CEMECON The Tool Coating

CUSTOMER MAGAZINE
FOR COATING TECHNOLOGY

FACTS

No. 53 September 2021

HiPIMS – THE GAME CHANGER

HARD. HARDER. SteelCon®

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COORDINATED SOLUTIONS

Do you want to launch a new tool on the market, differentiate yourself more from the competition or even improve the cutting results of your tools? We support you in this – with individual coating concepts. For this purpose, we coordinate the premium coating precisely with the requirements in joint engineering with the tool manufacturer. This results in the perfect combination of substrate, geometry and coating for the respective application. You can find out how this works on pages 10/11 and 22/23.

The advantages of HiPIMS technology are demonstrated, for example, by Kanne Premiumwerkzeuge, which uses HiPIMS coatings to significantly improve the machining of titanium implants (pages 6–9). And Stepper, an expert in filigree stampings for the electronics industry, proves that HiPIMS can also be successfully used in stamping tools (pages 16–19).

With EMO, we are now returning to "normality" after an absence of around one and a half years from the trade show (pages 12/13). As a trendsetter and technology source for premium coatings, we again have a lot to offer, such as our new HiPIMS coating material SteelCon® for dry and wet processing of hardened steel with more than 50 HRC (pages 14/15). Visit us at EMO at booth G05 in hall 2! It will be worth it!
Yours sincerely,

Dr. Toni Leyendecker Dr. Oliver Lemmer Bernd Hermeler

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CemeCon AG
Adenauerstrasse 20 A4
52146 Würselen
Phone +49 24 05 44 70 100
Fax +49 24 05 44 70 399
www.cemecon.de
info@cemecon.de

Editor
KSKOMM GmbH & Co. KG
Jahnstrasse 13
56235 Ransbach-Baumbach
Phone +49 26 23 900 780
Fax +49 26 23 900 778
www.kskomm.de
ks@kskomm.de

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MAGIC OR ART?

HiPIMS is conquering the markets as a coating technology. A few years ago, when this technology was first introduced, CemeCon in particular set industry standards as a technology leader and pioneer. In the meantime, other manufacturers also offer similar technologies, but 35 years of experience in sputtering and 15 years in the application of HiPIMS cannot be caught up so quickly.

The performance of a cutting tool is determined by the cutting edge. And this is where a coating has the hardest time! Whether it's a micro-milling cutter with the sharpest edges for titanium machining or the highest possible coating thickness on cutting inserts for heavy-duty machining: the fine-tuning of the coating residual stresses to the geometry of the cutting edge is the crucial point. This is exactly where HiPIMS comes in, transferring the precision of the tool manufacturer in designing the micro-geometry of the cutting edge to the coating world.

WHAT MAKES HiPIMS SO SPECIAL?

HiPIMS combines properties that previously required different coating processes or even multiple lines. HiPIMS coatings are smooth and droplet-free, the morphology is exceptionally dense with best adhesion, hard and tough at the same time and the coatings are characterized by very low residual compressive stresses. HiPIMS can be used to coat a wide range of substrates, and virtually any element of the periodic table can be used. But is every HiPIMS system on the market a guarantee for the future?

HiPIMS IS NOT JUST HiPIMS!

CemeCon relied on sputter technology from the very beginning. Here, very high voltages are used for ionization. HiPIMS takes this approach a step further. Extremely short pulses form a high-energy plasma that ionizes the coating materials to be deposited in an unprecedented way. Handling this

Synchronization of the HiPIMS pulses of the cathodes with the substrate table

energy in the pulse units is thus a critical success factor. CemeCon has had a lot of practice in this. 35 years, to be precise.

The CC800® HiPIMS was designed from the ground up consistently and without compromise for HiPIMS. The HiPIMS pulse units are located on the chamber doors in close proximity to the cathodes. This eliminates the need for a cable between the two components. Cable paths not only present a resistance and thus energy loss but also change the pulse patterns due to their inductance and capacitance. These limitations do not exist in the CemeCon HiPIMS systems. The same applies to the positioning of the HiPIMS bias in the immediate vicinity of the substrate table. Due to this design, the necessary energy reaches where it is needed, directly to the cutting tool to be coated, without loss or delay. All components are built by CemeCon itself and are 100% adapted to this task.

HOW IS IT POSSIBLE?

The synchronization between the cathodes and the substrate table makes the residual stress management of the coatings possible.

How it works: HiPIMS pulses are very short, but still consist of three phases. Energy is selectively applied to the substrate table only during the growth of the coating layer. This prevents working gas from entering the coating.

This technology package patented by CemeCon is the key to coatings with very low, adjustable residual compressive stresses. The benefit for the tool manufacturer: the HiPIMS coating shows performance where it really matters: on the cutting edge of the cutting tool.

Full power into the plasma through lossless energy supply.

NEW OPPORTUNITIES, NEW MARKETS

Low residual stresses that can be specifically adjusted to the microgeometry of the cutting edge are the key to completely new solutions for extremely sharp micro cutting tools for applications in medical technology with stainless steel, titanium and CrCo.

Milling applications dominate the manufacture of implants and hard milling market for the mold and die industry. The new SteelCon® coating material for hard machining benefits of the dense and thus tough layer, combined with low residual compressive stresses. This together provides the performance boost for the interrupted cut of a milling tool. This combination can only offer HiPIMS!

Crankshaft machining is the supreme discipline in the use of insert tools. In this high-performance milling application, in the heavy-duty machining of wind power components and in the milling of railroad rails, every µm more of the coating helps. The cutting performance of inserts with layer thicknesses of currently up to 12 µm with FerroCon® Quadro reaches an unprecedented level.

What sounds like magic is ultimately pure engineering!

Our colleague Dr. Christoph Schiffers (Product Management Coating Equipment, CemeCon AG) provides deeper insights into this topic on the CemeCon YouTube channel: cemecon.com/346

KANNE SECURES COMPETITIVE ADVANTAGES IN MEDICAL TECHNOLOGY WITH THE CC800® HiPIMS

HiPIMS-COATED MILLING CUTTER BRINGS TITANIUM INTO TOP SHAPE

In medical technology, precision and safety have top priority – both for the doctor performing the work and for implants and tools. For implants and prostheses, for example, surgeons, orthopedic technicians and dentists use the particularly biocompatible titanium and its alloys. The materials, which are difficult to machine, and the resulting changes in production techniques are constantly presenting tool manufacturers and users with new challenges. In order to overcome these sometimes high hurdles and achieve economical machining of medical technology components made of titanium, a manufacturer turned to Kanne Premiumwerkzeuge. He received a complete package consisting of technical advice, design and manufacture of a tool precisely tailored to the application – including HiPIMS coatings of the latest generation.

