

Heavy-Duty Demands

Modern Coating Technology Examined

Matthew Jaster, Senior Editor

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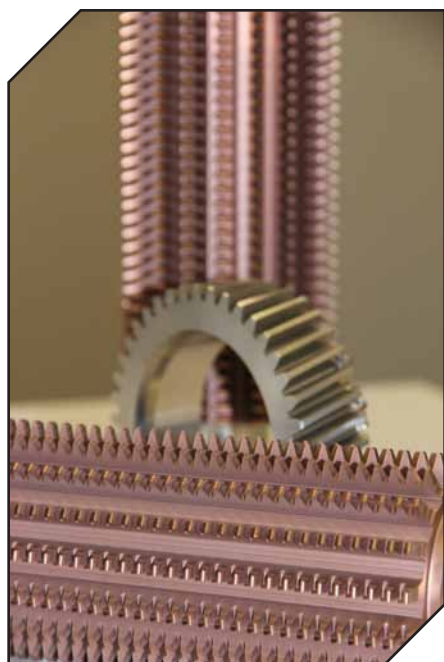
coatings

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The hob is a perfect example of how a little manufacturing ingenuity can make a reliable, highly productive cutting tool. It's an engineering specimen that creates higher cutting speeds, better wear resistance and increases rigidity. The cutting tool alone, however, can't take all the credit for its resourcefulness. Advanced coating technology from companies like Sulzer, Oerlikon Balzers, Ionbond, Seco Tools and Cemecon helps improve cutting tools by reducing overall costs, increasing tool life and maintaining the highest levels of productivity. The following is a quick recap of new technologies and the latest information in the coating market.

Coating Technology with Sulzer

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



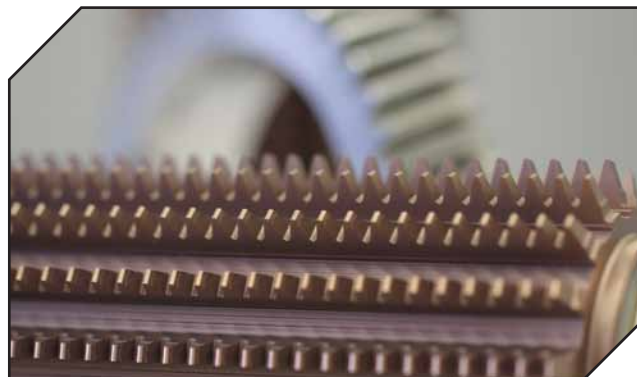
ity; prevention of cold welding; and formation of built up edges," says Annette Norin at Sulzer Metaplas GmbH.

The key strengths of the coating are its dramatic reduction of the sticking material on the cutting edge due to reduction of the surface roughness. It also boasts extremely high heat resistance.

According to Norin, Sulzer provides custom solutions through the combination of pre and post treatment of the tool surface coating material, layer architecture and system/equipment technology with which the coating will be applied. "We focus on advanced plasma-assisted/arc evaporator technology for innovative coatings," Norin says. "APA is based on the cathodic vacuum arc and offers diverse development possibilities for new layer architectures in terms of morphology, stoichiometry, doping, multiple layers and nano layers."

The benefits of APA include excellent coating adhesion and smooth coatings through the reduction of macro-particles. APA is also the basis for new hybrid technology.

"Customers are willing to test new coatings to determine the benefits and



also to come up with specific problems and we develop solutions together," Norin adds. "We develop coatings on our own R&D equipment and test new coating/layer designs together with our customers."

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

For more information:

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www.sulzer.com

Hyperlox by CemeCon

Hyperlox is a new generation magnetron sputtering TiAlN coating produced by Cemecon technology. It has been developed with extremely low internal stresses, maintaining high values of hardness and oxidation resistance. Hyperlox works for HSS hobs operating in wet (oil) conditions but can be used also in dry conditions on material with hardness over 50 to 70 HRC.

Hyperlox offers a more stable performance vs. standard CrAlN coatings in medium speed and wet cutting conditions. Furthermore the de-coating operations of this layer do not cause the productions of chromium (CrVI) in the stripping baths. For its low tensional stress, together with specific preparation of cutting edges, Hyperlox allows extremely high chip thickness in hobbing (tests have been run up to 0.48 mm) with a very stable and limited flank wear. With these properties it is possible to offer stable and reliable conditions of production.

Hyperlox is best utilized for hobbing operations with medium and low cutting speeds, in both dry and wet conditions; it is becoming widely used in Europe by major automotive groups such as VW and ZF. It is used also in milling applications on milling cutters of hard metal (HM) and high-speed steel (HSS).

