In the SPOTLIGHT

S³P IN OIL & GAS APPLICATIONS

AVOID GALLING

REDUCE WEAR SIGNIFICANTLY

MAINTAIN CORROSION RESISTANCE

PROVEN REPRODUCIBILITY

Bodycote

SPOTLIGHT

S³P – Specialty Stainless Steel Processes
Oil & Gas Applications

Kolsterising®: Resistance against galling and corrosion

Natural gas and oil inherently contain a certain amount of hydrogen sulphide (H_2S). In combination with increased temperatures and pressure in environments containing chloride, sulfide stress cracking (SSC) can occur. Typically these conditions occur in oil and gas extraction, predominantly off-shore. Due to their corrosion properties, corrosion resistant alloys (CRA) are suitable for use in sour gas environments, but the wear properties can be insufficient. With Bodycote S³P, featuring Kolsterising®, it is possible to achieve the required wear resistance of CRAs whilst retaining the resistance to sulfide stress corrosion.

S³P processes, featuring Kolsterising®, are suitable for many austenitic, martensitic, and duplex stainless steels as well as nickel-based alloys relevant in the oil and gas industry. The surface hardness of these materials can be increased to >1 000 $HV_{0.05}$, while the martensitic grades can exceed 1 400 $HV_{0.05}$. The wear and galling resistance is thus significantly increased.

SSC resistance achieved

Compared with other diffusion processes such as nitriding, Kolsterising® does not impair the corrosion resistance. Furthermore, the cavitation resistance, galling resistance and fatigue strength is significantly improved by Kolsterising®.

The investigations were carried out and certified by independent laboratories. For application in sour gas enviroments, the S³P treatment of three materials is qualified according to NACE MR0175 (resistance against sulfide stress cracking). Numerous positive customer experiences and qualified applications exist. However, as this thermo-chemical surface process is currently not mentioned expressly in the corresponding standards (e.g. NACE MR0175), the corresponding treatment should be qualified before application. The results of these qualifications do not indicate negative influence on the SSC resistance in any of the materials and processes tested.

If you want to know more, we can help you! Please contact us for further information and certificates on other corrosion tests such as ASTM A262 or G48.

Material	Treatment	SSC-resistant according to NACE MR 0175
AISI 316L (1.4404)	K 33	✓
Duplex 2205 (1.4462)	K Duplex	✓
15-5PH (1.4545)	S³P M	✓

Overview of the alloys and processes tested by Bodycote S³P for resistance to sulfide stress cracking. We would be happy to supply you with the certificates.

Microstructure of a S³P-treated 1.4462 (AISI 318LN) after 720 hours in a sour gas atmosphere at 90 °C under mechanical stress.

Microstructure of a S³P-treated 1.4404 (AISI 316L) after 720 hours in a sour gas atmosphere at 149 °C under mechanical stress.

Microstructure of a S³P-treated 15-5PH (1.4545) after 720 hours in a sour gas atmosphere at 120 °C under mechanical stress.

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