2018/2019

solutions

gear manufacturing technology magazine

Smart.

The Evolution of Chamfer Cutting

Bright Future

In sight with digital services employing AR technology.

At the Speed of Light

Innovations in Hard Power Skiving, non-contact laser inspection, and Closed Loop manufacturing.

Customer Success

Metalcastello meets surging demand with Power Skiving.

Total Gear Solutions Gleason

Welcome to Gleason

John J. Perrotti

President and
Chief Executive Officer

Dear Valued Customers:

You've heard it called Industry 4.0 or perhaps the Smart Factory – the convergence of new digital technologies that are fast re-shaping the way we make things. Like those that came before it, this latest industrial revolution is creating considerable upheaval, as well as enormous opportunity for new products that work intelligently together to reduce downtime, improve quality and deliver a host of other benefits.

We call that *Smart*.

It's an exciting time at Gleason. With the industry's most comprehensive array of solutions we're helping our customers benefit from smart new technologies in every gear manufacturing category. We're leveraging breakthroughs in digital, Augmented Reality, laser, software, designs and innovative processes to meet long-standing – or brand new – gear design, production and inspection challenges.

As our Cover Story suggests, we're leaving no stone unturned. With the addition of a new Chamfer Hobbing process, we now have expanded our array of integrated, automated and productive chamfering solutions to reduce cost and improve quality.

We have truly revolutionary advancements with our GMSL multi-sensor Inspection System, which uses non-contact laser scanning to acquire massive amounts of data at rapid speed compared to tactile probing, opening new frontiers in gear analysis. With the new GRSL, we've employed the same non-contact laser scanning technology for in-line inspection.

Hard Power Skiving has become an economical option for fine finishing, and includes a Closed Loop systems approach that optimizes the production process by networking Gleason Power Skiving machines directly with Gleason GMS® metrology equipment. Measurements and the resulting corrective actions are fast, accurate and automated.

Our Gleason 4.0 solutions have four families: gUptime, gProcess, gProduction and gTools. We are developing the digital world for gearing around these families. The goal: zero planned downtime, connectivity from design to production and inspection – and most of all, extraordinary value for our customers.

Exciting developments are taking shape in gear, gearbox and drivetrain design as well. A new interface connecting our KISSsoft and GEMS software empowers designers with new product optimization tools. We also continue with solutions to better link design and production.

…And much more. We're excited about what the future holds. We hope you partner with Gleason when taking the next step down this smart new technology path.

Features 2018/2019

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The Evolution of Chamfer Cutting

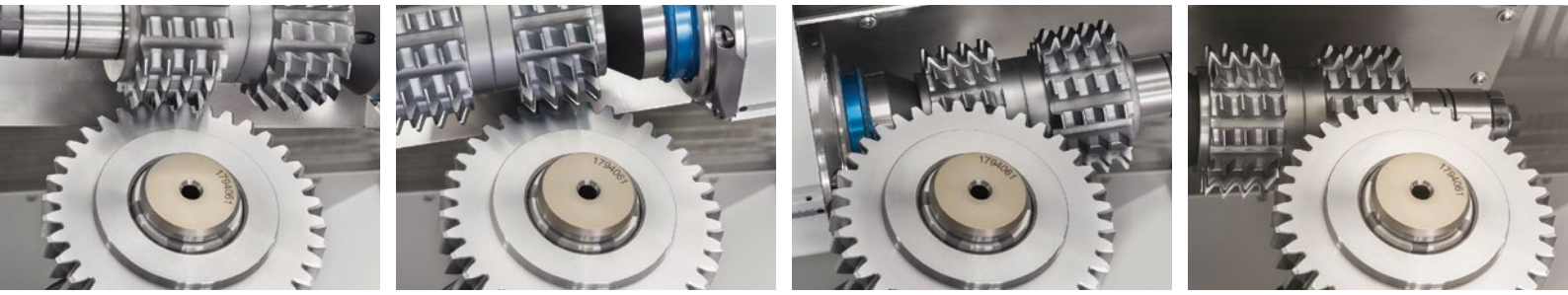
New Genesis® 160HCD Hobbing and Chamfering Machine adds Chamfer Hobbing to integrated chamfering and deburring solutions.

Automotive gear manufacturers in particular recognize that premature transmission failure, less-than-optimal fuel efficiency, or unacceptable noise can result from application of transmission gears operating with anything less than a flawless tooth flank. For these manufacturers, generating a chamfer to precise customer specification for size, shape and angle is of critical importance in order to minimize the potential for sharp, brittle edges after heat treat, as well as to avoid material plus conditions in the tooth flank prior to the hard finishing operations.

Chamfering and deburring are particularly critical in advance of the honing process, where excessive stock and hardened burrs can greatly diminish honing tool life and, as a result, significantly increase cost per piece.

Chamfer Solutions for Every Application

At Gleason, we're working to offer these manufacturers chamfering and deburring solutions that are just as easy to apply as the primary soft and hard processes. With our latest Genesis® series of hobbing and chamfering machines, we give users the ability to apply the optimum chamfering process for their particular application – up to and including truck-size gears.



The new Chamfer Hobbing process offers an extremely efficient solution to create the desired chamfer without secondary burrs.

Chamfer rolling, available on the Genesis 210HiC Hobbing Machine and horizontal P90CD, is ideal for planetary pinion applications requiring particularly fast cycle times (10 seconds or less chip-to-chip) or for shafts with little or no clearance below the root diameter. The formation of a secondary burr requires removal by an additional operation downstream in advance of a subsequent honing operation.

As an alternative, Gleason now offers a new process called Chamfer Hobbing. It delivers, in parallel to hobbing, long tool life cutting dry, and does not generate a secondary burr requiring removal downstream.

Chamfering is performed using a Gleason Chamfer Hob, with diameters similar to a gear hob, made with the latest high-speed steel materials like G50 and featuring AlCroNite®Pro coating for exceptional tool life in dry cutting conditions. Gleason Chamfer Hobbing employs one Chamfer Hob for each tooth flank, with a tooth profile which is specifically designed for the particular chamfer form to be realized.

This design delivers greater flexibility – comma or parallel-chamfer forms are possible as well as chamfers along the tooth edge only, or including the root area. Chamfer angles like those commonly produced in the chamfer rolling process are also easily achievable.

In the Chamfer Hob design process, Gleason software is used to identify and avoid all potential collisions of the tools with the counter flank and with interfering contours above and below the actual gearing.

Finally, the Gleason Chamfer Hobbing process offers tool shifting which, as compared to competitive processes, delivers increased tool life and minimal change times resulting in lower cost-per-piece.

Chamfer Hobbing for Lower Cost Per Workpiece

The new-design Genesis 160HCD combines the proven Genesis vertical hobbing platform with an integrated chamfering/deburring station to perform the Chamfer Hobbing process in parallel to hobbing, and thus achieving cycle times that satisfy the requirements for automotive MT, DCT, and electrical spur gear transmissions. A high speed 2-position gantry loads the workpiece for hobbing, transfers the workpiece to the chamfering station and then delivers the finished workpiece to the parts conveyor.

Countour Milling: Mastering Chamfers on Larger Gears

Chamfer Contour Milling offers producers of larger, ‘truck-size’ gears a flexible, easy and economical process for their increasingly important chamfer/deburr operations.

While chamfering gets increased focus with automotive-size gears, effective solutions for larger, ‘truck-size’ gears are becoming nearly as important – and more readily available.

The new continuous ‘fly cutting’ process offers significant advantages for improving chamfering flexibility as well as reducing machine and tooling costs as compared to chamfering on a dedicated, stand-alone machine. The continuous fly cutting process, called Chamfer Contour Milling, generates a chamfer along the gear edge contour by synchronizing fly cutter and workpiece rotation such that the fly cutter – generally a star-shaped body with 2-4 standard, replaceable indexable carbide inserts – contour mills the chamfer with the desired characteristics.

The Chamfer Contour Milling process is similar to hobbing in that it is continuously indexing and creates a cutter path that envelopes the tooth geometry from the outside of the part in. All six axes in the chamfer unit are used during generation of the tool path, and the tool seeks to use the straight side of the indexable blades to optimize the process. The result is a faceted chamfer finish, similar to the finish after a hobbing process. Since each edge of the tooth is done separately and the chamfer size and angle depends on machine movements and not on the tool design, the process is quite universal. It can, with only a few set of indexable carbide inserts, cover parts ranging from module 2.5 mm to the maximum machine capacity of module 8 mm. The process enables just a relatively few different standard insert blade sets to accommodate a wide range of gear sizes, geometries and chamfer requirements. Due to the size of the cutter some clearance below the root diameter is necessary to avoid collision. This requested clearance depends on chamfer angle, root chamfer requirements and tool diameter.

Therefore best results with this chamfer contour milling process can be expected with disc type parts or shaft type parts with some distance between the root diameter of the gear and the shaft itself.

Genesis 400HCD Hobbing and Chamfer Contour Milling Machine

While fly cutter chamfering has long been successfully employed on bevel gear cutting machines, it has just been adapted for the first time as a viable chamfering process for cylindrical gears on Gleason's new Genesis 400HCD Hobbing Machine, designed for workpieces up to 400 mm outside diameter and module 8 mm. The optional Chamfer Contour Milling station, positioned at 90 degrees to the main hobbing work area, allows parallel hobbing and chamfering processes to increase productivity. A four-station ring loader transfers workpieces between the machine's central worktable and the chamfering/deburring station, which is equipped with the aforementioned fly cutter. The new software interface allows an easy and fast learning experience for smooth set up and operation.

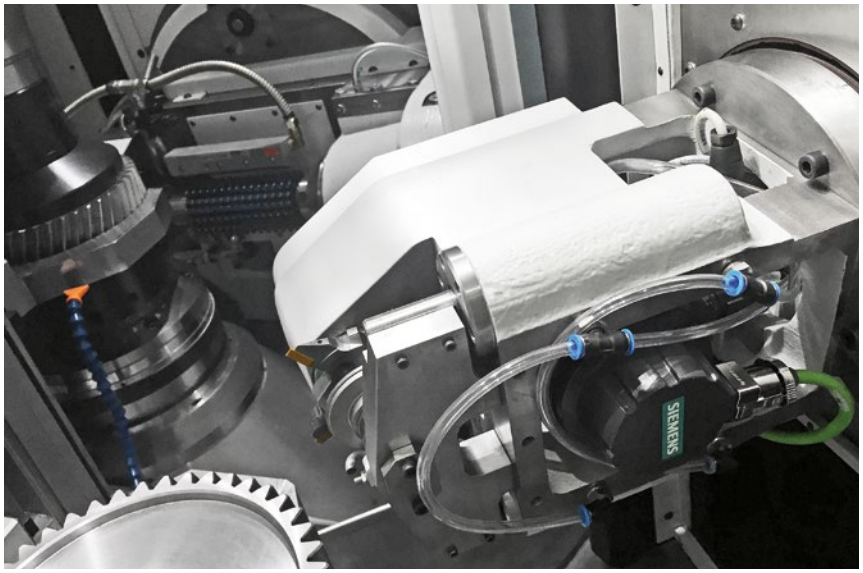
While available for wet cutting, the 400HCD is also optimized for dry hobbing and chamfering. A machine bed with steep angles and large openings directs hot chips away from machine components. Additionally, hob head and workpiece spindle speeds can accommodate the latest tool materials like G50 or even G90 with AlCroNite® Pro coatings for high performance cutting.