The ideal material for medical technology? Above all, it must be biocompatible – such as titanium and its alloys. The material combines maximum biocompatibility, mechanical strength and corrosion resistance. This is why prostheses and implants in particular are made from it. However, machining often causes users headaches. "Titanium is very hard and tough, has poor thermal conductivity and tends to form strong adhesions. The tools used must therefore be particularly wear- and temperature-resistant," says Dipl-Ing. Volkmar Kanne, Managing Director of Kanne Premiumwerkzeuge. "Ideal cooling conditions, robust substrate, effective tool geometry and a coordinated coating – all of these must mesh perfectly in order to master the milling process economically."

When it comes to coating the precision tools in its in-house coating center, Kanne relies completely on CemeCon technology

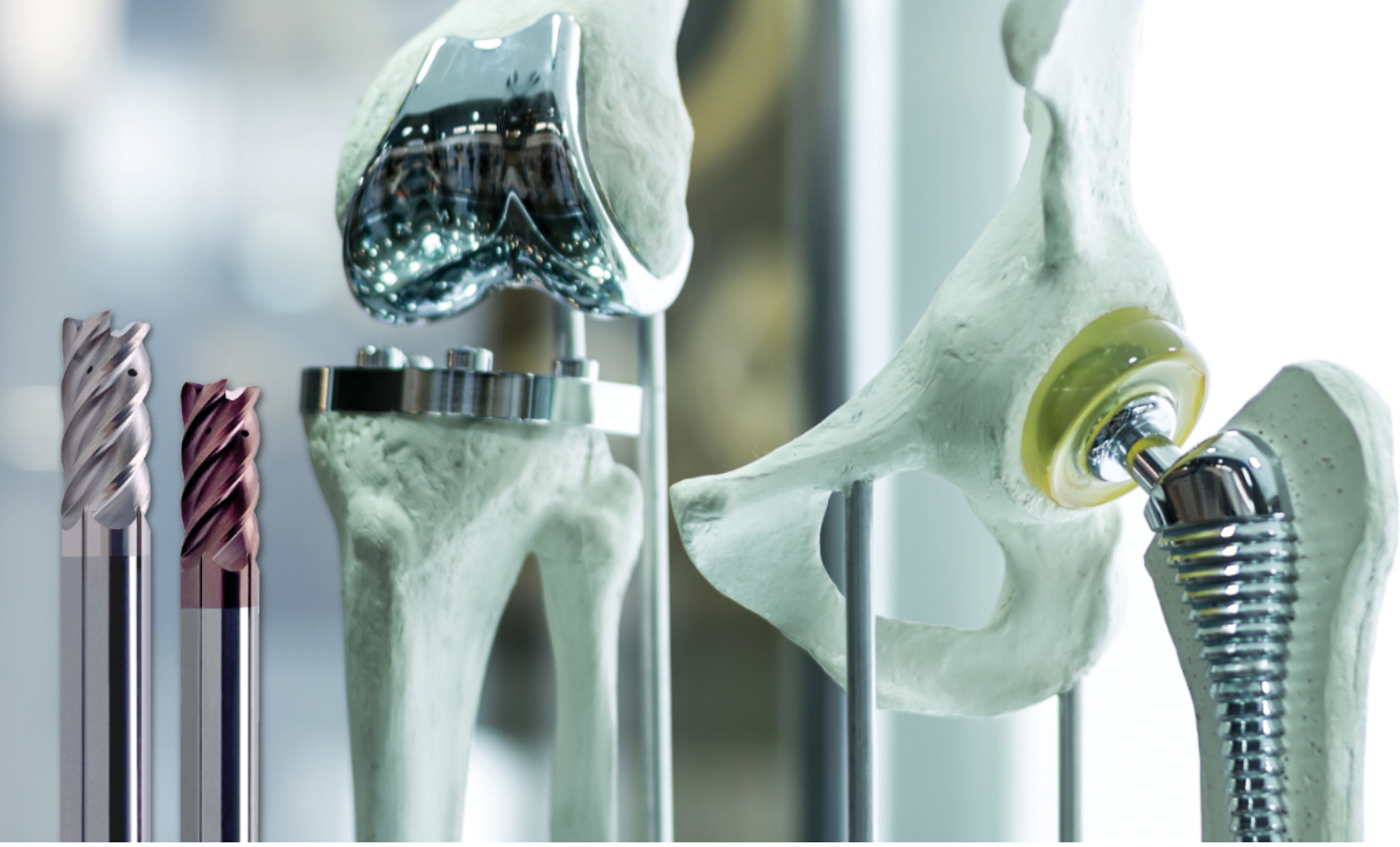
TAILORED SOLUTION FOR TITANIUM MACHINING

The task was thus clearly defined when a manufacturer of high-quality surgical instruments and cement-free joint implants looked to Kanne Premiumwerkzeuge for an application-specific solution for milling the difficult-to-machine material. Volkmar Kanne: "Our designers then developed a new solid-carbide tool with a special cutting geometry as a five-flute cutter. They also integrated internal cooling with an outlet in the chip space as well as cooling grooves on the shank. Since only the best premium coating is good enough for such a cutting task, we employed the innovative HiPIMS technology from CemeCon."

Kanne Premiumwerkzeuge has been able to establish its coating competence in-house for more than ten years now and has continuously invested in future-oriented coating

"Thanks to the combination of our NEWLY DEVELOPED SOLID-CARBIDE CUTTERS with the HiPIMS COATINGS, the user was able to increase PRODUCTIVITY in the machining process and improve the SURFACE QUALITY when machining TITANIUM. In addition, the TOOL LIFE was significantly extended – by up to 50 percent. A top result!"

Dipl-Ing. Volkmar Kanne,
managing director of Kanne Premiumwerkzeuge



Perfectly matched: The substrate, geometry and HiPIMS coating of the new milling cutters form a perfect unit. This enables the user to machine implants made of titanium more economically. (Tool photos: Kanne)

KANNE PREMIUMWERKZEUGE

Kanne Premiumwerkzeuge has been an expert in cutting tools and industrial tool reconditioning since 1978. The company with about 50 employees produces, distributes, grinds and coats premium tools for highest requirements. Tools with extreme precision and minimal tolerances are produced at two locations, in Northeim and Aschersleben. Customer-specific special solutions are among the company's strengths. In order to meet the requirements, Kanne Premiumwerkzeuge relies on continuous further development and qualification of its employees as well as investments in innovative plant technology.

