Technical article

Smart application expertise delivers four times the tool life

ta-C coating in progressive die stamping for optimized wear protection of high-strength stainless steel

When high-strength stainless steel sheets are machined, uncoated stamping and forming tools rapidly reach their limits. However, any wear-protection solution must also be economically viable – a requirement shared by the stamping and forming specialists at SAXONIA-FRANKE and their customers alike. As a surprisingly powerful lever for higher production volumes and measurable cost savings, the carbon-based BALINIT® MAYURA coating from Oerlikon Balzers outperformed all other approaches in achieving significant tool life extension.

The machining of high-precision stamped and formed parts is a core competence at SAXONIA-FRANKE. Headquartered in Göppingen, Germany, the family-owned company also demonstrates in-depth expertise in metal forming and injection molding, serving international customers primarily in the automotive, construction, and electrical industries. From the initial inquiry through to series production, the specialists consistently focus on component quality as well as efficient and reliable manufacturing processes.

Maximum tool loads when forming high-strength stainless steel sheet

To manufacture highly durable components, high-strength alloyed stainless steel sheet was stamped and formed in a single operation (progressive die stamping) using punches and dies in a stamping-bending process. During operation, the tools are exposed to extreme abrasive and adhesive wear, as they must withstand a tensile strength of 1,000 MPa.

“Uncoated tools suffer from premature failure after a very short time,” explains Lucas Höer of SAXONIA-FRANKE. As Assistant to the Management Board, he was involved in the search for solutions led by Andreas Ziller, former Head of Tooling, now retired. After initial implementation trials, Ziller also discussed the challenge with Alexander Sulz, Customer Consultant at coating partner Oerlikon Balzers. This resulted in the design of a tool made from high-speed steel with an AlCrN wear-protection coating. The result of initial production trial: around 140,000 parts produced. Economically sound, but still insufficient given the large-scale production volumes and the heavy machine utilization. “There had to be a better solution,” recalls Höer. The goal was clear: to keep downtime and scrap caused by tool maintenance and re-entry phases to an absolute minimum.

BALINIT® MAYURA makes the difference

These demanding conditions led Alexander Sulz to recommend a particularly high-performance coating solution: BALINIT® MAYURA. This hydrogen-free ta-C carbon coating offers extremely high hardness (> 65 GPa), making it ideally suited for abrasive progressive die stamping of high-strength stainless steel sheet. In addition, this material tends to cause material pick-up and galling – challenges that this wear-protection coating effectively addresses through its excellent anti-adhesive properties and exceptional smoothness. At the same time, the extremely low coating thickness – just 0.8 µm (mircons) in this case – ensures that sharp cutting edges are retained over long production runs.

Fourfold tool life extension ensures process stability and reduces costs

The recommendation proved spot on. The newly designed tool, now made from cemented carbide, was surface-treated using a special process at Oerlikon Balzers and coated with BALINIT® MAYURA. The result: 600,000 parts produced – more than four times the service life achieved with the previous solution. To further increase process reliability, SAXONIA-FRANKE replaces the tools after 400,000 strokes. This performance improvement significantly reduced maintenance and setup times as well as machine downtime. For the two punches installed in a single tool module, only one-third of the previous number of spare parts is now required.

Across all applications and operating periods, Lucas Höer estimates the annual cost savings compared with the previous solution at around €13,000. This clearly demonstrates how the right coating solution, combined with targeted application and surface engineering expertise, can increase tool life and significantly improve the economic efficiency of forming operations.

About SAXONIA-FRANKE GmbH & Co. KG

Founded in 1981 by Jörg Franke in Göppingen, SAXONIA-FRANKE has grown into a corporate group with four production sites in Germany, Switzerland, Slovenia, and the United States. With around 170 employees at its German headquarters, the specialist manufactures high-precision products using stamping and forming technology as well as plastic injection molding, serving international customers primarily in the automotive, construction, and electrical industries. An in-house tool shop together with a modern machine park form the technical basis for complete solutions – from co-development of demanding components to assembly of complex modules.
https://www.saxonia-franke.de/en/

