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“ELECTROMOBILITY, COMMUNICATIONS, MEDICAL TECHNOLOGY – with the technological progress in these and other FUTURE MARKETS, the machining of HIGH-PERFORMANCE MATERIALS has become essential. In addition, the components, which are sometimes filigree, require ever smaller PRECISION TOOLS. Only with powerful and FLEXIBLE TECHNOLOGIES, such as our CC800® HiPIMS, we can develop TAILORED SOLUTIONS for these demanding machining tasks. Those who already have the INNOVATION GENE will be SUCCESSFUL in the competitive markets of tomorrow.”

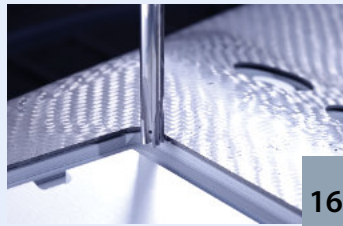
Dr.-Ing. Toni Leyendecker, CEO der CemeCon AG.

Manufacturing of Molds for Curved Smartphone Displays with Diamond Coatings

CCDia® CarbonSpeed

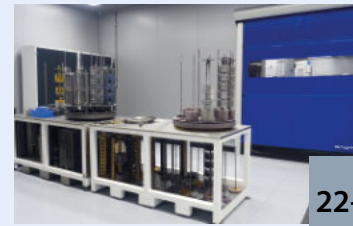


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BOEHLERIT USES THE DEVELOPMENT POSSIBILITIES OF THE CC800® HiPIMS

HiPIMS OPENS UP ENORMOUS POTENTIAL IN TURNING

Short distances and the complete tool development process from a single source – this strategy has put Boehlerit from Kapfenberg, Austria, on course for growth. Gerhard Melcher, Sales Manager at Boehlerit, gets confirmation of this every day. A key component in the development of new, high-performance coatings is the CC800® HiPIMS from CemeCon – giving the cutting material and tool specialists from Styria an absolute technological edge.

Boehlerit carbides and precision tools solve the world's most demanding machining tasks and set standards in the machining of metal, wood, plastics and composite materials. Examples include highly specialized tools for crankshaft machining as well as for metallurgical technology for rotary peeling, tube and sheet metal machining and heavy-duty cutting. The Austrian experts' recipe for success undoubtedly includes a high level of vertical integration and extensive know-how in all facets of tool manufacturing – from design to coating technology.

To meet ever-increasing demands and ensure continuous growth, Boehlerit relies on the latest technologies and is pursuing a broad



Broad innovation and investment offensive at Boehlerit: the new cleaning system optimally prepares the inserts for coating.

innovation and investment offensive. "Over the past two years, we have invested tens of millions in equipment, automation and digitalization in manufacturing at vari-

ous locations," says Gerhard Melcher. "We are securing an absolute technological advantage with the CC800® HiPIMS from CemeCon."



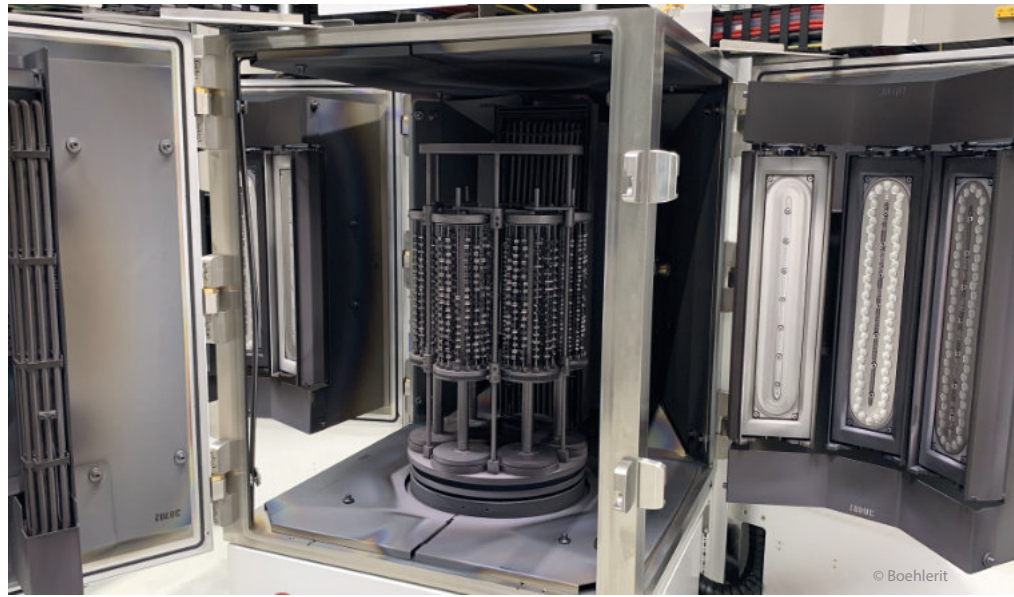
"In the past, PVD was considered for milling, CVD for turning. The **HiPIMS-TECHNOLOGY** changes this abruptly. Today, **COATING THICKNESSES** of up to 12 μm can be realized. This enables successful use in **DEMANDING TURNING PROCESSES.**"

Dr Arno Köpf,
Development Manager for PVD coatings at Boehlerit.

PARADIGM SHIFT WITH HiPIMS

"In the past, the undisputed dogma in specialist circles was: PVD coatings for milling and CVD coatings for turning. It was unthinkable to use PVD coatings in turning operations, as the required coating thicknesses could not be achieved with this technology," explains Dr Arno Köpf, head of development for PVD coatings at Boehlerit. "HiPIMS technology changed that abruptly. Today, it is possible to achieve coating thicknesses of up to 12 µm in a reproducible manner. This enables successful use even in demanding turning processes."

What does HiPIMS technology have that others don't? Thanks to the synchronization of the HiPIMS cathode pulses with the substrate table – a unique CemeCon feature – the residual stresses of the coating can be actively managed. This enables high coating thicknesses of up to 12 µm. In addition, HiPIMS again significantly increases the quality and performance of the coatings: HiPIMS



HiPIMS enables coating thicknesses of up to 12 µm and also significantly increases the quality and performance of the coatings.

coatings are very smooth as well as hard and tough at the same time. They have excellent adhesion and, thanks to the uniform distribution of coating thicknesses, provide optimum wear protection for the tool.