Through the continuous development of competencies, stringent quality management and a strong network of reliable business partners, Kanne has established itself as a premium producer and service provider for cutting tools.

www.kanne-werkzeuge.de

technology and plant engineering to this day. Two fully automatic sputter coating systems and unrestricted access to innovative coating materials make it possible to handle the entire coating process extremely flexibly and at the highest quality level on one's own responsibility. With the CC800® HiPIMS, the company also has the latest generation of plant technology.

THE SOLUTION FOR MATERIALS THAT ARE DIFFICULT TO MACHINE: HiPIMS

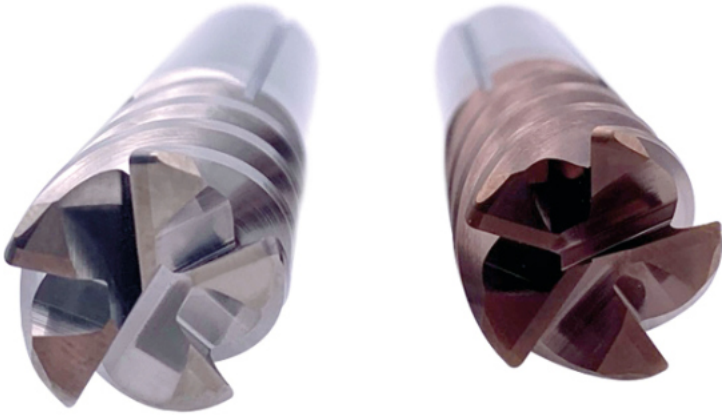
HiPIMS coatings combine a large number of positive properties: They are extremely smooth, very hard and tough at the same time. In addition, they have low residual stress, excellent coating thickness homogeneity even on complex geometries, and outstanding adhesion. This exceptional combination makes HiPIMS coatings perfect for demanding

With the CC800® HiPIMS, Kanne not only gains competitive advantages in medical technology but also in all other future markets.

cutting processes in particular. "We have chosen two different coating variants for our new milling cutter. Depending on the titanium alloy to be machined, either a coating based on the HiPIMS coating material InoxaCon® with a thickness of 3 µm or a coating with an AluCon® coating specification and 2 µm coating thickness is used."

The two HiPIMS coating materials are the first choice for machining the demanding material. Why? Christine Hammer, Sales Manager at CemeCon, knows the answer: "On the one hand, the extremely good adhesion and the particularly high degrees of hardness of InoxaCon® and AluCon® ensure high wear resistance. In addition, they are resistant to oxidation up to a temperature of 1,100 °C and thus optimally protect the substrate from the heat of the cutting process. The machinist also no longer has to worry about built-up edges or adhesions – these are a thing of the past thanks to the very smooth surface and excellent friction behavior. Another plus point of AluCon® in particular is its extremely low affinity to non-ferrous metals."

The result is impressive: "Thanks to the combination of our newly developed solid-carbide cutters with the HiPIMS coatings, the user was able to increase productivity in the machining process and improve the surface quality when machining titanium. In addition, the tool life was significantly increased – by up to 50 percent. A top result!" Volkmar Kanne is pleased.

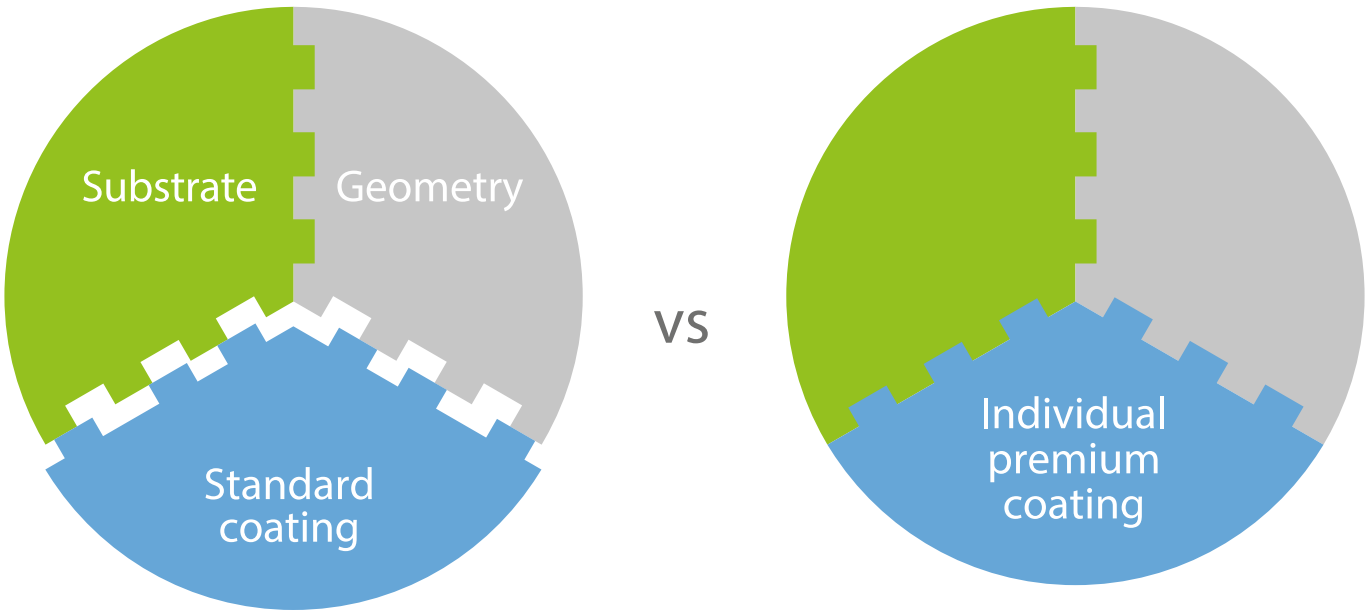


The HiPIMS coating materials AluCon® (left) and InoxaCon® (right) are the first choice for machining titanium. (Photo: Kanne)

THE PERFECTLY MATCHED PREMIUM COATING

Medical technology, electromobility, electronics – machining operations in these markets often entail high demands. The experts at CemeCon know these machining markets very well and understand the challenges faced by manufacturers of precision cutting tools and how they can be overcome. "Only very precisely adapted coating concepts deliver competitive advantages! Consequently, the path is moving away from standard coating as a commodity to individualized coating as a response to market requirements," Jürgen Balzereit, responsible for engineering. Of this he is certain.

CemeCon has been the world market leader in diamond coatings and the technology leader in HiPIMS coatings for 35 years and is the first address for sophisticated tool coating. The company is a technology developer, plant manufacturer and coater. Every day, up to 80,000 precision tools are coated in the worlds largest coating center in Würselen. CemeCon uses this wealth of experience to ensure that every tool re-



In joint engineering, the individual premium coating is precisely adapted to the requirements. This creates a perfect unity of substrate, geometry and coating.

