

SULZER

Sulzer Metco

MAXIT[®] CrN
PVD High-Performance Coatings

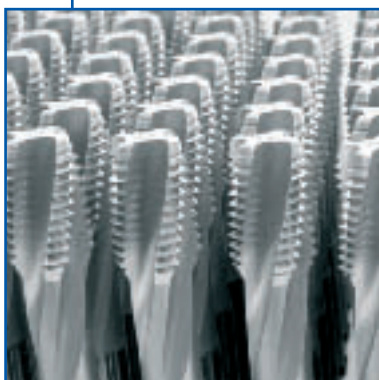




MAXIT® CrN-coatings:

The development of MAXIT® CrN focused on the universal usability of the hard coatings in the areas of metal forming technology and plastics processing. Here the selection of this coating material was based on the following aspects:

- CrN offers a chemically saturated structure.
- CrN offers besides a well pronounced toughness a relatively high resistance against oxidation compared to TiN or TiCN coatings.



The chemically saturated structure efficiently prevents cold welding in the case of metallic wear during metal forming, respectively sticking of moulding materials (deposits) during plastics processing.

Moreover, the excellent adhesive properties permit also metal forming processes during which extremely high shear forces occur, for example in the case of backflow presses.



CrN characteristics:

- Monolayers
- Coating thickness 2 to 5 µm
- High oxidation resistance
- Very good adhesive properties of the coating
- Resistant to solvents

Typical areas of application:

- Metal forming tools
- Bending and breaking-down rollers
- Plastics processing
- Medical technology
- Engine components (automotive industry)
- Pump components in the area of fluid technology

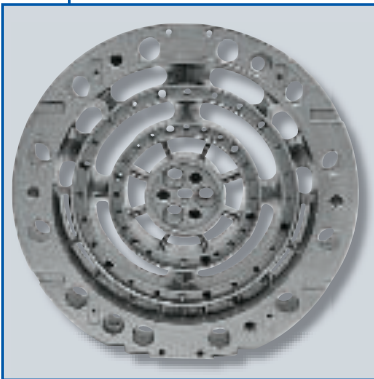


| Properties | Coating-types | | | | |
|-------------------------|---------------|----------------|---------------|-------------|--------------|
| | CrN | CrN-multilayer | CrN-modified | TiN | TiCN |
| Hardness HK | 2100 - 2500 | 2100 - 2500 | 2200 - 2700 | 2300 - 2800 | 2800-3300 |
| Max. operating temp./°C | 650 | 650 | 700 | 500 | 400 |
| Ductility | Very good | Very good | Good | Good | Satisfactory |
| Colour | Steel gray | Steel gray | Multicoloured | Gold | Gray, copper |

CrN-Multilayer

MAXIT®

Wear Protection



MAXIT® CrN-multilayer:

The development of the CrN-multilayer was mainly based on the demand for an especially thick and highly adhesive coating ($> 6 \mu\text{m}$). In addition multilayer structures also offer the benefit of confining corrosion as it may, for example, occur in connection with the processing of plastic materials. Thus can be caused by for example the residual humidity in the granulate material, in mould separating agents or in decomposition products. Since the CrN-multilayer structure itself is corrosion resistant, corrosion resistance may be attained by depositing a system of coatings which is as dense as possible.

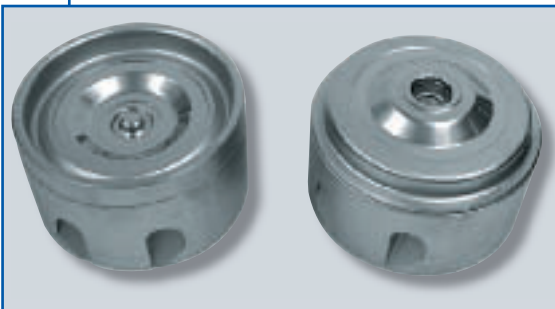


In numerous applications there exists the necessity of being able to adjust a well-defined surface roughness and maintain it. When coating eroded tool surfaces for plastic injection moulding or in the case of the feed rolls used in sheet metal processing, the requirements with respect to abrasive wear of the surfaces are high. These requirements are met by the CrN-multilayer coating.



CrN-multilayer characteristics:

- Multilayer
- Coating thickness 3 to 9 μm
- Pure chromium intermediate coatings
- High degree of oxidation resistance
- Very smooth surface
- Excellent adhesive properties of the coating



Typical areas of application:

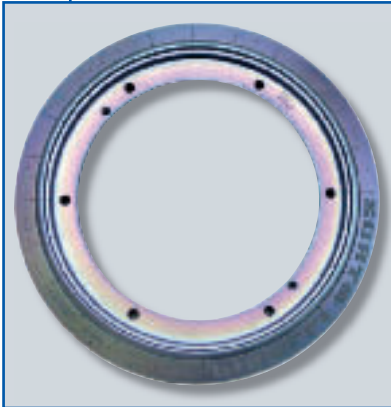
- Plastics processing (for example, injection moulding, extrusion, blow moulding)
 - Glass fibre reinforced PA
 - PVC
 - ABS
- Pressing/embossing rollers
- Forging



