Integrated Production Chains

KAPP NILES DEVELOPS GEAR GRINDING PLATFORM THAT DELIVERS TIME SAVINGS, ENHANCED QUALITY AND INCREASED SYSTEM AVAILABILITY

Martin Witzsch

High volume production requires top quality at increasingly shorter processing times. The machines are already technically very advanced. Great savings potentials are no longer to be found among the processing techniques, but rather within upstream and downstream process stages such as set-up, measurement and communication between machine and measurement equipment. Therefore, Kapp Niles has developed a platform to tie together and automate these processes. Thanks to open standards such as umati and GDE, it even works on a multi-vendor basis.

There are different approaches to further increase the efficiency of production processes, for example by integrating as many process steps as possible into one machine. However, from a technical point of view, this is very complex and inflexible, and thus unreliable.

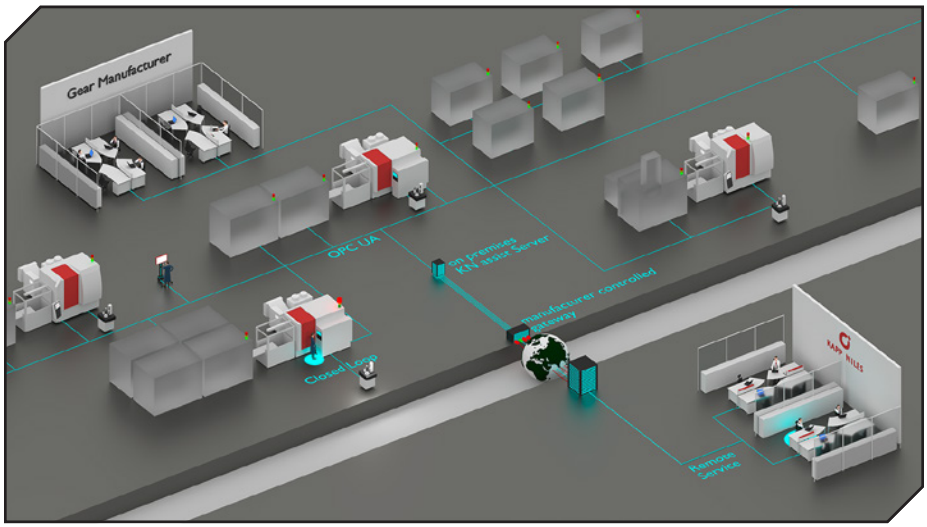
"Instead of integrated machines, we rather envision integrated production chains with as little manual handling between individual chain links as possible," said Konstantin Schäfer, head of product management. "Kapp Niles continues to develop from a pure machine manufacturer to a solutions provider."

This becomes apparent in the growing measurement technology sector, Kapp Niles Metrology. What's more, the existing portfolio is being optimized for production systems communicating with each other. Through the new KN assist platform, for example where control system software like KN grind supports the user from the project planning stage through production.

KN grind, a hands-on control system

As part of the project-related configuration, all required processing options are combined in one workpiece project. With the step-by-step intuitive user interface, concrete project data are collected. In a virtual set-up process, the user selects the gear type and the suitable tools from a component set. Each step is displayed on a conventionalized machine. Upon request, KN grind also offers technological suggestions.

"Unlike with previous releases, critical or incorrect values are displayed to the user. A sequential control allows for a straight-forward compilation of workflows via drag & drop. This comes in very handy for complex processing, for example, of workpieces with multiple processing positions within one project. These generated sequences can be used for automated processing as well as for set-up sequences," said Volker Zenker, software development manager.



The need for softkeys is replaced by a touch screen display control panel. All new machine generations feature this control system.

No data security compromises

Compared to highly automated production centers, it seems like a relic of the early days of industrialization if operating personnel have to walk from the measurement room to the machine to carry over measurement reports in order to manually type in corrected values. The fact that this is still practiced within a high-tech environment is due to the extremely high safety standards of users such as the automotive branch who have so far circumvented simple data integration. Moreover, the use of USB sticks is strictly prohibited. Another factor has been the lack of consistent data transmission standards to allow for secure data integration. That is why Kapp Niles has developed solutions that no longer require the installation of invasive software and thus allows users to retain control over their data at all times.

"This concept does not include any cloud services," added Schäfer. Applications that go beyond direct machine control are programmed in HTML5. This allows the user to apply them on both classic computers and mobile end devices.

KN assist: the bigger picture—which also applies to all manufacturers

The result of the above thoughts is the KN assist platform. Thanks to above mentioned HTML5 programming, KN assist runs without any further software requirements on a PC and mobile end devices alike. All the user has to do is to call up a single address on the Intranet and thus is granted access to the system through his browser or an app.