Put us to the test in joint engineering! Tell us your requirements! You can only win.
Our coating experts are just a click away:
coatingservice@cemecon.de

ceives the optimum treatment. Practice inspires theory, theory reinforces practice.

Jürgen Balzereit: "Tool manufacturers often approach us because they want to launch a new tool on the market and request our expertise or to differentiate themselves more from their competitors. It also happens that the user's machining is not running optimally and they want to adapt the tool better to the application. We love such challenges! And the more specific they are, the clearer it becomes that CemeCon delivers the best coatings in the world." The experts prove this time and again in joint engineering through direct comparison. Because there, in close cooperation, they match the premium coating precisely to the requirements so that it combines with the substrate and geometry to form an optimum machining solution for the respective application – perfect for new geometries, demanding tool concepts and special applications.

But how does that work? First of all, the coating experts analyze previous machining results, the tools and the material to be machined – in other words, everything that the manufacturer can supply them with. The more the specialists know about the application, the better they can "configure" the coating. There are a number of variables that can be adjusted: coating material, coating thickness, tolerance, pretreatment, finishing and much more. In engineering, the process steps are then sensibly combined and individually adapted to the parameters. "Often, several variants are conceivable here. That's why there is sampling – prototype production, as it were. Here, the precision tool receives one or even several recommended premium coating(s) for the first time. We then test different designs to obtain the best result. The goal is the customer-specific coating specification that is perfectly matched to the tool and the application," says Jürgen Balzereit.

The CemeCon experts keep improving the combination of parameters until the suitable result is achieved and then save the successful work plans. The precisely documented, individual production processes and the separation of the coating batches according to shank and insert tools ensure that the specified coating can be produced with the same, perfect result at any time and worldwide in all CemeCon coating centers on behalf of the customers.

WE LOOK FORWARD TO SEEING YOU AGAIN!

In October, we will be exhibiting at EMO in Milan and we have plenty of good news in store:

HiPIMS makes your business future-proof

No other technology can do more: from micro drills with less than 1 µm coating thickness to inserts with 12 µm. No system on the market is more flexible and faster!
What demands will your customers place on the precision tools of tomorrow? Which coatings will become relevant?

Do your customers manufacture injection molds? Then you should get to know SteelCon®!

SteelCon® is a HiPIMS coating material for dry and wet machining of hardened steel with more than 50 HRC. Look forward to very homogeneous wear properties, to very smooth surfaces and maximum adhesion!

CAN'T MAKE IT TO EMO?

We have two attractive shortcuts for your success:

Send us your requirements today!

We love challenges, and the more special they are, the more clear it becomes that CemeCon delivers the best coatings in the world. Compare and put us to the test. You can only win with this!

Our coating experts are just a click away:

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New markets for machinists!

CCDia®CarbideSpeed® – A diamond coating for the milling of sintered cemented carbide. Milling instead of EDM! The production of punches has now become much more attractive.

Find us at booth G05 in hall 2

Look over our shoulder!

In the world's largest coating center for cutting tools or online. Experience how the CemeCon HiPIMS systems work, how quickly the changeover between, for example, a batch of FerroCon®Quadro with 12 µm to a batch with microtools and a coating thickness of 1 µm is completed, how naturally and easily smooth, hard and at the same time tough coatings with very low residual compressive stresses are produced.

Book your personal live batch at:

coatingtechnology@cemecon.de

MORE PERFORMANCE IN THE MACHINING OF HARDENED STEEL FOR INJECTION MOLDS

HARD, HARDER, SteelCon®

In tool and mold making, the machining of hardened steels beyond 50 HRC is standard. It nevertheless remains a discipline for specialists, especially for manufacturers of precision tools. The milling cutters used are subject to very heavy wear. Tool manufacturers therefore know that long and, above all, process-reliable tool life is only possible with a coating adapted to the tool. With the new HiPIMS coating material SteelCon®, CemeCon now offers the best solution for this.

Hard machining, especially the machining of injection molds made of hardened steels with more than 50 HRC, is a demanding application: The materials are both hard and tough, and alloying components that increase corrosion resistance further complicate the machining tasks. "Here, the milling cutters used literally cut their teeth due to enormous feed rates and high temperatures at cutting speeds of up to 250 m/min. At the same time, the highest surface qualities are required even for the smallest contours. In order to machine as economically as possible under these extreme conditions, first-class precision tools are required. A prerequisite for this is, of course, the right coating. With our new HiPIMS coating material SteelCon® we provide the right basis for this," says Manfred Weigand, Product Manager Round Tools at CemeCon.

PERFECT COMBINATION FOR TOP PERFORMANCE

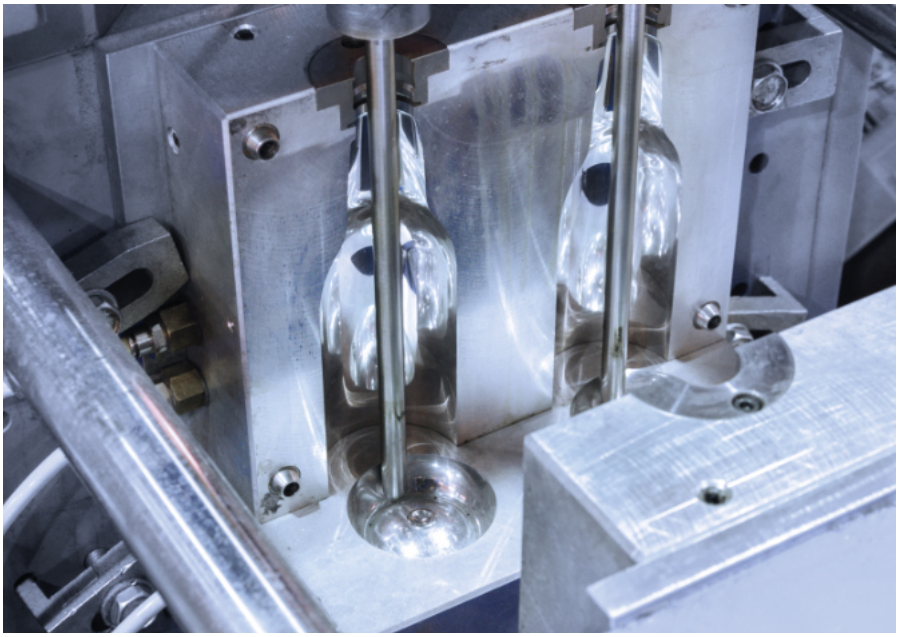
SteelCon® is the second silicon-doped HiPIMS coating material from CemeCon. While InoxaCon® is excellently suited for machining stainless steel, titanium and difficult-to-machine materials, the coating experts have developed SteelCon® specifically for machining

hardened steels beyond 50 HRC. Whether dry or wet, milling, drilling, reaming or threading – SteelCon® is the ideal solution in hard machining thanks to its outstanding properties.

