2025/2026

solutions

gear manufacturing technology magazine

160 Years of Innovation

Gleason Corporation Celebrates its 160th Anniversary

Small Bevel Gears Made Easy

New Phoenix 100C Bevel Gear Cutting Machine

Success Stories

Marine Industrial Gears and Engranajes Juaristi

160 1865 2025

Total Gear Solutions Gleason

Welcome to Gleason

John J. Perrotti

Chairman and
Chief Executive Officer

Dear Valued Customer,

As we celebrate Gleason's 160th anniversary this year, we take a moment to reflect on our long and successful history – but more importantly, we look ahead to a future full of opportunity.

Over the past sixteen decades, Gleason has continuously evolved into a Total Gear Solutions provider, and today we remain committed to driving innovation across the entire gear production process.

At the heart of our strategy lies a fully integrated approach to a gear technology ecosystem, built on three pillars "Design, Manufacture, Measure" to deliver maximum value to our customers.

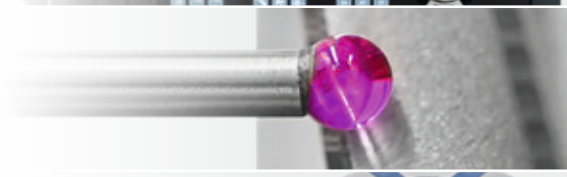
The true strength of this integrated platform comes from the data it generates – and how that data is shared across the entire value chain. The Gleason Ecosystem connects every stage of gear development, from design through manufacturing and measurement, while also integrating with broader business systems like ERP, MES and Quality. This connected network is enabling a new era of real-time optimization for quality, productivity, and cost efficiency.

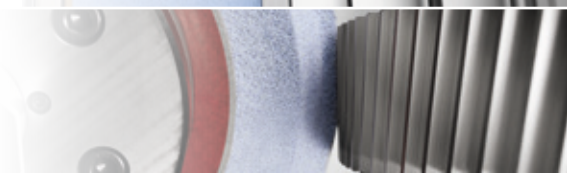
Technology will continue to play a defining role in our customers' success, but some things never change: our unwavering commitment to an exceptional customer experience. That remains the foundation of our work – the driving force for our more than 2,300 employees around the world.

As we mark this special 160th year, we thank you for being part of our journey. We are proud of where we've come from, and even more excited about where we are going – together.

Enjoy this new edition of Solutions Magazine, and thank you for your continued trust in Gleason.

Yours sincerely,





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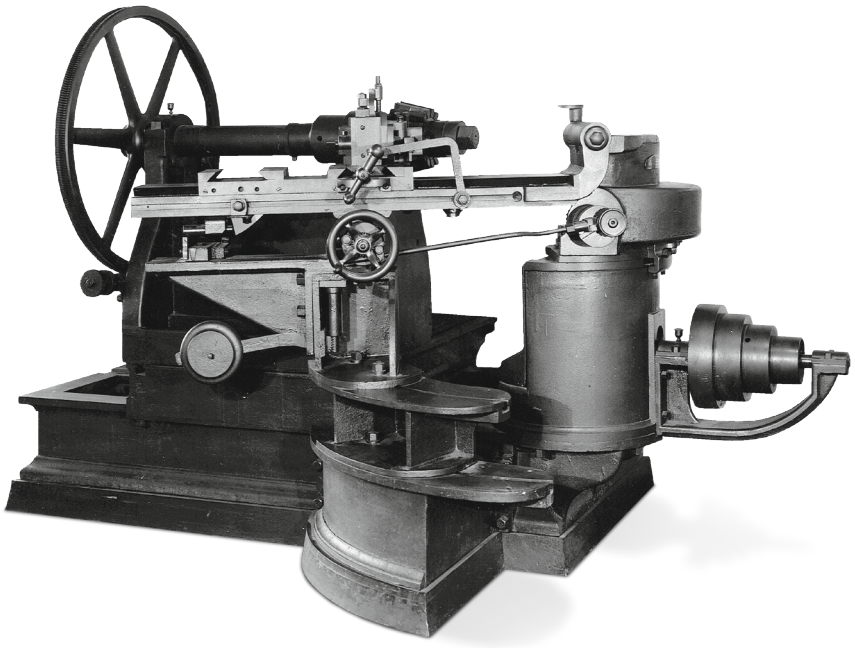
Gleason Corporation:
A Legacy of Precision, Innovation, and Global Leadership

For over 160 years, the Gleason name has been synonymous with groundbreaking advancements in gear technology. From its origins as a small machine shop to becoming a global leader in precision engineering, Gleason Corporation has continuously redefined the industry. This journey, marked by pioneering inventions and strategic expansions, has left an indelible mark on sectors ranging from automotive and aerospace to robotics and renewable energy.

The Gleason story began in 1865 when William Gleason established his first machine shop in Brown's Race, Rochester, New York. His commitment to precision engineering quickly gained recognition, but it was the invention of the First Bevel Gear Planer in 1874 that transformed the industry. This innovation enabled the mass production of gears with unprecedented accuracy, setting the foundation for Gleason's future dominance.

As demand for high-quality gears grew, William Gleason officially founded The Gleason Works and, in 1905, relocated the company to University Avenue, Rochester. This move allowed for increased production capacity and technological advancements, positioning Gleason as the premier name in gear manufacturing.

The first Gleason machine is still in existence, preserved at the Henry Ford Museum in Dearborn, Michigan. Another restored machine is located at the Smithsonian.

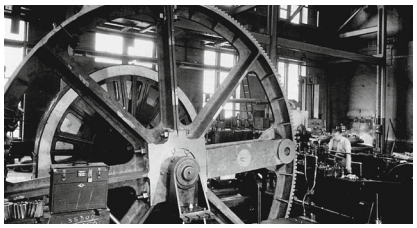


Engineering Breakthroughs: Shaping Industrial Progress
Gleason's innovations played a crucial role in numerous engineering milestones, including the Panama Canal, where its precision gears were integral to the canal's lock systems.

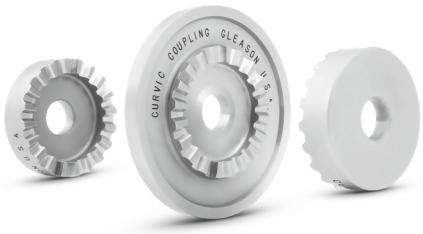
The introduction of the Hypoid Gear in the 1920s revolutionized the automotive industry by improving drivetrain efficiency, enhancing vehicle performance, and enabling modern differentials.

Another remarkable contribution was the development of the Curvic® Coupling, a highly precise gear connection that improved alignment and power transmission in industrial and jet aircraft engines. These advancements solidified Gleason's reputation as an indispensable partner in industrial progress.

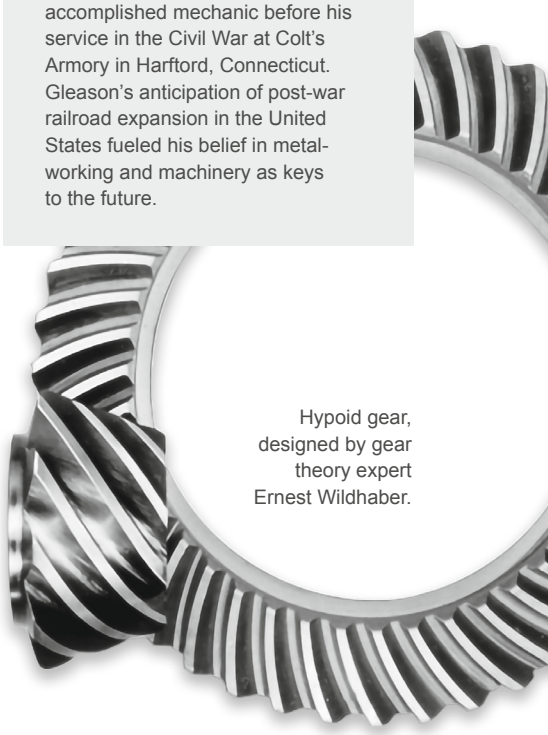
William Gleason was born in Ireland on April 4,1836. He was an accomplished mechanic before his service in the Civil War at Colt's Armory in Harftord, Connecticut. Gleason's anticipation of post-war railroad expansion in the United States fueled his belief in metal-working and machinery as keys to the future.



A 20ft Gleason spur and internal gear planer is used to cut the gears inside the Panama Canal's locks and doors.



Curvic Couplings for industrial and aerospace applications.



Hypoid gear, designed by gear theory expert Ernest Wildhaber.

During the mid-20th century, Gleason continued its technological leadership by contributing to the Apollo Space Program, where its gears played a critical role in space exploration machinery.

A Family of Innovators
The success of Gleason Corporation is deeply intertwined with the vision and dedication of the Gleason family. Each of them played a significant role:

Kate Gleason
A pioneering female engineer and business leader who expanded Gleason's global reach.

James E. Gleason
A technical innovator who played a crucial role in advancing gear manufacturing technology.

Andrew C. Gleason
A distinguished mathematician who contributed to scientific advancements beyond the company.

James S. Gleason
The modern architect of the company's continued success and strategic global expansion.

The launch of the Phoenix Machine Series introduced cutting-edge CNC bevel gear cutting and grinding solutions, setting a new industry benchmark for precision and efficiency.

Under the leadership of James S. Gleason, the company reached new heights. In 2000, Gleason returned to its roots as a privately-owned company, reaffirming its long-term commitment to innovation and quality.

Global expansion followed, with the establishment of Gleason Gear Technology Suzhou in China and a major investment in India.

Total Gear Solutions
In 1995 and 1997, the company strategically acquired leading European gear manufacturers Hurth and Pfauter to enhance its production capabilities and range of cylindrcial gear products.

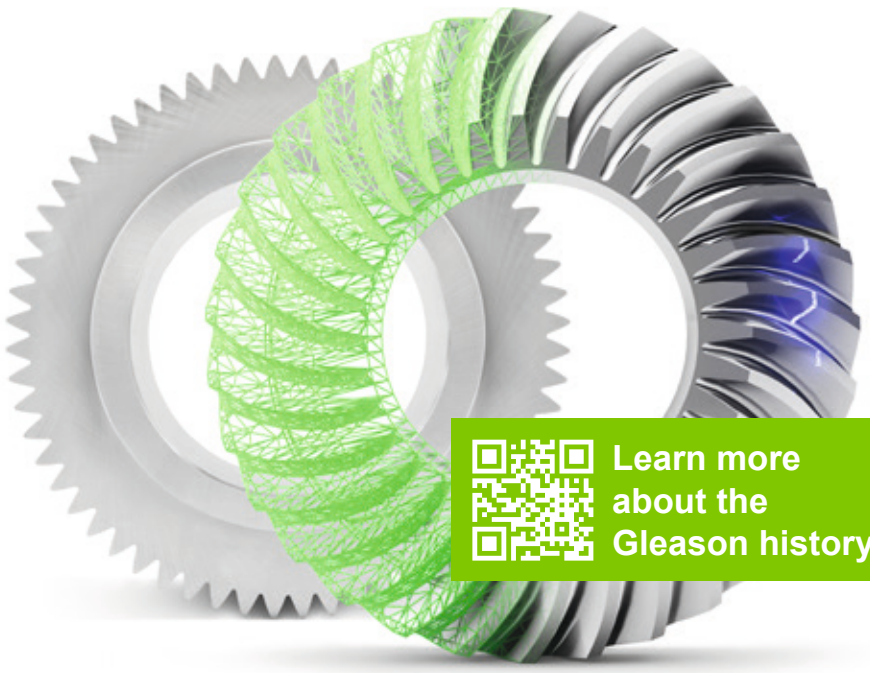
The following years saw further strategic acquisitions, including M&M's Metrology Systems and KISSsoft, a leading provider of gear design and analysis software, making Gleason the only gear technology provider to offer the complete value chain, from design to the finished gear.

