

CUSTOMER MAGAZINE FOR COATING TECHNOLOGY

# FACTS



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THE FUTURE OF CUTTING INSERTS
IS CALLED HIPIMS
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## THE RIGHT COATINGS FOR ALL MATERIALS

THE SOLUTIONS FOR DEMANDING APPLICATIONS:

SteelCon® and InoxaCon®

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HiPIMS coatings on cutting inserts provide competitive advantages



Always the right solution for difficult-to-machine materials with SteelCon® and InoxaCon®



With highly trained specialists and state-of-the-art measurement technology, CemeCon ensures premium quality



More profit with in-house coating thanks to training at CemeCon in the USA

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## HIPIMS OPENS UP NEW MARKETS

The world of machining is changing. With the transition from the internal combustion engine to alternative drive systems, traditional automotive manufacturing as the most important mainstay for many machining companies and tool manufacturers is being reduced enormously. The challenge is to win new markets, such as tool and die making, heavy machining, aerospace, and likewise electromobility. However, these markets are already highly competitive. Only those who clearly stand out from the rest and convince in terms of performance will prevail here. Our contribution to your solution: our HiPIMS coatings.

Better performance, faster machining and higher process reliability are the key to increased productivity and thus to new markets. The coating materials FerroCon®, InoxaCon® and AluCon® provide users and tool manufacturers with precisely these advantages – whether for standard applications or demanding machining tasks. They ensure excellent chip flow and better surface finishes at the same time. Less coolant is nec-

essary and often the cutting parameters can be significantly increased. In addition, tool life is longer and so are setup intervals. Such production advantages are the best arguments for winning new customers and markets.

SCORING IN
TOOL AND MOLD MAKING

The decline in the automotive business is also a challenge for tool and mold makers. They now have to position themselves more broadly and win new industries. To maintain

a top position in global competition, economical production of molds, punches and dies at the highest quality standards is an absolute must.

One of the most important technologies in tool making is milling due to its high productivity and flexibility as well as the achievable quality. Innovative tooling solutions for tool and mold makers are in demand. "FerroCon® with 6 µm layer thickness and FerroCon®Quadro with an impressive12 µm layer thickness are made for roughing operations on molds made of steels. Thanks to the high coating thickness, inserts with the HiPIMS coatings achieve a very



good metal removal rate, which automatically increases productivity," says Inka Harrand, Product Manager Cutting Inserts at CemeCon.

#### **IDEAL FOR HEAVY MACHINING**

FerroCon® with 6 um and FerroCon®Quadro with 12 µm coating thickness are the first choice, especially in the heavy-duty machining of rails, turnout, pipes and crankshafts, as well as in the rotary peeling of cast iron and ferrous materials, to achieve the required maximum wear volume. This is because in such roughing operations every micrometer more determines the economic efficiency of the process. For example, in the maintenance of rails: Milling operations are used here to eliminate major damage and restore rails to almost their new condition. Inka Harrand: "Here, profile tools with maximum working speed and machining quality are required, usually equipped with a very large number of cutting inserts. Higher coating thicknesses significantly extend their service life - the key to economic efficiency. The relationship in such applications is almost linear - and this is where FerroCon® with 6 µm coating thickness and FerroCon®Quadro with 12 μm coating thickness come into play."

When milling 1.0503 (C45) with a hardness of 32 HRC ( $v_c = 220 \text{ m/min}$ ,  $a_p 0.5 \text{ m/min}$ , without cooling), for example, the inserts with a FerroCon®Quadro coating achieve a tool life of 180 min. Various inserts with conventional coatings are significantly lower at 120 min, 95 min and 65 min, respectively.

#### FUTURE MARKET AEROSPACE: TITANIUM MACHINING WITH HIPIMS

For safety reasons, it was previously the rule in aircraft construction not to change processes once they had been qualified. This also includes mechanical processing. Thus, the processes and tools have often been in use unchanged for a very long time, but are inefficient from today's perspective. However, the past few years have put enormous pressure on aircraft manufacturers and suppliers. In order to reduce costs and produce more economically, processes are now being put to the test in many places. This is the opportunity for tool manufacturers to gain a foothold in the industry with highperformance solutions.





