In the SPOTLIGHT

S³P IN FOOD CONTACT APPLICATIONS

- NO DELAMINATION
- MAINTAINS CORROSION RESISTANCE
- NO GALLING
- FDA MASTERFILE

Bodycote

SPOTLIGHT

S³P – Specialty Stainless Steel Processes Food Contact Applications

Stainless steels are widely used in food and beverages applications because of their corrosion resistance and non-toxicity. Additionally, stainless steel surfaces demonstrate good cleanability and can be disinfected and sterilized easily. The Hygienic Design Guidelines by the European Hygienic Engineering and Design Group – (EHEDG) focus on design principles for optimal cleanability. Surfaces which are in contact with processed products should be free of surface defects such as cracks or grooves. The surface roughness should be Ra 0.8, or better. The cleanability is highly dependent on the surface topography.[1]

CoE Guidelines

Under certain conditions, metal atoms may leach and must be well below levels which might cause health issues. New guidelines on metals and alloys in food contact materials were published by the Council of Europe (CoE) in 2013. These guidelines include limits for metal transfer in food contact applications and a new, more aggressive test which applies citric acid as the food simulant. Sweden's KTH Royal Institute of Technology, Stockholm, tested several stainless steel alloys used in the food processing industry, proving that the migration of metals is significantly below the limits for all tested alloys.[2]

Scratches and wear reduce cleanability

Stainless steels are rather soft, which increases the risk of wear and galling. Due to wear, cracks or grooves may form and cause deterioration in cleanability and reduce corrosion resistance. Bodycote's Specialty Stainless Steel Processes, including Kolsterising® technology, increase the surface hardness of stainless steels to more than 1000 $HV_{0.05}$ without negatively affecting corrosion properties. A longer lifetime for processing equipment components in the food and beverage industry is therefore achievable, especially due to lower wear rates and the elimination of stainless steel's tendency to galling. This also presents opportunities to optimise component design, such as dosing pumps without the need of additional sealing (Fig. 1). Also delamination, and thus contamination of the product, is not an issue for these diffusion processes. S³P processes are acknowledged by the FDA and have been applied successfully in the food and beverage industry for over two decades.

In order to prove compliance with the CoE 2013 guidelines, surface hardened 316L sheet metals 100 x 100 x 2 mm with an as-rolled surface (2B) (Fig. 2) were tested for migration of metals in food contact applications after Kolsterising®. According to the CoE guidelines 5 g/l citric acid was used as an aggressive food simulant. The samples were immersed for 2 hours at 70 °C followed by 24 hours at 40 °C in total 3 migration cycles. The migration for 316L samples treated with Kolsterising® is significantly below the specific release limits by the CoE (Fig. 3), proving that Kolsterising® is safe to use in food contact environments such as food processing machines.

For applications in the food & beverage sector, a FDA master file is available for Kolsterising®.

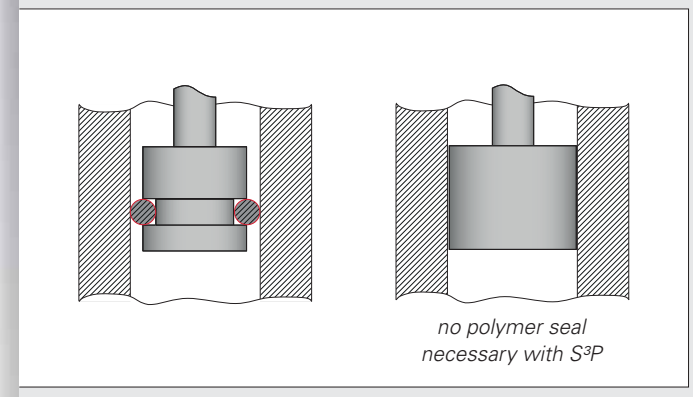

Fig. 1 Left: Without S³P – polymer seal necessary; Right: Metal on metal – superior cleanability.

Fig. 2 Tested specimen; AISI 316L sheet metal (as-rolled 2B surface) after Kolsterising®.

Migration of metals for 316L sheet metal after Kolsterising®				
Parameter	Average after 1. + 2. Migration in µg/kg	Spec. release limit after 1. + 2. Migration in µg/kg	Average after 3. Migration in µg/kg	Spec. release limit after 3. Migration in µg/kg*
Chromium	119	1750	56	250
Nickel	47	980	n.d.	140
Molybdenum	n.d.	840	n.d.	120
Manganese	n.d.	12600	n.d.	1800
Iron	n.d.	280000	n.d.	40000

*Fig. 3 Migration values for surface hardened AISI 316L sheet metal; all values are well below the spec. release limits; n.d.: non determinable; *Requirements acc. to "Technical Guide on Metals and Alloys used in Food Contact Materials, CoE (2013)".*

[1] EHEDG Guidelines; Hygienic Equipment Design Criteria; Second Edition, April 2004

[2] Matinanian, Hedberg, Herting, Wallinger; Metal release and corrosion resistance of different stainless steel grades in simulated food contact; Corrosion 2016 72(6):775-790

Bodycote

www.bodycote.com
S3P@bodycote.com

10.2018/EN 422-1796