Designing the machine for dry hobbing also enables the chamfer process to run dry without limits. Chamfer Contour Milling is a process where flexibility, low tool cost and high tool life match perfectly with dry cutting.

Fly cutter with indexable carbide inserts for economical chamfering.

In Summary

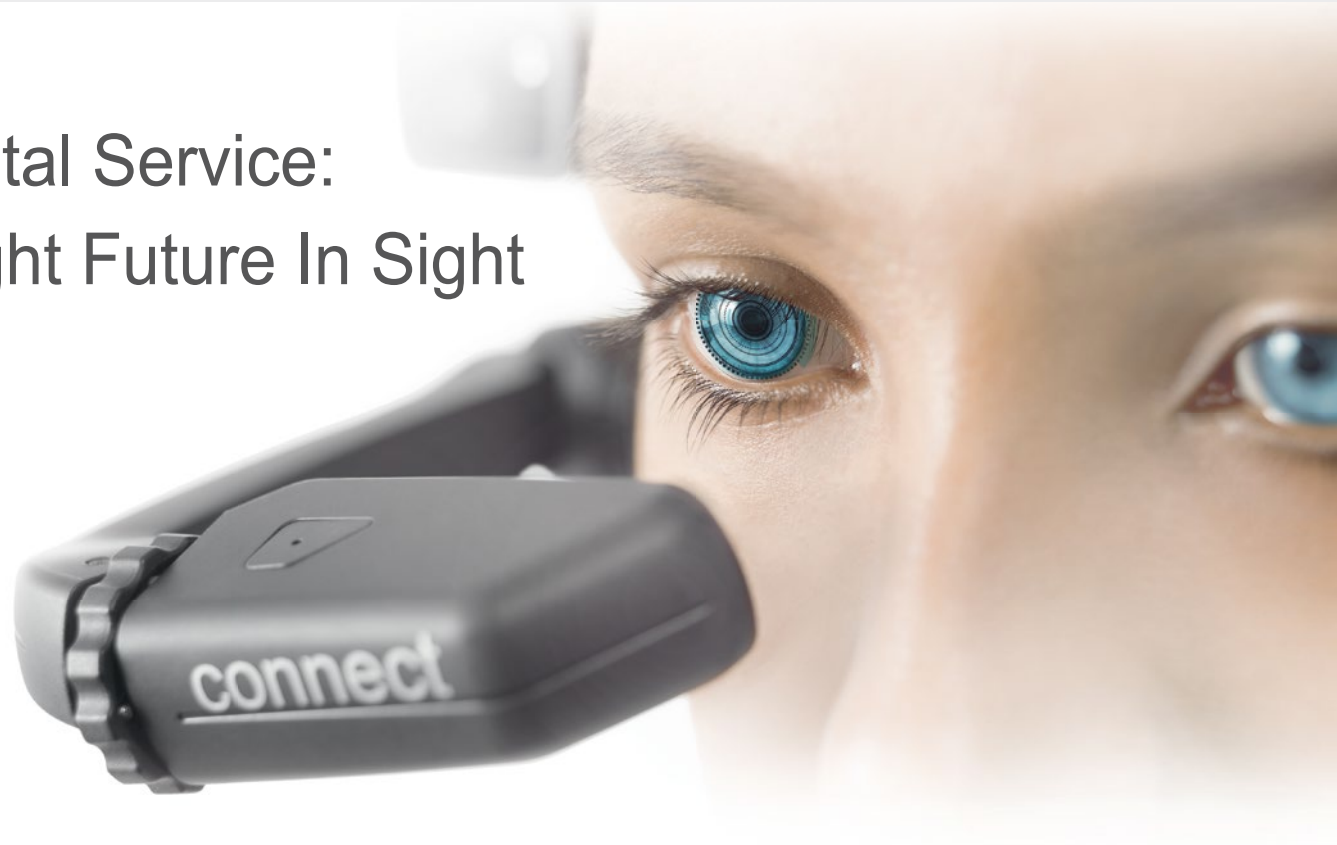
It's fortunate that, today, manufacturers now have a variety of integrated and automated chamfer/deburr options available, whether the well-proven chamfer rolling process, or these newest Chamfer Hobbing and Chamfer Contour Milling processes. Better yet, Gleason hobbing machines are available with the right chamfer process for every application – from small pinions produced with the shortest possible cycle times, through automotive-type gears and shafts, up to truck-size gears and job shop applications. These are complete solutions as well, including machine, tooling and application expertise.



Chamfer Contour Milling in parallel to gear hobbing on the 400HCD does not add cycle time.

Gottfried Klein
Director of Product Management Hobbing, Chamfering and Shaving
Gleason Corporation

Digital Service: Bright Future In Sight



Gleason digital service technologies solve service problems on the fly – or even before they occur. End result? Uptime like you've never seen.

One of your machines is down, and the clock is ticking. You're losing precious production time and putting a tight customer delivery date at risk. Your Gleason service technician arrives, but it could take hours to diagnose the problem, communicate with support staff at the Gleason factory, and then implement a remedy.

Or not.

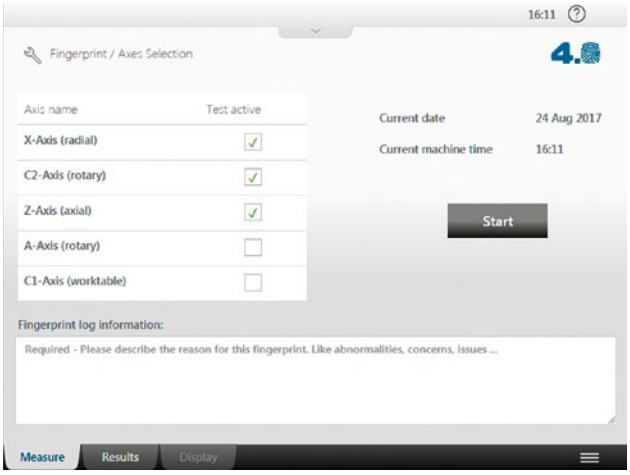
Fortunately, your Gleason service technician is equipped with a pair of Gleason Smart Glasses. The glasses are equipped with a bi-directional communications capability that enables the service technician to deliver live imagery and voice communications to the support staff at the factory. Now, they're already working together to quickly identify the problem. The support staff then guides the technician through the service process, using Augmented Reality to project documents onto the glasses and highlighting or labeling certain components in the technician's field of view. Your machine's up and running again in a fraction of the time it used to take.

The Future of Service Has Arrived

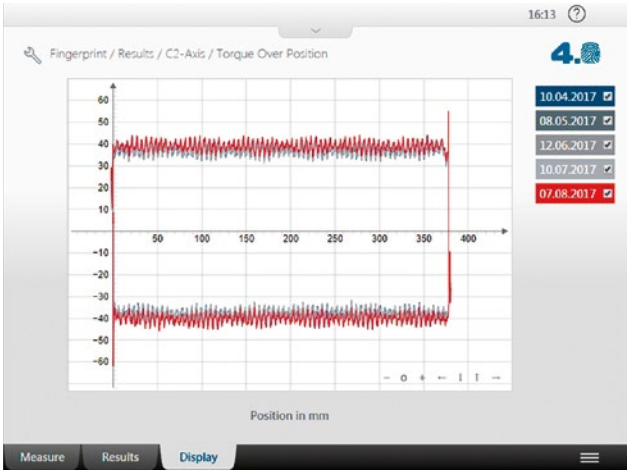
Gear manufacturers have high expectations for their advanced new production machines. They're capable of delivering performance far in excess of what was possible just a few years before. Gleason's customers expect these machines to be up and running productively around the clock – and there's little tolerance for any extended period of downtime, whether for unexpected service or routine maintenance. The recognition of this new service paradigm has spurred Gleason on to develop two new 'digital' service technologies that will make a quantum leap in service speed and efficiency:

Gleason Connect+

Gleason Connect+ is based on the familiar Gleason remote service concept. This service option was installed across the board as long ago as the 1990s, using MS Windows. The new feature with Gleason Connect+ is the service referred to as "Augmented Reality". The core of this innovation is formed by Smart Glasses with a viewing field onto which information can be projected. Projection options range from the highlighting of individual components to the transmission of complex suggested solutions. It puts office-based Gleason service staff in a position either to help



Gleason Fingerprint user interface.



Clear graphical display allows for rapid identification of faults.

the customer directly or to support the Gleason customer service engineer on site with information and additional documentation. In collaboration with customers or the engineer, a problem can thus be detected more quickly, reducing system downtime to a minimum.

Augmented Reality has enabled Gleason to create a win-win-situation: noticeably shorter machine downtimes for the customer and a Service Organization which can work much more effectively.

4.0™

Gleason Fingerprint™

Similar to a human's fingerprint, machines have a specific mechanical fingerprint too. It's unique to the machine, and can show the machine's true condition. Gleason Fingerprint is based on the well-known Kilometer Zero Test. It can be used to retrieve a direct comparison of the machine's current status and the ideal/normal status on the user interface of Gleason machines. Fingerprint information can then result in faster, more detailed diagnostics and more proactive service actions.

This new diagnosis tool, unique to Gleason, is the starting point for Gleason's vision for the future: to move away from the conventional reactive servicing model toward status-based and, eventually, anticipatory/predictive maintenance. The eventual goal for this development is intended to be the "smart machine", where the machine is capable of completely automated and continuous self-diagnosis. Direct transmission of all the necessary data for servicing/repair then takes place automatically and without service intervention at the ideal time – before a fault can happen.

'Digital' isn't just for new machines. Gleason Connect® is available for older machines, with installation of the Gleason Connect® box, which digitally connects your machine to Gleason Global Services for remote analysis and troubleshooting.

Robert Peyr
Product Manager
Global Services

New Frontiers for Power Skiving

Power Skiving is the new competitive alternative for hard finishing, with the potential for major savings.

What began a few years ago as a promising, but specialized, process alternative for cylindrical gears with challenging interference contours is now exceeding performance and application expectations. There are now Gleason Power Skiving solutions for soft cutting and hard finishing of internal and external gears and for machining shafts, worms and special profiles such as cycloidal gears, as well as for gears as large as module 9 mm and diameters up to 800 mm.

Getting here hasn't been without its challenges. Power Skiving places considerable demands on the overall system of machine/clamping device/tool/process. The best possible result can only be achieved if these elements are working in harmony with one another and the system as a whole has the necessary stiffness. Gleason has worked hard to put the complete system in place: process simulation, production machines and metrology equipment, workholding, tools and support services – all working in concert.

Effective Machining of Small Internal and External Gears

Internal and external gears with small overrun space can be produced more economically than shaping using the 100PS, the smallest machine in the Gleason Power Skiving family. In the case of external gears with small overrun space, Power Skiving may even outperform hobbing, since small hob diameters actually impede the efficiency of the hobbing process, while highly productive Power Skiving cutters with relatively large diameters can instead be used.

