Influence of final turning on SCC susceptibility and corrosion properties of austenitic stainless steel 08Ch18N10T

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Final machining, such as final turning or final milling, aims to smooth the given machined surface of the material and obtain dimensional tolerance. However, with tough materials like austenitic stainless steels, where deformation hardening also occurs, the machining of these materials is complicated, and consequently the character and properties of the machined surface of these steels can have a negative impact on corrosion resistance. The affected parameters may include surface microhardness, roughness or residual stresses. In this work, the influence of final turning on stress corrosion cracking susceptibility and corrosion resistance of austenitic stainless steel 08Ch18N10T was monitored where as a toll a replaceable double-sided sintered carbide cutting plate with a negative rake angle was used. A combination of two machining parameters was set up: feed (0.12, 0.2 and 0.3 mm) and cutting speed (100 and 250 m min^{-1}). The roughness, microhardness and the surface deformation zone depth were analysed on the machined surface. It was found that hardness but also roughness increased with increasing tool feed. Using the exposure of samples in a boiling $MgCl_2$ solution, susceptibility to stress corrosion cracking was observed. Density of cracks as well as the depth or length of cracks into the material were studied and evaluated using SEM and ImageJ software. With increasing feed, the density of cracks decreased, on the contrary, the length and depth of cracks increased. Electrochemical potentiokinetic reactivation analysis, a double loop method, was used to determine sensitization to intergranular corrosion. The samples were determined to be non-sensitized. This method also showed the effect of roughness on the resulting polarization scans.

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