Dedicated PVD Coating Development for High-Performance Gear Hobbing

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**Motivation**
- Increasing global gear production (approx. 90 million units in 2014)
- Gear hobbing is the commonest green manufacturing process
- Specific characteristics of hobbing are continuously changing chip thicknesses
- Sophisticated demands for the coated cutting edge

**Test Setup and Conditions**
- To investigate wear behaviour in gear hobbing an analogy test is used
- Wear behaviour of a full hob can be reproduced using only a single tooth

**Hobbing**

**Fly-Hobbing Test**

- Tests were conducted on a Liebherr LC180 hobbing machine using a manual transmission gear geometry
- A gap of a gear is generated via multiple generating positions (GP's)
- The wear of a tooth is caused by superpositioning of all GP's

**Coating Thickness & EdgePrep**
- Edge rounding by wet blasting
- Increased surface roughness for higher radii
- High tool life possible for wide radius range

**Coating of Fly-Hobbing Teeth**
- Edge prep & Coating of fly-hobbing teeth like a real hob
- Realistic shadowing during micro blasting & PVD process

**High Bias Voltage**
- All tested coatings with 4 µm coating thickness
- High Bias: Top layer with +70% increased Bias voltage

**Multilayer with Nanolayered Substructure**
- Multilayer Structure:
  - Alternating hard & tough AlCr based layers
  - Composition by ARC control
  - Alternating Al and Si or Ti content
  - Period: 50 – 100 nm

**Testing Nanostructured QuadCoatings\textsuperscript{4}**
- Base coating:
  - AlCrN/SiN: CBN, columnar
  - AlCrN: Fine columnar
  - nACRN = AlCrN + SiN: Very fine structure
- AlCrN with Ti doped top layer inhibits crater wear best, shows lowest flank wear and highest tool life!

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