



SENSITIZATION IN WELD ZONE OF PRESS HARDENED MARTENSITIC CHROMIUM STEEL

Task

Steel with more than 12 weight percent of chromium is intrinsically resistant to corrosion. For this reason, different grades are commonly used in the vehicle engineering and in vessel manufacturing. Their strength can be increased by press hardening; with increasing carbon content, greater strength is achieved, wherein laser beam welding is used for joining. This project shall examine how and in what way a corrosive attack occurs on welded joints.

Method

The investigation aims, on the one hand, to test if the oxalic acid test can be applied to martensitic steels. On the other hand, it shall investigate the susceptibility of the weld zone to corrode in press-hardened metal sheets and in welded plates after press hardening. The tests were conducted on grades with a carbon content from 0.03 to 0.46 percent by mass.

Result

Thanks to the comparative tests, it has been shown that the oxalic acid test is applicable to the examination of press-hardened stainless chrome steels according to ASTM 763-83.

In welding seams in press hardened materials, corrosion sensitivity increases with the carbon content and application of welding heat treatment. If the steels are press-hardened after welding, dual etched structures occur only sporadically on steel with the highest carbon content.

Applications

The ASTM 763-83 makes available a method for the simplified testing of intergranular corrosion. The results show that stainless chromium steels with a martensitic structure do not exhibit any loss in their corrosion resistance on tailored blanks where press hardening is applied after welding. When press-hardened materials are welded, there is a sensitization. Nevertheless, the resistance to intergranular corrosion is significantly higher than that of unalloyed steels. For many applications there is now a statement on the weldability of the grades considered here.

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5 1.4034 press-cured after welding.

6 1.4034 welded after press hardening.