HiPIMS coatings open up new markets. They are the future for cutting inserts









Quality assurance is part of the coating process at CemeCon right from the start

A good example is titanium machining. Many components of an aircraft are made of different titanium alloys. However, machining this lightweight material is anything but simple. With the HiPIMS coating materials InoxaCon® and AluCon®, significant

leaps in performance are possible here. In oil-cooled machining of the high-strength titanium-aluminum alloy TiAl6V4 ( $v_c = 100 \text{ m/min}$ ,  $f_z = 0.06 \text{ mm}$ ,  $a_e = 15.28 \text{ mm}$ ,  $a_p = 0.8 \text{ mm}$ ,  $v_b = 0.34$ ), for example, the X-geometry insert coated with AluCon® achieves a tool life of 14.48 m. This is an increase of more

than 30 percent compared to the TiAlSiN-coated tool, which had a tool life of only 11 meters.

### POTENTIALS OPEN UP IN E-MOBILITY

There are far fewer machining tasks for e-mobility than in classic automotive construction. This is precisely the reason why the machinists are increasingly losing out to the industry. "In addition, aluminum alloys are mainly machined. Tools tailored to the requirements are the solution for securing market share here. AluCon® coated inserts can be a good alternative to uncoated carbide," Inka Harrand is convinced. When milling aluminum, for example, AluCon® increases the service life of



## "HIPIMS is the FUTURE in the coating of CUTTING INSERTS.

#### No one can get around this."

Inka Harrand, Product Manager Cutting Inserts at CemeCon

inserts by 30 percent compared to uncoated inserts.

#### **OUALITY GUARANTEED!**

Not only do the HiPIMS coating materials themselves belong to the premium class, but the quality is also outstanding: In order to always provide customers with the best possible coating in the same specification and high quality, the CemeCon team

looks very closely and right from the start at, for example the edge condition, possible damage, the degree of contamination and the substrate surface. Because these criteria can have an influence on the coating quality. Then the parameters and work steps such as coating material, coating thickness, pretreatment, finishing and much more are precisely adapted to the tool and the application.

Once the adapted coating solution has arrived in series production, regular checks reliably guarantee consistently high quality. All employees at the individual stations continuously check the working materials, the individual process steps, and the handling of the inserts at each work step. Random input and output checks at each order position are part of series production.

Incidentally, thanks to mirrored processes and productions in the CemeCon coating centers worldwide, tool manufacturers everywhere receive the same coating solution in the same quality as in Germany.

#### **HiPIMS coating materials for cutting inserts**

#### FerroCon®

for unalloyed and alloyed steels as well as cast iron

#### **Coating material:**

AlTiN-based

#### Max. operating temperature:

1,100 °C

#### Color:

Anthracite

## Coating thicknesses for cutting inserts:

3 μm, 6 μm and 12 μm

#### InoxaCon®

for stainless, high-alloy steels, titanium, nickel-based alloys and difficult-to-machine materials (CrCo)

#### **Coating material:**

TiAlSiN-based

#### Max. operating temperature:

1,100 °C

#### Color:

Copper

## Coating thicknesses for cutting inserts:

3  $\mu m$  and 6  $\mu m$ 

#### AluCon®

for aluminum, titanium, copper and other non-ferrous metals

#### **Coating material:**

TiB<sub>2</sub>-based

#### Max. operating temperature:

1,000 °C

#### Color:

Silver

## Coating thickness for cutting inserts:

2 µm







# THE RIGHT COATINGS FOR ALL MATERIALS

Hardened and stainless steels and titanium – silicon-containing coatings are the answer to materials that are difficult to machine. With SteelCon® and InoxaCon®, CemeCon has the right coating material for every application. Visually, the two are almost identical, while the differences are hidden inside.

"Generally speaking, the tougher the coating material, the more suitable it is for machining soft materials. With its high toughness, our HiPIMS coating material FerroCon® is therefore ideal for machining precisely such steels at high feed rates and cutting speeds. The harder the material, the higher the temperature in the machining process. This is

why hard and resistant coatings are required here. Silicon-doped coating materials are the solution," explains Manfred Weigand, Product Manager at CemeCon. "With our two silicon-doped coating materials InoxaCon® and SteelCon®, we optimally cover the complete range for difficult-to-machine materials thanks to their different coating properties."