The horizontal arrangement of the workpiece axis and equipment with a tailstock make the 100PS an outstanding choice for machining both shafts (Figure 1) and internal gears. Furthermore, the 100PS can be equipped with an integrated chamfering/deburring station for external gears. The chamfering process is interpolated before the final cut and helps achieve finished machining quality afterwards. For internal gears, the 100PS has a patented deburring unit which can be programmed via 2 NC axes. As a special feature, the machine provides the option for skiving worms (Figure 2).

Medium and Large-Sized Workpieces With Integrated Deburring

For medium and large-sized workpieces up to 800 mm in diameter and module 9,

Fig. 1

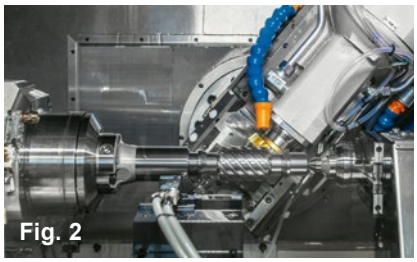


Fig. 2

there is a whole range of Gleason Power Skiving machines, from the 300PS to the 600PS, which can be expanded to a diameter up to 800 mm.

The machine concepts with extreme stiffness are perfectly complemented by modular workholding equipment in various sizes. The precision and reliability of the overall system results in shorter cycle times, as well as outstanding gear quality and surface finish. Not only can cycle times be reduced by a factor of 2 to 5 (depending on the application) but, when compared to gear shaping, tool cost per workpiece is significantly reduced as well.

Hard Power Skiving: Attractive Alternative

The demand for quieter gear boxes and higher torque increasingly require finishing of hardened gears. Now, for the first time, Hard Power Skiving brings economical hard finishing solutions to the small to medium-sized internal gears market. Tooth space position is detected with the stock dividing sensors – similar to those on grinding machines (Figure 3). The combination of the extremely stiff machines with direct drives, simulation software, process expertise and modern carbide tools combine to achieve quality and surface finish levels that are perfectly adequate for the majority of finishing applications.

Power Skiving for Bevel Gear Cutting Machines

It is also possible to install Power Skiving onto the current generation of Gleason bevel gear cutting machines with an expansion package. Various tool systems, including solid carbide or PM tools, as well as indexable carbide-insert cutting blades, are incorporated in these Power Skiving solutions.

Simulation Software

Most importantly, Gleason Power Skiving technology and simulation software (Fig. 4), enables the end user to simulate the entire skiving process in advance to determine the most effective process strategy and tool design. The simulation software analyzes the impact of various tool geometries and process parameters on chip formation, gear-cutting quality and the collision situation, as well as effects on cycle time.

Closing the Loop on Quality

Finally, the Gleason Closed Loop method optimizes the production process by networking Gleason Power Skiving machines directly with Gleason GMS® metrology equipment. Measurements and the resulting corrective actions are fast, accurate and automated.

Despite significant and sustained progress in recent years, the potential of Power Skiving is far from exhausted. It will be exciting to see where Gleason goes from here.


Fig. 3

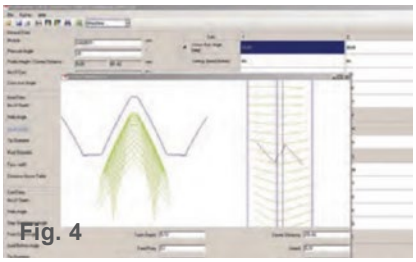


Fig. 4

Udo Stolz
Vice President
Worldwide Sales and Marketing
Gleason Corporation

In-Process Gear Inspection at Light Speeds

New GRSL technology adds value to high volume transmission gear inspection by combining revolutionary non-contact laser inspection with tried-and-true composite roll testing.

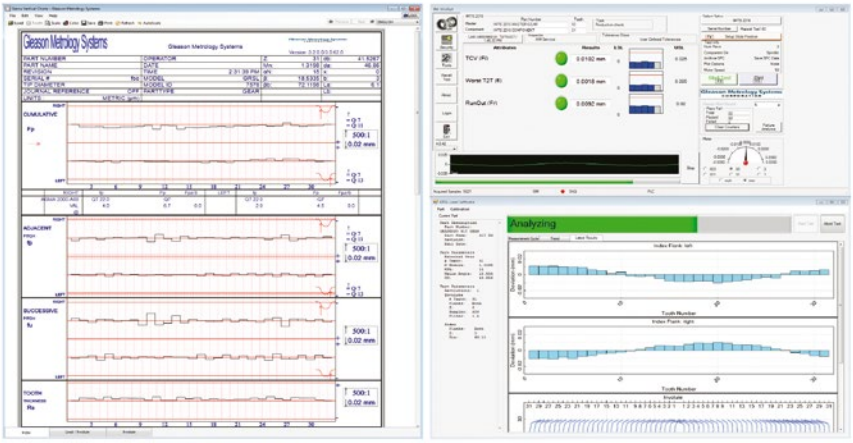
Gleason Metrology Systems is racing to keep pace with the inspection challenges that now exist for today's gear manufacturers and, ultimately, to add value with new technologies that improve accuracies, cycle times, capabilities and ease of use.

GRSL: Bringing Non-Contact to High Volume

The most recent example of where all of these 'added value' user benefits have converged in a single technology: the new Gleason GRSL Gear Rolling System with non-contact laser inspection. GRSL combines the latest non-contact gear analytical measurement innovation with the tried-and-true double flank roll test gear inspection process used today in most high volume gear production where 100% inspection is required. This new product follows the strategy of the recently introduced multi-purpose GMSL non-contact inspection system from Gleason: the industry's most powerful multi-sensor instrument for gear inspection and process development. Where the GMSL was developed to exceed the requirements of today's most stringent gear processing research, development and reverse engineering needs, the GRSL brings high accuracy, high speed, non-contact measurement of gears in-process to the high volume production environment, where performance expectations have never been higher.

The new, powerful GRSL product stays true to the strategy Gleason's

GRSL combines the latest non-contact gear analytical measurement innovation with the double flank roll test gear inspection process, including nick detection, to deliver unprecedented in-process inspection speed and flexibility for cylindrical gears up to 250 mm in diameter.



Non-contact (laser) index and profile inspection can be performed on all the gear teeth in a matter of just 10 to 15 seconds, as compared to several minutes when done conventionally.

Develop New Gears Faster with GMSL

GRSL joins GMSL®, the industry's first non-contact multi-sensor inspection system with both cylindrical gear and bevel gear measuring capability. GMSL is a true gear design and development tool that combines the data acquisition speeds of non-contact laser scanning with the complete gear inspection capabilities inherent in Gleason's standard line of GMS gear inspection products.

partner customers continue to ask for. It adds value by adding measuring capability with multiple sensors on a common platform to reduce cost of ownership, the number of operators required and the footprint. In addition, it adds throughput by measuring both the composite, functional error and the individual part characteristics of both involute and index simultaneously during the same revolution of the gear during the test cycle.

Single Platform, Exciting Possibilities

This patent pending, dual purpose inspection system provides additional value by offering the versatile GRSL platform in three different configurations for use as a stand-alone manual gauge, a semi-automatic gauge or even as a fully automated gauge where high volume throughput is the priority. Tests for full analytical results of both involute and index are performed on all teeth for most external, cylindrical gears up to 250 mm diameter in a matter of seconds along with the composite double flank roll test, with both tests taking place simultaneously.

With the new GRSL, the power of high speed involute and index measurements also comes with the ability to integrate with Gleason Metrology's GAMA gear analysis and charting output. This means options for AGMA, DIN, ISO as well as OEM specific analysis are available for the involute and index measurements, with common charting as seen on the GMS line of analytical machines in use throughout the gear industry.

Consider the possibilities of full, high speed involute and index measurement in process, inline. Add to that the ability to network this data in a closed loop configuration directly to the machine tool using Gleason Connect® to communicate results that can assist in determining necessary changes to the machine tool, the cutting tool, part setup, etc. All of this is now available, fully integrated with the traditional double flank roll, composite testing still called out on most part prints today in high volume gear production.

Faster Cycle Times, Greater Throughput

The possibilities are exciting to think about and the capabilities continue to grow. Measurements of analytical characteristics are typically taken on a dedicated, stand-alone analytical machine in a lab or on the shop floor, not inline. This typically takes several minutes for a sampling of teeth for involute measurement and all teeth for index. The GRSL offers analytical measurement of all teeth in a matter of seconds, with many tests completed in 10 to 15 seconds, and provides the double flank composite test data simultaneously, including nick detection, thus delivering significant throughput value. The GRSL also offers the flexibility of operating the analytical and composite, double flank tests independent of one another if desired. This can offer advantages such as extending the life of the master gear if, for example, it is determined that not all parts require double flank composite testing.

Douglas Beerck
Vice President and General Manager
Gleason Metrology Systems

Gleason-Pfauter Studen Leaps Forward

Gleason-Pfauter Studen's new Technology Center keeps pace with growing global demand and exciting strategies for future growth.

After one year of planning and preparation followed by a year of construction, the Gleason-Pfauter Studen operations have relocated to an advanced new Technology and Manufacturing Center located just a short distance from the previous building in Studen, Switzerland. Here, Gleason will produce horizontal and vertical hobbing machines for gears with diameters up to 250 mm, including the existing product portfolio, the Genesis series and future machine developments as well as automation solutions.

Moving into a work environment that has been tailored to suit the exact needs of a modern machine builder has been a huge leap forward, according to Gleason-Pfauter Studen General Manager Rudolf Moser. “New technologies, including Power Skiving, are driving great interest and business opportunities from our customer base,” says Mr. Moser. “Our success is a credit to our employees. Through their efforts our business continues to grow each year. Our new factory will create an even better environment to further develop new products and technologies and continue producing the highest quality machines.”

The new building’s footprint expands office space by 30% and machine assembly capacity by almost 60% compared to the previous premises.

The assembly area has grown in height to fit an optimized storage of pallets and create the possibility to directly load machines from assembly floor to heavy trucks inside the building. Even with the larger footprint, Gleason-Pfauter continues to optimize material flow and work processes. Special attention has been paid to the carbon footprint of the new facility, utilizing energy-efficient construction materials, integrating thermal insulation and installing an air-based heating system. Energy savings are expected to be significant, with 100% of the plant's energy needs met from renewable hydropower.

About the New Gleason-Pfauter Studen Technology and Manufacturing Center

Location:

- Studen, Switzerland

Resources:

- Hobbing, Profile Grinding and Power Skiving machines.
- Automation solutions.
- Full customer service and training support.

Customer Benefits:

- Standardized, highly efficient assembly methodologies.
- Robust quality systems to drive continuous improvement.
- Optimized capacity utilization to help meet and exceed customer expectations for delivery.