HiPIMS COATINGS ALREADY SUCCESSFULLY IN USE

Boehlerit is already using HiPIMS coatings on tools for milling, in crankshaft and tube machining, and

in the turning of stainless materials. New cutting material grades with HiPIMS coatings for draw peeling and turning of steel are in the test phase. SawTec 2.0 circular saw blades are an innovative highlight in Boehlerit's product range. Their special feature: unlike other solutions on the market, the cutting edges are not soldered on, but can be replaced. This saves users an enormous amount of time and money. Another plus is the new



“HiPIMS-TECHNOLOGY opens up enormous **OPTIMIZATION POTENTIAL** for us: it allows us not only to further improve coating variants that have been tried and tested for years, but also to develop **INNOVATIVE COATING COMPOSITIONS** that open up **NEW MARKETS** for us.

The possibilities are enormous.”

Gerhard Melcher, Sales Manager at Boehlerit.

HiPIMS coatings on the replaceable cutting edges. "This makes our new saw blades perfect for steel and stainless materials, especially in robust applications. Initial projections have shown that an average of four SawTec 2.0 saw blades can replace around 100 brazed saw blades," adds Thomas Waltenberger, segment manager at Boehlerit.

NEW POSSIBILITIES AND ENORMOUS POTENTIAL

"HiPIMS technology opens up enormous optimization potential for us: it allows us not only to further improve coating variants that have been tried and tested for years, but also to develop innovative coating compositions that open up new markets for us. The possibilities are enormous," says a delighted Gerhard Melcher.



Thomas Waltenberger: "Thanks to HiPIMS coating, the new SawTec 2.0 saw blades are perfect for machining steel and stainless materials."

BOEHLERIT



Boehlerit, headquartered in Kapfenberg, Austria, has been part of the Brucklacher family group of companies (Bilz, Boehlerit and Leitz) since 1991. With 800 employees at twelve locations worldwide, the company develops and produces cutting materials, semi-finished products and precision tools as well as tool systems for milling, turning, drilling and forming for a wide range of materials. These include highly specialized tools for crankshaft machining as well as for metallurgical technology for rotary peeling, tube and sheet metal machining and heavy-duty cutting. Hard metals for structural parts and wear protection are also among the company's strengths. The cutting and wear protection materials are continuously developed using modern analysis methods and in close cooperation with universities and research institutes. Thanks to its many years of expertise in metallurgy, coating technology and with state-of-the-art pressing technology, Boehlerit is also a competent and sought-after development partner for toolmakers.

www.boehlerit.com



COATING TRAINING ENSURES COMPREHENSIVE EXPERTISE

KNOW-HOW MADE BY CemeCon

Which coating material is good for which application? What is actually the difference between coating material and coating? What options do tool manufacturers have? What do you have to pay attention to before coating? Expand your knowledge. CemeCon imparts appropriate coating know-how to tool manufacturers and users in coordinated training courses.

If you want to present your tools in the right light and clearly highlight their advantages over the competition, you need precise knowledge of every detail – especially given the ever-increasing complexity and variety of different applications. An important mosaic piece for a precision tool is the coating. CemeCon offers training to tool manufacturers and users so that they can expand their knowledge and know-how about CemeCon technologies and their possibilities.

“We provide them with the knowledge so that they can better advise their customers and thus find exactly the right solution,” explains Inka Harrand, Product Manager Cutting Inserts at CemeCon. “Users, such as manufacturing companies

for medical technology or aerospace, also benefit from such know-how. It enables them to specify the best tool for their application together with the tool manufacturer.”

Participants in such coating training have access to a wealth of experience. In Würselen, CemeCon combines the complete know-how in one place: Not only are the coating systems developed and built here, in engineering and product management the experts also define and design coordinated coating solutions for their applications together with the tool manufacturer on request. And in the world's largest coating center for cutting tools, specialists finish up to 80,000 precision tools with high-quality premium coatings every day.

Inka Harrand: “Anyone interested in expanding their own coating know-how should discuss this with their customer advisor. A suitable date can then be coordinated promptly.” Topics of the training include market challenges and opportunities as well as detailed explanations regarding the interaction between substrate, geometry, coating and application. Experts explain important criteria for the correct selection of a coating material for specific applications and show manufacturers the wide range of options available.

At present, the training courses are held online only. Hopefully, in the future they can again be held in person on site in Würselen. Just the way the customer wants it.

CCDia®FiberSpeed® AND CCDia®MultiSpeed NOW ALSO IN CHINA

MACHINING CFRP AND GFRP ECONOMICALLY



Whether in e-mobility, aerospace, for wind turbines, implants or sporting goods – anyone who wants to machine CFRP or GFRP economically needs high-quality precision tools with adapted coatings. The coating materials CCDia®FiberSpeed® and CCDia®MultiSpeed were developed by CemeCon specifically for use in fiber-reinforced plastics, but also hypereutectic aluminum and ceramics. Now these two "specialists" are also available in China: Many CFRP applications are booming there – and the coatings enable optimum results.

The same premium coating solution in the same quality worldwide! CemeCon keeps this promise consistently in all coating centers thanks to mirrored processes and productions. This begins in Würselen – the world's largest coating center for cutting tools – where CemeCon first perfects all processes. Successively and as required, the processes and production sequences are then transferred to the subsidiaries around the globe.

"In China, the machining of fiber-reinforced plastics is becoming increasingly important - whether for alternative drive concepts or sports articles. This is reason enough to expand our Chinese offering in this area. Since December 2020, tool manufacturers can have their precision tools coated with the diamond coating materials CCDia®FiberSpeed® and CCDia®MultiSpeed directly in our coating center in Suzhou. This opens the way to

economical and precise machining of fiber-reinforced plastics, hypereutectic aluminum and ceramics," says Jimmy Zhang, Sales Manager at CemeCon in China.

The diamond coating materials in the CCDia® range offer a special combination of properties: By growing crystalline and nanocrystalline layers alternately – called multilayers – they combine the advantages of both structures: very good adhesion, smooth surfaces, high hardness and pronounced thermal conductivity. In addition, due to this multilayer structure, these coating materials have crack-inhibiting properties within their own composite. All this ensures process reliability, long tool life and the optimal machining results – especially for the special requirements of the aforementioned high-tech materials.