As the name implies, the HiPIMS coating material InoxaCon® offers ideal conditions for the reliable machining of stainless steels. It is hard and tough at the same time. Here, these two properties more or less balance each other out. At the same time, it has a low affinity for stainless steels, which have a tendency to build up. This reliably prevents

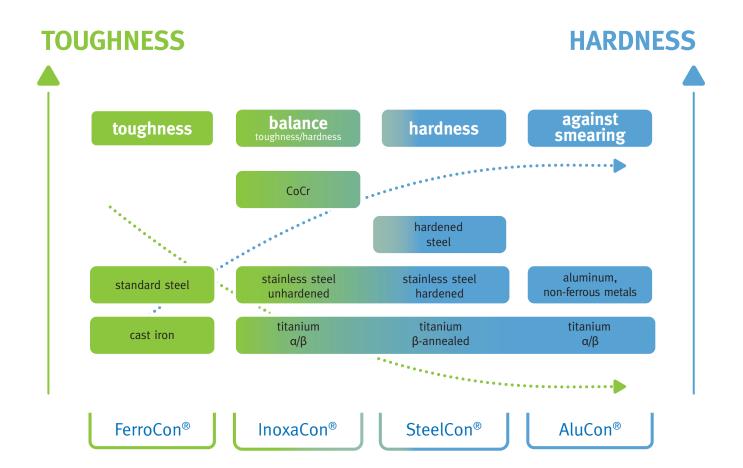
SteelCon® (left) and InoxaCon® (right): Hard to distinguish from the outside, but different on the inside. The layer properties determine the respective area of application











premature wear and ensures process reliability. In addition, InoxaCon® is very smooth, which reduces heat in the cutting process and optimizes chip flow. InoxaCon® also plays out its advantages when machining chrome-cobalt alloys: The smooth surface of the coating reduces friction. Because of its very good coating properties, InoxaCon<sup>®</sup> is available in two coating thicknesses, 1.5 µm and 3 µm. With this, cutting edges are kept extremely sharp so that the feed rate and cutting speed can be selected for minimum cutting forces – i.e. low pressure. InoxaCon® thus prevents work hardening and ensures process stability.

The new coating material SteelCon® is extremely hard. Coupled with a

nevertheless high toughness and excellent adhesion, it produces very high wear resistance – perfect for machining hardened (stainless) steels beyond 50 HRC. It has a dense layer structure, and thermal stability has been increased. These are top prerequisites for best performance in hard machining. Like InoxaCon® and the other HiPIMS coating materials, SteelCon® is extremely smooth due to the process. 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. This combination of properties results in significantly longer tool life and excellent machining results - even in other materials that are difficult to machine. This is

demonstrated by numerous applications.

"Visually, there is no difference between InoxaCon® and SteelCon®. The different structure of our two silicon-doped coating materials provides the right solution for every application. In addition, we turn many other screws for an individual premium coating," says Manfred Weigand. "In addition to the coating material, these are the coating thickness, tolerances, pretreatment and finishing. In engineering, the process steps are then sensibly combined and adapted to the tool. The result is a customized coating specification that perfectly matches to the application."



"In order to find the BEST POSSIBLE
COATING for our matched micro tools,
our development team carried
out numerous laboratory tests.
One diamond coating clearly stood out
from the others and
delivered excellent results:
CCDia®AeroSpeed® from CemeCon."

Sales Manager MCT (Micro Cutting Tools) at HPTec GmbH

"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

"Technological change and modern materials pose challenges to hoggers again and again – at the same time they offer unique opportunities. As a tool manufacturer, our innovative strength is the key competence of our time. Increasingly, we are slipping into the role of a holistic process optimizer. In close cooperation with coating experts and end users, we bundle our extensive know-how and jointly develop application-specific PRECISION TOOLS – including COATING SOLUTIONS."

Stefan Zecha, Chairman of VDMA Trade Association Precision Tools and Managing Partner of ZECHA Hartmetall-Werkzeugfabrikation GmbH

"We have developed extensive expertise in all facets of tool production and we can offer our customers tool designs they can use to achieve QUALITY and PRECISION. Innovative technologies from strategic partners, such as the CC800® HiPIMS from CemeCon, are the key to our competitive advantages and, ultimately, successful and satisfied Horn customers."



