

THE NEW LOW FRICTION COATING FOR ALUMINUM FORMING

New CARBON-X®-AL decreases the production costs and enhances the environmental soundness of the manufacturing process

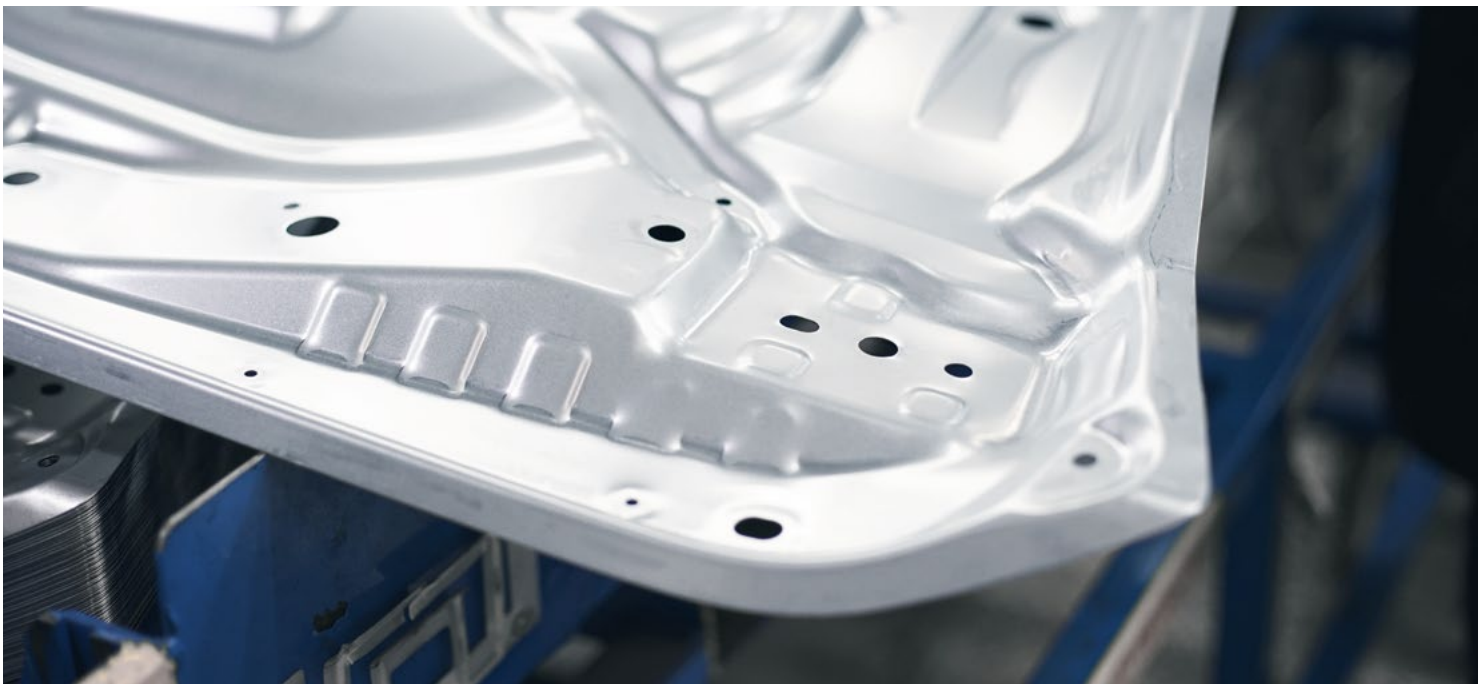
During the last decades the application of aluminum and its alloys has gained major importance in industrial segments, such as in the automotive and the aerospace area, due to its light weight, great formability and better recyclability.

However, as aluminum does not flow like steel and exhibits a higher adhesion affinity the forming process is significantly influenced by the friction between the forming tool and the aluminum. To overcome this galling effects the optimization of the tool surface by application of PVD coatings and the appropriate lubrication is a major factor of the design and procedure of aluminum forming processes.

CHALLENGE

The most important challenge of aluminum forming is the lubricant selection and application. While oil-based lubricants have traditionally been employed in forming aluminium parts, changes in regulations, pre-treatment and waste treatment processes have driven the focus toward synthetic chemistries and/or reduced lubricant application.

The addition of optimized DLC based PVD-coatings with low friction properties decreases the galling tendency and increases the support of reduced insufficient lubrication and thereby enhances the tool performance and prolongs it's service life.



SOLUTION

In order to optimize the aluminum cold forming process with focus on tool performance and lubricant consumption, the R&D department of the voestalpine eifeler Vacotec designed an innovative DLC (diamond like carbon) based PVD coating system synthesized by sputtering technology, named CARBON-X®-AL. The CARBON-X®-AL exhibits superior hardness, remarkable abrasive wear paired with beneficial tribological behaviour to provide the best performance in the forming of aluminum sheet material.



“The DLC based CARBON-X®-AL coating combines the high hardness of diamonds and the lubricity of graphite, which enables its application under starved lubrication conditions. The combination of these properties along with high abrasive wear resistance makes CARBON-X®-AL an excellent protective coating for tools in the aluminum cold forming process.”

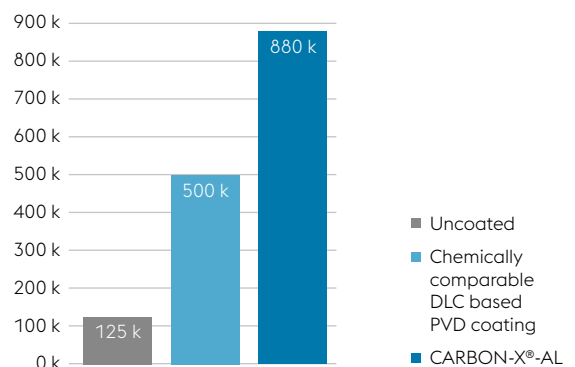
Dr.-Ing. Soroush Momeni, R&D Project Manager voestalpine eifeler Vacotec

THE RESULT

To underline the superior performance of the CARBON-X®-AL the coating has been tested on the industrial scale in an aluminum extrusion process (can production). The application of CARBON-X®-AL leads to a performance gain of about +75% (more flawlessly produced parts) as compared to punch-coated parts with comparable coating systems such as CARBON-X®. The decreased friction and reduced material adhesion compared to chemical comparable coatings (e.g. CARBON-X®) results in lower maintenance efforts.

Furthermore, the application of voestalpine eifeler sputtering technology (150 – 200 °C) ensures the deposition of CARBON-X®-AL on temperature-sensitive substrate materials.

Tool Life / Number of good parts stamped



Information on test procedure

Process: Aluminium extrusion
Punch material: D2 tool steel (1.2379)
Punch hardness: 60 ± 2 HRc
Formed material: An aluminium-based alloy (99.95% aluminium)

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