Diamond coatings for CFRP machining now available from CemeCon in China.



NACHREINER:
WELL TRAINED FOR
IN-HOUSE COATING PRODUCTION

SECURING AND EXPANDING THE TECHNOLOGICAL LEAD WITH HiPIMS

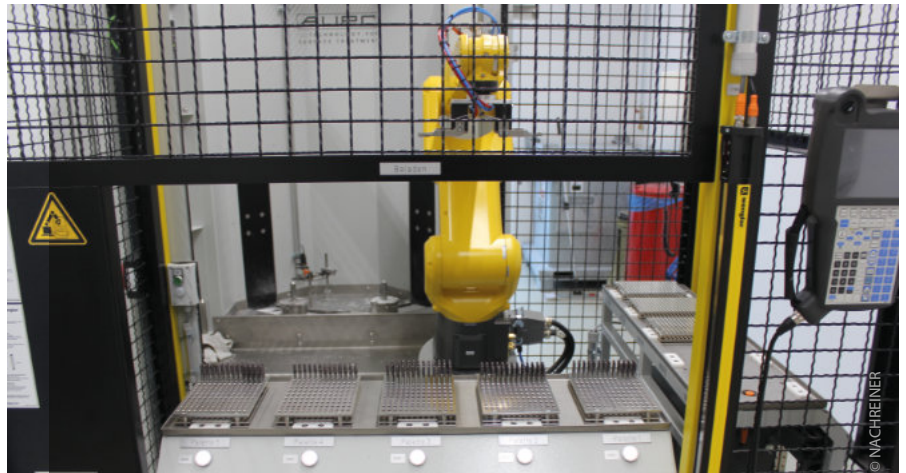
With strong investments in state-of-the-art, sustainable production capacities, in digitalization and in the service area, the tool manufacturer NACHREINER is making itself fit for current and future market challenges. The tool specialist from Balingen-Weilstetten already has a large vertical range of manufacture, with which it keeps the entire value chain and product quality under its own control. Since the integration of state-of-the-art HiPIMS coating technology from CemeCon, the progressive tool manufacturer provides its premium tools with the unique HiPIMS coatings now and in the future with decisive performance and quality advantages in the highly competitive market.

Sabahudin Seferovic,
responsible for coatings at
NACHREINER.



Precision tools from NACHREINER solve the demanding cutting tasks all over the world and set standards in the machining of metal, non-ferrous metals, plastics and composite materials. NACHREINER produces with a high vertical range of manufacture and optimized manufacturing, quality and service processes. In this context, temperature-stabilized manufacturing, state-of-the-art technology for edge preparation and optimization of micro-geometry, modern grinding, measuring and automation technology are fixed parameters of tool production designed for sustainability, efficiency and quality.

“We are committed to providing metalworkers with the best in cutting tools now and in the future, enabling them to achieve outstanding quality in their products. By incorporating premium coating ex-



State-of-the-art grinding, measuring and automation technology in NACHREINER production ensures the high quality of the cutting tools.



NACHREINER



NACHREINER
spanabhebende Werkzeuge

NACHREINER GmbH from Balingen-Weilstetten is a renowned tool manufacturer with a high reputation in the global industry. Since 1981 NACHREINER has been regarded as a reliable solution partner for machining technology and consistently follows the guiding principle “Precision means leaving nothing to chance” The company produces the high-quality milling, drilling and threading tools for machining a wide range of materials at its sites in Balingen and the Black Forest with a high degree of vertical integration. In addition to the standard program, the experts also offer users from a wide range of industries intensive technical advice on all aspects of customized solutions and manufacture individual special tools for special applications. An efficient regrounding service as well as innovative coatings optimally round off the range of services.

www.nachreiner-werkzeuge.de

expertise from CemeCon in the form of our new CC800® HiPIMS in-house coating line, we now have the complete manufacturing chain and thus the final mold under control," says Markus Hallas, Managing Director of NACHREINER GmbH.

ONLY THE BEST FOR THE BEST

With the CC800® HiPIMS, CemeCon has once again significantly increased the quality and performance of coatings compared to other processes. The technology is

flexible and suitable for coating many different tool variants. Whether small batches or large lot sizes: It can be optimally adapted to different requirements, for example, from micro tools to tools for heavy machining – and this within a very short time.

For premium quality across this entire range, HiPIMS coatings have outstanding properties: they are smooth, adhesive, hard and tough at the same time, have a fine-grained, dense morphology, low

residual stresses and high thermal stability. The uniform coating thickness distribution also contributes to optimum wear protection of the cutting tools.

Markus Hallas: "The decision to use our own coating technology was a very special step. With it, we have set the course for the future. Therefore, it was important for us to have a partner at our side who not only provides us with the best technology, but also accompanies us from the first step, trains and educates

"With **CemeCon COATING EXPERTISE**, we excellently fulfill our promise 'PRECISION means leaving nothing to chance' with **FIRST-CLASS QUALITY**. The **CC800® HiPIMS** provides our premium tools with a further quality leap and is the key to being able **TO DIFFERENTIATE** and set ourselves apart from the competition even better with **HIGH-QUALITY COATING SOLUTIONS**."

The management of Nachreiner GmbH (from left):
Markus and Sandra Hallas as well as Marianne and Siegfried Nachreiner.





The NACHREINER team is very satisfied with the CC800® HiPIMS and the support from CemeCon (from left): Sabahudin Seferovic, responsible for coatings at NACHREINER, Petar Canzek, production employee at NACHREINER, and Michael Tabbert, production expert Round Tools at CemeCon.

our employees and supports us in the development of our own coatings.”

Dr.-Ing. Beate Hüttermann, Executive Director Sales at CemeCon: “We have been operating a coating service ourselves for 30 years. At the same time, we develop, build and sell this equipment technology. The users benefit from this. Through our transparent technology transfer, the customer has the guarantee of being optimally supported in every phase of their instead of his coating engagement.” The production process, which has been tried and tested in the world's largest coating center, is trained on site in Würselen in the coating service and at the customer's production facility.

“CemeCon's well thought-out training concept has enabled us to quickly move into real coating production. Even afterwards, the experts are available to answer all our questions and help us adapt the coatings to the specific applications,” adds Sabahudin Seferovic, responsible for coatings at NACHREINER.

