



## NEWSLETTER DTI TRIBOLOGY CENTRE

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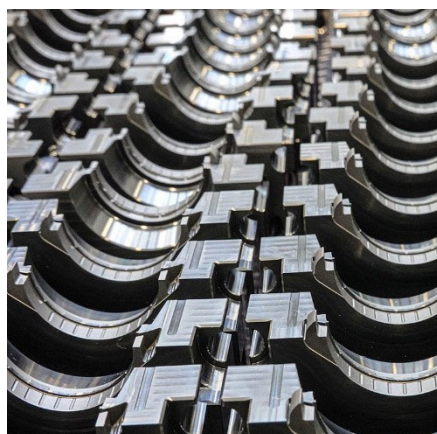
### Coating of larger series of 3D printed tool parts

As something rather new we are currently receiving larger series of 3D metal printed tools and components for PVD coating. This indicates that the production chain is beginning to adapt to 3D metal printed tool parts and components, whenever the 3D printing technology provides additional benefits compared to conventional machining.

This is often the case for complicated geometries, not directly accessible by conventional 5-axis CNC/EDM machining or if the components have complicated internal geometries, where e.g. cooling channels need to follow surface contours.

We see different types of base materials such as stainless steel (AISI316), titanium alloys and different tool steels like W.Nr. 1.2344 (H13) or W.Nr. 1.2709 (MS1).

The picture below shows a series of relative complex tool parts with conformal cooling channels. The tools have been produced by a combination of 3D metal printing and traditional machining. The tools are made in precipitation hardening steel (W.Nr. 1.2709) and subsequently coated with DLC-TR to prevent galling on the sliding surfaces and to increase the wear resistance in general.



Larger series of 3D metal printed tool parts coated by DLC-TR.

The various coatings used for 3D metal printed tool parts and components are typically:

#### **CrN-SD:**

CrN-SD (Chromium nitride SuperDense), is an allround chromium nitride, suitable for tools, wear parts and machine components. The hardness of CrN-SD is 3-6 times higher than hardened steel and around 2 times higher than conventional electroplated hard chromium.

CrN-SD solves wear issues, fretting/galling. Furthermore, it provides improved release properties in connection with injection moulding and prevents mould wear from dye and fillers.

#### **CrN-SS:**

CrN-SS (Chromium nitride SuperSlip) is a specially developed coating that provides excellent slip properties in connection with injection moulding. CrN-SS is based on a combination of CrN and a special post ion implantation. CrN-SS solves slip issues and provides wear protection. Furthermore, it gives the moulding process a larger and more stable process window, enabling faster cycle times and more robust production lines.

#### **DLC-TR:**

DLC-TR is a functional gradient low-friction coating that consists of an adhesion layer, a transition layer and a low-friction top layer. DLC-TR lowers the friction, enabling reduced need or even total elimination of lubricants. Furthermore, it solves galling, friction and wear issues.

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