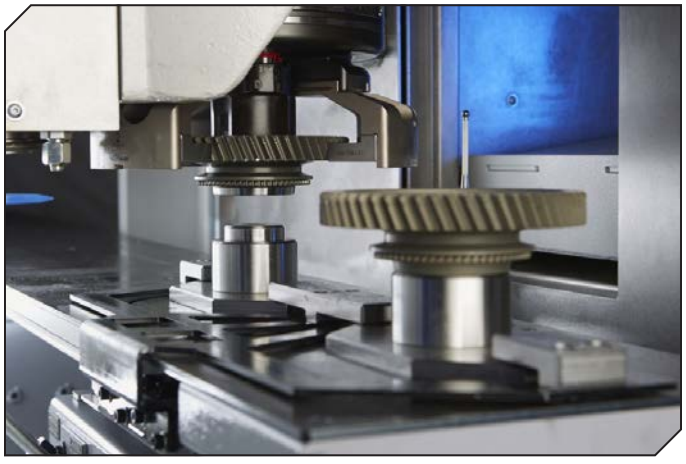
EMAG

VLC 200 GT OFFERS DIVERSE MACHINING CONCEPTS

EMAG's VLC series covers a very broad range of machining technologies: turning, drilling, milling, gear hobbing, hard and soft machining.

"VLC machines enable us to cover the entire process chain for the manufacturing of transmission components, from blanks to finished parts," explains Peter Loetzner, president and CEO EMAG LLC. "Customers benefit from the unified design of our machines — consistent transfer heights and an integrated pick-up automation system that make it easy to connect machines."



The pick-up automation system is the platform for the success of EMAG machines. Every machine in the VLC series features a parts storage area for raw and finished parts, as well as a working spindle that is automatically loaded and unloaded from this unit. It guarantees minimized non-productive times and high efficiency.

"Of course, these qualities are shared by the VLC 200 GT, a combined turning and grinding machine that we developed specifically for the hard machining at the end of the process chain," Loetzner adds.

The VLC 200 GT was developed primarily with a focus on transmission gears and was first launched in 2016.

"Because of their large production numbers and high quality requirements, transmission gears are ideal parts to be machined on the VLC 200 GT,"Loetzner explains. "When we analyzed the machining process, we found that we could perform the entire machining process in a single clamping operation."

To achieve this, EMAG combines the processes of hard turning and grinding. The shoulder and the bore are hard-turned first. Only a few micrometers of material is then left to be removed from the transmission gear. This ensures a much shorter grinding process using aluminum oxide or CBN grinding wheels, which saves costs in two ways: through lower tool costs resulting in a lower unit cost, and through faster cycle times. The machining quality also benefits from the combination of turning and grinding: When there is only a small amount of material remaining to be ground away after turning, the specifications for the grinding wheel can be based more precisely on the end quality required—as a result, surfaces with an average peak-to-valley height Rz of less than 1.6 micrometers can be reliably achieved with the VLC 200 GT.

For more information:
EMAG LLC
Phone: (248) 755-9775
www.emag.com

3M

INTRODUCES HIGH PERFORMANCE, PRECISION STRUCTURED INTERNAL GRINDING WHEELS

Specifically designed abrasive tools require tight wheels, geometry, and tolerance for mass production. Companies that grind in the most complex ID applications need tailor-made solutions that adapt to tool design and specifications, and offer improved outcomes. 3M's new Precision Structured Portfolio for internal grinding brings to market the first product available using 3M's expertise in abrasives, bonding, manufacturing and 3D technology: 3M Precision Structured Vitrified CBN Grinding Wheel 1PVP.

"We listened to customer needs before we pioneered Precision Shaped Grain in Conventional Bonded Wheels, and we've seen significant productivity benefits in ID Grinding for our customers," said Felix Thun-Hohenstein, global business director, abrasives systems division. "But many customers are using Super-Abrasives and are also seeking process improvements—now we're engineering a Precision Structured portfolio

of products that could help customers see similar benefits in very challenging ID grinding situations."

Digital modelling, combined with a 3D printing process, allows flexibility in wheel design in terms of wheel shape. This includes unique 3D shapes and structures, surface slots, integrated cooling holes, passages and channels — all key elements that improve outcomes in detailed applications like fuel injectors, rotary bearings, steering components and more.

