

In the SPOTLIGHT:

REACH REGULATION: REPLACEMENT OF HARD CHROME WITH S³P

For many years hard chrome plating was an industrial standard process for wear and corrosion protection, but due to the European REACH regulations the application of hard chrome plating will be highly regulated after 2017. Beside desired properties like wear resistance, medium corrosion resistance and galling resistance the application of hard chrome is limited by reduced fatigue strength and flaking of the coating. S³P surface-hardening of corrosion resistant materials is an efficient alternative to hard chrome, which is superior to a coating in many applications thanks to its technological properties.



Corrosion resistant, hard yet ductile

Bodycote S³P (Specialty Stainless Steel Processes) offers processes that produce a very hard yet ductile diffusion zone with a surface hardness of more than 1000 HV 'microhardness' on the surface of corrosion resistant steels, nickel-based and cobalt-chromium alloys. Benefits of the processes include considerably enhanced wear resistance, which is superior to hard chrome plating in many areas, fig. 1.

Unlike coatings, the bending fatigue strength can also be significantly improved, which allows a more efficient design of components. No flaking occurs on the hard outer surface either. Especially product-contact applications of hard chromium can be safety-critical, fig. 2.

Low processing temperatures (< 500 °C), which prevent the formation of carbides and nitrides, are essential for the S³P hardening process. These precipitations would significantly reduce the corrosion resistance and most mechanical characteristics. A further advantage of the low processing temperatures is that no dimensional changes can occur on finished components, and thus no reworking is required. Another disadvantage of platings such as hard chrome is, that complex structures cannot be coated uniformly. Internal contours, indentations and even the smallest boreholes can be treated with S³P.

Benefits

- Avoids Cr⁶⁺ in manufacturing¹
- No flaking possible in diffusion-based processes
- Eliminates galling
- Retains corrosion resistance
- Increases fatigue resistance
- Improves wear resistance

¹ Galvanic baths for chrome plating consist of chromic acid, sulphuric acid and other additives. But the chromic acids in particular pose a problem. Harmful Cr⁶⁺, which occurs during the galvanic process, has triggered a rethink in the European Union. From 2017 the REACH Regulation (Registration, Evaluation, Authorisation and Restriction of Chemicals) will enforce considerably stricter regulations for the use of chromium trioxide. The substance is classified as carcinogenic and mutagenic.

The contents presented here are based on experiences and laboratory testings and are not a warranty of the performance of any product of any company.

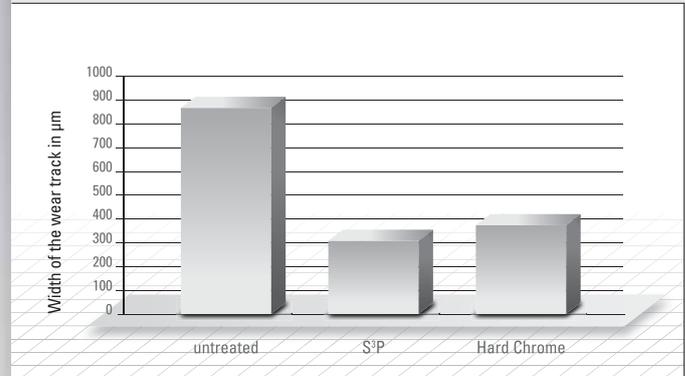


Fig. 1 Wear width in pin-and-disc tribometer (Al₂O₃ ball Grade 25 according to DIN 5402:2012), contact pressure: 100 N, sliding speed: 66 mm/s, wear tolerance: 5 m, base material: 1.4404; the S³P-treated component exhibits the strongest abrasion resistance.



Fig. 2 Hard chrome-plated cylinder with flaking due to dynamic stress; this problem does not exist with S³P treated surfaces.