"The HiPIMS coating material SteelCon® is very wear-resistant, on the one hand due to its high hardness, and on the other hand due to its toughness coupled with excellent adhesion. It has a dense layer structure and the thermal stability has been increased. Top conditions for best performance!" emphasizes Manfred Weigand. "Another plus: The wear behavior of SteelCon® differs significantly from other coatings available on the market. Tool manufacturers as well as users are enthusiastic and give us consistently positive feedback: 'We have never seen such homogeneous wear behavior.' This ensures high process stability."

Since no droplets can form thanks to the HiPIMS process, SteelCon® is extremely smooth. This means that nothing stands in the way of optimum chip and heat removal. The tool can dissipate the heat in the chips, and process stability increases. Excellent surface qualities are achieved, so that the user can often save subsequent work – in some cases even the polishing of their workpieces.

Those who use tools with a matched SteelCon® coating when machining hardened steels are on the safe side: Shorter machining times, reduced setup and handling procedures, and better surface quality significantly reduce the bottom line costs. "We achieve such advantages thanks to the extreme hardness, high toughness, smooth surface, maximum adhesion, high thermal stability and dense morphology of SteelCon®," says Manfred Weigand in summary.

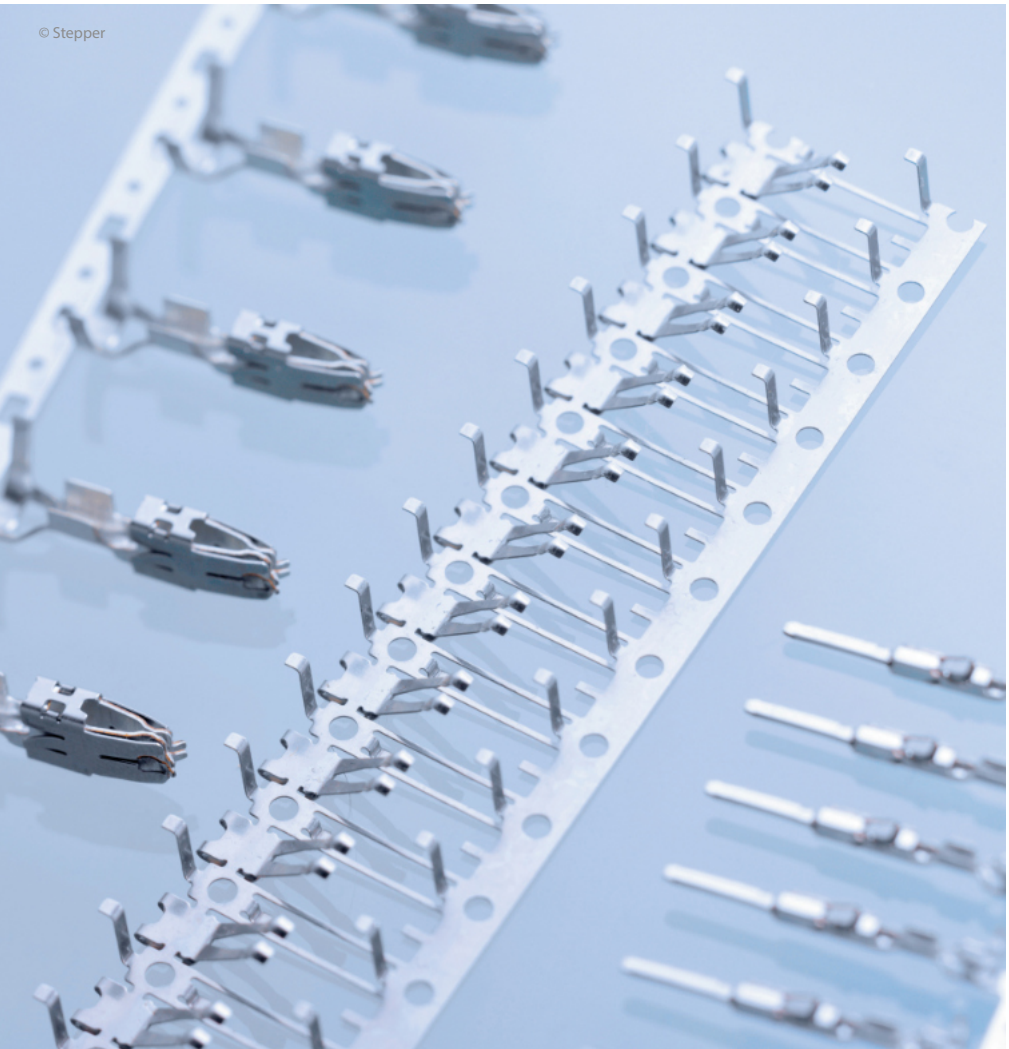


Whether wet or dry – SteelCon® significantly increases tool life when milling injection molds made of hardened steels.

STEPPER TAKES A GIANT STEP FORWARD IN STAINLESS STEEL PROCESSING WITH InoxaCon®

THE HiPIMS ADVANTAGE FOR THE NEW DIMENSION IN STAMPING TECHNOLOGY

Hardly any product has been in such demand in the past two years as electronic components – no electronics without plugs and plug contacts. In order to economically manufacture precision contacts in large series of 10 million or more, high-performance automatic stamping machines and, above all, specially manufactured highly complex tools are the be-all and end-all. Fritz Stepper GmbH & Co. KG is an award-winning expert in modular progressive dies that produce electronic contact parts at up to 3,000 strokes per minute. To continuously improve these stamping tools, the company based in Pforzheim, Germany- is always ready to break new ground. The HiPIMS technology from CemeCon is another important step along this path.



Sophisticated stamped parts for the electronics industry are the core competence of Stepper.

"If you want to do something better, you face two options. You can either improve an existing process or rethink it from top to bottom." Fritz Stepper, founder of Fritz Stepper GmbH & Co. KG, wisely chose the second option and applied this mindset to launching a series of technological innovations that have always kept the company a step ahead: the right step to take for the highest levels of precision and productivity. The turning point to modern toolmaking is primarily considered to be the progressive

Modular progressive dies from Stepper can incorporate over 1,000 PVD-coated moving active parts, such as cutting punches, cutting, bending and embossing inserts. Excessive wear on any one of these active parts affects product quality. With HiPIMS technology, Stepper can significantly extend required maintenance intervals (typically to well over 10 million punch strokes without maintenance intervention).

dies with modular design developed and patented by Stepper in the 1970s. The innovative strength of the company from Pforzheim, Germany today is demonstrated by numerous awards: Stepper has been voted one of Germany's innovation leaders several times by the FAZ Institute and in 2019 was named Toolmaker of the Year 2019 and overall winner of "Excellence in Production" by the renowned Fraunhofer Institute for Production Technology IPT.

