

Industries in upheaval: Drive turnaround changes machining tasks. High-performance coatings from CemeCon as the solution

Electric drives are increasingly replacing traditional combustion engines. As a result, many engine components are no longer needed. They are being replaced by completely new components made from materials that are sometimes difficult to machine—with corresponding new requirements for cutting tools. Thanks to high-performance coatings from CemeCon, tool manufacturers can face these challenges with confidence.

The move away from conventional drives is becoming increasingly apparent—especially in the automotive industry. However, electrification has long since penetrated far more areas: Two-wheelers, construction machinery, motorized work equipment or industrial trucks such as telescopic handlers and forklifts are also gradually being equipped with electric drives. A far-reaching structural change that undoubtedly poses challenges for the machining industry. Because wherever a combustion engine is replaced by an electric drive, other components are installed. Changing shapes and modern materials are placing fundamentally new demands on processes and tools.

New materials—new challenges—new opportunities

In the past, the majority of machining tasks involved aluminum, cast iron and steel components for engine blocks, cylinder heads or crankshafts for combustion engines. Today, typical components of electric drive systems—motor housings, battery frames or components for thermal management—are increasingly made of aluminum and magnesium alloys. These materials are challenging to machine and are often thin-walled and therefore very sensitive to vibration. The mixed machining of different material combinations, such as aluminum motor housings with pressed-in steel bushings, is particularly complex.

For toolmakers, this new variety of materials means that many previous solutions will soon be obsolete. However, this does not have to jeopardize their own economic success—it can be consolidated and even expanded with coordinated, specialized precision tools. “Tailor-made

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coating technologies are a good way forward here,” says Inka Harrand with conviction. The experienced product manager for cutting inserts at CemeCon explains the target-oriented approach: “To ensure maximum performance, we first identify the right coating material. Then we tailor the coating precisely to the tool, component geometry, material and machining situation. With our highly developed processes, we make a decisive contribution to maximum precision and flawless surface finishes in every specific application.”

Using coatings of the future today

CemeCon offers the perfect answer to the special requirements that modern lightweight materials—aluminum and magnesium alloys—place on cutting tools during machining. The HiPIMS coating AluCon® for round tools and cutting inserts, for example, has already proven itself in an exceptionally wide range of applications. With its smooth coating, which is only 2 µm thick, it is extremely effective in preventing built-up edges from occurring in the first place. At the same time, the high hardness and nanocrystalline structure of AluCon® enable outstandingly long tool life and high cutting speeds when machining aluminum—for battery housings, for example.

Another important component to be machined is the scroll compressor. It is a central element of the temperature management in electric vehicles and was previously mostly made from heavy iron materials. With the switch to aluminum, the compressor is a current prime example of the change in materials due to the demand for lightweight construction. Tools with adapted CemeCon diamond coatings from the CCDia® series are an ideal solution here. They enable precise, reliable, highly efficient and economical machining of the aluminum alloys with increased silicon content from which the complex-shaped components are manufactured today.

Other future-proof coating solutions are also already tried and tested. For the demanding mixed machining of aluminum-steel components, for example, CemeCon offers InoxaCon® and InoxaCon® Plus tool coatings with high wear resistance. The characteristic red-gold HiPIMS coating material with its balanced ratio of hardness and toughness combined with very high temperature resistance is predestined for high-performance applications in this area.

Active partnership right from the start

“If you rely on the right partner, your range of tools can hold its own in the dynamic competition in the long term,” summarizes Manfred Weigand, CemeCon Product Manager Round Tools. “Our material expertise, which has grown over decades, our close cooperation with users and the efficiency of our own coating center make us an active, strategic ‘ally’ in tool development.” This is expressly about an active partnership: Through early consulting, engineering and process support as early as the development phase, the optimal coating becomes an integral part of the overall concept of the ‘precision tool of the future’.

Box 1:

AluCon® for non-ferrous metals

Aluminum alloys are gaining widespread acceptance as versatile lightweight materials in more and more applications. Thanks to the TiB₂-based HiPIMS coating material AluCon®, machinists can meet the challenges of machining aluminum and other non-ferrous metals with ease. AluCon® is a nanocrystalline, extremely dense and smooth coating material with maximum coating adhesion and a hardness of up to 4,000 HV0.05.

It effectively prevents built-up edges and ensures optimum cutting results even at high temperatures.

Box 2:

InoxaCon® Plus for stainless steels, titanium and steels up to 70 HRC

Very hard and tough materials place high demands on cutting tools. CemeCon has developed the coating material InoxaCon® Plus especially for the high-precision machining of high-alloy steels or titanium. Thanks to its temperature stability, outstanding adhesion and high degree of hardness, it guarantees reliable processes and a long tool life. In addition, its very smooth surface with extremely low coefficients of friction effectively prevents built-up edges and adhesions.

Bildunterschrift 1:

The turnaround to electric motors is creating many new machining tasks. New types of components, such as those made from aluminum and magnesium alloys, are challenging to machine

Bildunterschrift 2:

Extremely smooth and with layer thicknesses of only 2 µm, AluCon® is highly effective in preventing built-up edges from forming in the first place

Bildunterschrift 3:

CCDia® coatings ensure precise and highly efficient machining of scroll compressors made of aluminum alloys with increased silicon content

About CemeCon AG

CemeCon is the world market leader in diamond coating and technology leader in PVD coating of precision tools for machining. The coating materials required for premium coatings are produced within the coating systems developed by CemeCon.

Customers make use of the company's expertise in both coating services and plant engineering. Renowned tool manufacturers worldwide use the technology and expert knowledge of CemeCon for their own competitive advantage and to open up new business areas.

CemeCon has brought the future technology HiPIMS to market maturity. It combines the advantages of all common PVD coating processes – and that with high economic efficiency. With HiPIMS, maximum performance and a significantly longer tool life are possible even when machining materials that are extremely difficult to machine. Maximum productivity in the machining of innovative materials – such as fibre-reinforced plastics, ceramics or graphite – is guaranteed by the patented multilayer technology in diamond coating developed by CemeCon.

Founded in 1986 by Dr. Toni Leyendecker, CemeCon AG has expanded continuously over three decades. At its headquarters in Würselen, the company operates the world's largest coating center. All important international markets are served from there and from the centers in the USA, China and Japan as well as by our sales partners in the Czech Republic, Denmark, Taiwan, Korea, India and Russia.

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