Lothar Horn. CEO of Paul Horn GmbH



"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

"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

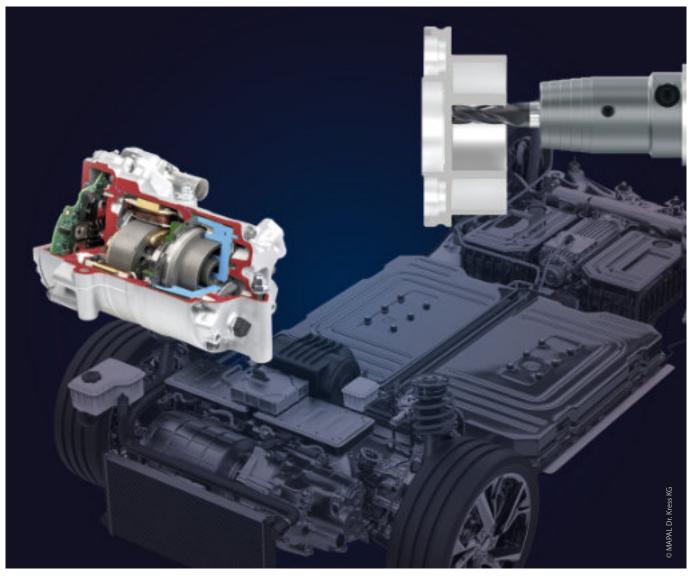


"With CemeCon's diamond coatings, for example, we have been able to significantly increase the PERFORMANCE of our cutting inserts – both in terms of tool life and machining quality."

Director of Alsameca

# AluCon®: THE BEST FOR NON-FERROUS METALS

Whether for e-mobility or in aircraft construction – lightweight materials such as aluminum and titanium-aluminum alloys are increasingly being used to reduce weight. These high-performance materials pose special challenges for machinists, which they can only meet with coordinated highend tools. The TiB<sub>2</sub>-based HiPIMS coating material AluCon® – the further development of the successful coating material AluSpeed® – enables such innovative tool concepts.



AluCon® opens up new potential in the machining of aluminum alloys for e-mobility

Like the well-proven coating material AluSpeed®, AluCon® is based on TiB<sub>2</sub>. The low affinity to non-ferrous metals and the high hardness make the coating materials so successful in the machining of aluminum, copper and titanium. The big difference: AluSpeed® is produced using the traditional sputtering process, while AluCon<sup>®</sup> is produced with HiPIMS, the further development of sputtering. This enhances the outstanding physical properties even further. AluCon® thus combines the advantages of AluSpeed® with the layer adhesion, density and hardness of the HiPIMS process.

Thanks to the coating thickness of 2 µm and its fine crystal structure, AluCon® is particularly suitable for aluminum machining with sharp cutting edges. The HiPIMS coating



#### **Materials:**

Aluminum, titanium, copper and other non-ferrous metals

#### **Coating material:**

TiB<sub>2</sub>-based

#### Max. operating temperature:

1.000 °C

#### **Color:**

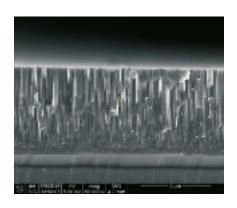
Silver

#### **Coating thickness:**

2 µm

#### **Tool types:**

Drills, milling cutters, reamers, threading tools and cutting inserts





The comparison of the SEM images makes it very clear: thanks to the production in the HiPIMS process, AluCon® (right) has a much finer structure than AluSpeed® left) and thus improved coating properties