NEW WAYS FOR THE BEST STAMPING TOOL

The finest stamped parts for the electronics industry are Stepper's specialty. "Whether computer or automobile – the demands of our customers are very high. Maximum precision and productivity are required. This requires an ultimate tool life. In addition, they must be outstanding in terms of material, surface quality and accuracy in order to produce the demanding geometries of the microcomponents with consistently high precision," says Martin Hess, who, as Head of Research and Development and Head of the Surface Technologies Department, develops innovative coatings at Stepper and implements them on the stamping tool. "Firmly anchored in our company philosophy is to build the best and most reliable tool possible. Wear on a single active part installed in this high volume can already compromise this claim and must therefore be constantly minimized. To achieve this, we pursue every means and are constantly evaluating new materials, production processes and technologies."

This also applies to the coating processes that Stepper uses in the entire range from a first arc system to hybrid systems consisting of arc and

STEPPER

STEPPER DIE NEUE DIMENSION DER STANZTECHNIK

Fritz Stepper GmbH & Co. KG was founded in 1965 and since the very beginning has stood for the design of modern stamping tools using the latest cutting-edge technologies. The development of the world's first modularly designed stamping tool in 1975 by Stepper marks a turning point in toolmaking. Thanks to modular inserts in a base body, individual tools for complete families of parts are created – with easy handling, minimal maintenance and large stroke rates even for demanding bending, rolling and embossing operations.

Stepper also produces high-precision contact parts in large quantities for sectors such as the automotive or computer industries at its Pforzheim site. In line with the mission statement "The best or nothing," Stepper's customers can rely on maximum quality and precision as well as comprehensive expertise with 50 years of experience – from the start of the project to the series product with the best high-performance stamping tools.

www.stepper.de

"Only CemeCon's HiPIMS TECHNOLOGY allows us to adjust NUMEROUS VARIABLES to finely calibrate the power to perfectly match our, in some cases, EXTREMELY FILIGREE ACTIVE ELEMENTS – of which over 1,000 can be installed in a single high-performance progressive die! This has enabled us to take a HUGE STEP FORWARD in STAINLESS STEEL."

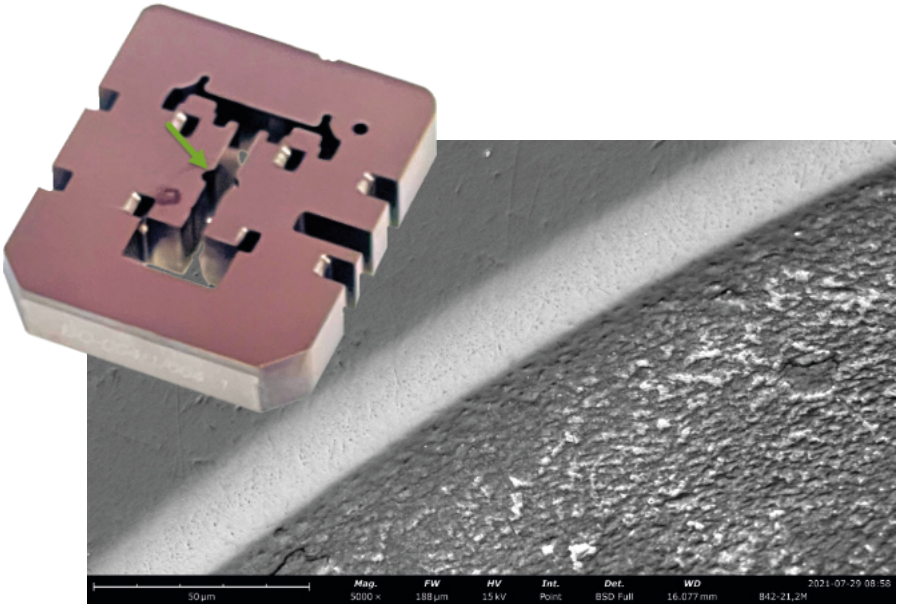
Martin Hess, Head of Research and Development and Head of the Surface Technologies Department at Stepper, presents a HiPIMS-coated cutting die.

magnetron technology to a special pulsed laser machine for ta-C coatings for wear protection developed in-house in close cooperation with an university. Over 30 years of coating expertise have been continuously optimized to meet the special requirements of the filigree active elements in high-performance stamping and the various materials to be stamped. A supreme discipline are tools that process two punching strips in parallel with very different material properties, such as bronzes with tensile strengths R_m around 600 N/mm^2 and stainless steels with R_m up to over 1,400 N/mm^2. The active parts machining the stainless steel should also achieve minimum stroke rates in the double-digit million range here before any maintenance intervention on the progressive die. With this material, the experts did not make significant progress with conventional coating processes despite many in-house developments – not even with ultra-hard ta-C.

Martin Hess: "Wear analyses with state-of-the-art measurement technology show us the details that need to be improved: In the case of active elements, such as cutting punches with sizes sometimes far below 1 mm, for example, the surface artifacts ('droplets') that are unavoidable with conventional technologies due to the process or the layer microholes that emerge during post-polishing can often trigger initial wear if they occur on an edge line that has been rounded with micrometer precision. The consequences are local burr formation on the stamped part and a resulting necessary change of active element. Also, residual stress minimized edge lines, coating stress gradients matched to the substrates, and punch strip matched tribochemistry can only be optimized with the added process control of the latest coating technology. We never look for just any solutions. We always want the best. So we turned to CemeCon with the idea of using HiPIMS technology for our stamping tools."

A revolutionary idea, because CemeCon has perfectly adapted the CC800® HiPIMS to the coating of cutting tools. "So it was a matter of transferring what is right for cutting tools to the new applications of shearing, bending and embossing.

Thanks to the cooperation with Stepper and the high flexibility of the coating unit and the HiPIMS process, we were able to quickly show that adapted HiPIMS coatings trigger a technological leap for stamping tools. Then we went on a journey of discovery together – and the results were more than convincing!" says Dr. Stephan Bolz, expert for the development of HiPIMS coatings at CemeCon.