The data exchange takes place via the standard interface OPC UA (Open Platform Communications Unified Architecture) facilitating machine-to-machine communication with very little effort. As an overview of the overall system array, KN assist uses the open data exchange format such as GDE

(Gear Data Exchange) and umati (universal machine tool interface), developed by VDW in cooperation with project partners. This allows the exchange of basic gear/toothing data, modifications, assessments, etc. among manufacturers. Furthermore, the operating states of all machines in the plant are displayed. This gives each user from every location a production overview.

Kapp Niles KNM 2X measuring device for production-related applications. All photos courtesy of Kapp Niles.

An even more complex application is the data management of all component-specific parts such as clamping, dressing and grinding tools. Until now, set-up component data had to be manually entered at the machine to avoid the possibility of supplier data carriers accessing the production areas. In future, RFID or 2D codes will be attached to dressing rolls, worms or clamping tools that can be read by the machines. This reduces set-up times considerably and allows components to be clearly identified. Storage locations, service life, clamping cycles or assignments to a project in planning can be conveniently documented this way. In doing so, the response time to service requests and internal processes is reduced.

Quicker response times to service requests

The customer expects prompt service in case of a service request or system malfunction. However, the classic chain of messages is comparatively slow. Machine operators detect an error, notify the Service Department and describe the problem. The Service Department then contacts the manufacturer; the latter queries additional data — best case scenario — via a modem to be activated, however, more likely over the phone. In doing so, information can get lost or displays can be misread. That is how the first hour is spent: converted into idle time, this creates a costly situation. Moreover, the machine manufacturer will have to collect, update, and analyse the data first. A conventional data transmission via the internet would be feasible, however, it is considered not secure by most users.

Kapp Niles has taken remedial action for this process: The customer can now initiate the contact in KN grind. Christian Füger, manager of sales and service, described this option: "The

service request can be initiated via a button on the display of the machine, or via the web interface of any mobile end device. This allows the Service Manager, operator or planner alike to respond without delay," Füger said.

The service request is sent to Kapp Niles directly via a TÜV-IT-certified VPN connection. Diagnostic data, log files, etc. of the relevant machine will be provided to the customer upon explicit release, without losing the royalties over the process and the data.

In-process measurements via "closed loop". With the dark green area, drifting setpoint values can be detected and corrected, even during ongoing processes

Currently, the response time is around 12 hours. In other time zones without local representation, 24 hours at worst.

"We strive for end-to-end service with a response time of two to four hours. This can be done, as all information such as commission numbers, error patterns, measurement reports, etc. is already provided along with the service request," Füger said.

Turbo for the measurement technology

As previously indicated, the portfolio now also includes machines for production-related measurements, as significant time savings can also be achieved for follow-up work of grinding processes. During the classic process, random workpiece samples had to be taken from production to be carried to the measuring machine usually located in a different hall. Depending on the workload, the results would usually be available about 15–20 minutes later. Afterwards, the measurement report had to be taken back to the machine to manually type in the corrections. In order to reduce these times, Kapp Niles is drawing on multiple factors. The measuring machines are also designed for product-related applications. They can do without a climate chamber (see image). The individual axes and the workpiece are monitored via sensors for temperature compensation purposes. Air springs absorb vibrations. In doing so, the measurement accuracy meets the highest standards, even in high volume production.

"The machines can be accessed freely

by the operator from three sides, and thus is also suitable for automated loading. Flexible positionable counterholders are provided for the measurement of wave-shaped parts. In addition, the machines can be converted for a new workpiece in seconds with a quick-change clamping system," said Gerhard Mohr, managing director of Kapp Niles Metrology.

Automation also contributes at least as much to the time savings. The direct connection between the grinding and measuring machines is known as "closed loop" within the sector. The measuring machine provides data not only in form of reports, but also as GDE dataset. In the first version, these are the typical correction variables (fHα, fHß, tangent length correction /pitch correction) which will change in case of a temperature increase or tool wear. Compared to manual input, these data can be imported and analysed much quicker and with fewer errors via OPC UA in KN grind. If a new measurement result is provided, the operator will be notified and receives correction suggestions.

"What happens here is not a pure Target/Actual comparison. On the contrary, the operator receives the measured values prepared, which allows him — based on his experience — to decide whether and how he will intervene. Based on the project, automated tracking is another option," said Christian Graf of software development.