CemeCon has been supplying in-house coating technology for 25 years. Drawing on experience from Europe's largest coating production operation, CemeCon has now tailored its system technology to meet the needs of its customers with its CC800/9 series of coating systems. Both existing and new coating materials can be implemented on all models.



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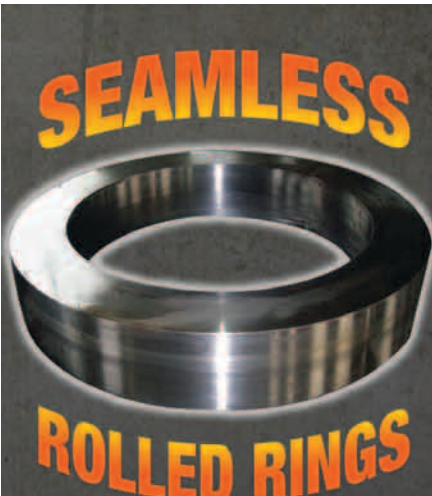
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For more information:

CemeCon AG
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Oerlikon Balzers

EXPANDS COATING OPERATIONS

Many in the gear market are familiar with Oerlikon Balzers' coating technology. Balinit coatings, for example, are just a few thousandths of a millimeter thick, but harder than steel; these low-friction coatings are extremely wear-resistant and chemically inert. The optimum coating is determined on the basis of both conditions of use and economic considerations. The material and properties of Balinit coatings can be selected to match customer-specific requirements. The typical coating thicknesses that can be reproduced in mass-production lie between 0.5 μm and 4 μm . Sharp edges, textured or mirror surface finishes and close production tolerances remain unaltered. Therefore no finishing work is required and the coating can be carried out as the final production step.

In order to meet the ever-increasing demands of its customers, Oerlikon Balzers continues its global expansion. The company recently opened its eighth coating center in India to establish a stronger presence in Chandigarh (Punjab).

"Despite current economic uncertainties, we further invest proactively in our global footprint," explains Dr. Hans Brandle, CEO at Oerlikon Balzers. "We believe in the growing demand of mobility in India and therefore increased our presence in one of the automotive parts and tractor industry hubs of the country."

To date, the company has 90 coating centers worldwide.

In line with its global growth strategy, Oerlikon is also expanding its global service offerings. Increasingly, the company will be able to provide complete solutions for the reconditioning of high-performance round tools to its customers, particularly in emerging regions. To this purpose Oerlikon Balzers is adopting a standardized concept by the brand "rox" for the setup and operation of regrinding centers from the Austrian Tool Management provider, TCM International, in addition to taking over the "rox" training facility in Stainz (Austria). Coated high-performance tools such as drills and milling cutters are crucial for high productivity in present-day metal processing. If correctly reground and recoated, they reach the same performance as if in new condition.

Adds Manfred Kainz, CEO of TCM International, "We are pleased that the concept developed by us has convinced Oerlikon Balzers. I am sure that the company will see to its global and professional implementation."

Additionally, Oerlikon Balzer's Ingenia coating system recently won the German International Forum (iF) Design Award 2013 in the industry/skilled trade category. The award-winning Ingenia system made its world premiere in September 2011 at the EMO fair in Hannover, Germany. With Ingenia, Balzers' engineers and physicists succeeded in extending the company's technological lead by developing a coating system that has the highest level of power densities and takes up a minimal amount of space.

Helmut Rudigier, head of research and development at Oerlikon Balzers, adds, "We were able to cut the cycle times in half and thus significantly increase productivity. And we accomplished this while doubling the precision of the coating thickness."



The system can also be equipped with the new S3p technology, a system developed by Oerlikon Balzers that produces uncommonly smooth, thick coatings that are both extremely hard and wear-resistant. The award-winning system has already been successfully implemented

in its first coating centers and by third-party customers. The network is being constantly expanded.

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Seco Tools

DURATOMIC TECHNOLOGY

The Duratomic technology from Seco produces a durable coating by arranging aluminum and oxygen atoms in a unique way to provide increased toughness and abrasion resistance. The importance of atomic arrangement can be understood by one extreme illustration. Both graphite and diamond are made from carbon atoms; but the properties of those two materials are dramatically different because of the way the atoms are arranged. In a somewhat similar way, the Duratomic coating is more valuable than traditional coatings because of its atomic structure.

