"A key goal of the new Technical Center is to create a unique environment where customers can not only see the latest tooling and machining technology, but also participate in discussions with Ingersoll engineers and our machine tool partners to find solutions for their specific manufacturing needs," said Chuck Elder, ICTC president.

Peter Wiedemann, president of Liebherr Gear Technology, Inc., adds; "We have a history of providing our customers with turnkey solutions in gear production and inspection. Having the LC1200 in Rockford allows Ingersoll to demonstrate and highlight the most productive cutting tool technology available in the gear industry, and gives Liebherr the opportunity to demonstrate the machine's capabilities to our North American customer base."

For more information:

Ingersoll Cutting Tools
Phone: (815) 387-6600
info@ingersoll-imc.com
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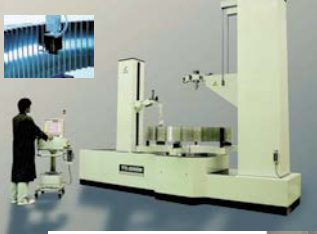
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 Tokyo Technical Instruments Inc.
 Main Office Ph: +81-3-3726-4188
 Factory Ph: +81-284-73-1733

See Details

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Wenzel GearTec

WGT 280 EXTENDS SERIES

Wenzel GearTec presented the new WGT 280, the first model of a new generation of gear measuring machines in a new industrial design at Control 2013. This extends the approved WGT series by a measuring machine especially for small gears and rotationally symmetrical parts.

With the new WGT 280 Wenzel offers a gear measuring machine for the fast and efficient analysis of small gears up to a maximum diameter of 280 mm. Because of its compact construction and small footprint it can be easily integrated into existing processes. The easy to access measuring volume allows a simple loading and operation of the measuring system. Therefore the WGT 280 is ideal for the use of automated loading systems.

The high precise rotary table can be loaded with parts up to 50 kg weight. The WGT 280 is equipped with the Renishaw scanning probe SP 600 and allows the measurement of gears starting with a module of 0.5 as standard. For the accurate measurement of shafts, the gear measuring machine can be equipped additionally with a tail stock. The WGT 280 allows measurements in a Z range of 500 mm.

"The developments in drive technology make precise and reliable measurements of gear components and especially gears mandatory. Drives of any kind have to be as efficient as possible. In future gears will still be of great importance," explains Heinrich Brüderle, responsible for the product series gear measurement at Wenzel Group. With the new gear measuring machine Wenzel combines innovative technology and modern industrial design.

During the development of the WGT 280, Wenzel focused on one of its core competencies. The base plate and linear guides are made of massive hard stone and finished by hand. The combination of granite technology and precise air suspension makes a gear measuring machine a durable and highly accurate measuring system according to VDI/VDE 2612/13 group 1. Furthermore the specially developed controller for gear metrology provides optimal 4-axes-control and high measuring performance. The WGT gear measuring machines are equipped with a modular software package. The user is led intuitively through different input masks to enter parameters for part, measurement and analysis. Additionally the user is supported by different graphics. The basic package *TGear* can be individually extended by different modules for the measurement and analysis of different types of gears and shafts.

For more information:

Wenzel America
 Phone: (248) 295-4300
inquiries@wenzelamerica.com
www.wenzelamerica.com



Sulzer

COATING TECHNOLOGY FOR COMPLEX SURFACES

Sulzer offers a variety of coating equipment, material and services for the most complex surface applications. The company's custom solutions based on PVD and diamond coating technologies reduce production costs, increase tool cutting rates, reduce use of lubricants, prolong tool life and improve wear resistance. Significant for gear cutting is the company's new M.Power coating technology. "M.Power is a micro-alloyed TiSiXN-based coating that offers smooth surfaces; high hardness; high oxidation resistance; high wear resistance; low coefficient of friction; high tool quality; prevention of cold welding; and formation of built up edges," says Annette Norin at Sulzer Metaplas GmbH.

The key strengths of the coating are its dramatic reduction of the sticking material on the cutting edge due to reduction of the surface roughness. It also boasts extremely high heat resistance. According to Norin, Sulzer provides custom solutions through the combination of pre and post treatment of the tool surface coating material, layer architecture and system/equipment technology with which the coating will be applied. "We focus on advanced plasma-assisted/arc evaporator technology for innovative coatings," Norin says. "APA is based on the cathodic vacuum arc and offers diverse development possibilities for new layer architectures in terms of morphology, stoichiometry, doping, multiple layers and nano layers."