In the LEED at Gleason Works (India)

Gleason is proud to announce that, just a year after the Grand Opening of the ultra-modern new Gleason Works (India) factory in Bangalore, the facility has been awarded the prestigious LEED (Leadership in Energy and Environmental Design) Platinum Certification. LEED is the global 'standard' for recognizing the level of sustainability, efficiency and cost-savings achieved by "green" buildings. A Platinum rating is the highest of four LEED certification levels, and a measure of seven key criteria that Bangalore has excelled at, including:

1. Site:

Construction pollution prevention

Hardscape and softscape efficiencies

Water harvesting

2. Water Efficiency:

Water conservation and treatment over 40%

3. Energy and Atmosphere:

High performance glass, HVAC systems, LED lighting

4. Materials and Resources:

Track and monitor waste during construction

Recycled content

5. Indoor Environmental Quality:

Low VOC paints and flooring

Fresh air – 30% extra

6. Innovation in Design:

Solar (Photovoltaics)

Water use reduction – exemplary performance

7. Regional Priority:

Purchasing local

"The building was constructed with a target of LEED Silver or Gold certification, but with the addition of a rooftop solar (photovoltaics) system to meet a significant part of the facility's energy needs we were able to achieve the highly sought-after Platinum level," says Tom Sawyer, Gleason Cutting Tools Facility Manager and Project Leader of the construction project. "It's truly a testament to Gleason's global commitment to sustainability."

The New Blue: Improving Workholding Life

Gleason's new Segmented Collets deliver exceptionally reliable, accurate and 'universal' bore clamping for a very wide range of cylindrical (and some bevel) gear production applications.

Gear manufacturers today must turn on a dime to meet fast-changing customer demand and marketplace conditions with faster production of smaller lot sizes. More frequent part changeover has fostered the development of workholding systems with quick-change, often tool-less designs to take increasingly valuable non-productive time out of the process. This new gear production paradigm has also exposed the inherent weaknesses of conventional I.D. clamping devices that lack flexibility and/or reliability – and created an opportunity to greatly improve overall clamping performance.

Segmented Collets Made More Reliable

Workholding systems using segmented collets that expand to center and clamp in the gear bore bearing diameter are among the best solutions for today's small-batch, diverse-part production environments. Their expansion range inherently offers users greater flexibility, so a single collet can accommodate a range of bore diameters, thus helping to reduce both equipment cost and the non-productive time needed for changing over less flexible workholding. These segmented collets are typically composed of an assembly of high-strength steel segments bonded together with rubber utilizing an injection molding process. This steel/rubber assembly delivers both a wider range of expansion than steel alone and, additionally, vibration dampening. Typically, the collet is expanded (chucked) or contracted (de-chucked) by an expander that's actuated by a

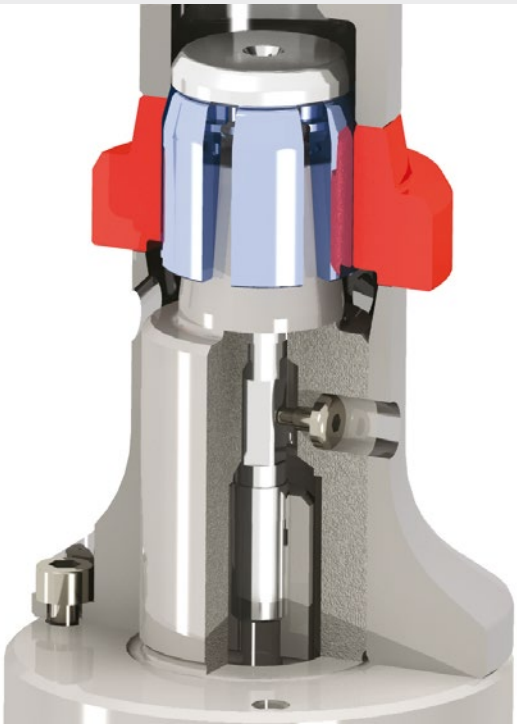
drawbar connected to the production machine. As the expander pulls down it causes the collet to expand and produce a particularly rigid radial face clamping/pull back effect on the workpiece.

But the composite metal/rubber construction that gives a segmented collet its wide expansion range also exposes an Achilles heel: reliability. Over time, after thousands of chuck/de-chuck cycles, excessive wear and runout often become evident. These conditions can be further exacerbated by what's known as 'over-chuck', or when chucking is initiated without a gear blank in place. Excessive runout can result from just one or two instances, not to mention causing the collet to break.

In response, Gleason's Tooling Products Group has developed a completely new segmented collet that combines highly desirable flexibility with exceptional accuracy and reliability. Only eight different configurations of the new Gleason single-angle Segmented Collet are needed to cover bore diameters ranging from 20 to 100 mm – the most common sizes for automotive gear manufacturers and many others. Each configuration delivers a particularly wide expansion range of up to .76 mm so that fewer sizes are needed to accommodate a wider range of bore clamping applications – cylindrical, as well as some bevel gears. The outside diameter of the collet blanks can also be easily and quickly ground to a specific customer size. It's the closest thing yet to a 'universal' segmented collet design.

Even more compelling is the new product's exceptional performance. In order to minimize or eliminate altogether the potential for excessive wear, fatigue and runout, Gleason started development with a clean sheet, and employing both FEA and the most rigorous lifecycle testing using test fixturing to cycle prototypes through a simulated chucking/de-chucking cycle over one million times – or many times what could be expected during the average life expectancy of the product. In fact, over the course of a million cycles or more, these new Segmented Collets showed no evidence of excessive wear or fatigue – with runout never exceeding 5 microns.

The process helped validate the new design and, most importantly, proved that the proprietary new injection molding process that Gleason developed with its supplier would eliminate the potential for the rubber elements that are injected between the steel segments from 'dis-bonding' with the steel segments and causing the collet to fail. Additionally, the proprietary rubber 'recipe' developed for the rubber elements exceeded expectations and the criteria set for characteristics like elongation, hardness, sensitivity to changes in the environment, stability, and even its distinctive blue color.



Segmented collets give workholding maximum wear life; with sizes and an expansion range covering the bore clamping requirements of the most common cylindrical – and some bevel – gear types and sizes.

Today, Gleason is rolling out Segmented Collets in conjunction with many of its existing workholding systems, including the latest quick-change models, and for use on all types of Gleason and non-Gleason gear production machines. Customers will have ready access to these products quickly and on-demand from strategic Gleason locations worldwide, where they can be easily ground to specific customer requirements and delivered in a matter of just a few weeks.

Gleason quick change workholding solutions for both cylindrical and bevel gear bores now feature a new segmented collet that greatly improves clamping reliability, flexibility and accuracy.

Tim Zenoski
Director, Global Product Management, Workholding
The Gleason Works

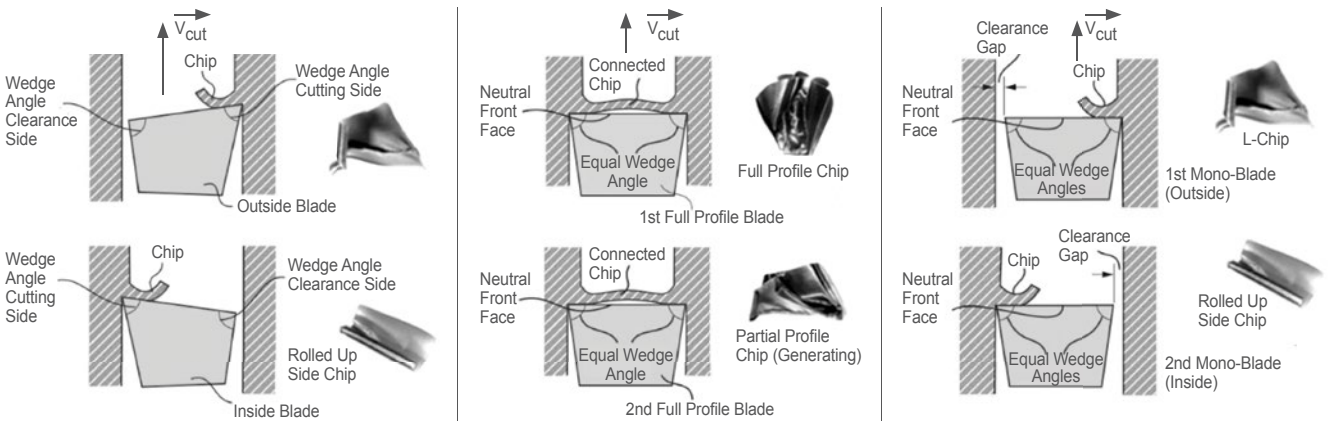
In a Class by Itself

Bevel and hypoid gearsets which are hard finished by grinding are first semi-finished with the single indexing face milling process, requiring greater efficiency and cost effectiveness. Enter the Pentac®Mono-RT.

When the full profile cutter blade system (center in Figure 1) was introduced, the manufacturer hoped this was the solution for highest chip removal effectiveness compared to the inside-blade, outside-blade system (far left in Figure 1). The idea of using the same blades in all the cutter head slots appeared tempting and the fact that each blade acts as an inside as well as an outside blade promised a duplication of cutting efficiency.

The practical experiences with full profile blades revealed several disadvantages which had not been anticipated. It began with cutter head building, which can only achieve an averaging of the radial errors between inside and outside cutting edge because they are part of one blade. The unfavorable chip formation requires high cutting forces leading to severe part heat up and high temperature drop between first and last cut slot (red temperature labeling in Figure 2). Also the phenomenon of chip packing between two consecutive

Fig. 1: Three different systems for chip removal.