The Phoenix® machine series first appeared 1988 has since been a success story. The latest editions to this line are the 100C and 500C Bevel Gear Cutting Machines.

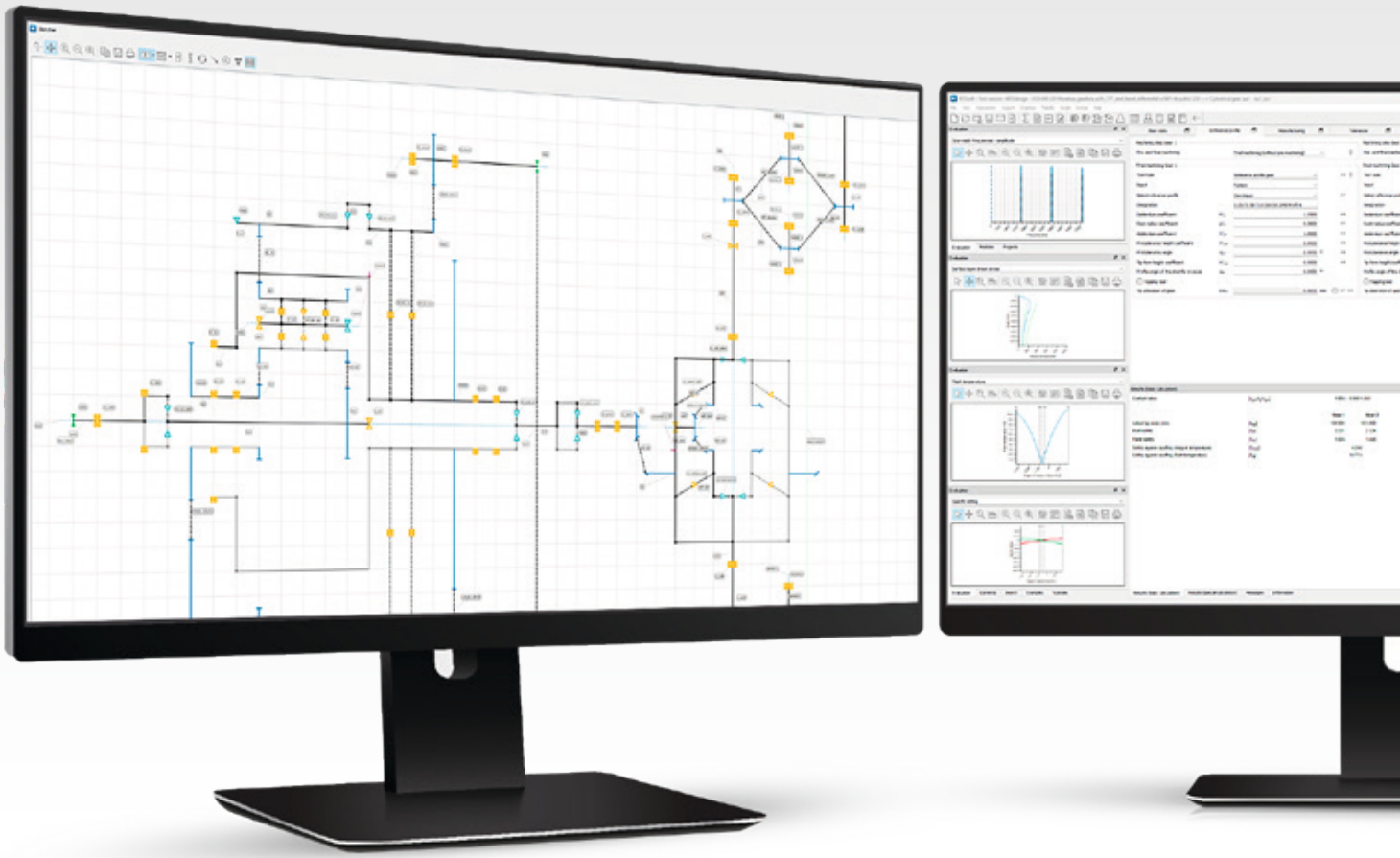
Today, Gleason is at the forefront of technological advancements in wind power, e-mobility, automation, and robotics.

A Future Driven by Innovation
The culmination of Gleason's expertise is encapsulated in its "Design, Manufacture, Measure" approach, based on Digital Twins and Smart Loop technology. This ecosystem of advanced simulation, real-time manufacturing, and precise metrology ensures superior quality and performance, redefining the future of gear production.

As the company continues to explore new frontiers in digitalization, sustainability, automation and robotics, its legacy of precision engineering remains as strong as ever. With a steadfast commitment to excellence, Gleason is not just shaping gears – it is shaping the future of the industry itself.



Learn more about the Gleason history



KISSsoft System Module, What Does It Do

KISSsoft® Release 2025 now available features the KISSsoft System Module, and accelerates the calculation of complex drive trains.

KISSsoft System Module allows intuitive concept design on a system level. In addition to the elementary components, complete gearboxes can now be designed in a separate module. The main focus lies on fast concept building and fast calculations of complex kinematics. This is of benefit particularly in the initial phase of a project, when an engineer needs to be able to roughly model different variants of possible solutions in order to compare critical criteria.

Working with sketcher, user interface and 3D geometry on separate screens.

The KISSsoft System Module is a versatile tool used in various scenarios including:

- Designing new products based on key requirements.
- Modifying legacy systems for new conditions.
- Re-engineering reference designs.
- Analyzing existing designs documented through drawings.
- Managing and comparing design variants with the same topology.
- Creating databases of gearbox series with different ratios for different torque ranges.
- Visualizing, explaining, and promoting concepts, proposals, and preliminary designs.
- Elaborating on concepts for costs, mass, and size to enable quotations.
- Connecting, managing, and safeguarding KISSsoft files used for modeling individual components.

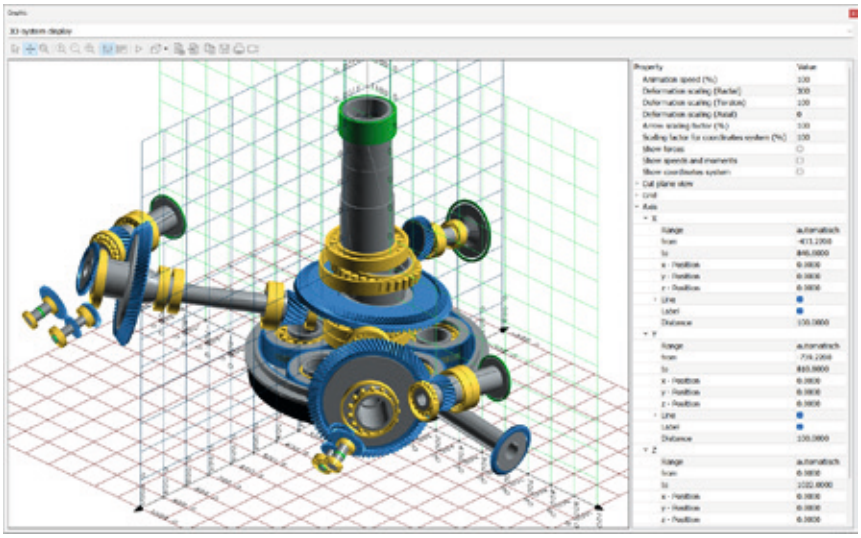
Working Modes
With KISSsoft, the user can choose between the three working modes “component level only”, “system level” and “collaborative approach”.

The “Component Level Only” mode involves using KISSsoft modules other than the System Module. It's a detailed, low-cost, and time-saving approach suitable for less complex systems where calculations for individual components are done independently from each other. This mode is ideal for projects requiring maximum speed, efficiency, and simplicity.

The “System Level” mode integrates components into a holistic system, combining power flow analysis, spatial and collision-free arrangement, and top-level requirements-driven conceptual design. It is highly efficient for experienced designers with a deep understanding of all aspects of gearbox or transmission design. It is the mode of choice for most licensees globally.

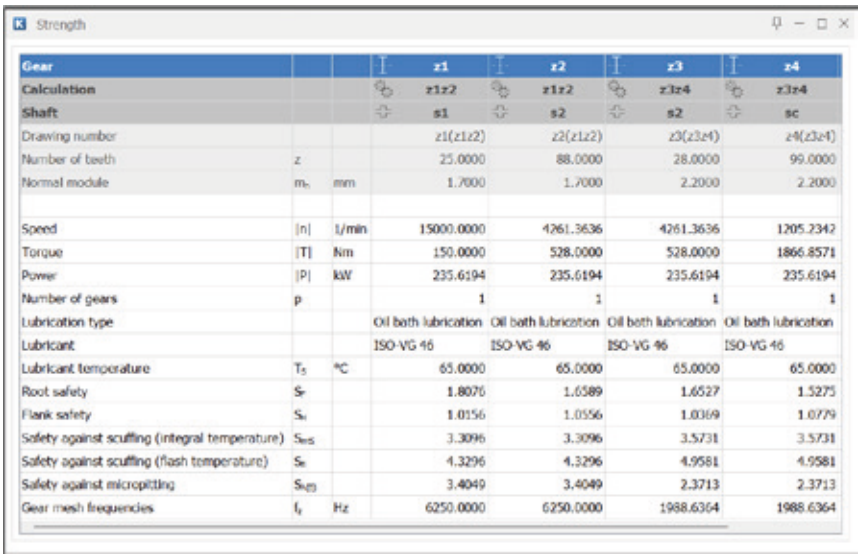
Finally, there is the “Collaborative Approach” mode, which supports a team-based design process. Domain experts work on individual components using independent KISSsoft instances, performing detailed sizing, optimization, and analysis. Iterative design improvements are uploaded into the system model, gradually enhancing its fidelity.

Switching between these modes is seamless, with data exchange enabled through KISSsoft files as well as bespoke and neutral formats (e.g., Gleason GAMA™, GEMS®, GDE, REXS).



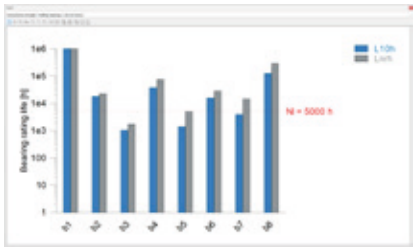
3D view of a gearbox with information about size and scaled deformation.

Target Users
Target users are on the one hand Gear and Bearing Experts and on the other hand System Architects. The module is suitable for Gear and Bearing Experts because it provides an environment for managing all single components within their expertise. Components are sized, optimized, and rated in familiar KISSsoft modules, and once optimized, they can be integrated back into the system model with a single click. System Architects however focus on ratios, design space, power flow, system reliability, operating conditions, and comparing design variants. They need a clear, communicable design description for stakeholders and are concerned with team-wide access to consistent product data, managing design iterations, and ensuring design survivability under different load regimes.



