

Unique wear reduction by using Expanite hardening on martensitic stainless steels!

Wear on stainless steel

Wear is a pervasive problem for stainless steel, - also on martensitic stainless steels even after having being vacuum hardened. Based on a standard ASTM G133 test for wear resistance of materials, the reduction in wear for martensitic stainless steel with the ExpaniteHigh-T surface hardening process is remarkable and shows that Expanite is one of the solutions to improve wear resistance!

ASTM test for linearly reciprocating ball-on-flat sliding wear

The ASTM G133 test geometry involves a pin with a ball shaped tip, sliding in a reciprocating motion with a constant force of 25N, doing 5400 strokes. After the sliding action has been completed, the resulting wear track is both visually inspected and measured with a profilometer. This yields a profile and a value for the depth of the wear track. In this case, two solutions with martensitic stainless steel were tested, one with standard vacuum hardening and one with ExpaniteHigh-T hardening.

Test results, standard vacuum hardening against ExpaniteHigh-T

This test shows a track depth approximately 320 times smaller on an ExpaniteHigh-T treated martensitic 1.4021 alloy, compared to a standard vacuum hardened 1.4021.

The graph in fig. 1 demonstrates clearly the benefit of applying ExpaniteHigh-T. When illustrated on the same scale, the wear-track of maximum 4µm in depth from the ExpaniteHigh-T treated 1.4021 disappears in comparison to the approximately 220µm deep wear track of the vacuum hardened 1.4021.

The photos in fig. 2 and 3 further demonstrates the superior wear properties of the ExpaniteHigh-T treated 1.4021 alloy. The visible track on the left-hand side image, displaying the ExpaniteHigh-T treated test samples, is only partially prescribed to actual wear. The visible track is predominantly a polishing of the surface, since the wear depth 4µm won't be visible to the naked eye. The right-hand side photo is of the standard vacuum hardened test samples, and demonstrates severe wear, both on the plate and the pins. The tip of the pins has been completely removed during the test.

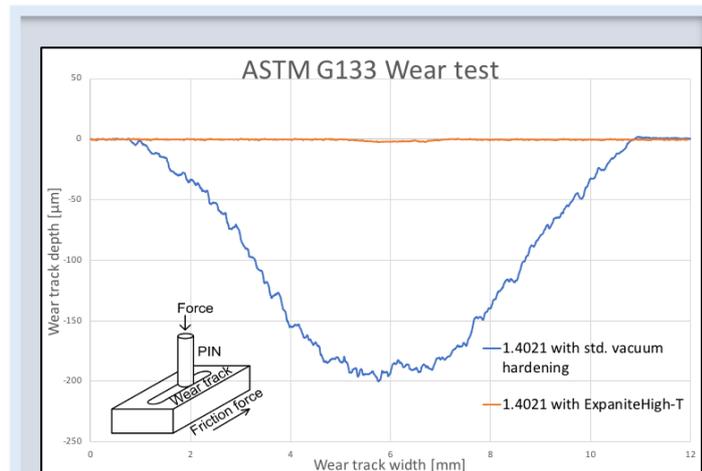


Fig 1: Benefit of applying ExpaniteHigh-T

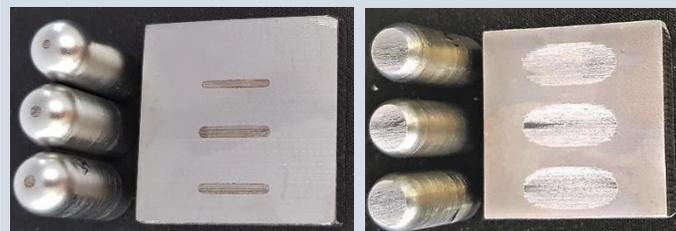


Fig. 2: With Expanite

Fig. 3: Without Expanite

Results with Expanite a case study

Customer aimed to replace salt bath carburising treatment on turbocharge for cars. The Expanite® process significantly improved wear resistance as well increasing corrosion resistance.