Controlling the structure of the aluminum oxide coating leads to several benefits for the user. First, it brings a harder and tougher atomic structure into the cut. Just as wood can be easily split with—but not against—the grain, aluminum oxide is more brittle in some atomic directions than others. Seco builds the coating in a controlled way to ensure the best structure is engaged in the cut.

Secondly, controlling the structure produces a smoother surface, resulting in less friction and heat during the cut. This translates directly to less build-up, a better surface finish, less tool wear, greater tool life and speed capability.

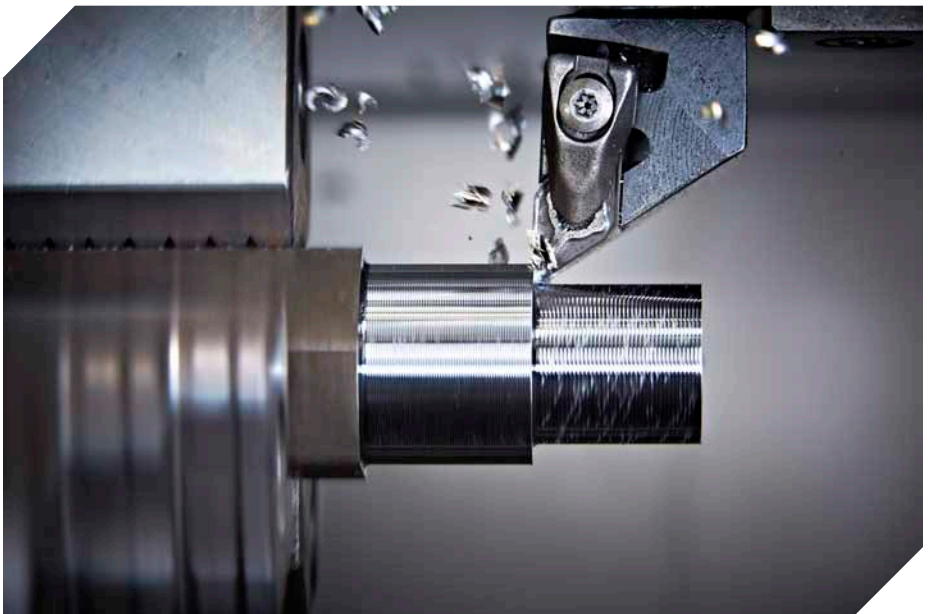
The flat facets on the Duratomic coating prevent built up edge and improve surface finish. These benefits are par-



ticularly important in stainless steel machining. The hardness and toughness of the Duratomic coating dramatically reduce insert wear. The result of these properties is dramatic. Inserts coated using the Duratomic process show less wear, less deformation and much greater tool life.

For more information:

Seco Tools
 Phone: (248) 528-5200
www.secotools.com



IHI Acquires Ionbond

Last fall, IHI Corporation of Japan entered into an agreement to acquire 100 percent of the shares of Ionbond, a manufacturer of wear protection coatings headquartered in Switzerland. IHI provides thin-film technology to industrial customers through its physical vapor deposition (PVD) equipment and services, and together with its subsidiary, Hauzer Techno Coating B.V. in the Netherlands, acquired in 2008, is involved in diamond like carbon (DLC) technology.

Joe Haggerty, CEO of Ionbond, saw the opportunity to combine Ionbond's process engineering and coating network with the coating machinery at Hauzer. "This will lead to many innovations and advantages for our customers in the coming years. In addition, Ionbond's strength in CVD products complements the current PVD and PACVD offerings within Hauzer and the IHI Corporation."

Hardcut is a multilayer coating for high speed and high efficiency machining in minimum or zero lubrication conditions. It is a TiSiN-based coating with a support layer. Optimal performance is possible by means of a patented process that forms a true nano-composite material whereby nano-crystallites of Si₃N₄ are embedded in a TiN matrix. The coating properties protect the cutting edge from heat transfer, oxidation and abrasion. It offers ultra-high cutting speeds, gear cutting with carbide hobs, finishing and semi-finishing milling, low lubrication and dry machining, very hard and abrasive work piece materials and titanium and exotic alloys.