Gear			z1	z2	z3	z4
Calculation			z1z2	z1z2	z3z4	z3z4
Shaft			s1	s2	s2	sc
Drawing number			z1(z1z2)	z2(z1z2)	z3(z3z4)	z4(z3z4)
Number of teeth	z		25.0000	88.0000	28.0000	99.0000
Normal module	m_n	mm	1.7000	1.7000	2.2000	2.2000
Speed	|n|	1/min	15000.0000	4261.3636	4261.3636	1205.2342
Torque	|T|	Nm	150.0000	528.0000	528.0000	1866.8571
Power	|P|	kW	235.6194	235.6194	235.6194	235.6194
Number of gears	p		1	1	1	1
Lubrication type			Oil bath lubrication	Oil bath lubrication	Oil bath lubrication	Oil bath lubrication
Lubricant			ISO-VG 46	ISO-VG 46	ISO-VG 46	ISO-VG 46
Lubricant temperature	T_S	°C	65.0000	65.0000	65.0000	65.0000
Root safety	S_F		1.8076	1.6589	1.6527	1.5275
Flank safety	S_H		1.0156	1.0556	1.0369	1.0779
Safety against scuffing (integral temperature)	S_{WS}		3.3096	3.3096	3.5731	3.5731
Safety against scuffing (flash temperature)	S_B		4.3296	4.3296	4.9581	4.9581
Safety against micropitting	$S_{H(f)}$		3.4049	3.4049	2.3713	2.3713
Gear mesh frequencies	f_z	Hz	6250.0000	6250.0000	1988.6364	1988.6364

3D view of a gearbox with information about size and scaled deformation.



Comparison of bearing lifetimes of all bearings in the system.

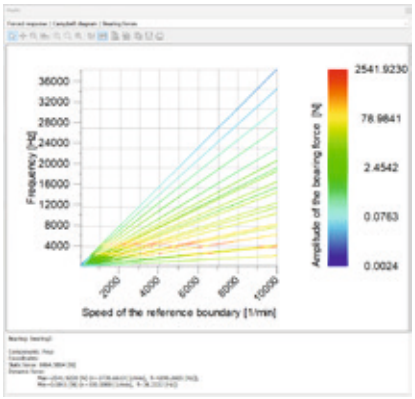
The software's user interface is tailored to the needs of both Experts and System Architects, allowing each to view the work in their preferred way without imposing an unfamiliar perspective.

Learning Curve and Required Skills
Familiarity with KISSsoft modules significantly reduces the learning curve. The user interface and sketcher are intuitive, leveraging common mouse and keyboard operations. New users can grasp the basics within a day and model complex systems within a week. Users need to master transmission design complexities, including load cases such as spatial and performance conditions. Experience with tree structures, context menus, tables, tabs, multiple windows, and standard engineering terminology is essential. The highly specific terminology used in KISSsoft is typically based on ISO, DIN, and AGMA standards. Familiarity with these standards is essential to correctly understand the intention, purpose and limitations of menu options, fields and buttons. To choose settings sensibly, assume derating factors properly, select calculation methods appropriately and use reasonable ranges for e.g. lubrication temperature, tolerances values or required lifetime, the user must have a thorough understanding of e.g. gear theory and methodology implemented in KISSsoft.

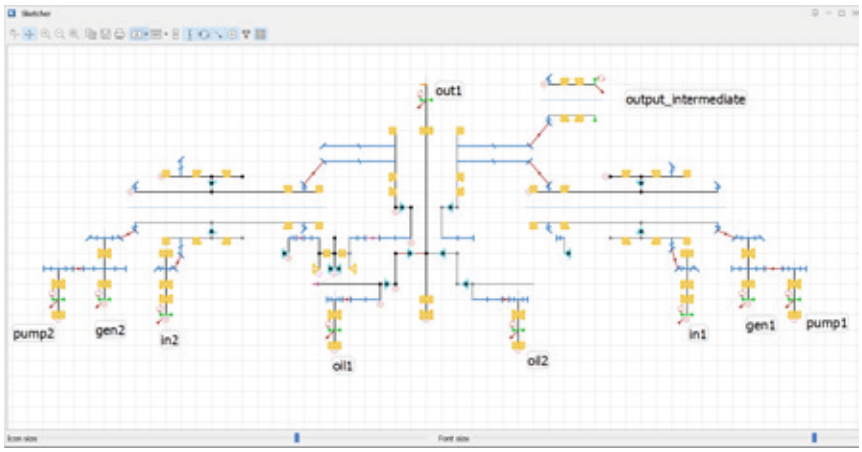
In summary, the skills and knowledge needed to make most of the System Module are engineering domain specific, not software specific.

Return on Investment
The System Module's parameter-based design approach manages the numerous parameters of gearbox and bearing design efficiently, reducing errors from manual data transfer. Experience from hundreds of projects confirms that the module accelerates project timelines and reduces errors, even for basic projects.

Once engineers become proficient, they consistently rely on the System Module for its efficiency and accuracy. The promise is simple and bold: Once an engineer has access to it and knows how to use it, he will always use the KISSsoft System Module, even for the most basic projects.



Result of forced response calculation: Campbell diagram of bearing forces and their amplitudes over a defined speed range.



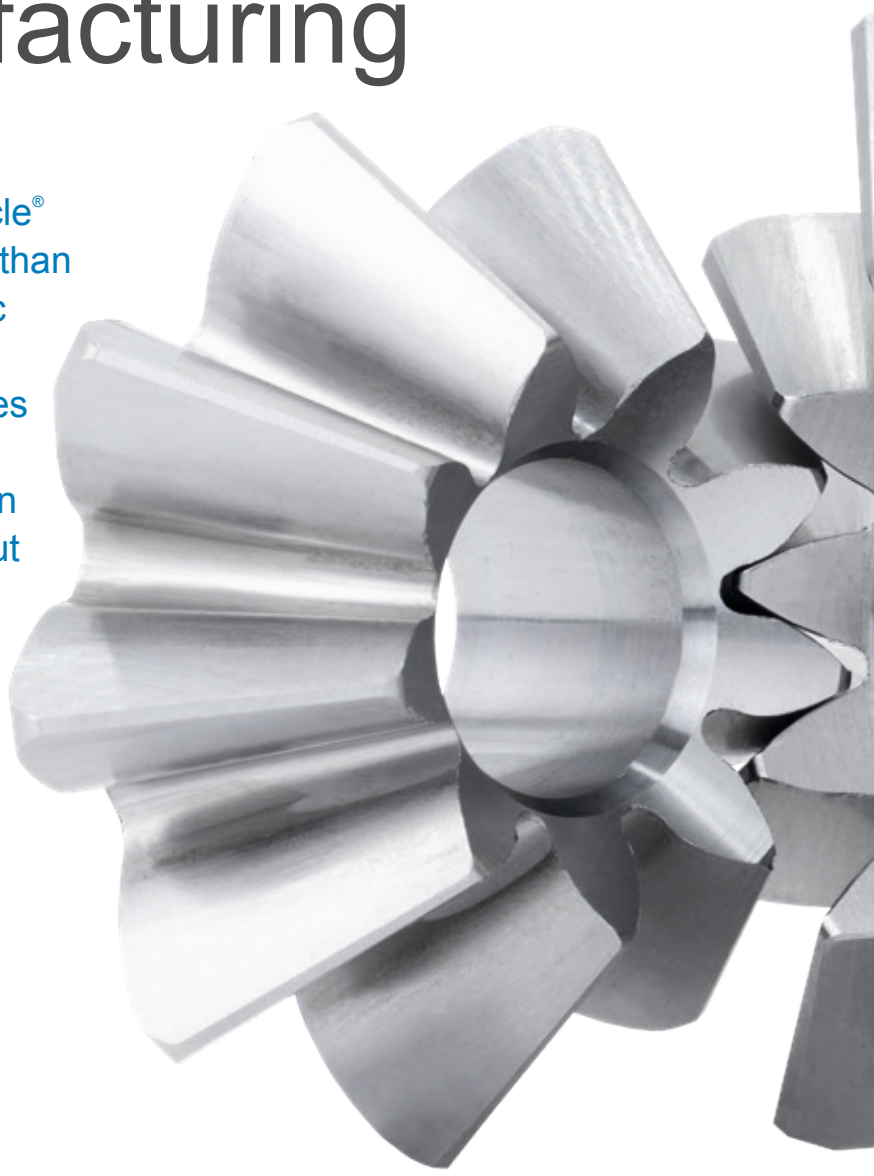
Sketcher window of a helicopter gearbox with multiple boundary conditions: A schematic view of all mechanical components. Power flow in the system is marked with red arrows.

Learn more about KISSsoft

Cengiz Yilmaz
Product Manager
System Module
KISSsoft AG

Coniflex Pro – New Process for Differential Gear Manufacturing

The manufacturing of differential gears went away from the Revacycle® broaching process to forging more than 30 years ago. Today, where electric vehicles create peak torque which are a multiple higher than in vehicles with internal combustion engines, the strength and the Noise Vibration Harshness (NVH) advantages of cut differential gears are re-visited.



The newly developed Coniflex® Pro straight bevel gears combine several new features which make them stronger and quieter than past straight bevel gears and far superior to the forged version. The basic geometry of Coniflex Pro was developed especially for modern Phoenix free-form CNC machines and takes advantage of the “unlimited” geometric freedoms and the possibility of higher order, non-linear kinematics. First field applications have proven that Coniflex Pro differentials have 30% lower root bending stress and 40% lower surface stress as forged differential gears. Coniflex Pro gears can also offset critical differential noise in electric vehicles because of their low transmission error.

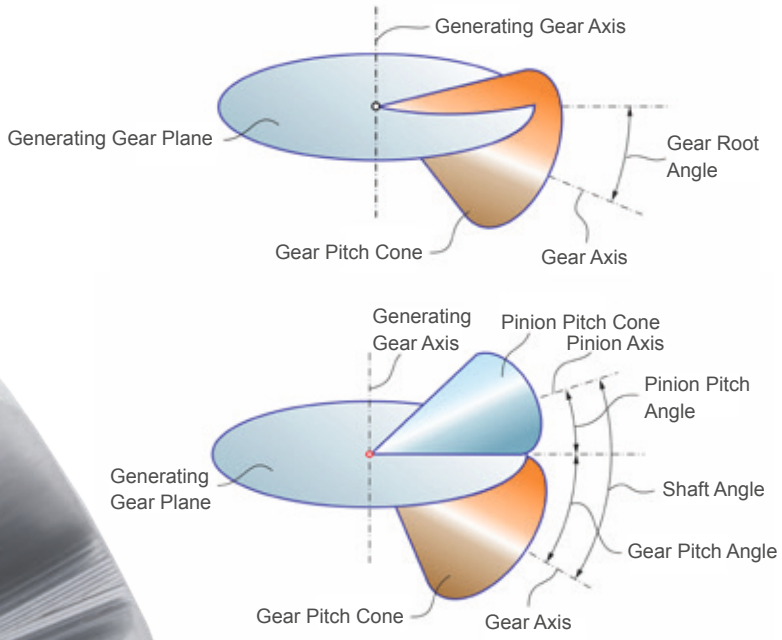


Figure 1: Coniflex Pro pinion and gear rolling on the pitch plane.

