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Theoretical and Experimental Analysis of Hard Material Machining

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Abstract : Machining of hard materials is a recent technology for direct production of work-pieces. The primary challenge in machining these materials is selection of cutting tool inserts which facilitates an extended tool life and high-precision machining of the component. These materials are widely for making precision parts for the aerospace industry. Nickel-based alloys are typically used in extreme environment applications where a combination of strength, corrosion resistance and oxidation resistance material characteristics are required. The present paper reports the theoretical and experimental investigations carried out to understand the influence of machining parameters on the response parameters. Considering the basic machining parameters (speed, feed and depth of cut) a study has been conducted to observe their influence on material removal rate, surface roughness, cutting forces and corresponding tool wear. Experiments are designed and conducted with the help of Central Composite Rotatable Design technique. The results reveals that for a given range of process parameters, material removal rate is favorable for higher depths of cut and low feed rate for cutting forces. Low feed rates and high values of rotational speeds are suitable for better finish and higher tool life.

Keywords : speed, feed, depth of cut, roughness, cutting force, flank wear
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