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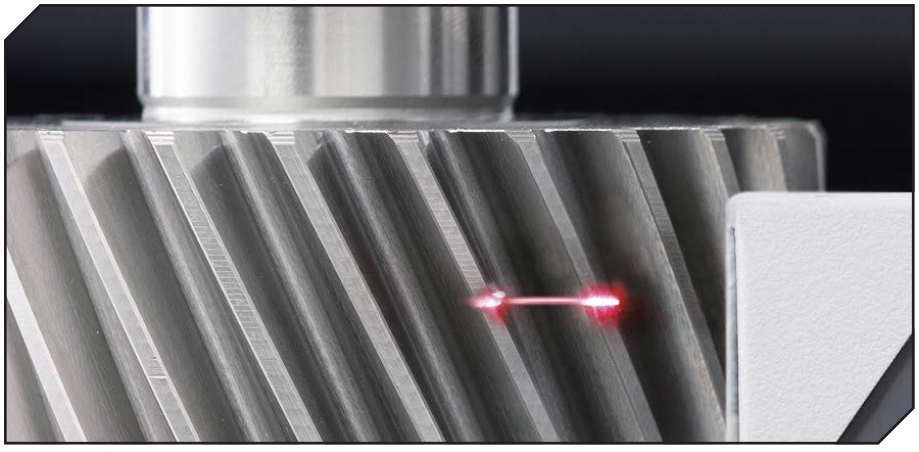
Gleason

PRESENTS GEAR INSPECTION TECHNOLOGIES AT CONTROL 2019



Gleason Corporation presented its 300GMSL Multi-Sensor Gear Inspection System and the GRSL Gear Rolling System with integrated Laser Scanning at the recent Control Show in Stuttgart/Germany.

The versatile platform of Gleason's 300GMSL Gear Metrology System provides the classic tactile probing methods for inspecting conventional gear characteristics on spur and helical cylindrical gears as well as straight, spiral and hypoid bevel gears with a diameter of up to 300 mm. In addition, the new inspection system allows non-contact laser sensor scanning of tooth flanks to support gear development. Complete topography data can be recorded far more rapidly than with conventional tactile probing, with comparable results - depending on the tooth flank surface.

The integration of laser scanning and associated 3D graphics with CAD interface considerably expand both the functionality and the range of applications for this machine platform. The new option makes the 300GMSL the ideal solution for research and development applications, for both prototype and production parts or when reverse engineering is required. Further options include surface finish measurement or Barkhausen noise analysis to inspect grinding burn.

The 300GMSL Inspection System is also an ideal fit for rapid measurement of topography in regular production operation and satisfies the increasingly stringent requirements on gear inspection. Compliant, soft materials (such as plastic gears, for example) can be inspected without sustaining damage. Multiple technologies combined in one single machine platform reduce operating costs, annual maintenance, certification costs and space requirements.

The GRSL Gear Rolling System with Laser allows in-process gear inspection and sets a new standard for throughput where high-speed, high-volume testing

Gear grinding from one source:

- Grinding machines
- Automation
- Grinding wheels
- Dressing rolls
- Workholding
- Services

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is required. It provides both, double flank roll testing as well as analytical index and involute measurement on all teeth in a matter of seconds.

This new technology is available in manual, semi-automatic or fully automatic configuration depending on the needs of the customer. The index and involute measurements are analyzed using Gleason *GAMA Gear Automated Measurement and Analysis Software* which allows operators to see common charting between a GMS Analytical Inspection Machine and the GRSL Gear Rolling System. With *GAMA*, over fifty analysis packages are available for customers with all major industry standards such as AGMA, DIN, ISO, etc., along with customer specific analysis requirements developed specifically for the *GAMA* Platform.

For more information:
Gleason Corporation
Phone: (585) 473-1000
www.gleason.com

Radix Technology

RELEASES GEAR TOOTH ALIGNMENT ANALYTICS

Radix Technology Solutions, a division of the AIS Technologies Group, released a new vision application at the Automate 2019 trade show and conference. This vision application, called Gear Tooth Alignment Analytics, is designed to automate the process of precisely aligning differential pinion and gears.

This configurable vision application inspects individual gear teeth (drive & coast), precisely calculating gear mesh contact patterns. With real-time feedback to the operator, this stand-alone application ensures the achievement of rapid and accurate pinion and gear alignment. Additional data provided by Gear Tooth Alignment Analytics includes length and width of pattern, position along the flank, total contact area, along with other metrics of value to gear analysis. An additional benefit to this product is that it requires only minimal rouging on each gear — a process and material savings of substantial value.

"Radix is well known for our ability to solve tricky manufacturing problems with clever technologies," says Josh Capogna, vice president, product innovation. "This is one more example of our commitment to innovation in intelligent manufacturing and Industry 4.0."