The benefits of APA include excellent coating adhesion and smooth coatings through the reduction of macro-particles. APA is also the basis for new hybrid technology. "Customers are willing to test new coatings to determine the benefits and also to come up with specific problems and we develop solutions together," Norin adds. "We develop coatings on our own R&D equipment and test new coating/layer designs together with our customers."

Norin believes the hybrids mentioned earlier will play a significant role in coating technology in the future. "This technology will include hybrids based on HI3 technology, a combination of AEGD (arc-enhanced glow discharge), a plasma etching process for layer adhesion; HIPAC (high-ionization plasma assisted coating), a highly ionized sputter process; and APA Arc (advanced plasma-assisted arc), a highly ionized arc process."

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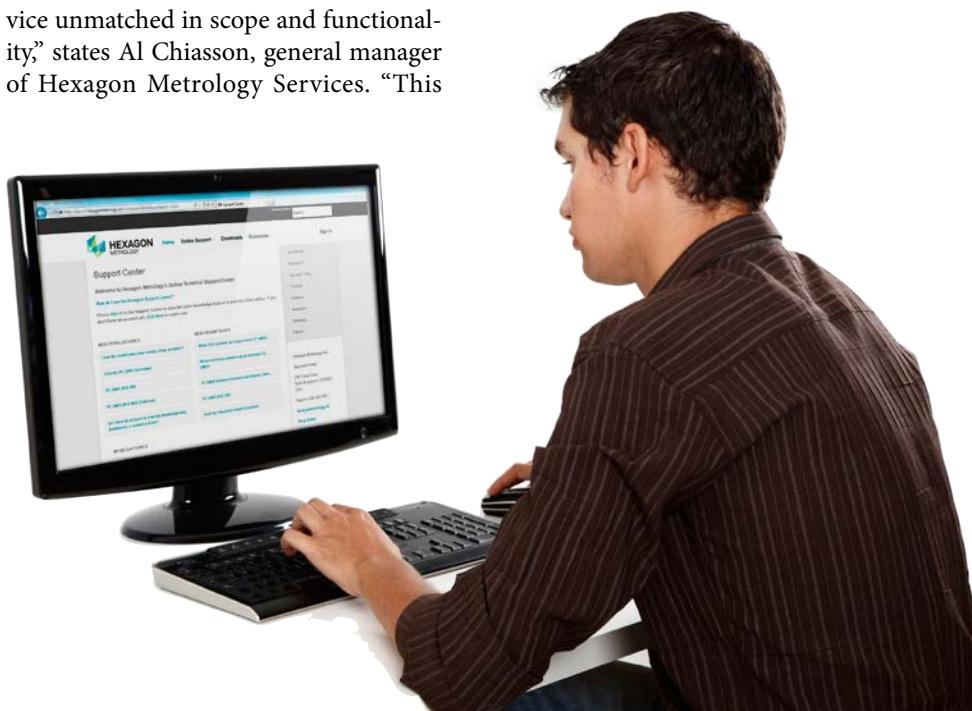
Hexagon Metrology recently launched the new Hexagon Metrology Support Center in conjunction with World Metrology Day. The online portal is a centralized resource for support of any Hexagon Metrology product. Customers will have 24/7 access to an FAQ (frequently asked questions) knowledge-base, and receive lifetime diagnostic phone support of any Hexagon metrology hardware. Clients with active software maintenance agreements (SMAs) can utilize the helpdesk for technical support inquiries and software downloads. The Hexagon Metrology Support Center establishes a one-stop location for all technical support needs, and provides three ways for customers to contact technical support staff—the online portal, email or via phone. All three methods provide closed-loop support, as all inquiries are automatically logged into the dedicated technical support call center.

“The Support Center’s innovative blend of self-service tools and professional advice delivers a customer service unmatched in scope and functionality,” states Al Chiasson, general manager of Hexagon Metrology Services. “This

new resource is unique to the metrology industry, and reflects our ongoing commitment to enhance the overall Hexagon customer experience. The Support Center provides convenient, self-directed solutions designed to achieve best-in-class response times to technical support inquiries.”

To use the system, Hexagon Metrology North America customers create a free account. Video tutorials and multimedia answers to common questions are posted throughout the site to enhance the user experience. Within the online portal, users can review support tickets and their history at any stage, even after a ticket is closed. Additionally, customers receive real-time e-mails when the status of their ticket has changed. Users also can view a listing of their Hexagon product inventory at any time.