CrN-modified

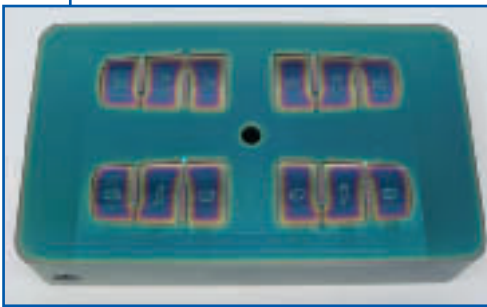
MAXIT®

Wear Protection



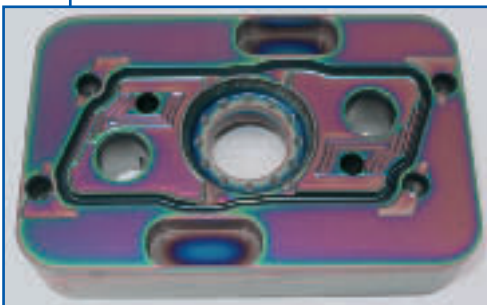
MAXIT® CrN-modified:

CrN-mod was developed especially for processing of highly adhesive plastic and elastomer materials as well as for metal forming of non-ferrous metals, light alloys and austenitic steels. The CrN-modified coating excels through its thin cover coating which is doped with special constituents. These form a glass like structure with a very low degree of surface energy. This property yields highly wear resistant surfaces with an extremely low tendency of sticking.



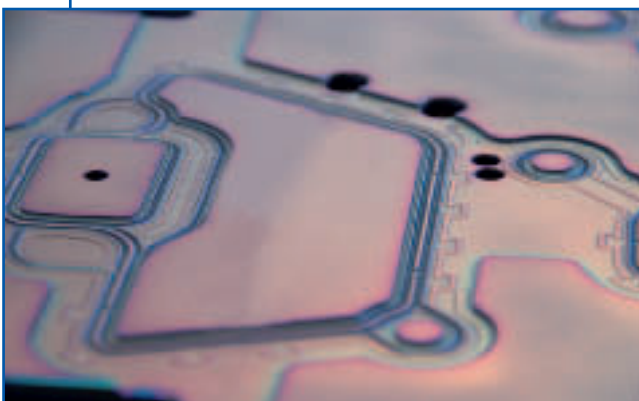
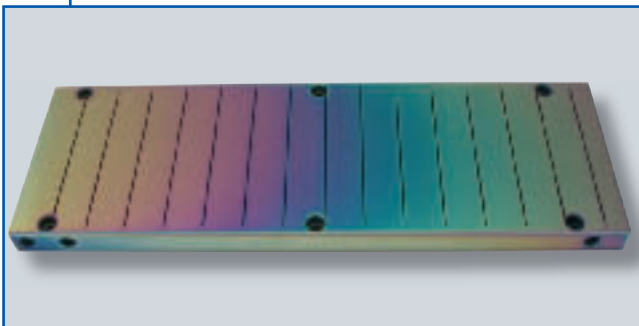
CrN-modified characteristics:

- Multilayer structure with a glass-like cover coating
- Coating thickness 3 to 9 µm
- Extremely low tendency of sticking
- Very low tendency of cold welding



Typical areas of application:

- Plastic and elastomer material processing (for example, injection moulding and extrusion)
 - PMMA
 - POM
 - PUR
 - NBR
 - Fluorcaoutchouc
- Metal forming technology
 - Austenitic steel (V2A, V4A)
 - Light metal alloys (aluminium 5XXX, titanium Ti6Al4V)
 - Non-ferrous metals
 - Zinc coated sheet steel



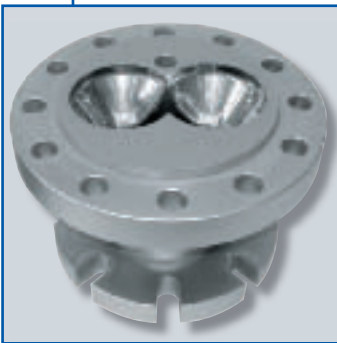
Process

MAXIT®

Wear Protection



The chromium nitride coatings (CrN) developed by Sulzer Metco are deposited using the PVD Arc process.



The significant advantage of the Arc process compared to sputtering is the considerably higher energy density of the plasma during the deposition process. Ionisation degrees of up to 100% ensure in the case of the arc process the significantly higher hardness and density as well as significantly improved adhesive properties of the wear protection coatings compared to the sputtering process. These are important parameters for the improvement of the operative properties of metal forming tools, for example. Whereas the ionisation degrees of typical sputtering processes amount to only 10 to 15%, even the most modern sputtering processes which offer ionisation degrees of up to 40% can principally not be used to attain the properties of Arc coatings.



CrN coatings excel compared to other classic hard coatings like TiN, TiCN and AlTiN through their excellent adhesive properties and low friction levels. Such properties are specially demanded in the area of metal forming technology where massive mechanical stresses and high shear forces occur in particular when processing austenitic steel and non-ferrous metals.



The chemically saturated and dense structure of CrN provides in the area of plastics processing the basis for good sliding properties of the moulding material on the tool surfaces. Through the multilayer structure, the individual layers are sealed by metallic intermediate layers so that decomposition products which might be corrosive can no longer diffuse through the coating and cause base metal corrosion.



In the instance of coatings belonging to the type CrN-modified the quasi-amorphous doped cover coating of a ceramic nature ensures pronounced anti-adhesive properties with respect to highly sticky moulding materials like EVA and ABS, for example. In connection with a high coating hardness the amount of abrasive wear caused by hard fillers is also significantly reduced.

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Sulzer Metaplas represents within the Sulzer Metco division the technologies: PVD coating and plasma-assisted heat treatment