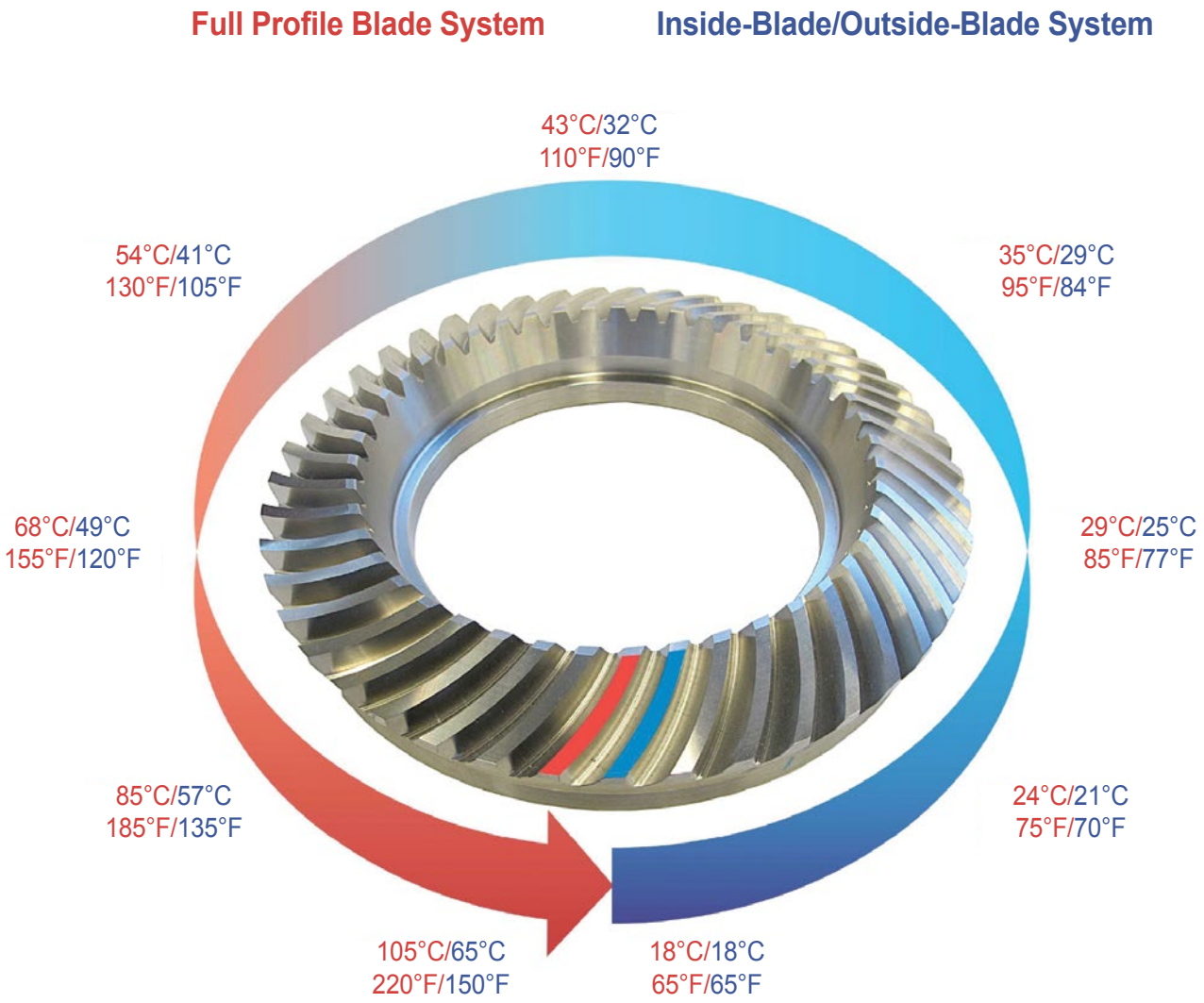


Fig. 2: Compare the part temperatures generated by the full profile blade cutter head versus the inside-blade/outside-blade Pentac®Mono-RT system. The full blade system results in chip formation requiring high cutting forces and causing severe high part temperatures that impact part quality and cutter tool life. By contrast, the Pentac®Mono produces far less process heat.

blades appeared more frequently than experienced with the traditional inside-blade, outside-blade cutter system.

The Mono Blade Breakthrough

A technologically sound solution for an advanced and highly productive face milling cutter system was developed with the Pentac®Mono-RT. Just like the full profile system, the Pentac®Mono requires only one type of identical blades for all cutter head slots (shown far right in Figure 1). The clearance gap which is achieved by stepped slot bottom radii alternates from one slot to the next and makes the identical blades either an inside or and outside blade. Building and truing of Pentac®Mono cutter heads is done fully automatically with the Gleason 500CB Cutter Build and Truing Machine. Via network, the actual cutter summary, as well as all cutter head specific data, is transmitted to the 500CB. Because of the radial blade positioning principle in the

Pentac®Mono

Figure 3: Automatic building and truing of Pentac®Mono with 500CB.

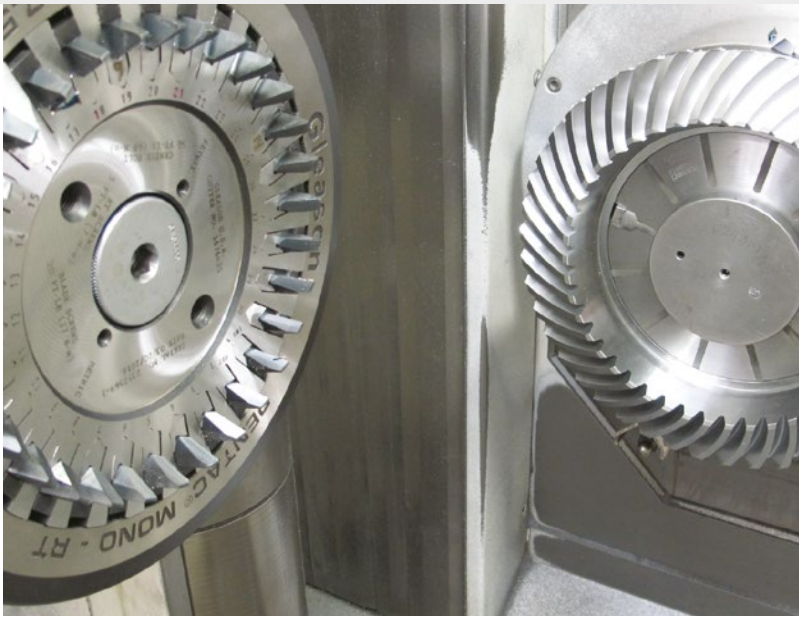


Figure 4: Phoenix 280CX after cutting with 7.5" Pentac®Mono-RT cutter head.

Pentac®Mono cutter head, a perfect radial truing can be achieved during the automatic cutter build operation.

Although the Pentac®Mono blades all have a zero degree side rake angle, the cutting edges act sharp due to an increased top rake angle. The chips roll up very compact and exit the space between two consecutive blades before the same blade enters a slot again. The cutting forces of Pentac®Mono are lower than the forces of the full profile system. Lower cutting forces and less chip deformation work result in an up to 40°C reduced temperature step between first and last cut slot. In connection with the low cutting edge runout of radially trued Pentac®Mono cutters, the cutting process runs very smooth and delivers high surface finish and improved spacing. A view of a Pentac®Mono 7.5 inch cutter head in the work chamber of a Phoenix® 280C after cutting a ring gear is shown in Figure 4.

Pentac®Mono is, for the future of stick blade cutter heads, a major step forward, comparable to the Hardac® cutter system breakthrough for side relief arc ground blades back in 1960.

Hardac cutter heads were radially truable and provided a large range of radii to be covered with one specific cutter size by utilizing parallel spacers between slot bottom and blade. In order to achieve similar flexibility, new Pentac®Mono cutter heads also feature parallel spacer elements with a prismatic profile which allow covering a range of up to 10 mm radius change.

Pentac®Mono cutter heads use the same blade summary for inside and outside blades, are radially truable and cause lower process heat than cutters with full profile blades. Lower cutting forces and the elimination of chip packing results in a smooth cutting process which makes Pentac®Mono the ideal cutter system for face milling. At the end of a tool life, the blades in outside slots are only worn on the outside cutting edges and the blades in inside slots are only worn on the inside cutting edges. In most cases of pinion and gear cutting it will be possible to “switch” the blades from outside to inside slots and vice versa in order to run a second tool life without re-grinding and re-coating of blades.

Ultimately, all the Pentac®Mono-RT advantages result in an increase of part quality, improved blade summary and cutter logistics and a reduction of the tool cost per part by about 50%.

Dr. Hermann J. Stadtfeld
Vice President
Bevel Gear Technology
Research & Development
Gleason Corporation

Uwe Gaiser
Dipl.-Ing (FH)
Director Product Management
Bevel Gear Solutions
Gleason Corporation

New Dressing Tools Work Harder

Productive new dressing tools that last longer and produce better quality are vital to hard finishing processes such as honing and continuous generating grinding.

In hard gear finishing operations manufacturers naturally tend to focus most on machines and cutting tools. When parts are produced as required, grinding wheels and honing tools get much of the credit. But just as critical are the dressing tools that put the correct profile onto the cutting tool. The rapid development in cutting materials and bonding systems has led to a new generation of advanced tools – all of which need to be dressed quickly and with the highest quality.

Gleason Hurth Tooling has long been a leading producer of Diamond Dressing Gears for honing and Diamond Dressing Discs for continuous generating and profile grinding. Today, Gleason is successfully fitting the highly desirable properties of these dressers to the needs of the latest honing and grinding tools.

Geared Up for Honing

Gleason Diamond Dressing Gears can be designed for conventional and Spheric® Honing, including the required profile modifications as well as specific bias/twist. Usually they have a bigger number of teeth than the workpiece to improve tool life, a module range from 0.8 to 6 mm, and are designed for the type of gear honing machine requested. Diamond type as well as grit size, bond type (usually electroplated Nickel),bond properties and thickness together with a very precise finishing process of the plated diamonds define the quality that will be achieved as well as the life time of the dresser.

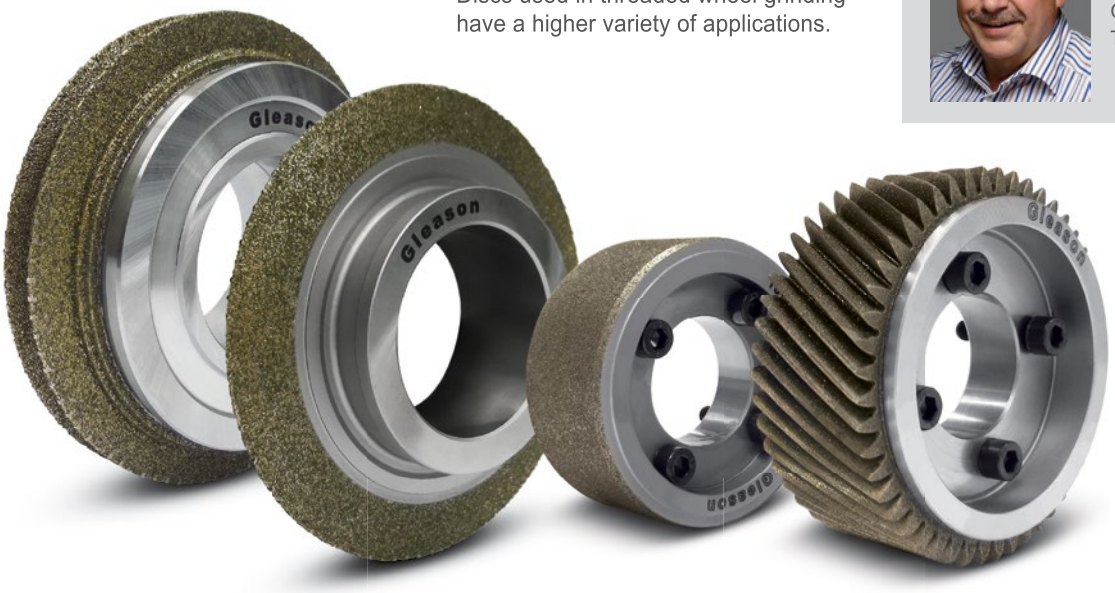
Perfect Fit for Threaded Wheel Grinding

While Diamond Dressing Gears are typically designed for one specific workpiece, the Diamond Dressing Discs used in threaded wheel grinding have a higher variety of applications.

For prototypes, universal dressers can produce any kind of profile modification required. For smaller lot sizes, flexible dressers with a certain pressure angle and module range are used. Workpiece-specific Diamond Dressing Discs usually include a tip radius dresser for fillet blending or even full form root grinding. Most importantly, all of these dressers can be used as part of the highly desirable twist controlled grinding process.

Ultimately, hard finishing processes can benefit greatly from the use of Gleason dressers that combine the highest quality, superior performance and maximum tool life in perfect fashion.