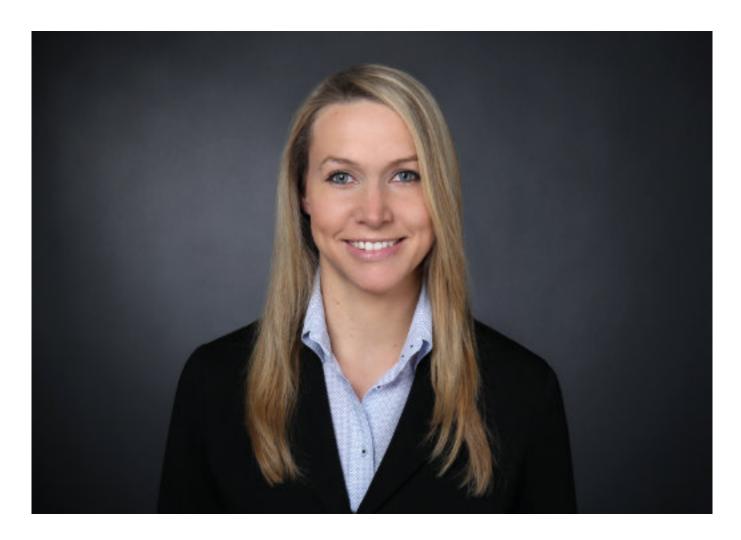
material provides excellent protection against built-up edges. The extremely smooth coating surface ensures optimum chip removal. The diminished friction lowers the temperature in the cutting process. The dense, closed layer structure also successfully reduces diffusion and thus wear at high operating temperatures. This results in significantly longer tool life. The very good adhesion coupled with the high hardness of 5,000 HV<sub>0.05</sub> and better ductility enables top performance in wet and dry machining - and that with increased cutting data. Thus, tools with an AluCon® coating achieve top performance when machining aluminum, copper and titanium.

"AluSpeed® has been the reference in terms of machining aluminum and non-ferrous metals for the past two decades. Since we introduced the HiPIMS coating material AluCon® to the market five years ago, numerous applications have shown that it can be even better. In all machining results, AluCon® achieves at least as good and in most cases even significantly better results than AluSpeed®. This proves once again: HiPIMS is the future of PVD coating. That is why we have decided to produce only the 'upgrade'. Thus AluCon® will now completely replace AluSpeed® at the end of the year," says Inka Harrand, Product Manager Cutting Inserts at CemeCon.





## NEW HEAD OF SALES EUROPE



"I am looking forward to the new CHALLENGE and my future TASKS as Head of Sales Europe. One of these will be to develop the sales structures in order to exploit the existing POTENTIAL even better.

I would like to express my thanks to Dr.-Ing. Beate Hüttermann the new CMO of CemeCon, in whose footsteps I am following. Her GUIDANCE and MANY YEARS OF EXPERIENCE are invaluable!

Together with the experienced and motivated CEMECON SALES TEAM, we can thus support our customers in the best possible way so that they can win new markets

with our first-class HiPIMS AND DIAMOND COATINGS.

Because their SUCCESS is our success!"

Christine Hammer, new Head of Sales Europe

## VISIT US AT THE AMB!

We show you how you can open up new markets with our high-performance HiPIMS and diamond coatings:

#### Machining aluminum with AluCon®

The perfect HiPIMS coating material for battery and component production in e-mobility

## Heavy-duty machining with FerroCon®Quadro

Produce components for wind turbines and machine rails economically thanks to high coating thickness



## Hard machining with SteelCon®

The HiPIMS coating material is a game changer and successful in hard materials, e.g. when machining injection molds made of hardened steels

Find us in hall 3, booth C50



## Machining zirconium oxide with CCDia®CarbonSpeed®

When machining crowns, inlays and bridges made of zirconium oxide, the diamond coating material ensures long service life, high precision and perfect quality of the dental restoration

## Carbide milling with CCDia<sup>®</sup>CarbideSpeed<sup>®</sup>

Milling instead of eroding! The diamond coating material makes it possible. The production of punches has now become much more attractive

#### **CAN'T MAKE IT TO AMB?**

#### 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 nothing but win with this!

Our coating experts are just a click away: coatingservice@cemecon.de

## PREMIUM QUALITY GUARANTEED

Those who have their precision tools coated by CemeCon can rely on premium quality. To ensure this, the experts use top-class, state-of-the-art measuring equipment and the know-how of qualified specialists.