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Leistritz

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use of modern cutting tool materials, including carbide to cut keyways in already hardened workpieces. The linear motor systems produce the high cutting speeds required to match that needed by the tooling and to shorten the cycle times for a production environment. With machine strokes up to 60" these machines can cut a wide variety of

grooves in steels previously un-thought of with little investment in both tooling and capital.

For more information:

Leistritz Corporation
Phone: (201) 934-8262
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www.leistritzcorp.com



high dollar value hubs or gears which have been processed to near completion using CNC turning and possibly grinding operations are often trusted with an antique keyseater for one of the final steps of production. Or worse yet, manually broached by hand in a press using shims to control the final depth.

Leistritz, a German machine tool builder, has a line of keyseaters to match the control and flexibility needed by today's manufacturers to produce a straight and accurate keyway. Their CNC keyseaters are very well suited for cutting small keys yet heavy duty enough for huge keyways, up to 7" wide, as well. The CNC control is a valuable time saving device and can optimize the cutting parameters through fully flexible programming of feed rates and cutting speeds, as well as variable depths, if required. The CNC also allows the addition of a rotary table to produce helical grooves for special applications or multiple grooves within a single bore.

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Bryant Grinder

MINIATURE GRINDER BOASTS HIGH RANGE CAPACITY

The new Bryant Miniature precision grinder (Model RU1) with standard 4.0 inch (100 mm) travel in both “X” and “Z” axis, brings a whole new dimension to small precision part processing. This machine is suitable for small parts manufacture, including optical and medical applications as well as bearings, fuel management and automotive requirements. Within the 64 cubic inches (1048 cubic centimeters) work zone, there are unlimited processing opportunities including conventional chucking for ID and OD grinding, between center workholding for multi-surface OD shaft work, roller blade fixture for ultra-small and thin walled parts, shoe fixture for ID and OD, bores, ball tracks and special applications, tri-roll fixture for long thin walled parts, dressing options including: single point, high frequency (cup or disk), radius (ball tracks), formed roll and CNC profile dress, loading options including double/single arm plug, buck-

et, single plane and robotic, acoustic emissions sensing for gap, dressing and crash detect and vector oscillation grind.

The model designation of this miniature machine is the Bryant RU1, which stands for *Revelations* operating system, “universal” capabilities and “1” for the machine size. This designation makes the newest machine an integral part of the new Bryant Grind Systems family that offers a range of sizes for totally universal, multi-surface machine tools to process a wide range of complex, precision workpieces.

Eugene P. Superior, vice president of operations, says “There are hundreds of old Bryant Model B’s still working long hours in American and foreign bearing companies. The older Bryant’s have



extremely small effective work zone due to the short stroke of both axes. The new Bryant Miniature is ideal for medical, optical, fuel management and automotive applications due its range capacity. And, Bryant’s patented *Revelations* CNC operating system offers customers total flexibility, the simplicity of single screen operation and programming, and a guaranteed reduction in cycle times.”

The Bryant Miniature, as with all the larger Bryant models, features round hydrostatic guide ways with Bryant’s

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For more information:

Bryant Grinder
 Phone: (802) 885-5161
gdnelson@bryantgrinder.com
www.bryantgrinder.com

Kennametal

SHOWS BENEFITS OF MTCONNECT

The recent 2013 MTConnect Connecting Manufacturing Conference was instrumental in further preparing the foundation of a monumental change in how manufacturing firms can obtain, manage, and share their machine tool and tooling data. Cutting tools can be an extremely valuable data source for shops to monitor, collect, and study, says Tom Muller, senior manager, Innovation Ventures Group, at Kennametal Inc. Noting that MTConnect is a protocol and that ISO 13399 is an international standard, Muller demonstrated that MTConnect does not have to go into the standards development business. Since ISO 13399 already defines and standardizes such cutting tool attributes as cutting diameter, edge angle, body diameter, overall length, functional length, and functional width, among many others, MTConnect

can simply adopt the ISO 13399 definitions and achieve a consistent language for exchanging data between machine tools, tool data management systems, presetters, and even CAD/CAM systems. "The more we can drive the standardization of cutting tool data, the simpler and more efficient we can make a shop's business," Muller said. Imagine not only staying on top of the volumes of data a shop produces, but having machine tools "know" what the presetter and the cutters "know" through the efficient exchange of

data. Hours of setup, touch-offs, and test cutting could become a thing of the disorganized past. Tribal knowledge or "how Joe does it" can make way for organized and systematized ways of manufacturing parts. MTConnect is in place, and the applications from the machine tool, tooling technology, and software leaders are coming.

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