QUALITY LEAP SECURED

Markus Hallas is pleased: “With CemeCon coating expertise, we excellently fulfill our promise ‘Precision means leaving nothing to chance’ with first-class quality. The

CC800® HiPIMS provides our premium tools with a further quality leap and is the key to being able to differentiate and set ourselves apart from the competition even better with high-quality coating solutions.”



With the CC800® HiPIMS NACHREINER completes the manufacturing chain in its own production and sets the course for the future.



HiPIMS COATING SERVICE SUCCESSFULLY LAUNCHED IN JAPAN

Since the beginning of 2020, CemeCon K.K. has been supporting Japanese tool manufacturers with diamond coatings at its new coating center in Nagoya. Now the experts have expanded their range to include HiPIMS technology.

Whether diamond or HiPIMS coatings – CemeCon is the global leader in both technologies. They deliver premium solutions for a wide variety of cutting applications.

Japan in particular – a highly technical and forward-looking market – is therefore tailor-made for CemeCon. With the coating center in Nagoya opening in 2020, CemeCon offers

Japanese tool manufacturers immediate access to the high-performance coatings.

“Before we set up our coating center in Nagoya, many tool manufacturers were interested in our coatings, but the long delivery times and complex logistics were often a hindrance,” says Alexander Marxer, Managing Director of CemeCon K.K. “Even though the past year presented special challenges for the



The management team of CemeCon K.K.. (from left): Internal Sales Manager Eunmi On Lee, IT & Service Manager Mike Romeo Meier, Sales Manager Tomokazu Kobayashi and Managing Director Alexander Marxer.

whole world, our diamond coating service nevertheless got off to a very successful start. Despite the limitations, many users have now visited the center and are impressed with our technology and its capabilities. With the newly installed HiPIMS coating equipment, we are now taking our service here in Japan to a new level."

In addition to the coating service, users have the opportunity to experience the coating technology and its advantages first-hand during "live batches". This allows customers to coat their own tools in the equipment. The research and development engineers in Nagoya also support tool manufacturers in finding the best possible coating solution in a short time. The technicians from the support department in addition service and maintain the systems installed in customer production facilities in Japan and Korea directly from Nagoya.

Alexander Marxer: "Our customers are very satisfied with the high performance of CemeCon coatings – they always have been. But now we can also score with relatively short delivery times." The same high quality and the same coating specifications as in all other CemeCon coating centers worldwide are guaranteed. This is because CemeCon perfects the processes and production centrally and then transfers them one-to-one to the branches around the globe.

Since September 2020, Tomokazu Kobayashi has been the new Sales Manager at CemeCon K.K. He has many years of experience in the tool



Whether diamond or HiPIMS - the experts in Nagoya support tool manufacturers in all matters relating to tool coatings with CemeCon's outstanding technology.

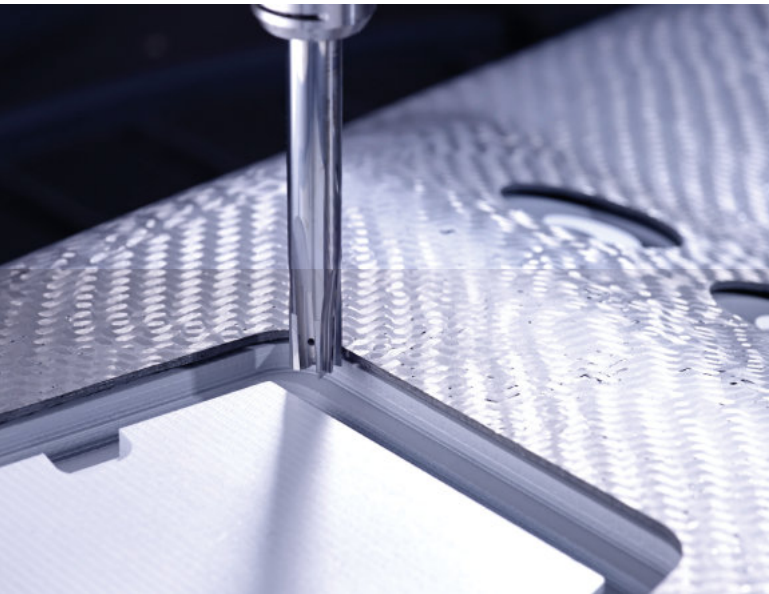


industry and was Sales Manager at the second of the biggest tool makers in the world. As an expert in cutting tools, he has the know-how to provide CemeCon customers with the best possible advice. Tomokazu Kobayashi: "Here in Nagoya, we combine high technology with a pleasant working atmosphere. The employees feel comfortable and are proud of the company. The feedback from our customers is also overwhelming: not only do users receive exceptional coating solutions here, but the coating center is also increasingly becoming a meeting place for technical exchange."



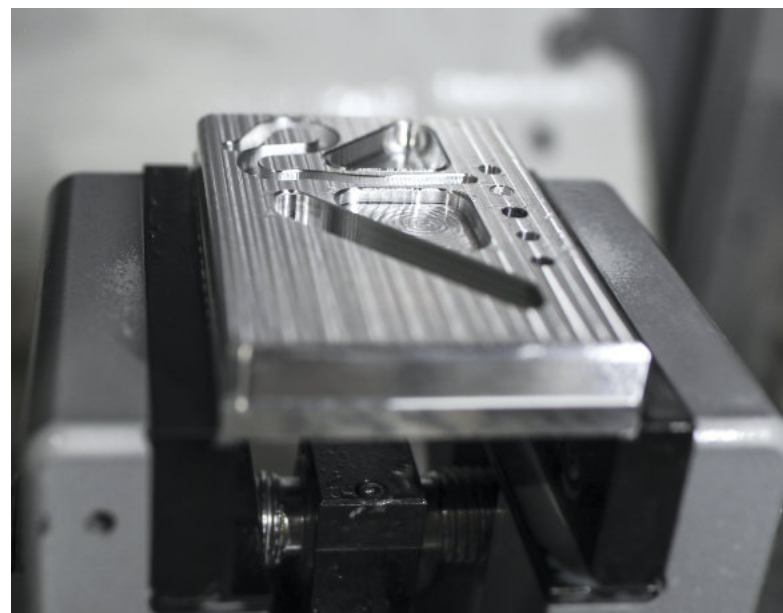
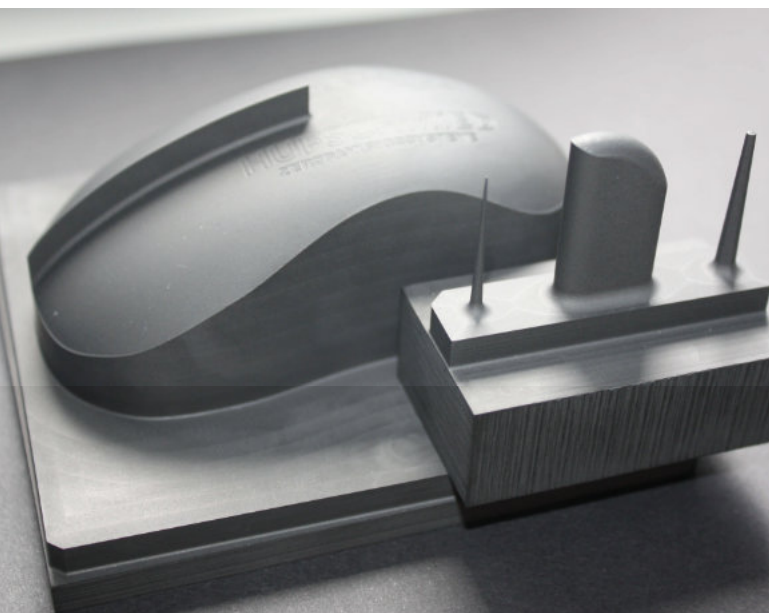
In addition to diamond, CemeCon K.K. also offers HiPIMS coatings.