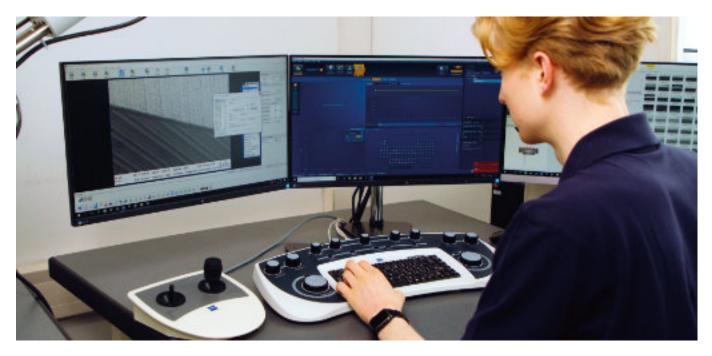
Determining material composition, measuring coating thicknesses, analyzing surface roughness, testing hardness and much more – in order to find the perfect coating solution for an application and ensure consistently high quality in series production, regular analyses and measurements are the be-all and end-all. CemeCon relies only on the best measurement technology: Tools are becoming ever more delicate and precise, and a high-end scanning electron microscope from Zeiss is the perfect "telescope" for detecting the finest details. With the new acquisition, the desktop scanning electron microscope, which has been available for some time, can now be used even more in everyday production for ongoing quality control. Are mechanical parameters of the coating important to you? A nanohardness tester from Anton Paar provides the answers.

BEST TRAINED IN ALL MEASURING AND TESTING METHODS

First-class measurement technology needs first-class experts to interpret the data. CemeCon trains and se-

cures qualified employees for the future. A good example is Stephan Geisen as a materials testing specialist. He learned his trade from scratch with the coating experts, specializing in metal technology, and after graduating in 2020 he has become the contact person for evaluating coating quality.

His tasks are diverse: Stephan Geisen uses a wide variety of measuring and testing methods as well as state-of-the-art equipment to examine coatings and materials for their properties, composition and also for possi-



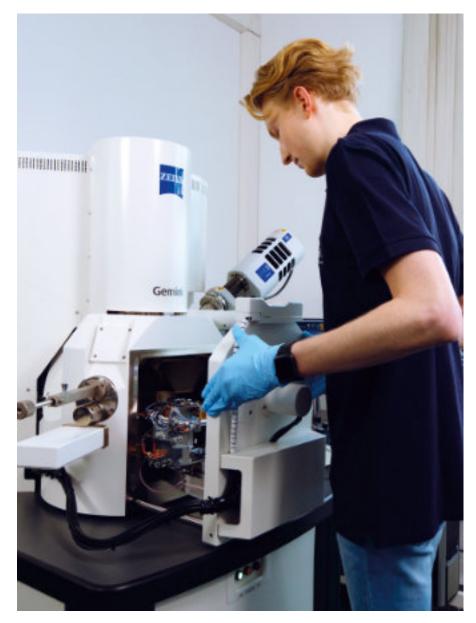
At CemeCon, analyses are important building blocks in processes and developments

ble defects. He checks cutting edges and the surface condition, determines the coating thickness, degree of hardness and more. Verifying measurements is just as much a part of the job as documenting the results for the tool manufacturer – and of course keeping an eye on the market for measurement methods. Since his training, Stephan Geisen has been cooperating with various institutes at RWTH Aachen University and industrial companies in order to always be up to date with the various testing methods.

His work and expertise are important building blocks in many processes. "I enjoy to work on research projects. For example, I was involved in the I was involved in the development of the new HiPIMS coating material SteelCon®. It's always exciting when, thanks to my analysis results, the material composition of a coating material can be adapted and perfected," says Stephan Geisen enthusiastically.

THE CLOSE LOOK
DURING ENGINEERING
AND SERIES PRODUCTION

Another important field of work for the materials tester is engineering. With his examinations of the customer's tool and prototypes, he helps tailor the customer's own premium coating individually to the requirements of the precision tool manufacturer. After all, an inspecting eye is crucial right from the start, in order to ensure outstanding quality



Stephan Geisen examines premium coatings and materials using the latest measuring and testing methods and state-of-the-art equipment

in series production later on and to always supply customers with the best possible coating in the same specification.

Continuous checks by all employees at the different stations of the workflow ensure reliable and consistently high quality in series production. The working materials, the individual process steps and the handling of the tools are checked at every work step. This also includes

random input and output checks at each order position. Stephan Geisen: "Although quality control in our own coating production is not one of my main tasks, I do of course support my colleagues with the required special examinations if necessary. Also, during acceptance testing of new equipment for in-house coating of our customers, I check whether all material values meet the high CemeCon standards."