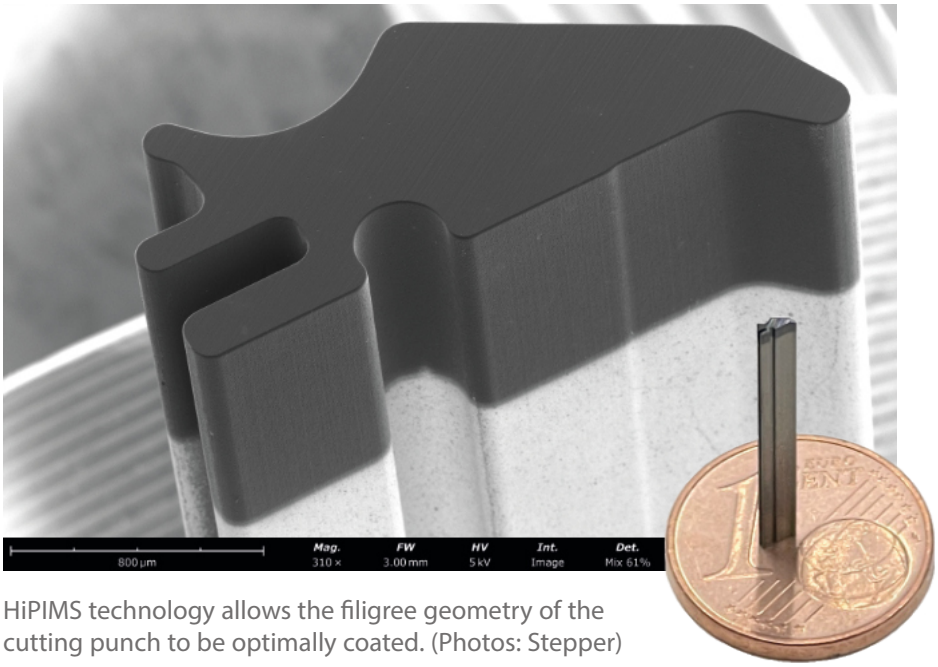
Even after 21.2 million strokes, the cutting die coated with InoxaCon® still has an unchanged edge. (Photos: Stepper)

OUTSTANDING RESULTS WITH HiPIMS

HiPIMS technology is perfectly suited for applications in stamping tools: During the production of precision contacts made of stainless steel, the installed active elements in the progressive die are subjected to enormous extrinsic stresses. They have to withstand up to 3,000 strokes per minute. An extremely hard coating alone is not enough to withstand impact stress with total strokes in the tens million range. To prevent the coating material from degradation, it must also be tough. At the same time, an extremely smooth surface and dense morphology are required for stamping applications. High-precision and sharp-edged geometries also require low residual stresses at the coating thickness level required for a high wear reserve. This combination can only be achieved by HiPIMS!

InoxaCon® as a HiPIMS coating material is a proven solution for stainless steel processing. With other coatings, undesirable material transfer (micro cold welds) from the stainless steel punching strip to the coated active elements was often observed. This does not happen with InoxaCon®. The tool life successes exceed all expectations: The tools now last 30 million strokes and more!

"Only CemeCon's HiPIMS Technology allows us to adjust numerous variables to finely calibrate the power to perfectly match our, in some cases, extremely filigree active elements – of which over 1,000 can be installed in a single high-performance progressive die! This has enabled us to take a huge step forward in stainless steel." reports Martin Hess enthusiastically. And the CC800® HiPIMS in-house opens the door to further innovative developments for the visionaries at Stepper. We are looking forward to them.



HiPIMS technology allows the filigree geometry of the cutting punch to be optimally coated. (Photos: Stepper)

PREMIUM SOLUTIONS AT THE SAME QUALITY WORLDWIDE WITH CEMECON

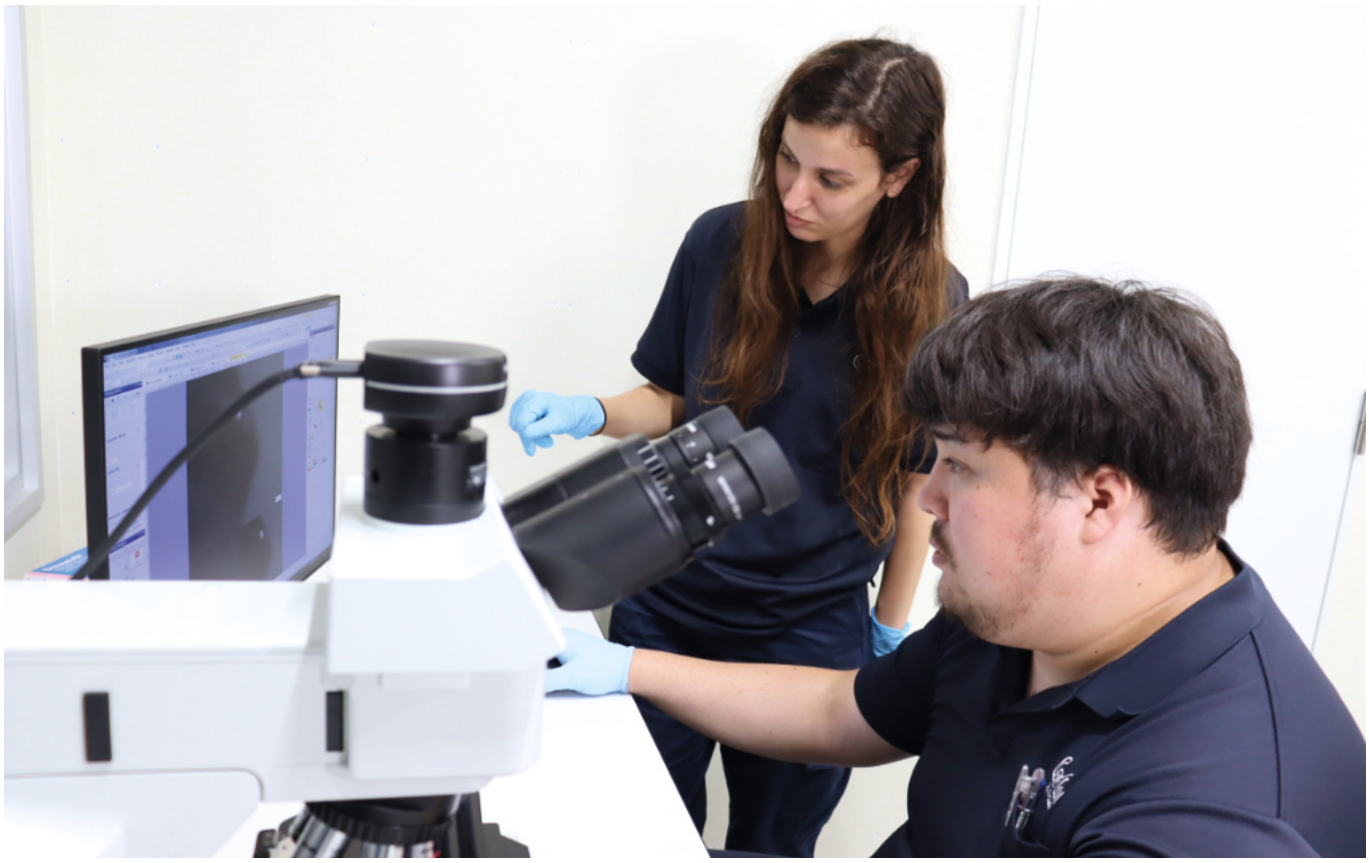
Tool manufacturers who come to the CemeCon coating center in Nagoya, Japan, are often looking for a solution in a highly competitive market to increase their profits with premium coatings for their precision tools. And they are in the right place: Whether diamond or HiPIMS coatings – CemeCon is a leader in both technologies.