Generating on the Pitch Cone

All the older straight bevel gears are generated by rolling on the root cone, rather than on the pitch cone. Figure 1 shows on top the traditional orientation between generating plane and the pitch cone of a gear. This orientation violates the kinematic coupling condition between gear, generating plane and pinion. Both mating Coniflex Pro members roll with their pitch cones on the common generating gear plane as shown at the bottom in Figure 1. This was not possible in the past because the tip circle of the cutting tool had to be adjusted to the root angle of the tapered depth teeth of the gears and due to the mechanical restrictions of older machines, the generating gear rotation was automatically orthogonal to the root line of the cut gear. Thus, the gears were generated on the root cone rather than on the pitch cone. Free-form Phoenix machines do not have the traditional mechanical restrictions.

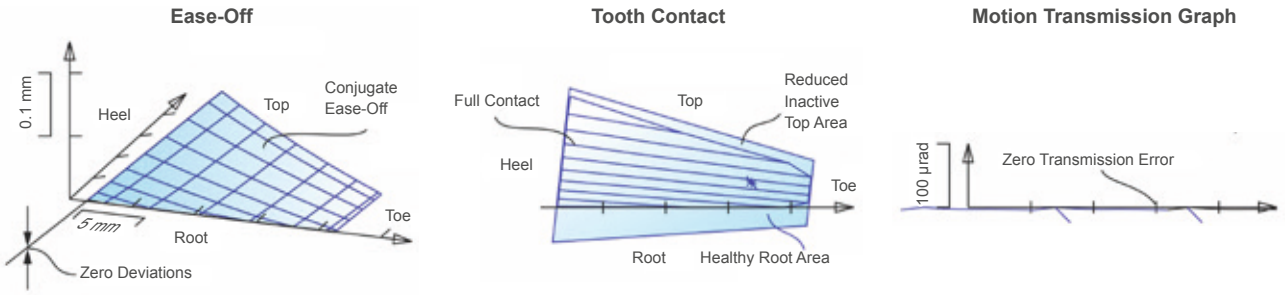


Figure 2: Contact analysis of Coniflex Pro gearset without crowning.

The result is a perfectly conjugate interaction between pinion and gear, like shown in the contact analysis in Figure 2. In order to prepare a gearset for manufacturing tolerances and deflections under load, length crowning can be created with a dished cutter as shown in Figure 3 and profile crowning can be created with a second order ratio of roll modification (Figure 4 bottom graphic).

Tip Relief

The tooth profiles of a high-power density differential gearset should be conjugate in the center and feature a pre-determined tip relief. A new function in Coniflex Pro allows creating a higher order tip relief which preserves a low transmission error and protects better against edge contact as the traditional circular profile crowning. A typical Coniflex Pro tooth contact analysis is shown in Figure 5. The Ease-Off has higher order relief areas along top and root. The flank center around the Mean Point is nearly conjugate and the tooth contact is full and centered. The motion transmission graph in Figure 5 shows very small amplitudes of 25 microradiants (compared to the traditional 300 to 2.000 microradiants).

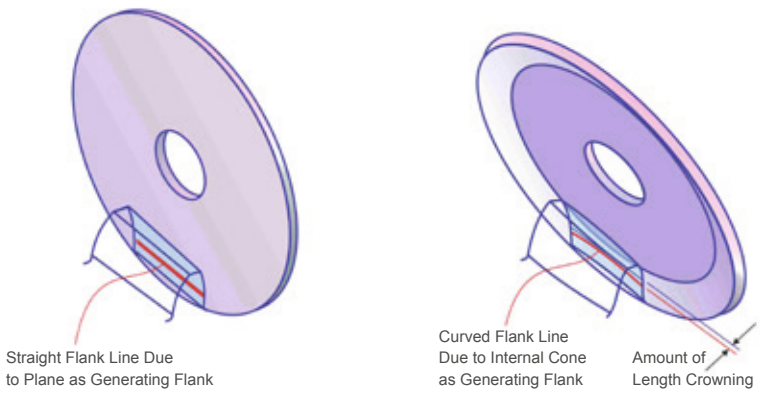


Figure 3: Length crowning created with a dished cutting or grinding tool.

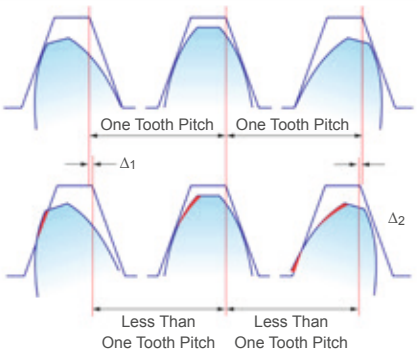


Figure 4: Conjugate generating (top), and generating of profile crowning (bottom).

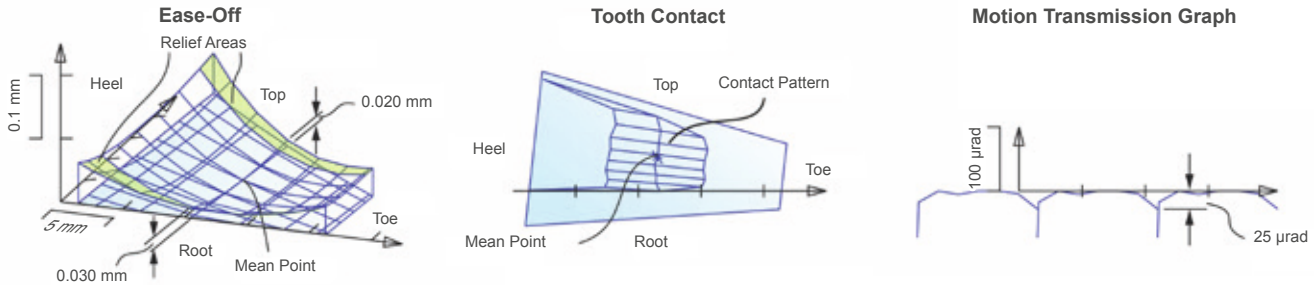


Figure 5: Coniflex Pro gearset with length crowning and kinematic top and root relief.

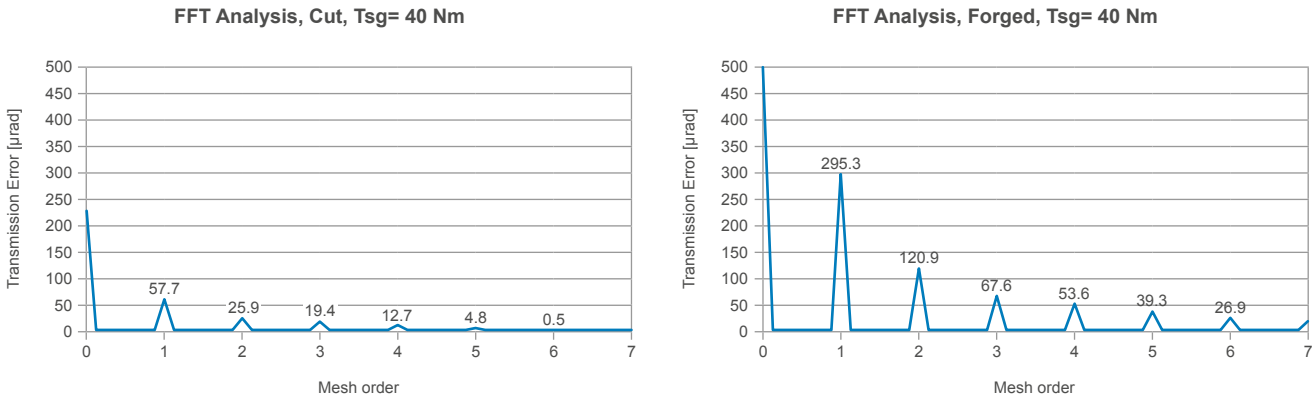


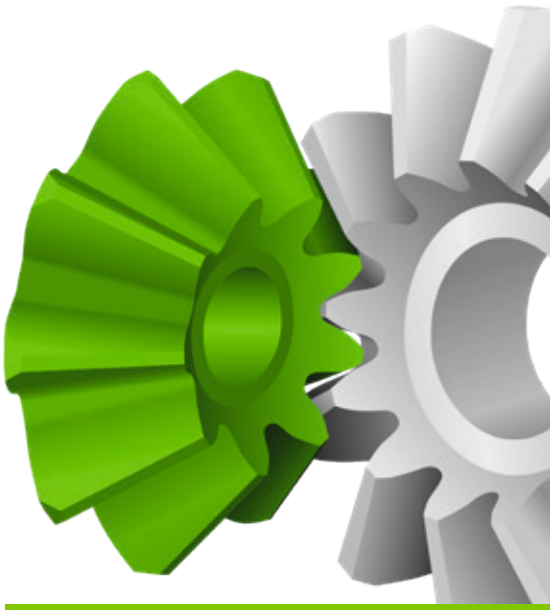
Figure 6: Comparison of Fast Fourier Amplitudes Coniflex Pro (left side) vs. forged (right side), side gear torque = 40 Nm.

Transmission Error and NVH Comparison

With the ANSYS Finite Element software the sample gearsets (cut and forged) have also been analyzed regarding motion transmission error under load. Fast Fourier Transformations (FFT) were performed from the motion transmission graphs. The results shown in Figure 6 present transmission error amplitudes versus orders of mesh. The forged gearset (Figure 6, right side) has 295mrad amplitude at the first mesh harmonic, which is also more than 5 times the value of the Coniflex Pro cut gearset (Figure 6, left side). FFT results reflect operating noise and vibration (NVH) rather well, which confirms that the sample Coniflex Pro differential has the potential to operate quieter than the forged version.

Summary

Coniflex Pro is a new development of straight bevel gears which in contrast to the original Coniflex process takes optimal advantage of the geometric and kinematic freedoms available in Phoenix free-form machines. The advantages of a conjugate base geometry and the free control of length and profile crowning with the possibility of a kinematic tip relief in connection with positive profile shifts in pinion and gear have been compelling facts for manufacturers of differential gears for electric vehicles. The number of Coniflex Pro EV differential gear designs is constantly increasing. Coniflex Pro differential gearsets can be designed and optimized in the Gleason GEMS software system. The tools used are Coniflex Plus stick blade cutters. Digital flank form data including correction matrixes can be transferred via network to coordinate measuring machines and a closed correction loop between measurement and manufacturing machine can be established.



Learn more about Coniflex Pro

Prof. Dr. Hermann J. Stadtfeld
Vice President Bevel Gear Technology and R&D

Small Bevel Gears Made Easy

Production of small, high-precision bevel gears for robotics and other similar-size applications enters a new era with Gleason's Phoenix 100C Bevel Gear Cutting Machine.

Gleason 100C with and without automation.