BEST SURFACE FINISHES AND STABLE PROCESSES



CFRP and GFRP, aluminum and titanium stacks, Peek, glass fiber-reinforced aluminum - if you want to machine modern materials reliably and at the same time faster and more precisely and with fewer machining steps, i.e. more productively, you need material-optimized tools and processes. HUFSCHMIED Zerspanungssysteme GmbH is exactly the right partner for this. Precision tools for new materials are the specialty of the family-owned company from Bobingen. Uncompromising quality standards are mandatory here for every detail. With the coordinated diamond coating DIP® – for example for CFRP machining – HUFSCHMIED therefore relies on the know-how of CemeCon, the global technology leader in diamond coating technology.

Diamond-coated tools are used in many applications: in tool and mold making for graphite machining (bottom left), in machining fiber-reinforced plastics (top left) or aluminum (right). Customized solutions bring clear competitive advantages here. (Photos: HUFSCHMIED)





HUFSCHMIED develops high-end solutions for machining in its engineering center in Bobingen.

“Standard tools and processes have narrow limits – especially when it comes to machining high-tech materials. That's why we develop customized high-end solutions for machining. In order to be able to turn all the screws, we have created our own competence center: our Engineering Center in Bobingen. In addition to high-quality engineering tools and measuring equipment, our experienced specialists have the opportunity to reproduce, analyze and ultimately optimize the important parameters of the relevant processes on numerous machine tools. This makes the difference at the chip and ensures shorter cycle times, high process reliability, better machining results, and lower production costs,” says Dr Javier Fuentes, deputy head of development at HUFSCHMIED, de-

HUFSCHMIED

HUFSCHMIED
ZERSpanungSSYSTEME

Founded in 1991 HUFSCHMIED Zerspanungssysteme GmbH develops and manufactures process-optimizing precision tools. In doing so, the family-owned company from Bobingen specialized early on in the machining of plastics, glass fiber materials and carbon fiber and is today one of Europe's leading manufacturers of cutting tools for new materials. The matched tools are produced in-house in Germany using state-of-the-art manufacturing methods. High-precision 3D measuring machines of the latest generation ensure the high quality. In continuous dialog with universities, machine builders and users, HUFSCHMIED continues to drive the development of process-optimizing tools of the highest quality. Tools and process consulting from HUFSCHMIED are especially appreciated in the automotive and aerospace industries as well as in medical technology.

www.hufschmied.net

scribing the work of the tooling experts.

High quality is always a must in the development and production of the customized tools. In addition, especially for special projects, for example the automotive industry or medical technology, the traceability of the production chain is an important factor in manufacturing. Dr Javier Fuentes comments: "Here we are also increasingly using digital twins of our tools, where, for example, test certificates and the history of the tool are documented.

This not only simplifies the management of the tools, but also opens up new possibilities in process monitoring: In this way, we can monitor and further improve the performance and service life of the tools as well as process reliability."

MATCHED DIAMOND COATINGS FOR OUTSTANDING RESULTS

With e-mobility and the associated lightweight construction of vehicle components, the machining of CFRP and GFRP is becoming increasingly important in the auto-

motive industry. Here, the question often arises as to which is better – PCD-tipped or diamond-coated tools. Diamond coatings have several advantages over PCD, knows Manfred Weigand, Product Manager Round Tools at CemeCon: "With diamond coatings, more complex geometries and thus significantly more diverse machining solutions can be implemented than with PCD. In addition to twisted cutting edges, which are only feasible to a limited extent with PCD, diamond coatings also enable, for example, complex chipbreakers,

Precision tools from HUFSCHMIED ensure outstanding results in the machining of high-tech materials such as fiber-reinforced plastics. A decisive factor for this is the DIP® diamond coating developed together with CemeCon.



“At CemeCon, as with us, the **ENGINEERING PROCESS** is also a central component in the **DEVELOPMENT OF CUSTOMIZED SOLUTIONS** for special applications. Our **DIAMOND COATING DIP®** is the result of our successful cooperation: it allows us to **INDIVIDUALLY MATCH** the tool and the coating, thus ensuring the **BEST SURFACE QUALITIES.**”

Dr Javier Fuentes,
deputy development manager at HUFSCHMIED.



compression or roughing cutting edges as well as multiple cutting edges. Diamond-coated tools also allow higher feed rates and speeds. Another plus is that the cost of PCD is usually many times more expensive than diamond coatings.”

The combination of geometry, substrate and coating plays a special role and requires individual coordination. “At CemeCon, as with us, the engineering process is also a central component in the development of customized solutions for special applications. Our diamond coating DIP® is the result of our successful cooperation: it allows us to individually match the tool and the coating, thus ensuring the best surface qualities,” Dr Javier Fuentes is pleased to report. The nanocryst-

talline and smooth surface structure prevents dust adhesion and ensures high tool life. At the same time, the milling cutters are also optimally protected against chemical influences and against aggressive mechanisms that can arise with abrasive and inhomogeneous materials such as CFRP.