Crosscut's AlCrN structure exhibits reduced flank and cutting edge wear in a wide range of cutting conditions. As the most versatile high-performance coating, it closes the gap between Maximizer and Hardcut. It offers medium to high cutting speeds; milling and gear cutting with HSS and carbide tools; reduced flank wear and cutting edge wear for a wide range of cutting conditions; predictable abrasive wear by continuous wear instead of chipping; a high quality machined surface achieved throughout the lifetime of the coating; low to

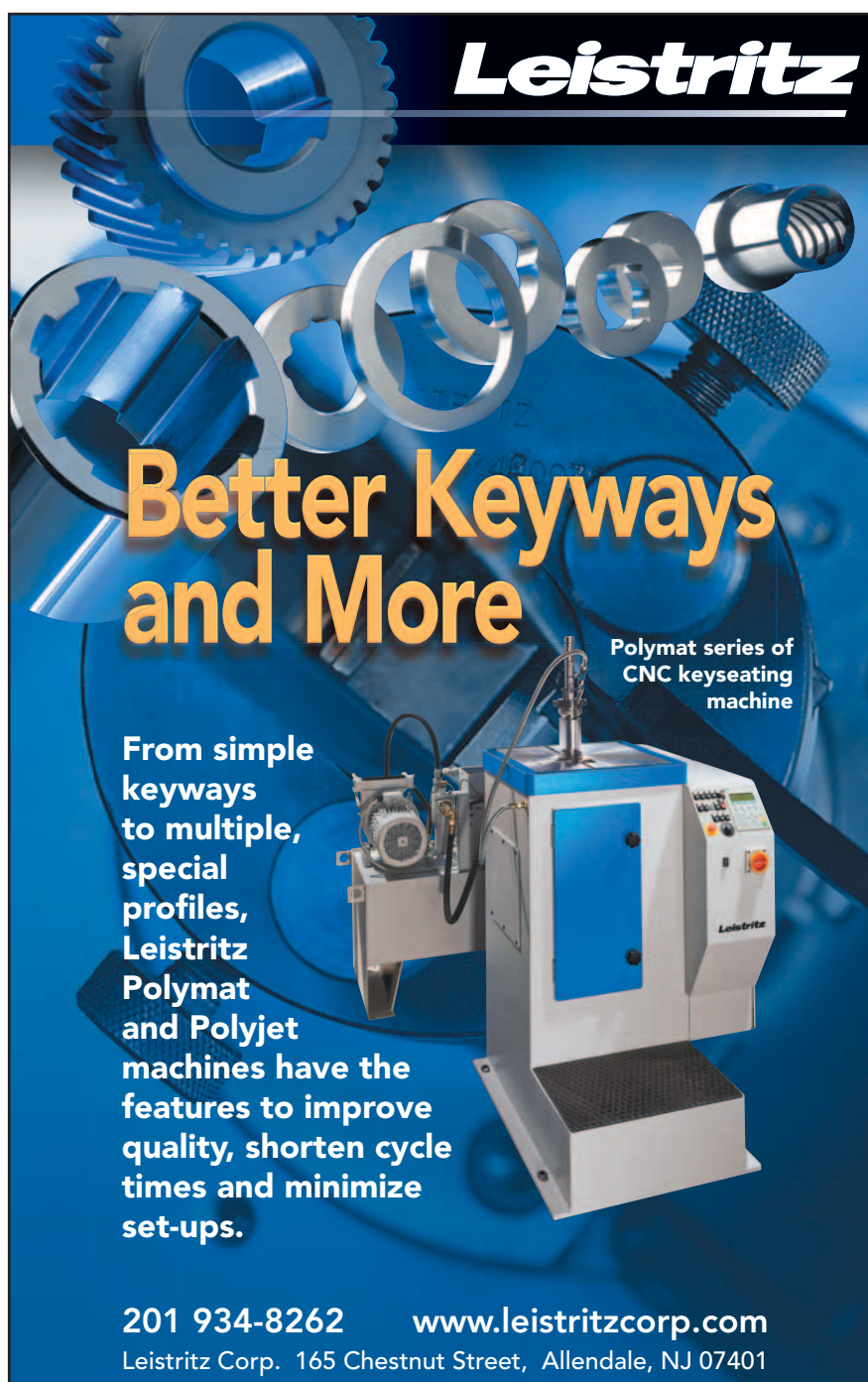
medium lubrication; and is suitable for machining a wide range of materials.

Maximizer is an AlTiN-based coating suitable for medium cutting speeds. The average crystallite size and stress have been optimized, resulting in increased cutting performance. Crack propagation is reduced by compositional fluctuations, and excellent ductility guarantees that coated tools are less susceptible to chipping. It offers medium cutting speeds,

drilling, milling, and gear cutting with HSS and cemented carbide tools, a wide range of lubrication conditions, a broad range of work piece materials including stainless steels and nickel alloys. ⚙️

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