By 2030, global robotics market size is expected to range anywhere from $160 to $260 billion. Clearly, the world is expecting robots to do a lot of the ‘heavy lifting’ going forward. But with demand pressuring supply for many of the essential components, new production technologies are needed to keep pace. Nowhere is this more true than for smaller, high precision spiral and hypoid bevel gears that play such a critical role in transmitting power and delivering precise, reliable movement in increasingly complex, multi-axis robotic systems. Yet, manufacturers of these gears have had surprisingly few options available to help them ramp up production of this new generation of high efficiency bevel gears – particularly in the increasingly common size range of up to 100 mm in diameter and smaller.

100C: Fitting Perfectly into Small Bevel Gear Production
The 100C has been designed to fit seamlessly into the world of small bevel gear production. Easily applied to “legacy“ production and the continued use of traditional solid body HSS cutter systems, 100C also adopts to a myriad of pre-existing workholding systems, and is perfectly suited for the application of today’s most advanced carbide stick blade cutter systems for Dry Power Cutting® at speeds 2-3 times faster than previous machines.

Additionally, the machine can be equipped with very fast, fully integrated gantry-type load/unload automation, which easily interfaces with common palletized, basket-type and/or conveyor parts handling systems for higher volume applications. The 100C’s exceptionally small footprint makes it a great fit as well. Even with its loader automation the machine takes up below 10 m^2 of precious floor space.

Example of integrated part handling system.

Bevel Gear Cutter Systems

A wide range of cutting tools is available for the 100C, from various stick blade systems, over solid carbide and HSS tools, to Coniflex tools for straight bevel cutting.

Scaled Down, Powered Up
In the case of the 100C, “downsized” doesn’t mean “under-equipped”. In fact, the machine offers many of the same features and benefits users have come to expect in the latest generation of larger Gleason Phoenix machines. For example, the powerful, high-speed direct-drive cutter and work spindles are designed to support almost every spiral bevel, hypoid and even straight bevel gear production application in its size range, including face milling and face hobbing, wet or dry cutting, low to high production volumes – all through application of all types of cutter systems. These include older-style solid-body HSS cutters, but also Gleason’s latest solid-body carbide cutters and most advanced Pentac® Carbide Stick Blade Cutter

Systems to achieve extremely high speeds and greatly improved productivity of the Dry Power Cutting process. The 100C also saves time with an integrated brush deburr unit that automatically deburrs the workpiece in seconds right on the machine.

The 100C comes equipped with the latest Gleason bevel gear quick-change tooling, also available with air blank seating to ensure proper chucking, to help eliminate much of the costly non-productive time that was once required to change over different parts – while at the same time achieving exceptionally high, repeatable accuracies. Note that the tooling system is designed for the machine's 39-taper spindle bore; existing workholding for legacy parts with other taper requirements can easily be accommodated with a variety of adapters for the most common bore sizes.

Working Smarter on Smaller Parts
Shorter cycle times and more efficient, error-free operation also result from Gleason's GEMS HMI (Gleason Engineering and Manufacturing), which makes setup and changeover more intuitive and simpler to both learn and operate. This user interface, coupled with the latest Fanuc CNC, provides several new process options and guides the operator intuitively through the workflows of the machine. Since setup and operation are largely summary-driven, even new operators can be trained to operate the machine practically overnight.

Operating software and network capabilities allow easy integration of the 100C into any modern production environment. They can also interface the 100C into GEMS leading to the "Smart Loop", which connects all process steps, from gear design to inspection, in a single system approach – for worry-free and intelligent gear production.

Maximum flexibility for production of various different parts.

Learn more about the Phoenix 100C

Dipl.-Ing. Markus Augsburg
Director of Product Management
Bevel Gear Solutions

Hobbing and Chamfering: Two in One Go

Gleason relies on Siemens Sinumerik One for high-precision gear manufacturing machines. The new 100HCD Gear Hobbing Machine not only impresses with its speed and precision, but also with the integration of the flexible Radial Chamfering process.

As precise as a Swiss clockwork: When watch manufacturer Karl Lüthy founded the machine factory Mikron in Biel in 1908, the company played a key role in the industrialization of the Swiss watch industry with its gear manufacturing machines and tools.

Today, Gleason Switzerland AG, now located in Studen, acts as a competence center for gear hobbing, power skiving, integrated chamfering processes and honing of high-precision gears. A wide range of secondary machining and automation solutions are also integrated.

Customers include companies from automotive, robotics and aerospace industries, manufacturers of industrial equipment as well as small and large gear jobbers.

“While the machines are assembled in Studen, individual components are manufactured by other Gleason sites and provided by numerous local companies. This makes Gleason Switzerland extremely flexible when it comes to customer requirements”, explains Dr. Markus Krömer, Director of Technology and Software at Gleason.

Innovative Combination
The Swiss machines are popular: Gleason has delivered more than 1,000 machines of the well-known P60/P90 series. During the hobbing process, unwanted burrs are created. These sharp burrs are completely removed by the chamfer cutting process. Dr. Krömer uses the example of EV transmissions to explain why this is important: “Modern transmissions are becoming quieter and quieter, and individual disturbing frequencies stand out. In order to meet the requirements, special hard finishing processes are used, which can be impaired by poorly chamfered components.”

With Radial Chamfering, Gleason integrates a universal chamfer cutting process directly into the hobbing or power skiving machine. This innovation does not only save time and space but also reduces the amount of work and costs involved in switching to other machines. This is interesting for gear manufacturers of all kinds: The entire manufacturing process is accelerated and production efficiency is increased. Because of the affordable chamfering tools used in this process, the innovative method is also applicable to small lots.

Siemens Sinumerik One with GEMS Hobbing HMI.

Radial Chamfering: the chamfer is created by a cutting process with one or two Radial Chamfering cutters, eliminating subsequent operations to remove the secondary burr, which was often caused by the roller chamfering process used in the past.

Benefits of Digital Transformation
"Especially in the automotive sector, the requirements are constantly increasing," says Dr. Krömer. "With a typical gear, we now achieve a deviation of five to a maximum of ten micrometers on the tooth flanks – one tenth of a human hair."

Gleason relies on the latest generation of the Sinumerik One control. The control system offers a linking function for tool and workpiece. This so-called electronic gearbox is an important quality feature on the 100HCD. A total of up to 18 axes have to be controlled on this hobbing and chamfering machine. This is done using Siemens Simotics servomotors. In order to control even the slightest deviations in speed or position, the process-defining rotary axes for the tool and workpiece are equipped with direct drives. This avoids inaccuracies caused by belts or gears.
With Sinumerik One, Siemens is driving the digital transformation of the gear manufacturing industry. All development processes can be mapped completely digitally with the virtual twin "Create My Virtual Machine". This significantly reduces product development and time-to-market for new machines and provides flexibility: The software for the 100H Hobbing Machine Series was developed by a team working in the office and remote locations – the digital twin made this possible.

Years of Trust as a Basis
Gleason Switzerland has been working with Siemens for decades, using Siemens controls exclusively on machine products. The recent switch of all machines to Sinumerik One is a result of this long standing business relation. Siemens controls offer solutions for all requirements and are available worldwide.

According to Krömer, who holds a doctorate in Mechanical Engineering from the University of Aachen, converting the control systems alongside the day-to-day business was quite a challenge. In addition to designing the drive and control components, Siemens also supported Gleason during the implementation phase with a direct customer service agent.

With the control system conversion, the latest EU Machinery Directive was implemented, ensuring employees safety, and firmly integrating Operational Technology security into the machine. Each operator needs a personal key and password to access a machine. However, it is important that the machines can be operated easily and intuitively despite the high security standards. Once the workpiece data and machining parameters have been entered via the GEMS HMI (Gleason Engineering and Manufacturing System), the control uses this information to generate the code for production.

Measure, Analyze, Save
Power consumption is becoming increasingly important for gear manufacturing machines. Rolf Leutwyler, Product Manager and Technical Consultant at Siemens, explains: “With Siemens’ energy-saving function Ctrl-E, machine operators always have an overview of energy consumption and energy recovery through deceleration processes. This information forms the basis for energy-saving measures and therefore also for a better CO2 balance in production.”

However, Gleason’s machines are economical anyway: In operation, the 100HCD consumes an average of 6,000 watts, with a maximum load of 13,000 watts. That’s not a lot for a machine like this. Even if fast cycle times or high torques are essential for the application, the machine immediately switches to energy-saving mode when the load is low. In addition to the use of efficient motors and/or energy-saving LED lamps, Gleason attaches great importance to the correct dimensioning of components to avoid wasting resources unnecessarily.

The fact that Gleason Switzerland relies exclusively on Siemens for its control systems and drives also ensures lean spare parts stocks. This means that fewer components have to be distributed via express services around the world – benefiting the CO2 footprint of Gleason machines.

Technology in a Nutshell
Thanks to its performance, the Simatic PLC S7-1500 integrated in the Sinumerik One is ideal for automation. Sinumerik One allows the control of up to 31 axes in 10 processing channels. A digital twin “Create My Virtual Machine” is an integral part of the CNC. The Simotics servomotors are compact and highly dynamic permanent magnet synchronous motors for a wide range of applications in industrial environments. They are characterized by high power density and overload capacity.

Radial Chamfering employs economic and resharpenable carbide tools with up to three cutting edges.

Dr. Markus Krömer
Director Technology and Software

Rolf Leutwyler
Product Manager and Technical Consultant Siemens

Nano-Level Gear Inspection Goes Smaller

With the introduction of the new 175GMS nano Gear Metrology System, Gleason brings its renowned ‘nano’ sub-micron level inspection capabilities to smaller gears, helping ensure minimal noise, greater precision, and longer life.

Complete inspection of gear surface finishes at the sub-micron level first became a reality with the introduction of Gleason’s 300GMS® nano, in 2022. The new system ushered in an exciting new era in gear inspection. For the first time, producers of EV transmission gears, and gears for other applications requiring very tight tolerances and low noise requirements, had the ability to quickly inspect surface finishes and perform extremely reliable noise analysis at sub-micron levels – benefits that were almost impossible to achieve just a few years ago.

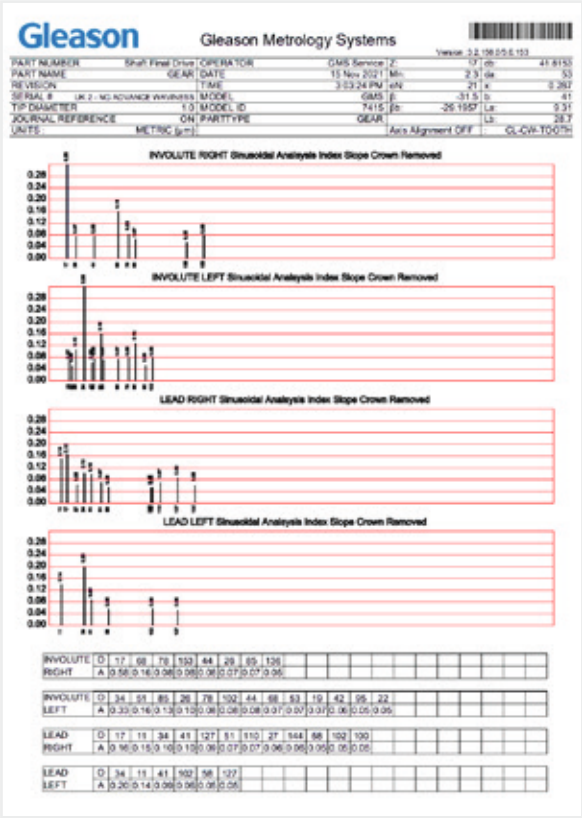
175GMS nano Gear Metrology System, for all types of small gears and shafts.