SUCCESSFUL IN USE

Also for Elbe Flugzeugwerke GmbH (EFW), expert for the development and production of lightweight components for aviation and partner of Airbus, HUFSCHMIED has already developed coordinated tools for the machining of fiber-reinforced plastics (FRP), which have already proven themselves in practice many times: “With tools by

HUFSCHMIED, we were able to significantly improve the machining process when machining reinforced CFRP floor beams for the Airbus A350. In terms of unconditional avoidance of delamination, well predictable tool behavior and smoother machining, HUFSCHMIED tools are the first choice for us in this particular process.” Reason enough for EFW to recommend the tool manufacturer as a development partner and tool supplier for all applications in which limits of what was previously possible are reached.

DIAMOND COATINGS CAN DO ALL THAT!

Graphite electrodes, dental implants, sporting goods, lightweight components for automotive or aerospace, punches and dies - diamond coatings are used in many different applications and materials. CemeCon offers solutions for all cases to help users achieve the best results.

The basis of every CemeCon diamond coating is the coating material. With different coating materials, CemeCon has the right solution for every application and thus also for every tool. But what are the differences between the diamond coating materials? Diamond is diamond, after all? "That's not quite true. One difference, for example, lies in the morphology. Depending on the coating material, the crystal structure and size differ. In addition, our diamond layer materials, the so-called multilayers, always consist of several layers. The number of layers varies from 2 to over 20. Finally, the topography, i.e. the surface, also plays a central role. Smooth, smoother, smoothest – the application determines this property," explains Manfred Weigand, Product Manager Round Tools at CemeCon.

Especially with diamond coatings, the following applies: The coating

material is only half the battle. In addition, there is preparation for optimum adhesion, coating thickness specifications including tolerances, precision coating and final inspection with documentation. With the optionally available precision coating, the tools receive a coating in a final dimension specified by the customer within the required tolerances – including the corresponding measurement report.

Especially with diamond coatings, the choice of a suitable carbide as a carrier for the actual cutting material "diamond" is a decisive factor. Depending on the carbide grade and coating material, the appropriate preparation is selected – from gentle to intensive – CemeCon processes the tools precisely so that the coating adheres excellently.

With these adapted premium solutions, users achieve the best results

when machining a wide variety of materials: CFRP/GFRP, zirconium oxide, graphite, hypereutectic aluminum and other non-ferrous metals. With the latest diamond coating material CCDia®CarbideSpeed®, nothing more stands in the way of cutting carbide. This opens up new possibilities for tool and mold makers (more on solutions for the industry on pages 26 and 27).

Diamond coatings are not suitable for machining ferrous materials, even if one might assume this due to their high hardness. For these materials, CemeCon has the right solution with coordinated HiPIMS coatings.

Whether diamond or HiPIMS – a first orientation to the suitable coating material for your application and your tools is available in the CemeCon Coating App at:

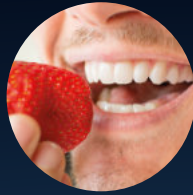
www.cemecon.de/en/coating-materials

MATERIAL TO BE MACHINED

APPLICATION EXAMPLES

DIAMOND COATINGS

ZIRCONIUM OXIDE



Crowns, inlays and bridges in the dental technology

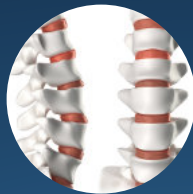
CCDia®CarbonSpeed®

FIBER REINFORCED PLASTICS (CFRP / GFRP)



Structural components for aircraft

CCDia®AeroSpeed®
CCDia®FiberSpeed®
CCDia®MultiSpeed



Back implants



Sporting goods such as bicycle rims



Lightweight construction components for e-mobility

GRAPHITE



Graphite electrodes for the mold production of displays

CCDia®CarbonSpeed®

CARBIDE



Stamps and dies for forming

CCDia®CarbideSpeed®

HYPEREUTECTIC ALUMINUM



Lightweight components in automotive engineering

CCDia®FiberSpeed®
CCDia®MultiSpeed

Diamond coatings are NOT suitable for machining steels. CemeCon offers appropriate solutions for this with high-performance HiPIMS coating materials.

HiPIMS CAN DO EVEN MORE – FLEXIBLE TO THE LAST DETAIL

Coating an extremely costly individual piece from high-tech markets under high time pressure is the nightmare of every production manager – and TEandM's successful business model. Flexibility is the DNA of the Portuguese specialist for component coatings from Coimbra. For a leap in performance and even greater dynamics, the experts are adding to their two CemeCon sputter systems a CC800® HiPIMS – the most flexible coating machine on the market.

Every day, Dr Ricardo Alexandre, Head of R&D at TEandM, is amazed at the components that customers send to TEandM for coating. And

what kind of workpieces they are: Core components – used at the limits of what is feasible – for the oil and gas industry or paper produc-

tion, intricate injection molds for plastics and light metal alloys and complex punches and dies for forming and cutting. “The components that we coat for our customers are mostly custom-made and usually one-off items. That is why we adapt each coating individually and precisely to the application. Often, work has to be carried out under time pressure. There must be no mistakes, otherwise it quickly becomes expensive,” Ricardo Alexandre describes the challenges at TEandM.

First-class technology, imaginative engineering and innovative materials as well as intensive cooperation, for example with the University of Coimbra, are the cornerstones of TEandM's success. CemeCon technology has been a central component in this equation from the very beginning: “TEandM and CemeCon have long been linked by a close strategic partnership.

TEandM



TEandM (Tecnologia e Engenharia de Materiais, S.A.) was founded in 2000 in Coimbra, Portugal. On a production area

of around 5,000 m², high-quality coatings for a wide range of industrial applications are produced. TEandM uses thermal sprayed as well as PVD and CVD coatings, primarily to protect workpieces and components as well as punches and dies against wear, corrosion and oxidation or to give them lubricating properties, among other things. In order to develop innovative solutions for its customers, the company uses new materials and coating technologies and works closely with institutes such as the Centre for Mechanical Engineering, Materials and Processes (CEMMPRE) at the University of Coimbra.

www.teandm.pt



“HiPIMS provides us with perfect support in the development of innovative coatings for **SPECIAL AND EXTREME APPLICATIONS**. In this way we create a springboard to **MORE PERFORMANCE**.