## **INCREASE PROFIT WITH HIPIMS**

The CC800° HiPIMS is the fastest, most flexible and most economical coating system on the market. A turnkey solution in their own production opens up an easy way for tool manufacturers to produce high-performance products with HiPIMS coatings and thus achieve competitive advantages in the market. Most important for US customers: Thanks to the training provided by CemeCon Inc. experts at the coating center in Horseheads, NY, any employee who can grind precision tools can produce premium coatings with a CC800° HiPIMS.

The decision to use your own inhouse coating is a very special step and sets the course for the future. An important success factor is the right technology: CemeCon's HiPIMS systems not only enable in-house coating production, but also deliver premium coatings with a future-proof technology. At least as important is a local partner who accompanies the

turnkey customer from the first step, trains the employees in the operation of the system and supports them in the development of their own coatings. US tool manufacturers









The CemeCon Inc. team supports customers with all coating technology needs. Top left: Eli Roberts, Technical Manager (r.), Kristi Holmes (I.) and Travis Lee of Coating Services. Top right: Marjorie Steed, President, Ryan Lake (I.) and Pete West (r.) of the Sales team. Bottom left: Kim Lambert (I.) and Tyler Taft (r.) of coating services. Bottom right: Kameron Waxman (r.) and Eli Roberts (I.) from Technical Support

## CemeCon coating materials worldwide in the same quality

In the recently expanded coating center in Horseheads, the coating experts turn numerous adjusting screws: coating material, coating thickness, tolerances, pretreatment, and finishing make the tool along with the coating to successful. Thanks to mirrored coating processes, all CemeCon coatings have the same quality worldwide.

will find all this at the coating center of CemeCon Inc.

"We have been operating a coating service for cutting tools in Horseheads ourselves for many years and have just expanded our capacities with another HiPIMS system. From daily practice, our team knows all the processes and workflows down to the smallest detail. The users benefit from this. Our transparent technology transfer guarantees customers the best possible support at every stage of their coating engagement. After the training in our coating center, the employees are very familiar with the CC800® HiPIMS and the first self-coated tool can be sold directly after installation," says Ryan Lake, Sales Manager at CemeCon Inc.

If the tool manufacturer then decides in favor of a CC800® HiPIMS in his own production, he receives a complete package consisting of substrate pretreatment, coating system and all other necessary peripherals - and on top of that the full service package "made in the USA". With our decades of experience, we can adapt the system to the wishes, requirements and local regulations in North America. CemeCon HiPIMS makes it easy for the tool maker: The cutting-edge technology is so well packaged and documented in the workflow that the employees of the tool maker are skillfull in doing coating themselves after the training.

**NOW NEW AT THE COATING CENTER IN HORSEHEADS:** 



#### SteelCon® – THE GAME CHANGER

When machining hardened steel beyond 50 HRC, precision tools with SteelCon® coatings achieve top performance. In addition to hard machining, the latest HiPIMS coating material shows its strengths in stainless steels, titanium, quenched and tempered steels and many other materials.

ALSO NEW: HIPIMS AICrN

With HiPIMS AlCrN for shank tools, there is now another option for milling steels and cast irons as well as for various drilling applications.

SteelCon® – game changer in hard machining

With the addition of SteelCon® and HiPIMS AlCrN, CemeCon Inc.'s coating service offers five HiPIMS coatings with thicknesses ranging from 1 to 8 µm for best-in-class performance in nearly all metalworking applications.

Customers with their own CC800° HiPIMS have access to all CemeCon coating materials on request, including FerroCon°Quadro and TapCon°, for example. Or they can simply develop their own unique coating with the system.

"The great demand for our coating technology in the North American market shows us that we are on the right track. With our training and support, toolmakers quickly gain the confidence and sovereignty to easily master the coating process and respond fast to the changing needs of the machining sector. This ensures the profit – right from day

one," says Marjorie Steed, President of CemeCon Inc.

And if questions do arise about the turnkey coating system installation? The experience of CemeCon Inc. is just a phone call away. We're happy to answer any questions about coatings and coating technology – 24/7 for your success.

# HiPIMS Coatings for Micro Tools

InoxaCon®









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## 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!

READER SERVICE

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