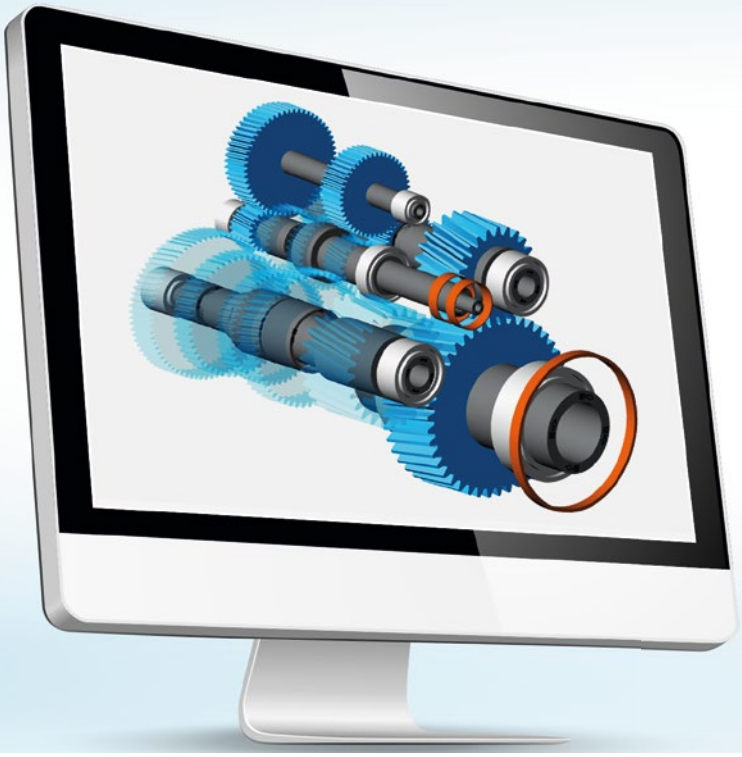
Dr. Klaus Lösch
Senior Engineer Development
Gleason Hurth Tooling GmbH



KISSsoft

Drivetrain Design Solutions

- System-level evaluations
- Highly efficient data processing
- Model complete gear units and drivetrains



The Power of 2

In line with the motto "Two software solutions – one goal", an interface has recently been created which exchanges gear design data between KISSsoft KISSsys® and Gleason GEMS®. This innovation combines the strengths of both systems to create a highly optimized overall system to meet gearbox/drivetrain requirements for strength, noise and efficiency. A further advantage is the combination of gearbox/drivetrain design with the gear design – by taking into account all manufacturing and production aspects. Here's an overview of both systems, and how they work together.

KISSsoft KISSsys: System Design and Simulation

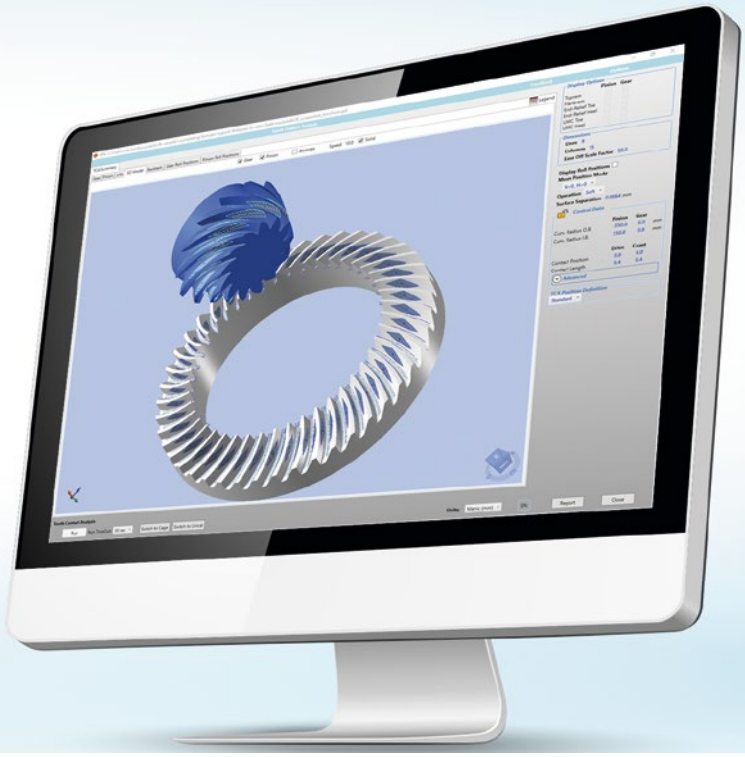
KISSsoft works on the basis of international calculation standards to provide extensive optimization options for the entire sizing process of machine elements. The software guarantees you can perform quick and accurate strength calculations. It also provides reports containing detailed information about safety factors and service life values. Interfaces to all the standard CAD programs complete the features of this product.

KISSsys is KISSsoft's system add-on that enables you to model complete gear units and drivetrains. KISSsoft calculates the service life and strength of the different machine elements, and transfers the results to KISSsys, where they are displayed in clear overviews. To achieve this, KISSsys brings together kinematic analysis, 3D graphics, and user-defined tables and dialogs.

KISSsys allows the users to perform system level evaluations in one run, while considering the interdependent effects of every single components of the gearbox on one another. System reliability, load spectrum calculation, efficiency and thermal balance evaluation, modal analysis are now available. And all that with consideration of all possible misalignments calculated in KISSsoft, coming from shaft deflections, planet carrier deformations, bearing stiffnesses, thermal effects, and others.

GEMS: Optimized Gear Design and Analysis

With GEMS, Gleason has introduced the next-generation design and manufacturing system for bevel gears. It is a powerful new software platform that provides highly desirable gear design and analysis capabilities, seamlessly connects with all your existing Gleason design software – and helps optimize the complete bevel gear manufacturing process.



GEMS

Design ◆ Prototype ◆ Produce ◆ Connect

- Optimized gear design and analysis
- Open design, seamless connectivity
- User interface and data processing innovations

The new KISSsoft/GEMS design interface gives users two powerful software tools that now work together to improve gear, gearbox and drivetrain system performance.

The GEMS architecture is very clear and flexible, because – based on the process sequence – all the necessary work steps are clearly arranged in different "apps". In turn, these apps help you design and analyze gears. They also create manufacturing data for tooling, milling and grinding data, and 3D coordinates for the closed-loop manufacturing process. In addition, this enables prompt implementation "time-to-market" of new functionalities.

GEMS is the world's first software for gear design that can be operated entirely via its touch screen. It is also fully compatible to keyboard and mouse operation which allows spontaneous changing between an initial touch interaction to the keyboard for example to enter numerical data during a tooth contact optimization. The GEMS software is also developed to be utilized on a tablet or a hybrid laptop to create a better User Experience (UX).

Two Software Solutions, One Goal

GEMS and KISSsys programs are now linked by a direct interface to exchange gear and system design data between the two software packages.

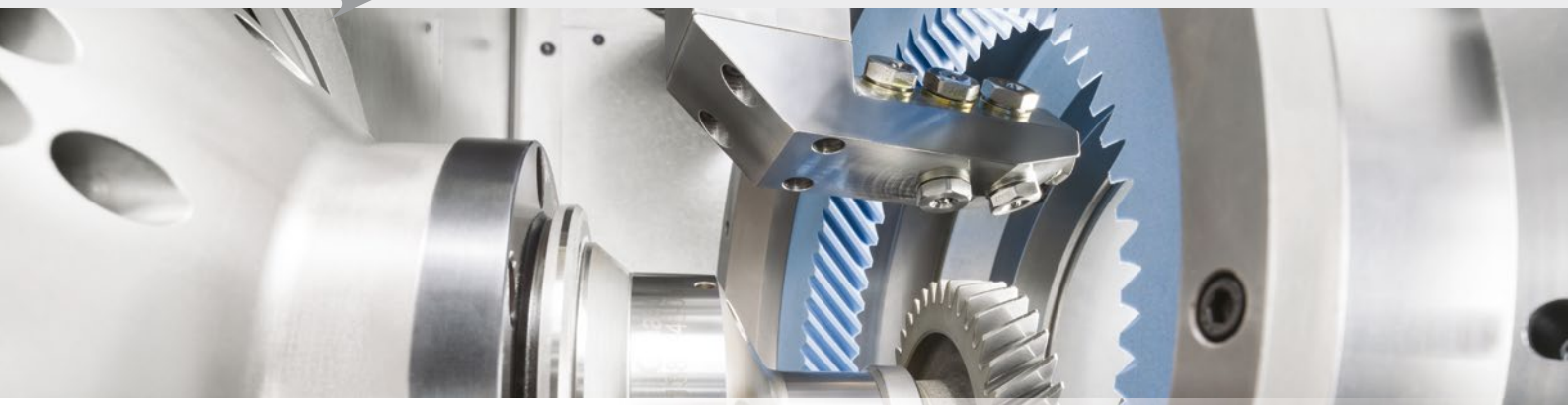
From a gearbox model in KISSsys, GEMS supplies the values for the geometry data of a selected bevel gear pair, which is imported and directly set in the corresponding KISSsoft calculation. Thanks to the automatic communication between the bevel set and shaft modules in KISSsys, KISSsoft determines the EPG misalignments of the gears, taking shaft bending values into account.

All the important results such as transmission error, meshing stiffness, root stresses, or even contact pressure on the flanks of the pinion and the wheel can finally be displayed in KISSsys after transferring back the result data from GEMS.

This process allows the user to evaluate and optimize in a more accurate way any type of bevel or hypoid gearset with a closed loop between the simulation and the manufacturing processes.

Markus Bolze
Manager Bevel Gear Theory and Software
The Gleason Works

Juerg Langhart
Technical Sales
KISSsoft AG



Hard Finishing With Power Honing Gets Even Better

The new-design Gleason 150SPH Spheric® Power Honing Machine takes a proven concept to new levels to meet the hard finishing challenges of increasingly complex gears with highly desirable low-noise characteristics.

In the early 1990s, Gleason did a great deal of pioneering work to develop honing into an independent Power Honing process. In fact, today's machines facilitate removal rates which are in no way inferior to those of grinding.

Power Honing has thus become a full-fledged hard finishing method on par with gear grinding – with even some key advantages over the grinding process.

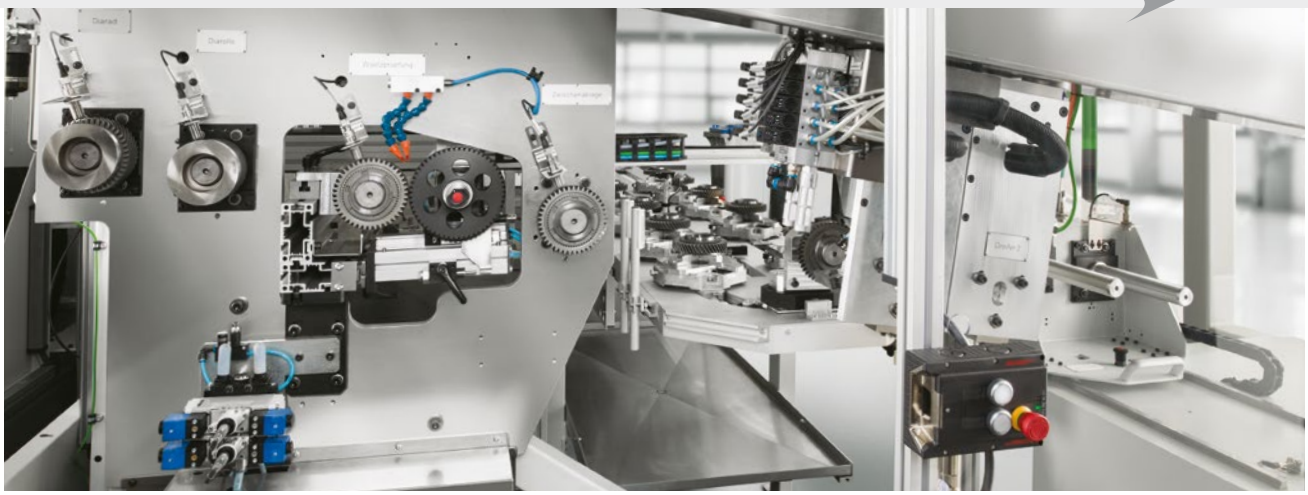
For example, the particular kinematics of the 150SPH allow a narrow cross-axis angle to be implemented between the tool (honing ring) and the workpiece, making it possible to machine workpieces with interfering contours. This is not possible using machining processes which require tool overrun travel. Another key benefit is the much-validated fact that honed components will feature favorable noise characteristics due to the typical surface structure of their tooth flanks. The very low cutting speeds prevailing in honing due to the nature of the process mean that there is also no risk of workpieces being subjected to thermal damage like grinding burn. High residual compressive stresses to prevent micro-pitting and help extend the long service life of the gears.