Coupled with our newly created clean room environment, we are laying the foundation for **THE NEXT GENERATION OF INNOVATIVE COATINGS.**”

Dr Ricardo Alexandre, Head of R&D at TEandM.





Every day, the TEandM team uses the enormous development potential of the CC800® HiPIMS for its own innovations.

The technology enables us to produce outstanding coatings: We meet the requirements for high wear resistance, optimum corrosion protection and above all very smooth surfaces. The layer structure can be optimally adapted and reproduced," says Ricardo Alexandre.

standing partner CemeCon: the CC800® HiPIMS.

The system, which was actually designed for cutting tools, can also be used to the full extent for

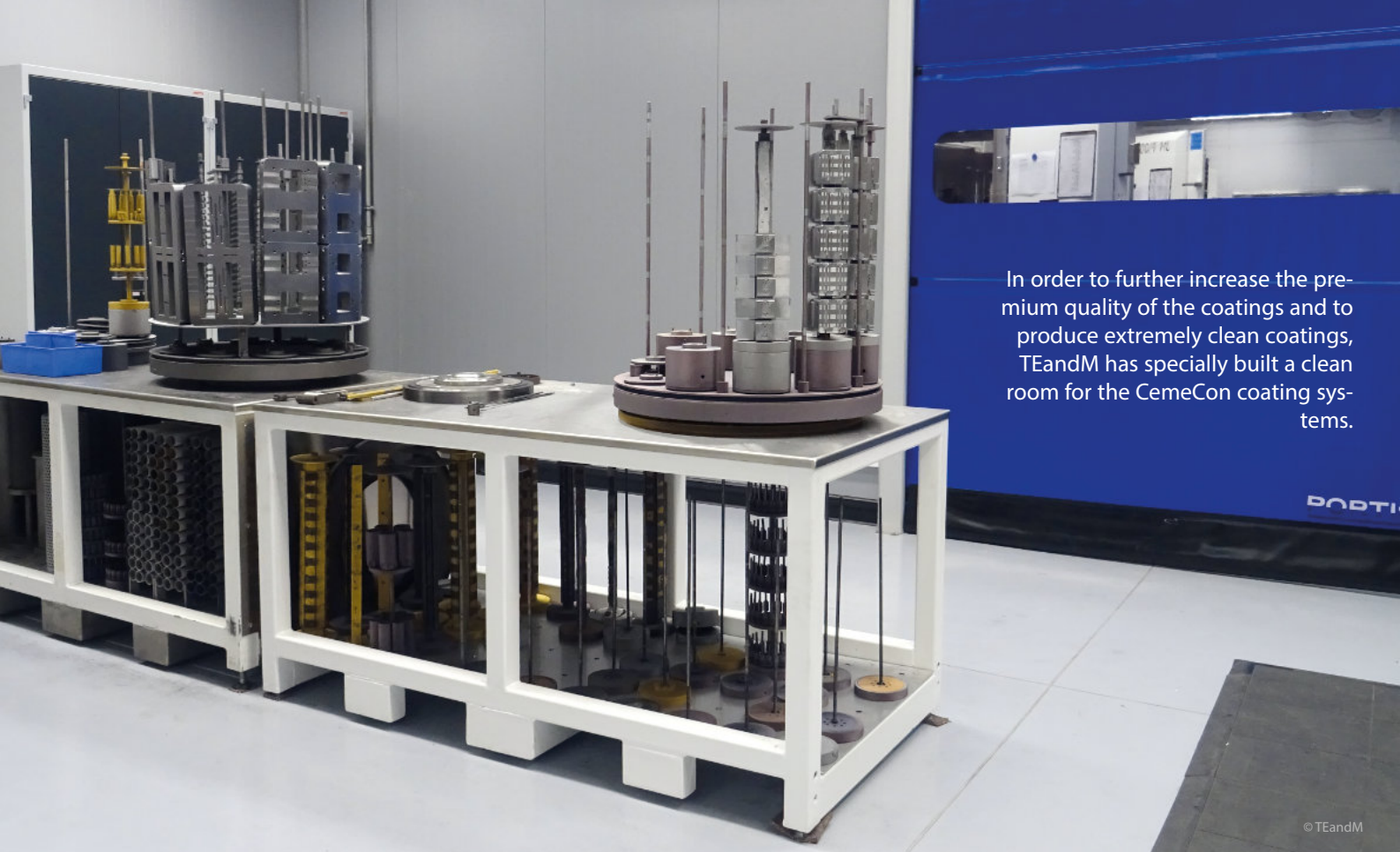
component coatings with the same hardware – and with a flexibility that cannot be found in any other system. "Almost any material can be used with it for the production

THE NEXT PERFORMANCE LEAPS

To further increase the premium quality of the coatings, TEandM has built a new clean room for the CemeCon coating systems. The unique parts and components can thus be coated extremely clean and without any dust deposits. The next step should bring even more flexibility and open the way to high-tech coatings at the highest level. TEandM found the right solution with its long-



Pure flexibility with the CC800® HiPIMS: TEandM precisely matches the premium coatings for the complex components to the application.



In order to further increase the premium quality of the coatings and to produce extremely clean coatings, TEandM has specially built a clean room for the CemeCon coating systems.

of the high-performance HiPIMS coatings. In addition, there are fast target changes and the possibility to produce special targets with new material compositions. In doing so, we give the users all the options they need: Both the HiPIMS parameters and the synchronization of the cathodes with the bias on the table are completely open. All in all, this means unbeatable flexibility and thus the perfect combination for TEandM's requirements," Dr Christoph Schiffers, Product Manager Technology at CemeCon, is convinced.

A further plus: The enormous plasma density of HiPIMS enables layers of materials with high ionization potential such as carbon or special materials. This provides for example a better protection

against corrosion by aggressive media in coated valves.

HiPIMS AS SPRINGBOARD TO INNOVATIVE LAYERS

The CC800® HiPIMS is a machine for visionaries, and TEandM is making the most of its enormous development potential for its own innovations: Injection molding of recycled plastic, for example, poses major challenges. The material is inhomogeneous, sticks to the die and is therefore difficult to demold. With HiPIMS, the experts not only produce the required extremely smooth layers, but also better protect them against adhesion with new material compositions.