For more information:
Radix (AIS Technologies Group)
Phone: (519) 737-1012
www.radixinc.ca

Studer

EXPANDS GRINDING MACHINE CAPABILITIES

The new S31 performs complex and varied grinding tasks precisely and reliably. It can be used to produce small to medium-sized workpieces with a distance between centers of 400, 650, 1,000 and 1,600 mm and a center height of 175 mm in individual, small batch and high volume production. With a high-resolution B-axis of 0.00005° the swiveling wheelhead enables efficient external, internal and surface grinding in a single clamping.

The foundation of the universal cylindrical grinding machine is the machine bed made from solid Granitan S103. This provides high dimensional stability thanks to its favorable thermal behavior, while the mineral casting largely equalizes short-term variations in temperature. In addition, the new S33, the CNC universal cylindrical grinding machine from Studer, offers flexibility. With distances between centers of 400, 650, 1,000 and 1,600 mm and a center height of 175 mm, it can be used for grinding small, medium-sized and large workpieces up to 150 kg in individual, small batch and high volume production.

For more information:
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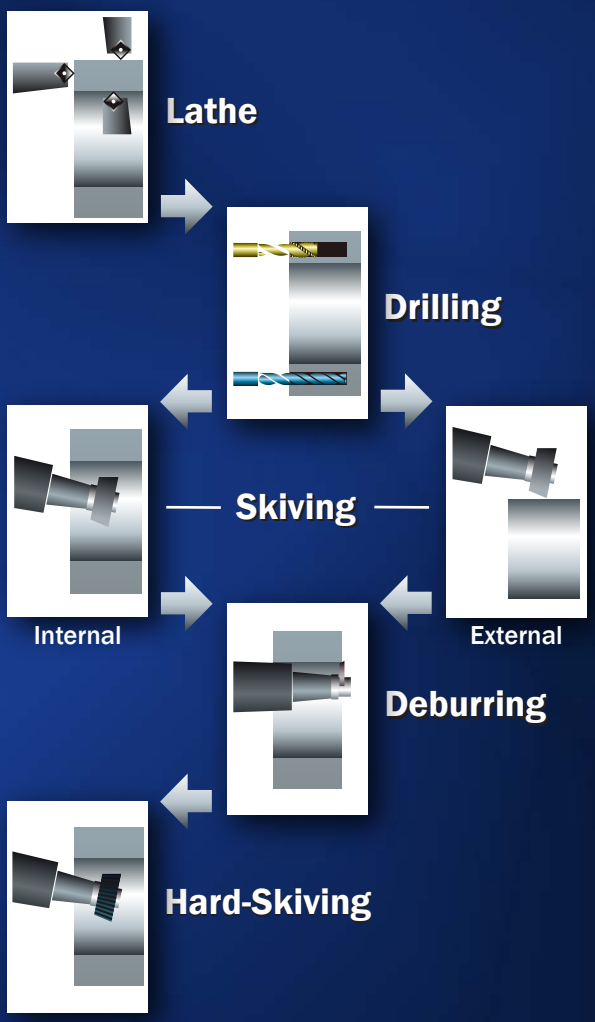

- High Efficiency Gear Skiving & Integrated Process Reduce Machining Time
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Scudding Tools by Star SU

Flexibility and High Productivity in Gear Manufacturing

Dr.-Ing. Deniz Sari

The main goal of gear cutting tools is to achieve high productivity while eliminating wasted motion and maintaining high gear quality. Today, through Scudding — a.k.a. Power Skiving — a revived process using CNC controls, it is possible to state that Scudding tools meet all of the above benefits.

Scudding is defined as a continuous cutting operation that uses a tool design similar to a shaper cutter. A great advantage of this technology is that it can be applied to many gear applications, including involute gears, non-involute gears or non-symmetrical gears.

The process is extremely flexible, reduces cycle times and completely eliminates unproductive upstrokes due to the synchronization of the cutting tool and workpiece. Another advantage in using this technology is that you can perform the machining of internal or external gears without the need of an undercut or groove.

Scudding can cut a gear in equal cycle time as hobbing, and can be five to six times faster than shaping an internal gear due to skiving's continuous chip removal capability. It can also be used to hard-finish gears with a carbide cutter and can be applied any time a form can be generated by shaping, hobbing or broaching.

This process is becoming very efficient due to the latest machine technology (direct-drive and stiff electronic gearboxes) and tool technology (complex geometry, material and coating). So, Scudding does not have any wasted strokes and, compared to broaching, can use the machine axes to make lead corrections such as crown and taper.

Cutting speed calculation. Cutting speed is obtained by a combination of workpiece rotation speed, tool rotation speed, and the intersection angle between them. It is generated by the cross-axis angle between tool and workpiece.