Measuring of gear pitch, tooth size, profile, and lead at sub-micron level with high speed along with surface finishes with a skidless probe.

Now, based on the success of the 300GMS nano platform, Gleason has expanded its nano series with the introduction of the 175GMS nano Gear Metrology System. The 175GMS nano picks up where the very popular 175GMS leaves off. Like its predecessor, it's designed for the complete inspection of all types of gears as large as 175 mm in diameter and shaft-type gears up to 480 mm in length, with a module range of 0.4 (optionally 0.15) to 6.35 mm.

But it also delivers the additional nano capabilities first offered with the 300GMS nano. Users can now measure, at sub-micron level, gear pitch, tooth size, profile and lead at high speed along with surface finishes with a skidless probe which is seamlessly integrated into the automated probe changer.

The latest GAMA™ software platform also performs noise analysis with the Advanced Waviness Analysis software tool. The 175GMS nano Gear Metrology System is equipped with a high-precision SP25 3D scanning probe head, a wide range of styli, and an advanced mathematical analysis that supports roughness evaluations to DIN, ISO, ANSI and other standards. It also offers 3D measurement and GD&T analysis rivaling those of a CMM.



175GMS nano quickly inspects surface finishes and performs extremely reliable noise analysis at sub-micron levels, using the latest GAMA software platform and Advanced Waviness Analysis Software Tool.

Like all metrology systems in the Gleason GMS series, the 175GMS nano seamlessly integrates into any user's manufacturing ecosystem through the use of Gleason's latest GAMA 3.2 application software with its user-friendly interface, supporting a wide array of different languages. Fully compatible with Windows, it effortlessly integrates into server environments, opening avenues for enhanced SPC data evaluation and remote maintenance services via Gleason Connect®, among others.

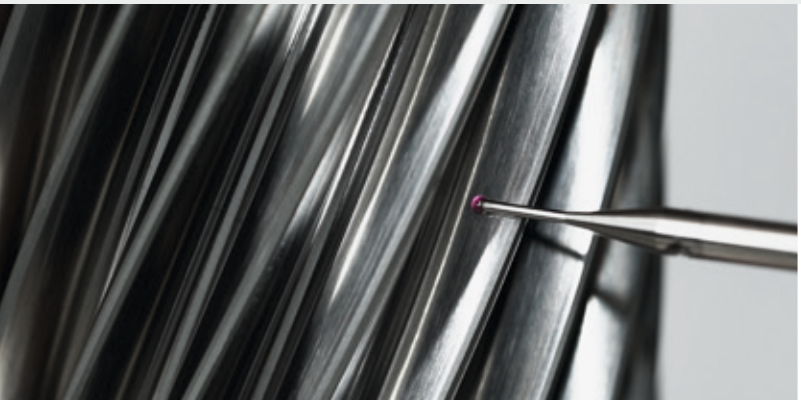
Through Gleason's "Closed Loop" feature, users can take the connectivity of manufacturing and inspection to the next level. The 175GMS nano communicates inspection results directly to Gleason production machines, enabling automatic correction of machine settings. From power skiving to threaded wheel gear grinding, this synergy opens new horizons for quality production. Additionally, inspection results like topography measurements and order spectrums from Advanced Waviness Analysis Software can be forwarded to KISSsoft Design Software.

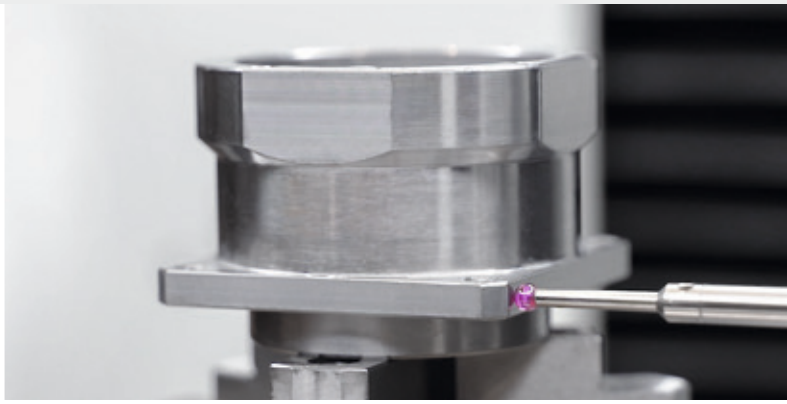
In KISSsoft, the designer can now see the differences between design and the actual produced gear and evaluate variables such as the differences in contact pattern in final application under various load conditions. Noise behavior can then be predicted even before testing on a single flank tester or end-of-line tester at final installation. This technology advantage, known by Gleason as "Smart Loop", holds the key to elevating gear designs faster and more seamlessly to a much higher level, for peak performance.

The Fastest Way to Your Expanding Mandrel

Select the LeCount® Mandrel of your choice and request a quick quote for a new mandrel or the re-certification of an existing mandrel. With the material number of your existing mandrel at hand, we can quickly determine the matching product.

LeCount Mandrel Selector





The 175GMS nano Gear Metrology System is equipped with a high precision SP25 3D scanning probe head, a wide range of styli, and an advanced mathematical analysis that supports roughness evaluations to DIN, ISO, ANSI, and other standards.

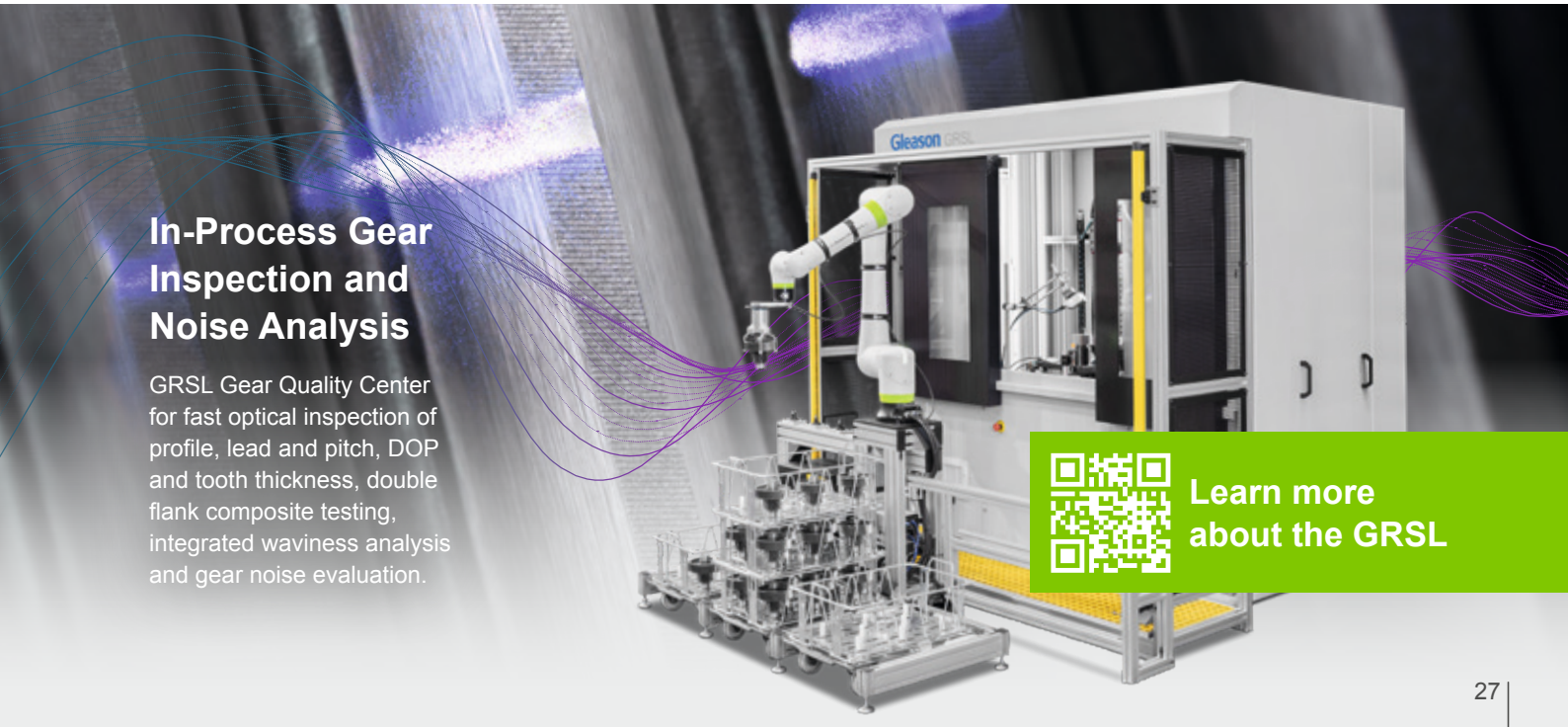
The 175GMS nano offers 3D measurement and GD&T analysis rivaling those of a CMM.

The 175GMS nano is optionally equipped with the patented Advanced Operator Pendant (AOP) enabling operators to record video and voice messages and to monitor environmental conditions. It may also be used to support remote maintenance via video telephony and can read bar and QR code information directly into the machine, for further use in inspection protocols or to select the appropriate inspection cycle.

As gear industries advance, so does the need for unparalleled precision. The 175GMS nano Gear Metrology System heralds the advent of a new era, where nano-level inspection is no longer the exception, but the rule.

Learn more about the 175GMS nano

Klaus Deininger
International
Sales Manager



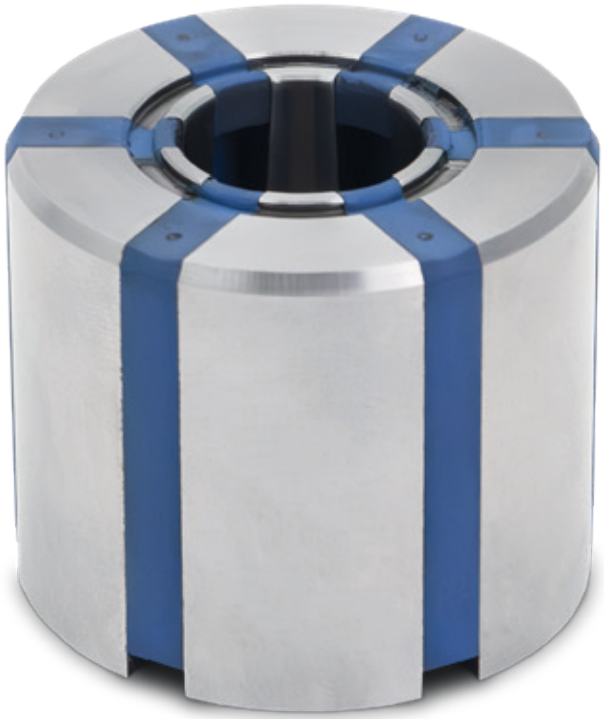
In-Process Gear Inspection and Noise Analysis

GRSL Gear Quality Center for fast optical inspection of profile, lead and pitch, DOP and tooth thickness, double flank composite testing, integrated waviness analysis and gear noise evaluation.