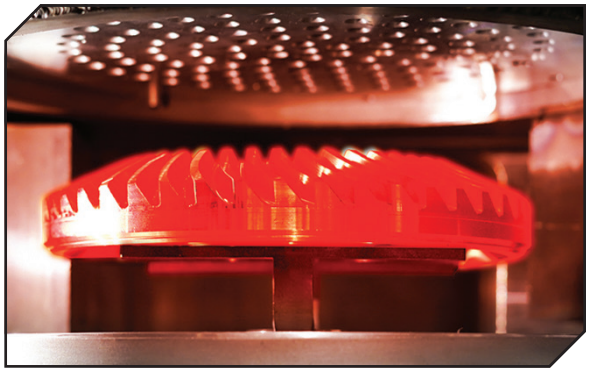
Overall, the described measures will significantly speed up and simplify the workflow. The user gains a better overview of the production process while taking advantage of the many benefits of the new software platform, even on a multi-vendor basis.

For more information:
Kapp GmbH & Co. KG
Tel.: +49 (0)9561/866-0
info@kapp-niles.com
www.kapp-niles.com

About the Author
Martin Witzsch is a graduate physicist and freelance journalist on behalf of Kapp Niles. Contact him at *info@witzsch.com*.

Seco/Warwick

INTRODUCES A MODERN ALTERNATIVE TO PRESS QUENCHING



The new UCM 4D Quench vacuum system introduced by Seco/Vacuum Technologies, a Seco/Warwick Group company, will replace traditional press quenching. The new furnace enables customers to achieve the same results or better as oil press quenching but with gas cooling after vacuum heating in a continuous, single-piece flow vacuum heat treatment system. 4D Quench is a cost-effective alternative for quenching and distortion control that cools as rapidly but without the issues associated with oil.

"Seco/Warwick's 4D Quench furnace is dedicated to those who want to avoid or eliminate press quenching and significantly increase quality and process integration of gears and other transmission components," said Maciej Korecki, VP, business segment vacuum heat treatment furnaces. "The 4D Quench system utilizes a proprietary arrangement of cooling nozzles that surround the part and delivers a uniform flow of cooling gas from all sides; top, bottom, and sides — for "3D" cooling. To complete the process, a table spins the part (the 4th Dimension), further enhancing quench uniformity."

The 4D Quench system solves the following process and product problems:

- Parts are quenched and cooled without the possibility of oxidation and without dirty oils
- Seco/Warwick's single-piece flow furnace with 4D Quench moves parts automatically and eliminates labor and product variations due to manual handling of parts
- The 4D process is perfect for through hardening and for hardening previously carburized parts with extremely low distortion
- The 4D Quench eliminates washing, chemicals, waste disposal, oil vapors and all the mess associated with quench oils; it also improves worker safety

How it Works

The entire nitrogen cooling system provides powerful and uniform quenching which results in repeatability and significant reduction of distortion and finally its control. Neither oil nor helium is required.

For more information:
Seco/Warwick
Phone: (814) 332-8520
www.secovacusa.com/4d-quench

Kennametal

OFFERS HARD TURNING INNOVATION

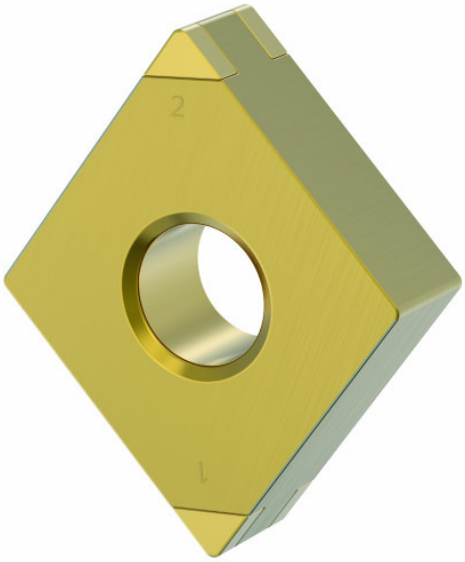
Kennametal recently announced its latest innovation in hard turning-KBH10B and KBH20B PcBN grades, double-sided inserts for materials up to 65 HRC. The new grades are specially designed to deliver higher productivity and longer tool life when turning tool steels and other hardened materials.

"Kennametal´s new KBH10B and KBH20B grade inserts are an excellent choice for high-volume production of hardened gears, shafts, bearings, housings, and other drivetrain components, where tooling cost per part is an important metric," said Robert Keilmann, product manager, turning.

Polycrystalline cubic boron nitride (PcBN) mini-tipped inserts have long been recognized as a great option for reducing part cost when turning hardened steel components. Kennametal´s new grades of PcBN inserts improve upon that value proposition by delivering increased productivity with a lower cost per part.