These benefits accommodate new developments in gear design, in particular. Higher and higher performance levels and significantly more stringent requirements with regard to noise characteristics are making gears used today increasingly complex.

Power Honing Gets Faster

At the same time, productivity is expected to increase. This can essentially be achieved by two measures: minimizing non-productive time and reducing primary machining time. Both objectives were the focus as Gleason sought to improve on the already very successful 150SPH Spheric® Power Honing Machine.

As with other processes, productivity can be increased mainly by means of higher cutting speeds which go along with higher rpm of the honing ring. A ring-shaped honing head is typically used in gear honing, with large bearings and motors being essential prerequisites for this head design, limiting its maximum speed. With a tool spindle speed of 3,000 rpm Gleason has been



The new simplified automation concept serves both disc-type parts and shafts. One linear loading axis transports parts from the conveyor directly to the workpiece spindle. Roll checking of workpieces is executed in between part pickup station and loading onto the workpiece spindle. The diamond master dressing gear and dressing roll are both stored and brought into action with the same grippers that also transfer the workpieces.

the benchmark in gear honing for years, achieving very short honing times with a classic honing ring design. The newly developed high-speed honing head allows speed increases of over 60% resulting in a tool spindle speed of 5,000 rpm and, consequently, increases in productivity of up to 30%.

The significant increase in speed is achieved by a specific tool head design which arranges bearings and motor no longer circularly around the honing ring, but in the axial direction behind the tool. The new design allows a reduction of bearing diameters and an increase of honing speeds. As a consequence the cup-type head does not feature tailstock support to clamp workpieces, which makes the concept ideally suited for workpieces which do not require tailstock clamping – disk-type workpieces for example. The classic ring-shaped honing head is available as an option to machine shaft-type workpieces and parts requiring tailstock support.

Optimized Automation, Minimal Non-Productive Time

In addition to the newly-developed high-speed honing head, both the automation concept and the auxiliary functions have been thoroughly redesigned and optimized to minimize non-productive time. The double-flank roll test to check initial machining quality, for example, has been eliminated from the manufacturing path and integrated into the loading step instead. Workpieces are no longer checked on the work spindle before the honing process is started – they are now validated in parallel with the actual machining time. This saves several seconds on every workpiece and – in the event of a faulty part – considerably more, as the workpiece in question never makes it to the honing process.

The entire automation process has been significantly simplified, with a remarkably positive impact on tooling-up time. Workpieces are removed straight from the conveyor belt using a double gripper and moved in a linear motion directly towards the work spindle. The work spindle takes the role of a pick-up spindle, removes the part from the gripper and takes the shortest route to the honing head. The roll checking unit is located on the route between the conveyor belt and the transfer position to the work spindle, including a SPC/NiO drawer.

The dressing tools (diamond dressing gear and diamond roller) are located outside the work area and can be loaded onto the work spindle by the existing gripper system. The loading system ensures that high-precision dressing tools are always stored safely outside the work chamber and can be conveniently maintained and changed.

The entire automation system of the new 150SPH is accommodated behind the machine, thus reducing the required floor space for the machine and its automation by about 40% compared to its predecessor.

The new SPH relies on the Spheric Honing kinematics which have been tried and tested over decades. This technology, developed and patented by Gleason, uses three interpolating linear axes to permit the flexible design of tooth flank modifications in the process. As with grinding, Spheric Honing allows crowning and lead angle modifications to be influenced by the process alone.

Dr. Antoine Türich
Director Product Management
Hard Finishing Solutions
Gleason Corporation

Adding Power Skiving to Meet Surging Demand

Italian gear manufacturer Metalcastello's investment in new Gleason Power Skiving technology comes just in time, as global demand surges for high-precision transmission gears used in heavy construction equipment and vehicles for agriculture.

What a difference a few years can make. The global heavy construction equipment and agriculture vehicle markets are flourishing again, fueled by new investment in infrastructure, energy and mining, and the demands of the fast growing emerging countries and their populations. In just a three month period ending in June, for example, heavy construction equipment manufacturer Caterpillar saw worldwide sales rise 25% year over year, including a 37% increase in the Asia Pacific region and 29% in Latin America.

Perfect Timing for Power Skiving

For Metalcastello S.p.a., the Bologna, Italy manufacturer whose heavy-duty transmission gears and shafts are used in earth-moving machines, tractors, and industrial vehicles operating on every continent, the timing couldn't be better. The company's recent investment in three new Gleason 600PS Power Skiving Machines has given Metalcastello capacity to spare for the production of critically important internal ring gears, some as large as 650 mm in diameter, used in the planetary gear systems of a customer's transmissions – while simultaneously improving quality from DIN 9 to DIN 7.

"There was nothing wrong with the traditional shaping process or the Gleason shaping machines that the company was using to produce these gears previously," explains Gleason Sales (Italy) Sales Manager Giulio Santantonio. "Unless of course you want to machine at speeds four to five times faster. When we demonstrated that the Gleason Power Skiving process for this application could achieve remarkable gains in productivity and quality, Metalcastello saw the potential."

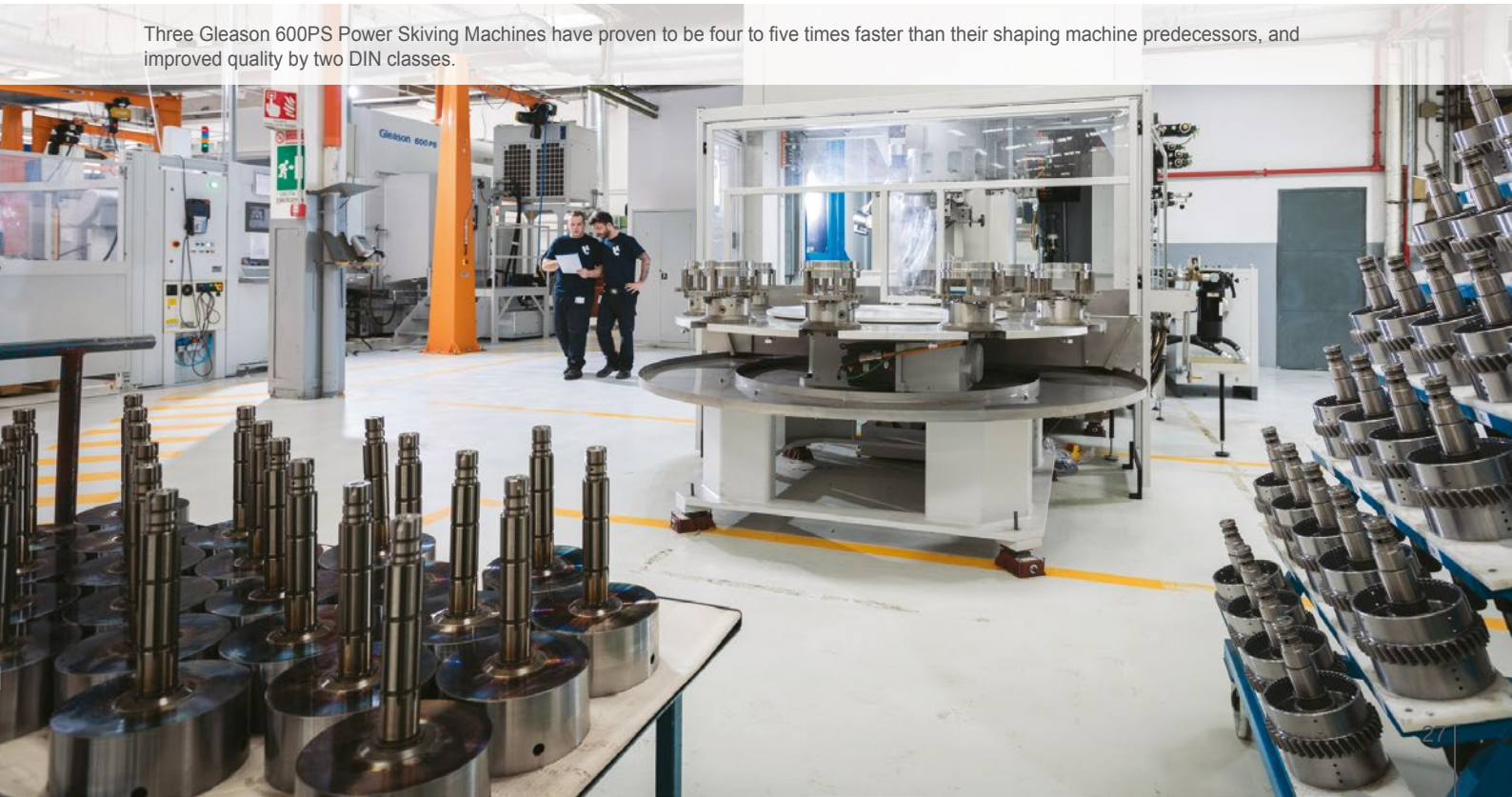
Seeing is believing, and Metalcastello managers came away firm believers in the Gleason Power Skiving process after Gleason conducted trial machining at its facility in Ludwigsburg, Germany. There, a Gleason 600PS was used to machine almost 100 3.5 module, 350 mm diameter 78-tooth ring gears made of hard 40CrMo4 material – actual customer parts that were being produced on Metalcastello's existing Gleason gear shaping machines. Additionally, the deburring required on the ring gear's lower face – a separate operation typically done off-line – was instead performed during the trial machining by the same cutter used for Power Skiving and thus requiring no additional workpiece changeover time. For this operation, Gleason grinds the backside of the cutter with the required contour of the workpiece to eliminate the burr.

Ultimately, the 100-part demonstration produced some impressive results: the 5.20 minute cycle time for complete machining was some four to five times faster than shaping, and profile, lead and pitch quality were measured at a highly desirable DIN 7, two classes better than what was being achieved by shaping. Additionally, it was determined that a cutter made with G70 high speed steel and using an advanced AlCroNite® Pro (AlCrN) coating produced the best results vs. a G50 cutter. Some 50 parts were completed (3,675 m/tooth) with the tool before the end of its useful life and the need for re-sharpening/re-coating.