Inclination angle:

$$\Sigma = b_0 \pm b_2$$

Cutting speed:

$$v_c = v_{Tool} \cdot \sin b_0 + v_{Workpiece} \cdot \sin b_2$$

- For spur gears, the axial feed f_a is directed in line with the Y axis.
- For helical gear the axial feed f_a is oriented in the y-direction, but an incremental tool rotation n_{Tool} has to be added to tool rotation n_{Tool}.
- A tilt angle can be used to increase the effective relief angles.

The mechanical element that is one of the most important in the industry — now and in the future — is the gear. Due to its versatility and high efficiency, gear drives are used in nearly all areas of powertrain technology. In addition to the design of gears, the production of these is a technological challenge. Therefore, diverse processes and process chains were developed.

A major part in the manufacturing process chain is the soft machining of the gear. The choice of the soft machining process depends on the component geometry, the required quality as well as the productivity. In the automotive and commercial vehicle sector, hobbing, shaping and broaching are the dominating processes for soft machining of gears. A highly productive alternative to the methods mentioned before is Scudding by Profilator.

Due to the geometrical boundary conditions, hobbing can only be used with external gears with enough axial tool travel space. For other cases, gear shaping is required — but this results in decreasing productivity. Another highly productive alternative for machining internal gears is broaching. Due to the process characteristics regarding tool and machine technology, broaching has a low flexibility and requires comparatively high investment costs. Scudding offers the possibility to produce internal and external and gears with and without interfering contours.

During Scudding, tool and workpiece mesh together — like a gear pair; external and internal-external combinations can be implemented. A significant and decisive difference is the cross-axis angle between the two partners that ensures a relative movement along the gear flanks. This relative movement of the cutting edge along the flanks ensures the chip removal. The rotational speeds of the

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workpiece and tool are coupled by the numbers of teeth. Under a defined penetration, a tool tooth rolls through the gap of the component to b_e generate the involute. To this movement an axial feed f_a is added, which ensures that the component is machined to its complete face width. The cutting speed results from the rotation speeds of tool and workpiece, as well as the set cross-axis angle.

Today, cutting speeds that are now being implemented with modern machine and tool technology, are up to $v_c = 250$ m/min; using high spindle speeds, high process dynamics occur. To avoid negative effects to the process dynamics on the manufacturing process, it is necessary to design a Scudding machine in a manner tailor-made to the process. This is the only way to ensure that vibrations are minimal and a rigid machine structure provides an optimal quality result.

The process runs continuously until the complete face width of the part is machined. Backstrokes — such as are necessary in shaping — are not required. To reduce the load on the cutting edges of the tool and increase the tool life, today multi-cutting strategies are dominantly used.

Star SU and Profilator have formed a global alliance to offer the market the best tool and machine technology. The experts of the three companies work together for each and every gear project in order to implement the best possible strategy. They can choose among different kinds of tools, like disc type, shank type or wafer Scudding tools, depending on the geometry of the piece. The final decision about the correct kind of tool to be used is taken by Star SU in close cooperation with Profilator. The choice of the combination of material and coating is optimized on the basis of the workpiece. Thanks to their accurate geometric design and high-precision manufacturing, the tools provide the customer with the possibility of repeated reprocessing, which can significantly increase the tool life. Through the use of Wafer Scudding tools, for example, the customer has the possibility to use cost-efficient, non-resharpenable tools for small-to-medium-sized batches.

Together, Star SU and Profilator have many years of experience in Scudding and they successfully supply well-known companies in the gear industry all over the world. David Goodfellow, President of Star SU LLC, sums up: "As a cutting tool manufacturer, we are not just a supplier. With such a high-tech process like the Scudding, we occupy a key position among the customer, the machine manufacturer and the process itself."

Application
Spur and Helical Involute Gears and Splines

Tool Types
- Wafer
- Disc
- Shank

Material
- PM HSS
- Super Alloy HSS
- Carbide

Coating
- Alcrona Pro (AlCrN)
- Altensa (AlCrNX)

Advantages
- Produce predetermined flank corrections
- Taper and crown can be set via machine parameters
- Improve the rolling action of the gear
- High productivity
- High gear quality with low surface roughness
- Reduce cycle times
- Dry cutting
- Hardened workpieces can be machined

Dr.-Ing. Deniz Sari in 2012 received his degree in mechanical engineering from the RWTH Aachen University. He began his career as a research engineer and a group leader of the Gear Manufacturing Group of Laboratory of Machine Tools and Production Engineering (WZL) of RWTH Aachen University. In 2016 he earned his Doctorate — with a core emphasis on gear finish hobbing — in mechanical engineering (Dr.-Ing./Ph.D.) from the RWTH Aachen University. In 2016 he joined Samputensili and its joint venture — Star SU. Sari in 2017 became a gear technology manager and, at the end of 2017, he was named sales manager for gear cutting tool in middle-Europe.