

Press Release

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Plasma Nitriding and PVD Coating: The Combi Treatment

The ongoing improvement in quality and performance for plastics and elastomers makes it necessary to upgrade tools for highest performance as well.

Multiple wear mechanisms take effect on tools or components surface. It is mainly caused by additives within plastics. Modified plastics include particles and corrosive reaction products which stress the forming tool during production process. This leads to abrasive and erosive wear and cavitations. Also adhesive interactions may lead to tool failures. Production downtime as well as removal and reworking measures on tools imply enormous economic losses.

PVD high performance coatings can prevent early tool failure. Additionally a nitriding previous to a coating process increases tool surface performance.

To prevent tools from previously described tribological wear mechanisms by hard particles, such as glass fibre, it is necessary to add a plasma nitriding process before coating. This allows optimizing the tools strength characteristics independent of the surface hardness and surface chemistry of the base material.

Plasma nitriding is a classic thermo-chemical surface treatment. This process increases on the one hand the surface hardness because of the diffusion of nitrogen in the surface zone and on the other hand the protection against plastic deformation. Thereby a solid foundation for the subsequent coating process is allocated. This process complicates the intrusion of particles into the base material. An optimum base for hard coating has been created.

Hard coatings by Sulzer Metaplas - a Sulzer Metco company - are created by physical vapour deposition (PVD) processes. For plastic and elastomeric industries the following PVD hard surface coatings have been proved to be of value: TiN, CrN, as well as CrN-multilayers and specially developed CrN-mod. DLC coatings of the types a-C:H:Me and a-C:H are also applied successfully, for example on ejector pins. The outstanding smooth and amorphous coatings of the type a-C:H are still the standard, for example for moulds used in CD- and DVD production. They are also widely used for the production of high-value optical surfaces in the packing industry.

Due to the high number of coating types and the possibility to coat at temperatures around 180°C a lot of different requirements can be met. The combination of plasma nitriding and PVD coating allows the use of tempering and lower hardening steel for tool manufacturing. The mechanical properties of the core material, like toughness and crack insensitivity remain unmodified after plasma nitriding and PVD coating processes.

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Figure 1: extruder screw during coating process in PVD system for large tools

The selection of the appropriate coating type has to comply with the plastics and elastomers used as well as with the specific parameters and processing techniques.

A maximum optimization in uptime and a simplification of cleaning can be implemented with special selected coating application. An enormous potential in increasing the lifetime can be achieved if coatings are already considered in the design phase of the tools. Also other production areas benefit from the increased durability. Product safety, reliability of delivery and competitiveness enhance every area of a company.

Enormous possible savings and less economic losses compared to uncoated tools argue for the use of coated tools and components.

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