

Influence of Cutting Fluids on the Corrosion Resistance of X20Cr13 Martensitic Stainless Steel

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Martensitic stainless steels are difficult-to-cut materials, so the utilization of the cutting fluids with high flow rates is considered necessary in their machining. However, flood cooling method represents a high risk to human health and environment and is also a great economic burden. A chilled jet of compressed air is one of the possible alternatives to conventional liquid coolants. As corrosion can occur even in dry machining, the aim of this paper was to investigate the feasibility of replacing conventional emulsion coolant with the chilled air out of Ranque-Hilsch counter-flow vortex tube. An important outcome of corrosion testing showed a beneficial effect of the chilled air-cooling method on the corrosion resistance since it is on increase over a prolonged time. As expected, the feed rate f was confirmed to be the most important factor affecting the Ra , but the most interesting finding was that about non-significant influence of the cooling method on reducing the Ra and consequently on increasing the corrosion resistance of machined surface. Therefore, the chilled air-cooling by a vortex tube can be successfully applied to turning of steel X20Cr13, thereby eliminating the ecological load caused by the application of conventional liquid coolant.

Keywords: martensitic stainless steel; corrosion resistance; cooling; electrochemical and gravimetric measurements.

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