"Thanks to the unique residual stress management of the CC800®

HiPIMS, we can go even further in layer development: The residual stresses of the coating can then be kept so low that the coated components can withstand an impact load for longer. HiPIMS provides us with perfect support in the development of innovative coatings for special and extreme applications," says Ricardo Alexandre enthusiastically about the incredible possibilities of the CC800® HiPIMS. "In this way we create a springboard to more performance, which further develops our processes and optimizes our existing know-how in a beneficial way. Coupled with our newly created clean room environment, we are laying the foundation for the next generation of innovative coatings."

ALWAYS THE RIGHT SOLUTION FOR TOOL AND MOLD MAKERS

Milling or die sinking? This question arises almost daily in tool and die making when it comes to the production of punches, dies, injection molds or similar. Unfortunately, there is no one true machining strategy for all eventualities. Diverse requirements determine which process achieves the desired results. CemeCon has the right premium coating on hand for all cases, making it the ideal partner for tool and mold making.

Tool and mold makers usually use hardened steel or carbide for the production of punches, dies and injection molds. This is because these resistant materials ensure long service lives. What is advantageous for precision parts, however, makes machining more difficult. This is why, in the past, manufacturers mainly relied on die sinking with

copper or graphite electrodes. Today, however, technological advancements also enable economical milling of the sometimes very complex geometries.

The choice of the right manufacturing process depends on various factors. For example, EDM is unbeatable, especially for the manufacture

of components with narrow and deep contours. It can be used economically, especially in large-scale production and for large components. In contrast, HSC milling impresses with fast machining times and the best surface finishes, usually even without reworking. In addition, it enables highly complex 3D contours. Milling plays out its advantages especially for small series and test tools.

“The processes have one thing in common: High-performance precision tools are an absolute must - either for manufacturing the electrodes from graphite or copper or for milling the steel or carbide itself,” knows Manfred Weigand, Product



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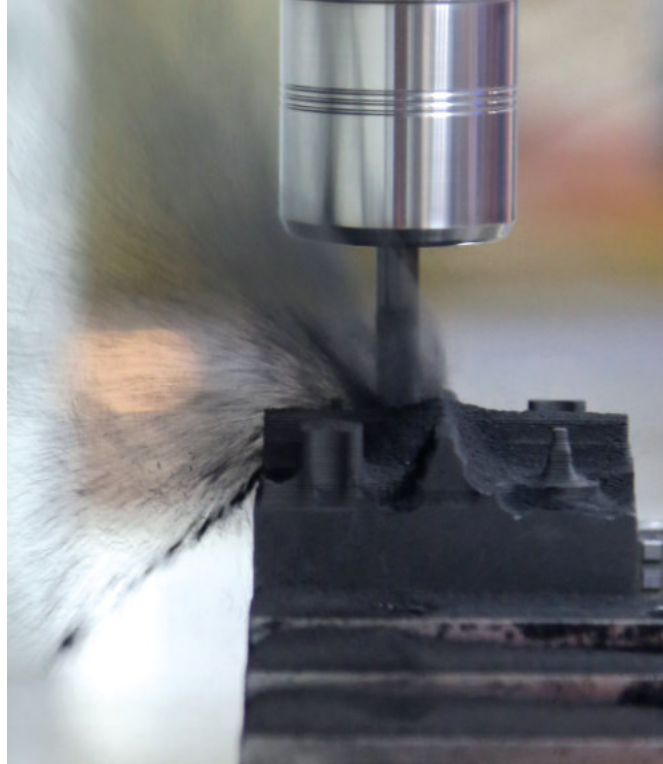
Milling punches from carbide: CCDia®CarbideSpeed® ensures excellent surface finishes.

Manager Round Tools at CemeCon. "With our HiPIMS and diamond coatings, we offer the right solution for every application."

The basis of all premium coatings are their coating materials: CemeCon has developed the diamond coating CCDia®CarbonSpeed® especially for milling carbide. As diamond coatings are unsuitable for machining ferrous materials due to their high affinity, the HiPIMS coatings FerroCon® and InoxaCon® represent the right choice for milling the hardened steels. For machining the graphite electrodes, CemeCon recommends the diamond coating material CCDia®CarbonSpeed®. For machining the copper electrodes, the HiPIMS coating material AluCon® is excellently suited, but a thin diamond coating can also produce the required results.

Manfred Weigand: "Close cooperation with our customers is the key to designing the right coating for a specific application. Because only if we know all the parameters can we optimally match pretreatment,

Diamond coatings from CemeCon offer the ideal solution for milling graphite electrodes (Photo: HUFSCHMIED).



coating material, specification, such as coating thickness, and finish to each other, the tool and the requirements. This is how precision tools with our premium coatings achieve outstanding results! By the way: whether HiPIMS or diamond - our customers always have the same contact persons who know all products in detail."

Those who have their tools coated at CemeCon not only find the right

solution for every application, but also have logistical advantages. The Würselen coating center is home to both diamond and HiPIMS coating systems. The fact that all tools can be sent to one address ensures less logistical effort and thus saves time and costs. This also applies to the CemeCon coating centers on the other continents. Here, mirrored processes and productions always enable the same coating in the same, accustomed quality.

At a glance: Solutions for tool and mold makers

Graphite milling	Copper milling	Carbide milling	Steel milling
CCDia®CarbonSpeed®	AluCon®	CCDia®CarbonSpeed®	FerroCon®, InoxaCon®
Coating material Diamond	Coating material HiPIMS (TiB2 based)	Coating material Diamond	Coating material HiPIMS (AlTiN respectively TiAlSiN based)



“**HiPIMS-TECHNOLOGY** opens up enormous **OPTIMIZATION POTENTIAL** for us: it allows us not only to further improve coating variants that have been tried and tested for years, but also to develop **INNOVATIVE COATING COMPOSITIONS** that open up **NEW MARKETS** for us.
The possibilities are enormous.”

Gerhard Melcher, Sales Manager at Boehlerit
(more on the pages 10–13).

WOULD YOU LIKE TO LEARN MORE ABOUT OUR COATING TECHNOLOGY?

All contact information for our Coating Service and Coating Technology experts around the globe can be found at www.cemecon.de/en/contact

We're only a click away!

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