Features include:

- Patented ceramic binder structure and TiN/TiAlN/TiN coating that provides extreme wear resistance even at elevated cutting speeds.
- A gold PVD coating makes it easy to identify when an insert needs indexing, while the numbered corners assure that a machine operator won´t inadvertently switch to a used edge.
- Two edge preparations in a »trumpet» style hone for heavier and interrupted cuts, and a light hone for continuous turning. Both are free-cutting, further extending tool life and generating surface finishes down to 0.2 Ra.
- The PcBN mini-tips are offered in four insert shapes — three rhomboidal and one triangular — which means up to six cutting edges per insert.



For more information:
Kennametal
Phone: (412) 248-8281
www.kennametal.com

GMTA

ANNOUNCES EXPANSION TO PROFILATOR LINE

GMTA, the North American distributor of Profilator, has added new machines using the process modules it already supplies. Profilator is suitable when customers require complex machining processes to be carried out effectively, efficiently and with high precision.

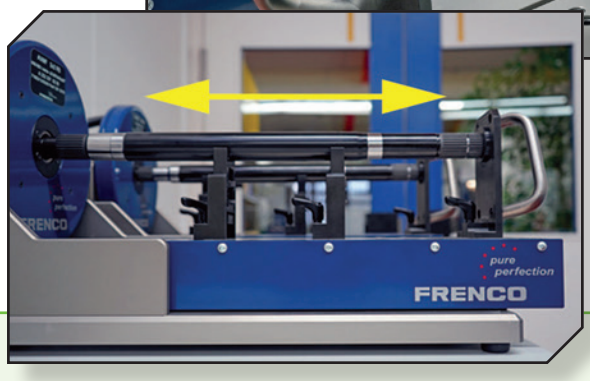
Today, an operator working on a modern machine expects a flexible

Frenco GmbH

OFFERS HORIZONTAL SLIDE OPTION FOR SPLINE INSPECTION

Frenco GmbH is now offering a horizontal slide option for the inspection of internal and external splines with AVM and IVM gauging systems. Advantages of this new development include easier handling of long workpiece shafts through adjustable V-blocks with longitudinal travel and the repeatability for MdK averages of ≤ 1.3 µm. Frenco Gmbh has been in the spline metrology business since 1978. Euro-Tech Corporation is the exclusive North American distributor of Frenco splines and gears.

For more information:
Euro-Tech Corporation
Phone: (262) 781-6777
Eurotechcorp.com



manufacturing process, short cycle times, reduced investment and running costs. With these requirements in mind, Profilator offers polygon and face slot machining, gear tooth pointing, chamfering and deburring, gear and spline cutting, shifter stop machining and Scudding.

The polygon turning unit is used for castle teeth machining on automotive gearbox parts. The rotating cutterhead is synchronized with the workplace spindle and a front face coupling is produced with the carbide insert arrangement and the transmission ratio. With additional inserts on the same cutter head, the part can be deburred. In gear tooth pointing, the pointing tower can be used in both rotative and indexing modes. Settings and corrections are made through the new Ergo Control SIMPS (Profilator Simplified Integrated Machine Programming System). For the chamfering and deburring of splines, gear wheels and shafts, Profilator uses the ZEM series gear deburring machines. This vertical, single spindle gear deburring machine offers clear advantages over conventional deburring machines. Gear cutting is used both for the Profilator rotative gear cutting with inserts and for hobbing. Through the application of Schlagzahn tools and carbide inserts, customers achieve the most economical manufacture of splines, gears, involute gears and front face gears. The shifter stop is synchronized so that the tool machines each tool flank. Lastly, Scudding can be used for a wide range of symmetrical gear applications as well as non-symmetrical gear or profile applications such as belt pulleys and synchronize gears. The same machine can be used for internal and external Scudding applications.

Profilator developed the S-type machine. This is a compactly and modularly designed, vertical single spindle pick-up gear cutting machine. Machines in the S Series are better than broaching and most applications feature a dry machining process. All machine components are designed for especially high static stiffness and optimal dynamic behavior. Furthermore, the machine's twin spindle arrangement speeds up the process considerably. A control panel and a media container are installed on the rear of the machine bed. The workplace flow direction is variable. S-type machines are available in three sizes, namely Profilator S-150, Profilator S-250 and Profilator S-500. Profilator S-150 has a part diameter up to 150 mm, while Profilator S-250 and S-500 have a part diameter up to 250 mm and 500 mm, respectively.

For more information:
GMTA (Distributor for Profilator)
Phone: (734) 973-7800
www.gmtamerica.com