AlTiCrN TripleCoatings\textsuperscript{3®} in Gear Manufacturing
AlCr based coatings are today the state of the art in the machining industry. In addition to the pristine Al-Cr coatings, the leading manufacturers have recently brought new coatings onto the market, which contain in addition Ti and even Si. With the conventional spot cathode technology one needs for these coatings different and expensive alloyed targets. Since the life time of a spot target is generally in the region of 25 batches, the targets (respectively the cathodes) must be changed fairly often.

PLATIT’s technology with rotating cathodes (LARC®: LAteral Rotating Cathodes; see figure 1) works predominantly with non-alloyed targets, whereby the stoichiometry and the structure of the coating can be freely programmed. Since the rotating cathodes can deposit over 200 batches, cathode changes are extremely seldom even with various coatings. Flexibility is combined with cost-effectiveness.

The pretense that the spot targets are cheap is deceptive. Regardless of
• the wage and changeover costs due to the much more frequent cathode change, and with this also the interruptions in production and
• the storage costs for the multiplicity of targets,
• the costs of the targets of the PLATIT rotating cathodes are over 20% cheaper per tool than the costs of the spot targets (see figure 2).

AlCrN coatings

If one only has 6 of the same alloyed cathodes (e.g. Al-Cr/70-30%) in the chamber, one achieves good productivity, but the coating however will only be able to create a monoblock structure. With two rotating cathodes (Al and Cr) one can deposit the triple structure (Triple-Coatings®), see figure 3:
• The base layer of the AlCrN® coating is CrN, with the best adhesion.
• The core layer is a nanolayer Al/CrN with a very high degree of toughness and crack absorption.
• The top layer is a monoblock (AlCrN) with a very high degree of hardness and wear resistance. The composition does not have to be 70:30%, which would be a compromise.
The top layer is again a AlCrN coating, which is optimised for hardness and with a very high degree of abrasive wear resistance.

**AlTiCrN**

The Al-Ti-Cr coatings produce the best results in the area of wet processing. The optimum structure here is again totally different from a simple monoblock (see figure 5):

- The adhesion layer of the AlTiCrN is a relatively thick CrN. Very many older machines work with cooling. The rigidity of this is generally lower than that of modern dry machines. The thick CrN base coating also simplifies the decoating of hobs.
- The AlTiCrN core layer is a typical all-in-one coating. It combines the positive properties of Al, Ti and Cr.
Outlook

The number of coatings used in machining exploded in the last decade [3]. Dedicated coatings, which are tailored to the application, increase performance in special application areas. Dedicated coatings cannot be carried out by job coating services, particularly for small and medium sized companies. For this reason there is an enormous increase in the importance of in-house coating which is integrated into the mechanical manufacturing process. One requires very flexible coating equipment and the corresponding pre-treatment methods and units, in order to deposit the different optimum coatings for the various application areas. For:

- Preparation of cutting edges,
- Cleaning,
- Decoating,
- Measurement and Quality Control as well as
- Handling.

With the rotating cathodes PLATIT offers very flexible coating equipment as well as turnkey solutions with the associated peripheral units. There are already hundreds of these systems installed worldwide. The most important aspect of this is the PLATIT Open Source (POS®) principle. Open Source means that PLATIT supplies turnkey systems with the complete know-how. In this way the customer and user, i.e. the tool manufacturer, can generate his own new products (e.g. new dedicated coatings) and thereby achieve a significant market advantage and profit. And PLATIT does not compete with him because PLATIT doesn’t do job coating. PLATIT concentrates on support of its machine customers.

The payback of the investment in a turnkey coating system is generally under 2 years [1].

References