Today, Metalcastello is reaping the productivity and quality benefits demonstrated at Gleason months earlier with an installation of three Gleason 600PS Power Skiving Machines. "While the Gleason shaping machines used previously are still producing parts, Metalcastello now relies on the PS machines to do most if not all of the gears for these important planetary gear systems for transmissions," explains Gleason's Mr. Santantonio. "Cycle time

Planetary gear systems with ring gears as large as 650 mm in diameter are a Metalcastello specialty. Gleason Power Skiving has greatly increased capacity for the production of these important components, and offer the potential for an economical fine finishing capability with Hard Power Skiving.

Three Gleason 600PS Power Skiving Machines have proven to be four to five times faster than their shaping machine predecessors, and improved quality by two DIN classes.



improvements were as demonstrated – and quality levels have been even a class or two better than what was achieved in Ludwigsburg."

Non-productive time is reduced as well with automated workpiece load/unload. The Gleason automation consists of a 2-station ring loader and 12-station revolving magazine. Both are easily adaptable to handle potentially hundreds of different part numbers with minimal changeover.

The Gleason PS solution at Metalcastello also includes the Gleason 160CPS Cutter Positioning System, which helps optimize the setting of the Power Skiving cutters, and also can be used to analyze cutter wear through an integrated microscope and PC. It also comes equipped with an RFID reader, which allows for the reading of important data from an RFID chip found in the Gleason Power Skiving cutters.

Finishing with Hard Power Skiving

While in the past the quality requirements for most, if not all, of these ring gears did not call for a hard finishing operation after heat treat, Metalcastello is now beginning to use these PS machines to perform Hard Power Skiving – an economical hard finishing alternative to finish grinding. "These machines can be easily adapted to perform Hard Power Skiving, so Metalcastello can begin realizing fine finishing benefits without additional investment in grinding machines," says Mr. Santantonio. "They are inherently extremely rigid platforms and, with the addition of stock dividing sensor and the use of carbide cutting tools designed for the task, can deliver quality and surface finish levels to meet many fine finishing requirements.

"Metalcastello is an example of how local Gleason sales support, combined with the Power Skiving process experts in Ludwigsburg, can partner with innovative companies like Metalcastello to successfully achieve the enormous productivity and quality benefits of this exciting technology," concludes Signore Santantonio. "The timing, as they say, was perfect."

For more information on Gleason Power Skiving, please refer to the article starting on page 10 of this issue of Solutions magazine.

> "Metalcastello is an example of how local Gleason sales support, combined with the Power Skiving process experts in Ludwigsburg, can partner with innovative companies like Metalcastello to successfully achieve the enormous productivity and quality benefits of this exciting technology."
>
> – Giulio Santantonio / Gleason Sales (Italy) Sales Manager

About Metalcastello

Headquartered in Castel di Casio, Italy near Bologna, Metalcastello S.p.a. is a world leader in the production of gears for mechanical transmissions found in earth-moving equipment, farm tractors, industrial vehicles and naval applications.

The company was founded in 1952 and is today part of CIE Automotive Ltd. For more information, visit: **www.metalcastello.com**.

Service Improves Machine Performance at IT S.A.

International Transmissions S.A. invests in Gleason Service Programs to keep even its older machines up and running productively – and predictively.

IT invests in Gleason Service Programs for a diverse range of Gleason machines, including shaving machines dating back to the 1990s as well as several of Gleason's latest ES Shaping Machines and Threaded Wheel Grinding (TWG) machines. In this interview, IT S.A. General Manager Roberto Baronchelli tells Gleason Global Services Product Manager Robert Peyr that machine output measured in uptime, quality and profitability have never been higher.

Q: Mr. Baronchelli, why did you start using Gleason Service Programs?

A: One of our strategies is the consistent quality and availability of the machines. We understand that machines need preventive maintenance like your car.

Q: Why go with the machine manufacturer? Often, the end user will try to do all the maintenance with their own personnel.

A: We saw that Gleason's flexible 'made to fit' approach to service would be perfect for this facility, where so many models and 'vintages' of machines exist. At International Transmissions, the combination of our internal maintenance resources with Gleason service skills and capabilities has really been the best of both service worlds. Most manufacturers are not flexible and only offer the standard solutions. We do not need standard solutions – we need solutions that fit in our needs.

Q: Could you see that Gleason Service Programs significantly improve machine performance?

A: We could see it for sure. The unexpected machine failures are gone and the cost per machine is lower per year because now we invest mostly in small wear parts which protect against larger future damages. Also, the required high quality after machining is provided consistently! We see our largest benefits here.

Q: Was there concern in the beginning?

A: Yes. In the beginning we believed that we had no time for preventive maintenance and could save the money. We changed that way of thinking and say today: We do not have time for machine failures and waste of performance! It paid to make this change.

Q: What other Gleason Service Programs are you using?

A: We also use the Gleason Connect Remote Service. This is a very fast and easy system to address machine failures if they occur. Even if the part is not in our stock, Gleason can temporarily modify the machine to run on limited conditions until the part arrives the next day.

Q: Last question. What would you say that Gleason Service is doing differently from the others?

A: Gleason Service has a very good reaction time, this includes older machines. Relative to older machines, other companies disappoint by saying: Too old, we cannot support you anymore, sorry. This is unacceptable. Gleason always finds a solution. This is another reason why we choose Gleaso,. and have quite a high number of machines from you.

Gleason's Robert Peyr (left) and IT's Roberto Baronchelli (right).

For more information, please contact:
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TEL: +41-91-6416030
internationaltransmissions.ch

KHK Sets the Standard in Stock Gears

Japan's leading manufacturer of stock gears relies on a diverse array of Gleason technology to meet the production challenges of 180 product lines and 17,300 different types of stock gears.

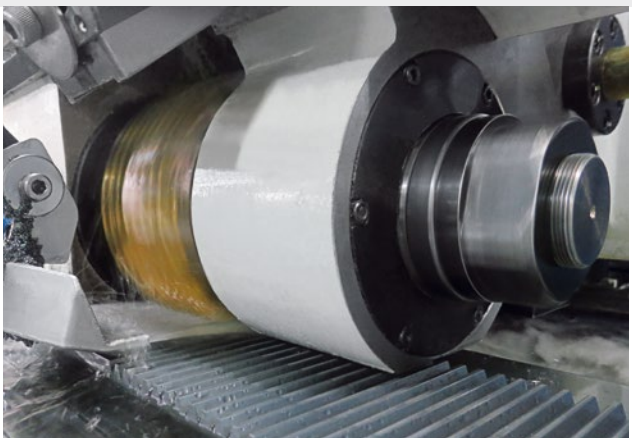
From ticket gates to trains…robots to rack and pinions. If it uses a bevel or cylindrical gear there's a good chance that Kohara Gear Industry Co., Ltd., Kawaguchi, Japan makes one for it. The company known as KHK has, for its entire 80 year history, specialized in 'stock'. In fact, KHK was one of the first in the industry to introduce the very concept of "stock gears." Today, the "KHK Stock Gears" catalog is considered a definitive source for standard gears used by gear design and application engineers around the world.

Yet, 'standard' shouldn't be confused with 'simple.' Quality and complexity for all types of gears have risen sharply in recent years, making KHK's task all the more challenging. How have they done it? "We could not have produced such an extensive range of gears without Gleason machinery," says KHK Managing Director Kenji Kohara. "It would have been very difficult."

The KHK Gleason Partnership

The long partnership between KHK and Gleason dates back to the 1950s. By 1967, all KHK bevel stock gears were completely manufactured using Gleason machinery. Today, KHK operates a comprehensive array of Gleason machines, from manual No. 104 Straight Bevel Gear Generators to CNC Phoenix® 200G and 275G Bevel Gear Grinding Machines, advanced 300TWG Threaded Wheel Grinding Machines, Gleason-Saikuni Rack Milling Machines and the latest GMS inspection technology. Here's a summary of how the company is benefiting:

More quality and productivity in bevel gear manufacturing: Bevel gears that were once ground mechanically often suffered from a lack of quality, says Mr. Kohara, and the time required to set up the equipment also made the problems worse. "At the time, operators used the techniques that they had learned over time, and it was so difficult to train others with those techniques and methods. Yet setup time was almost completely eliminated the moment we



KHK relies on Gleason-Saikuni Rack Manufacturing technologies, both milling and grinding, to improve production of high-precision racks for important rack and pinion business.

began using the Phoenix machines, and production work became so much faster. We could also grind gears to a much higher level of quality, and it also boosted productivity – Phoenix was truly revolutionary." KHK also takes much of the trial and error out of their on-going new bevel gear development efforts through use of Gleason's Engineering and Manufacturing System (GEMS) and its CAGE™ gear design software to calculate machine corrections and make summary changes. The system is networked with KHK's Gleason 350GMS Gear Inspection System, which provides fast, complete inspection data feedback for all types of gears up to 350 mm in diameter.

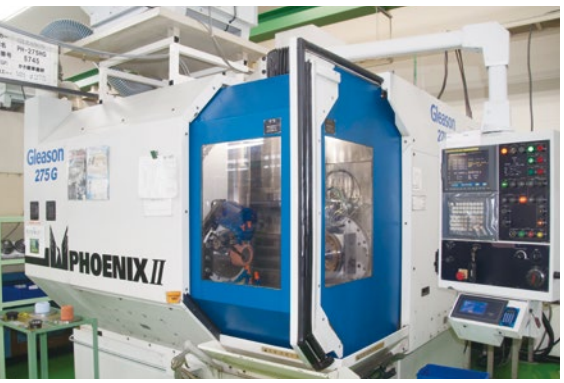
More throughput, quality two classes higher, with Threaded Wheel Grinding: A single Gleason 300TWG now does the hard finish grinding work of two or three older machines. Cost reductions, greater throughput and, most importantly, "Production of gears with quality two classes better than the previous standards," recalls Mr. Kohara. The 300TWG installation even enabled KHK to launch a new product line called High Quality Ground Gears, made to an even higher accuracy standard.

Rack manufacturing expertise: Racks for rack and pinions are one of KHK's most essential product lines, accounting for nearly 25% of sales. The renowned reliability and strong reputation of KHK rack products stem from the use of Gleason-Saikuni rack milling machines, according to Mr. Kohara. These machines include earlier versions of what are now called the 2000RM High Performance Rack Power Milling Machine, for racks up to module 12 mm and 2,300 mm in length, and 2000RGP Power Grinding Machine for the efficient, high-precision grinding of rack flanks. Gleason-Saikuni also provides KHK with a complete solution that includes milling cutters and grinding and dressing tools.

Service, support and peace of mind: "The comprehensive level of aftermarket support provided that Gleason provides was an important reason why KHK decided to use Gleason machinery," concludes Mr. Kohara. "Plenty of highly skilled and experienced field service engineers as well as a quick response when problems arise are vital for users of imported equipment. They come to help straight away. Their level of service means peace-of-mind."

For more information about KHK, visit: khkgears.net.

Phoenix® grinding machines deliver significant improvements in throughput as well as simple setup and operation.



300TWG delivers exceptional fine finish grinding speed and quality.

KHK uses the latest 350GMS Analytical Gear Inspection system for complete inspection of all types of gears.

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