Learn more about the GRSL

Blue

The Color of Precision



In many technical contexts, the color blue is associated with precision and reliability. Not surprisingly, a crucial element for ID clamping bears the color blue, available for all ID clamping workholding on the market.

The latest generation of segment collets from Gleason ensures exceptionally accurate and reliable clamping in the part bore, while the “universality” of the new segment clamping sleeves enables a wide range of components to be clamped.

Flexibility is key
Adaptability and flexible production is now possible even for small batch sizes. The frequent changeover between workpiece types shows the weaknesses of conventional fixtures for clamping on the inside diameter, which are often not flexible or sufficiently reliable.

Workholding systems that use segmented collets that expand to exert a centering and clamping effect in the diameter of the workpiece bore are among the best solutions available for flexible production environments. Workholding systems with segmented collets show their strengths equally with small batches and a large variety of parts. As a single collet can accommodate a whole range of different bore diameters within its clamping range, its use results in greater flexibility and simultaneous cost savings, as both equipment costs and non-productive times are reduced almost automatically.

Segmented collets usually consist of an assembly with segments made of high-strength steel, which are joined with vulcanized high-tech elastomer using an injection moulding process. This combination provides a larger expansion range than steel alone and also dampens vibrations. The expansion (chucked) or contraction (de-chucked) of segmented collets is usually carried out with an expander, which is actuated by a draw rod within the production machine. When the drawbar is actuated, the expander causes the segmented collets to expand and exerts a particularly rigid clamping effect via the end face, respectively a pulling effect on the workpiece.

Blue means precision
Gleason segmented collets are recognizable by the typical blue color of the high-tech elastomer and can be used on workholding devices from all common manufacturers. The standard product line of segmented collets, covers a range from 20 to 120 mm in fine increments of 0.25 mm, with an excellent concentricity of ≤ 0.005 mm. Additionally, Gleason manufactures clamping collets according to customer specifications on request.

Reliability rethought
In order to minimize or ideally eliminate the occurrence of excessive wear, fatigue and runout, Gleason segmented collets are designed from the ground up: In addition to finite element analysis, the most rigorous life cycle testing using specific test fixtures is employed to perform actual chucking/de-chucking cycles of the prototypes, simulating many times the average life expectancy of a segment collets – with more than 1 million clamping cycles. The results of the long-term tests speak for themselves: No signs of fatigue with a constant concentricity error of ≤ 0.005 mm.

Benefits:

- Industry standard, compatible with most common workholding devices.
- Standard version from 20 to 120 mm in very fine increments of 0.25 mm.
- Large expansion areas thanks to highly flexible vulcanization between the segments.
- Vibration damping through vulcanized segments.
- Concentricity accuracy of ≤ 0.005 mm.
- Pull back feature to ensure positive seating.
- Auto load compatible.

Modular workholding device with segmented collet.

Robert Peyr
Director Product Management
Global Sevices and Workholding

Keeping the Boats Afloat

Marine Industrial Gears (MIG) is always on call, ready to repair transmissions on everything from river boats up the Mississippi, to oil tankers on the high seas. With so much at stake, MIG relies on a new Gleason Profile Grinder to speed the return of big gears to peak performance.

Cliff Hill saw an opportunity to do it better. With a career that began in 1979 servicing Lufkin and Falk gearboxes for marine applications, he'd had his share of frustrating parts shortages, technology issues, difficulties in getting quotes and ever-increasing pricing. There had to be a better way. So, in 2003 Cliff Hill founded Marine Industrial Gears (MIG). 11 years later his son Clifton Hill joined the company. Today, Marine Industrial Gears is indeed doing it better, from its workshop on the Mississippi river just west of New Orleans, in Harvey, Louisiana, and a second repair facility strategically located in Paducah, Kentucky, a waterway hub where the Mississippi and Missouri rivers converge. From these two facilities MIG can cover much of the eastern United States, the Gulf of America/Mexico and, when the need arises, go anywhere in the world where a surface ship needs repair. This includes gearboxes of every make and model – Falk, Lufkin, Reintjes, Western, Twin Disc Gears and Haley – many of which have had to endure the harshest conditions that exist out on the open seas.

All Hands On Deck!
All of these projects have at least one thing in common: marine gearboxes leave no room for failure. Taking a ship out of service for an extended period can cost the owner a fortune, let alone the enormous price tag associated with replacing the gearbox. Repairing and returning a gearbox to reliable service must be done quickly and efficiently. It's what MIG excels at. With no time to waste, MIG takes an 'all-hands-on-deck' approach to repair. Most machining can be done in-house, rather than waste precious time outsourcing. This includes line boring of reduction gears, crankshafts, struts, stern tubes, and rudder stocks; drilling and reaming of engine and gearbox foundations after alignment; even machining and fabricating of foundation bolts, bearing sleeves, and shafts in the required high quality. And now, with the recent acquisition of a Gleason P1600/2000G Profile Grinding Machine, add finish grinding to the MIG toolkit.

Marine Industrial Gears Services at a Glance

Global service to the marine and industrial transmission industry, with facilities in New Orleans, LA and Paducah, KY. 24/7 Field Service. Line boring of reduction gears, crank shafts, engines, struts, stern tubes, and rudder stocks. Alignment, drilling and reaming of engine and gearbox foundations. Full service machine shop with turning and milling capabilities. Gear profile grinding up to AGMA class A. Rework and manufacturing of foundation bolts, bearing sleeves, seal components, thrust bearing spacers and shafts. Stock of clutches, bearing assemblies, rotating seals, airshafts, bearings, etc..

Marine Industrial Gears
2201 St. Joseph Lane
Harvey, LA 70058, USA
Tel. +1 504-362-2999
www.marineindustrialgears.com

The MIG Crew “on board”, installing a new transmission gear on high seas.

Geared Up for Grinding

While MIG’s focus up until recently had been the servicing of marine transmissions, including alignments, line boring, milling and other jobs, Cliff Hill saw an opportunity to gain control of inventory, shorten delivery and serve his customers better by adding medium and large gear production to MIG’s repertoire. Consequently, MIG sought a machine to cover their typical gear service range: gears 48-50 inches (1,210-1,270 mm) in diameter, 24 inch (600 mm) face widths, herringbone-type shafts with double helical gears and other industrial gears of similar size. And more …

While Cliff was researching grinding options, a customer and friend recommended Gleason. “He said, ‘Go to Gleason and ask for their 2 meter grinder’,” Cliff recalls. “So we narrowed our search down to the ideal machine: a Gleason P1600/2000G Profile Grinding Machine. This machine fits ideally the scope of the workload.” Indeed, MIG’s new Gleason Gear Grinder features cutting edge technology to rough- and finish-grind any cylindrical external gear up to 79 inches (2,000 mm), to the highest AGMA quality class. The P1600/2000G enables MIG to grind all main transmission elements such as bull gears, pinions or idler gears for all makes and models of marine and industrial gearboxes. Now, gears with minor surface damage can be kiss-ground (light surface grind) in-house with lightning fast turnaround on all gear elements to minimize downtime.

Final alignment touches to a reworked marine transmission.

Inside MIG's new gear profile grinding machine.

The new grinding machine also delivers a very important capability that wasn't possible with other grinders in this size range: rough grinding gears from a solid gear blank, and thus eliminating all of the costs and time associated with, for example, the typical gear hobbing operation. This includes the prohibitively long wait time for delivery of the hob needed to cut a particular gear. While 'Grind from Solid' makes sense in theory, its practical application is not easy to achieve, since very aggressive metal removal rates are required in the roughing stage, thus producing significant volumes of swarf and the need for exceptional thermal stability. According to Cliff, the Gleason machine excels in both areas.

"In addition to relying on the machine's capabilities, as a newcomer to gear grinding, we have leaned heavily on Gleason for all of their resources and knowhow," Cliff says. "They gave us the confidence early on to handle the technology and machine operation. It's opened the door to a robust gear grinding business over and above just gears for our usual marine applications."

What's Downstream?

With all these resources at hand, MIG is looking up river and across the Gulf for more industrial gearbox business. This includes mills for sugar cane and industrial drives found in grain elevators, not to mention the South American market, with huge demand for repair and replacement of aging transmissions. As MIG seeks to expand further into the gear business, "It will always be Gleason" says Cliff. "Marine Industrial Gears is a no-BS, hands-on shop with honest pricing and efficient service. This is why we chose Gleason as a partner – we talk the same language."

Learn more about P1600/2000G

Nick Deaville
Regional Sales Manager

ENGRANAJES JUARISTI

¡Rápido!

With 30% of its precision gears produced in lot sizes of just one, Spanish gear producer Engranajes Juaristi S.L. depends on Gleason machines for exceptional speed and flexibility.

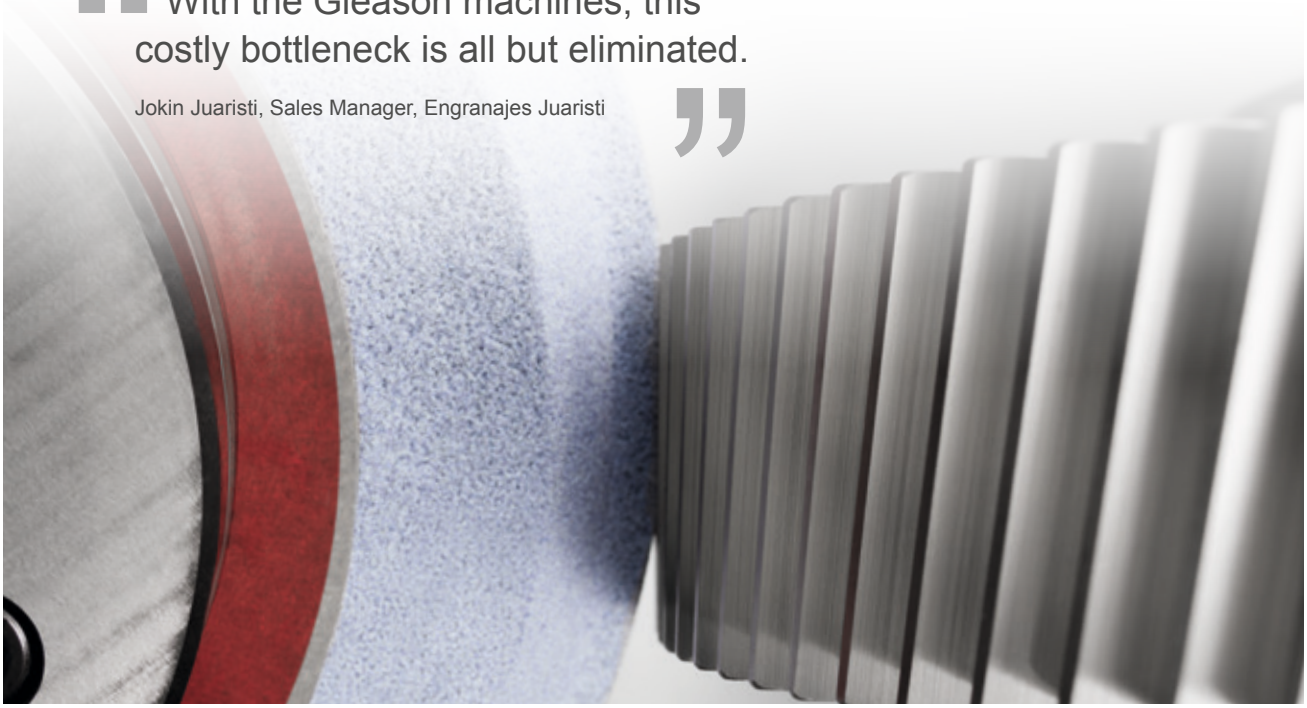
Zarautz, Spain might seem an unlikely place for a precision gear manufacturer. This beautiful coastal town in the heart of the Basque region is known for its beaches and considered among the top surfing destinations in the world. Surprisingly, the relaxed, holiday atmosphere and laid-back surfer 'vibe' turn out to be highly conducive to the production of gears. It is here that you will find Engranajes Juaristi, a renowned gear producer, owned and operated, for over 65 years, by the Juaristi family. The company specializes in the production of high precision external and internal gears up to 1,200 mm in diameter, as well as worm gear sets, spline shafts and other transmission components for everything from wind turbines to tractors, machine tools to trains. Significantly, 30% of the many thousands of gears produced by Engranajes Juaristi annually are in lot sizes of just one, and the average lot size is just seven parts. It's a bold strategy that attracts business and gives them a competitive edge. It also requires machines that can deliver faster cycle times and more flexibility. For that, there's Gleason.

