



## EXPANITE REACHES A MAJOR BREAK-THROUGH BY SURFACE HARDENING OF NICKELBASED AND AUSTENITIC ALLOYS FOR THE PUMP AND VALVE MARKETS

*In recent weeks and months, Expanite has developed surface hardening solutions for the pump and valve market. The main problems in the past in these industries have always been wear and galling - all applications where either metal sealing is needed, or due to high operational temperatures (far above 300 °C) and/or corrosive environments, conventional coatings and most non-metallic bushings cannot be used.*

### Diffusion-based hardening technology

Even where special coatings may be applied in certain environments, heating and cooling cycles normally introduce a high risk of spallation due to different coefficients of thermal expansion. Customers seeking improved performance finally found a more advanced solution - the unique diffusion-based hardening technology of Expanite that is applicable to most commercially available corrosion-resistant alloys. Recently, the Expanite-technology has set a new standard for wear and galling on different materials such as conventional stainless steel (1.4404/AISI 316, Duplex 1.4462, Nitronic, 1.4980/Alloy A-286), Ni-based alloys (e.g. Monel® K500, Inconel® 718 and Hastelloy®) and Co-based alloys such as Stellite®. Stainless steel is, in many cases, used in valves for food and pharma applications, whereas Monel & Inconel are widely applied in chemically aggressive and harsh environments.

### The new technology

Expanite's hardening technology generates surface hardness values in the area of 900 to 1500 HV - on stainless steel, Co-based and many Ni-based alloys, thereby effectively preventing galling. Especially on relatively large valves used in the chemical industry and power plants, galling on shifting shafts (opening and closing the valve) made of Inconel and Monel has previously caused severe problems. Applying the Expanite-technology on these shafts prevents galling and thereby increasing the life-time of the valve components.

### Unique test results

This has been impressively demonstrated by a test method for galling resistance (according to ASTM G98 test procedure) on an austenitic stainless steel (1.4404/AISI 316L), with and without Expanite surface treatment (cf. Fig. 1 & 2).



*Fig. 1: galling result on non-treated 316-material showing significant galling at relatively low contact-pressure*



*Fig. 2: galling result on Expanite-hardened 316-material showing absolutely no galling even at contact pressures well above yield strength*



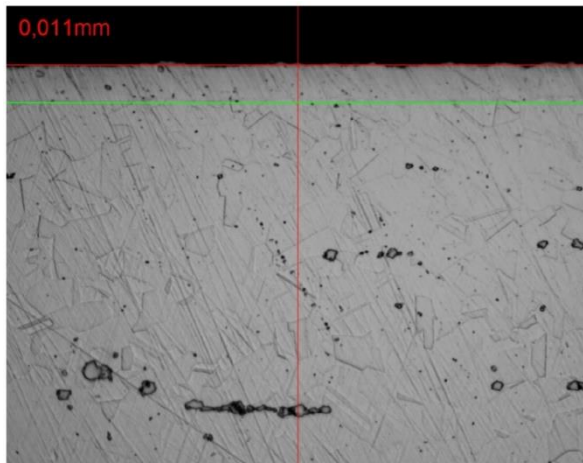


Fig. 3: light optical micrograph of an Expanite-hardened Inconel 718 evidencing a homogenous case-depth in the range of ca. 10 $\mu$ m. Surface hardness measurements reveal ca. 1,000 HV0.025

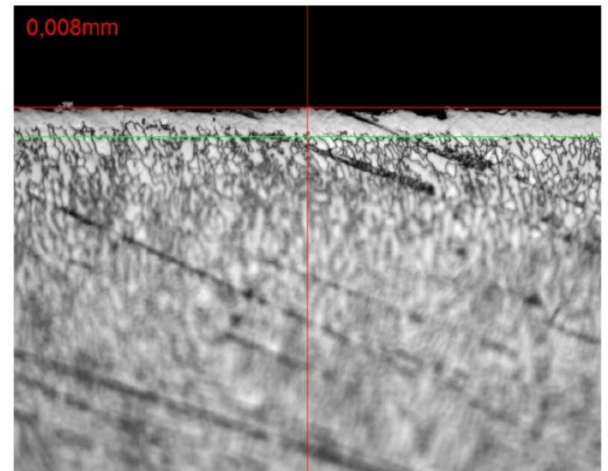


Fig. 4: light optical micrograph of an Expanite-hardened Stellite 1040 showing a hardened zone of ca. 8 $\mu$ m. Surface hardness measurements resulted in ca. 900HV0.025

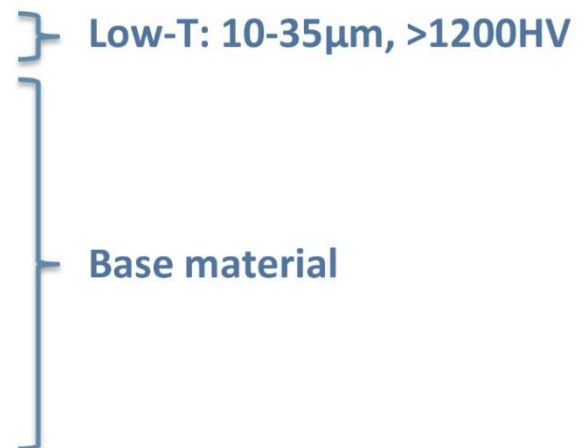
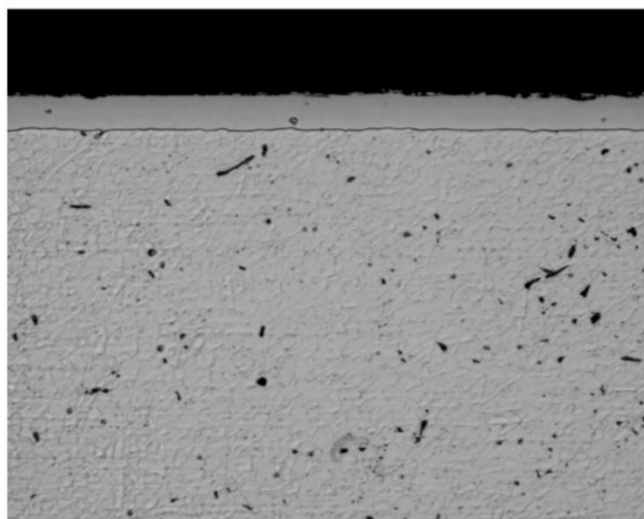


Fig. 5: light optical micrograph of Expanite-hardened A 286 (1.4980) material. The case-depth can be tailored between 10 and 35 $\mu$ m, resulting in surface hardness of 1,200-1,500 HV0.05

### About Expanite

Expanite offers state-of-the-art solutions for surface hardening treatment of stainless steels and titanium. With Expanite's processes, it is possible to increase the material's surface hardness tenfold while at the same time maintaining and even increasing its corrosion resistance. Expanite is a global organization with a combined development and production facility near Copenhagen, Denmark, and hardening capacity in both US, Germany, Korea and China. Expanite's solutions are flexible and can be introduced directly into a customer's own production line as part of a licensing arrangement. Learn more on [www.expanite.com](http://www.expanite.com).