"Especially from small and medium-sized tool manufacturers, we often hear about the difficulties to compete with the technology level of the big competitors. Smaller tool makers have to manage costs well to stay in business and often do so at the expense of development resources. This can jeopardize the profitability in the long term," says Alexander Marxer, Managing Director at CemeCon in Japan. "With our premium coating technology, we enable manufacturers to gain the competitive advantage."

ENGINEERING OF THE COATING SOLUTION

A tool manufacturer is the expert on its tools. Coupled with CemeCon's decades of expertise in coatings, the path to competitive cutting tools opens up. "As a rule, a tool manufacturer turns to us when a certain type of tool does not produce the required results. In a first step, we then analyze the tools and give a coating recommendation. And then we really get started," says Alexander Marxer, describing the typical start

The analysis of the wear patterns helps to tune the coating – for the best possible result.



For special applications or new geometries, CemeCon works with the tool manufacturer to develop an individual coating solution that is precisely tailored to the application.

of a close cooperation with the tool manufacturer:

Once the first tools have received the recommended coating, machining tests follow. The analysis of the wear pattern on the tools is used to further optimize the coating in close cooperation with the tool maker. There are many variables that can be adjusted: the coating thickness, the coating material, and the pretreatment or posttreatment. "It can take one or two loops until the perfect combination of the tool and the coating is achieved. But this way we can be sure to deliver the best possible result for our customers," Alexander Marxer is pleased to say.

CUSTOMER-DESIGNED COATINGS

For special applications or new geometries, tool manufacturers also often look for an individual coating solution that goes beyond the matching of parameters. With CemeCon, tool makers have exactly the right partner at their side. Together with the experts, the perfect coating to the application is tailored down to the smallest details.

In the coating center in Nagoya – as well in all other CemeCon coating centers around the world – customers are warmly welcome to experience the exclusive HiPIMS and Diamond technology.

THE DIFFERENCE LIES IN THE DETAIL

A premium coating is the result of numerous options that CemeCon, together with the manufacturer, precisely matches to the application and the precision tool. This applies to both HiPIMS and diamond coatings. The linchpin is always the coating material. With HiPIMS, the differences between the individual coating materials are obvious; with diamond, you have to look a little closer. CemeCon keeps a close eye on these details and therefore offers exactly the right premium coating for every application.

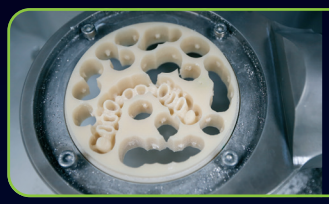
Graphite, CFRP and GFRP, zirconium oxide, hypereutectic aluminum, other non-ferrous metals and carbide – the list of possible applications for diamond-coated tools is even longer than the list of machinable materials. They are used in the machining of components for aircraft and classic automotive construction as well as for e-mobility. In addition, they are also used for the manufacture of sports articles or in dental technology. In tool and mold making, there are various areas of application: in the machining of graphite electrodes, as well as in the milling of carbide. CemeCon supplies the right solution for all applications.

Especially with diamond, adhesion is crucial. Thus, the choice of the suitable carbide as the carrier of the coating deserves special attention. The CemeCon experts know exactly what needs to be taken into account here and are happy to provide manufacturers with advice and support in advance. Depending on the carbide grade and coating material, CemeCon then selects the appropriate preparation. There are different gradations from gentle to intensive. This gives the tools the right preparation for optimum adhesion of the coating.

With diamond coating materials, it is the subtleties, for example in morphology and topography, that determine suitable applications. "The crystals of diamond coating materials have different structures and sizes. The coating materials also differentiate in terms of surface. They are all smooth, but some are smoother than others. Here, it is important to choose the right texture for the respective application," says Manfred Weigand, Product Manager Round Tools at CemeCon. "In addition, the number of individual layers influences the area of application. After all, our diamond coating materials are multilayers. Depending on the layer material, the number of layers varies between 2 and 20."

As with HiPIMS, the coordination process for the premium coating does not end with the suitable coating material. Here, too, CemeCon adjusts the variables as usual until the perfect result is achieved: preparation for optimum adhesion, coating thickness specifications including tolerances, and final inspection with documentation. For diamond coatings, CemeCon also offers tool manufacturers the option of precision coating. In this case, the customer receives a coating with the final dimension that they specified within the required tolerances – including the corresponding measurement report.

Whether diamond or HiPIMS – a initial orientation on the suitable coating material for your application and your tools is available in the CemeCon Coating App at:
www.cemecon.de/en/coating-materials

Application examples		Material to be machined	Diamond coatings
	Crowns, inlays and bridges in the dental technology	Zirconium oxide	CCDia®CarbonSpeed®
	Structural components for aircraft	Fiber reinforced plastics (CFRP/GFRP)	CCDia®AeroSpeed® CCDia®FiberSpeed® CCDia®MultiSpeed
	Back implants		
	Sporting goods such as bicycle rims		
	Lightweight construction components for e-mobility		
	Graphite electrodes for the mold production of displays	Graphite	CCDia®CarbonSpeed®
	Stamps and dies for forming	Carbide	CCDia®CarbideSpeed®
	Lightweight components in automotive engineering	Hypereutectic aluminum	CCDia®FiberSpeed® CCDia®MultiSpeed

"Thanks to the combination of our NEWLY DEVELOPED SOLID-CARBIDE CUTTERS with the HiPIMS COATINGS, the user was able to increase PRODUCTIVITY in the machining process and improve the SURFACE QUALITY when machining TITANIUM. In addition, the TOOL LIFE was significantly extended – by up to 50 percent. A top result!"

Dipl-Ing. Volkmar Kanne,
Managing Director of Kanne Premiumwerkzeuge
(more on the page 6–9)

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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Has your address changed? Would you also like to receive the FACTS regularly? Please send your company, name and address by e-mail to: marketing@cemecon.de