Doing More with Less

Over the course of the last two decades, Engranajes Juaristi has phased in a new generation of highly productive Gleason hobbing, shaping and profile grinding machines that one of the company owners Inigo Juaristi, General Technical Manager, and his son Jokin Juaristi, Sales Manager, credit for much of their company's success. For example, two Gleason P400 Hobbing Machines, and one P600/800 Hobbing Machine, have replaced more than six older manual hobbing machines, eliminating countless hours of costly downtime once required for part changeover. "When any of the manual machines needed to be set up for a new part type, it usually tied up the machine operator for hours, thus bringing all the machines to a costly standstill," explains Jokin Juaristi. "With the Gleason machines, this costly bottleneck is all but eliminated. Fewer machines are producing more parts faster, with less changeover time part to part."

The two P400 Hobbing Machines and the P600/800 Hobbing Machine eliminate countless hours of costly downtime.

> With the Gleason machines, this costly bottleneck is all but eliminated.
>
> Jokin Juaristi, Sales Manager, Engranajes Juaristi



Additionally, these P series hobbing machines are designed with highly accessible, ergonomically designed workareas with large operating doors to aid in manual part loading. The operator's task is further simplified with current Siemens CNC controls and operator friendly Gleason hobbing software, including support and service functions.

The machines are ideally suited as well to accommodate the widest possible range of workpiece types and sizes and have extended ranges for workpiece diameters and shaft lengths: axial slide travels of 600 mm on the P400 machines, and 1,000 mm on the P600/800 machine, for shaft applications.

The company also says that the machines have operated with exceptional reliability and minimal maintenance over the years. Robust guideways are standard, and the use of proven, reliable direct-drive work spindles or double worm gear table drives deliver the desired high precision cutting results.

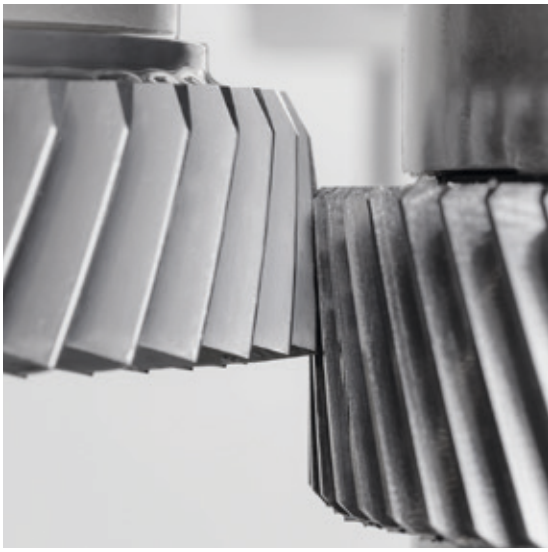
Learn more about Gear Shaping

Gleason P600/800ES Mid-Size Gear Shaping Machines with electronical helical guide for maximum flexibility.

New Business Shapes Up

It's not surprising, given Engranajes Juaristi's breadth of products, that shaping is a key capability. For internal gears, and those that can't be hobbed efficiently, the company uses two Gleason P600/800ES Gear Shaping Machines. Both machines feature an electronical helical guide – an additional CNC rotary axis – to replace the mechanical helical guides required in the older generation of shaping machines that these machines replace. In the past, the cutting of a new helical gear first required the expensive and time-consuming production of a mechanical guide used to produce the necessary helix by superimposing a rotary motion on the cutting stroke.

Then, there was the additional time needed to change guides for a new part. Now, changeover on the Gleason machines is done in minutes, via dialog-guided input on the Siemens CNC control. All gear cutting, tooling and part parameters, including the helix angle to be shaped, are entered, and the controller calculates all the necessary machine data and settings automatically. The machines are considerably more productive as well, featuring a backlash-free direct drive for the cutter spindle to deliver flexibility and operating ranges much greater than the previous conventional shaping machines. An extended stroke length using Gleason's optional shuttle shaping feature accommodates face widths of



Gear shaping tools designed and manufactured by Gleason.

approximately 400 mm – well beyond what was previously possible. Finally, one of the machines is equipped with a B-axis, which enables an inclination of the column under CNC to produce tapered parts and improve quality when shaping parts made from high-strength steels.

“The added capacity and faster changeover have opened the door to many new gear shaping opportunities, and jobs we couldn’t have taken on with the older shapers,” says General Technical Manager Inigo Juaristi. “For example, we now use the machine with B-axis to produce an important cone-shaped part for a farm equipment application. This would not have been possible before.”

Faster Finishing

Strong winds off the shores of Zarautz are good news for surfers, and for Spain’s burgeoning windpower industry, which now ranks as the fifth largest by capacity in the world, and second in Europe behind Germany. Wind is Spain’s largest, and fastest growing source of electricity. Engranajes Juaristi is keeping pace with this growth, and gears for wind turbines now represent 15% of its annual shipments. These gears are characterized by their high quality requirements, thus enabling them to run smoothly, quietly, and with great reliability in even the harshest conditions.

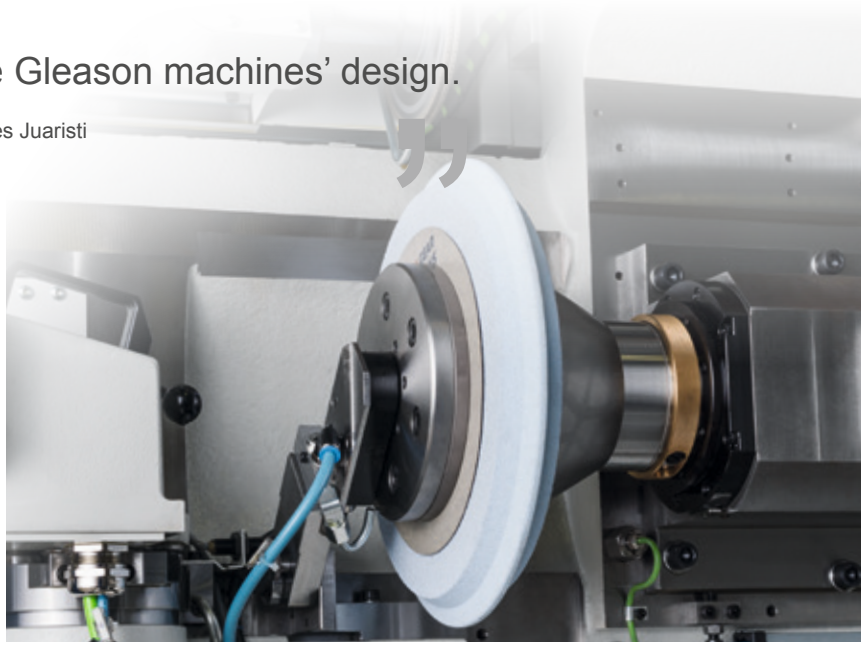
About Engranajes Juaristi S.L.

Engranajes Juaristi S.L. is a family-owned, 40-person company, founded in 1958, with over 3,600 m² dedicated to transmission element manufacturing. This includes geared parts such us planetary gears, pinion shafts, worm shaft /wheel sets, racks and pulleys, ranging in size up to 1,200 mm in diameter and 2,000 mm in length, from module 1 up to module 18. Major markets include windpower, railway, agriculture, machine tools and general industrial machinery.

For more information, contact:
Engranajes Juaristi, S.L.
Tel. +34 943 132 280
jokin@engranajesjuaristi.com
www.engranajesjuaristi.com

Easy data input with Gleason hobbing HMI.

> “It’s a testament to the Gleason machines’ design.”
>
> Jokin Juaristi, Sales Manager, Engranajes Juaristi



Gleason provides complete tooling solutions including grinding wheels and dressing tools.

Engranajes Juaristi uses two Gleason P600/800G Profile Grinding Machines to perform the critical hard finishing operations on external gears. One of the two machines has an extended axial travel to 1,000 mm, enabling the production of several important shaft-type parts for wind turbine gearboxes such as sun shafts and high speed pinions.

A one-piece machine bed with excellent stiffness and dampening is the foundation for these machines’ high accuracy requirements. Excellent accessibility to the work area of the machine is achieved by doors that open wider and a counter support placed in the corner of the machine.

Most importantly, the use of Gleason’s proven HSK external grinding head guarantees maximum flexibility and, thanks to the HSK quick-change system, allows the use of different grinding wheel spindles for dressable and non-dressable CBN grinding wheels in a diameter range of 40 to 350 mm. This has enabled Engranajes Juaristi to take advantage of the latest developments in ceramic grinding wheels that, in just the last few years, have made dramatic reductions in finish profile grinding cycle times.
“It’s a testament to the Gleason machines’ design,” says Jokin Juaristi. “The machines allow us to keep up with tooling innovations that make us more competitive. While we’re just doing external gear grinding with these machines, we’re now considering adding an internal gear grinding capability. These machines are easily adaptable.” An internal grinding device can be added without removing the external grinding spindle. As a result, the machines can be configured to finish grind a wide range of internal and external gears, as well as worms of all common types.

The machines also include integrated on-board gear measurement and the latest smart dressing technology, which reduces costly, time-consuming dressing time for initial or re-profiling of a grinding wheel. The innovative software function ensures that dressing only takes place on the necessary grinding wheel areas, thus saving time.

Localized Service and Support
Localized Gleason support has played an important role in helping Engranajes Juaristi transition its gear manufacturing from ‘mechanical to modern’.
“It’s gratifying to work with a company where ownership is so open to the possibilities of our new technologies,” says Xavi Vallsmadella, Regional Sales Manager, Gleason Sales Spain, who has supported Engranajes Juaristi throughout its 20-year modernization journey. “It’s an example of how a small company, with the right technologies, can do big things.”

Learn more about Profile Grinding

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Complete Solutions from One Source

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