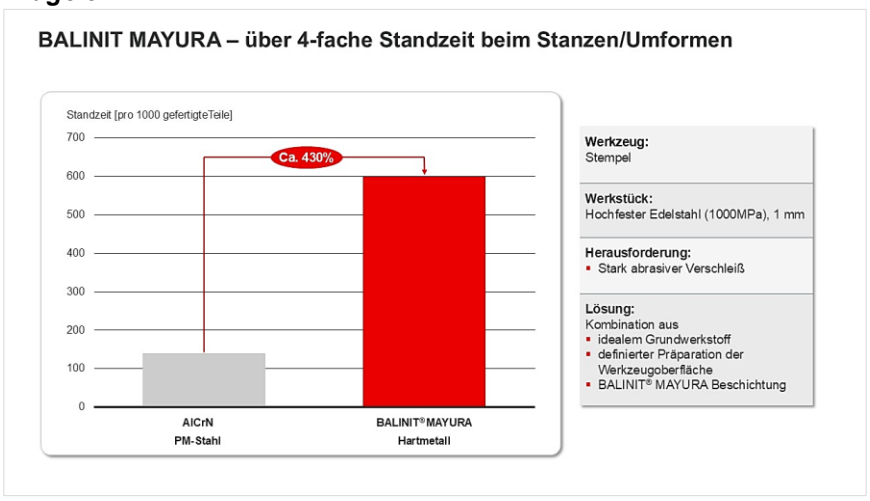
Image 1

On the right track (from left): Lucas Höer and Andreas Ziller (SAXONIA-FRANKE) Alexander Sulz (Oerlikon Balzers). They selected BALINIT® MAYURA for progressive die stamping of high-strength stainless steel sheet. / *Photo: Oerlikon Balzers*

Image 2

BALINIT® MAYURA ta-C coating applied to this cutting punch triples tool life in the series production of high-strength stainless steel stamped and formed parts. / *Photo: Oerlikon Balzers*

Image 3



Tool comparison: The new cemented carbide tool with BALINIT® MAYURA increased tool service life fourfold (up 430%) compared to AlCrN-coated PM steel – achieving 600,000 parts. / *Photo: Oerlikon Balzers*

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About Oerlikon Balzers
Oerlikon Balzers is one of the world's leading suppliers of surface technologies that significantly improve the performance and durability of precision components as well as tools for the metal and plastics processing industries.

Extremely thin and exceptionally hard coatings, marketed under the BALINIT and BALIQ brand names, reduce friction and wear. The BALDIA portfolio of diamond coatings enables top performance even when machining very challenging materials. The BALITHERM brand opens up a broad range of heat treatment services, whereas BALTONE comprises coatings that are available in a full range of elegant colours, perfectly suited for decorative applications. BALORA gives components effective protection from oxidation and corrosion in environments with extremely high temperatures. BALIMED ThinFilm coatings, with wear-resistant, biocompatible, antimicrobial and chemically inert properties, have been developed especially for medical applications. Under the BALIFOR technology brand the company has introduced technologies which provide tailor-made solutions for the automotive market.

Worldwide, more than 1,300 coating systems are in operation at Oerlikon Balzers' facilities and its customers. Equipment engineering and assembly of Balzers' systems are processed in Liechtenstein and in Bergisch Gladbach (Germany). Oerlikon Balzers operates a network of more than 100 coating centers in 35 countries in Europe, the Americas and Asia. Oerlikon Balzers is – together with Oerlikon Metco, Oerlikon AM, Oerlikon HRSflow, Oerlikon Riri and Oerlikon Fineparts – part of the Switzerland-based Oerlikon Group.

About Oerlikon
Oerlikon (SIX: OERL) is a global leader in surface technologies and advanced materials. With a unique portfolio spanning surface engineering, high-performance materials, coating equipment and components, we make products better by enhancing performance, efficiency and sustainability. Oerlikon serves a wide range of industries, including aerospace, automotive, energy, medical, luxury, semiconductors and tooling.

Headquartered in Pfaeffikon, Switzerland, Oerlikon operates in 38 countries with approximately 9,300 employees, achieving sales of CHF 1.6 billion in 2025.