

Cutting performance of solid ceramic and carbide end milling tools in machining of nickel based alloy Inconel 718 and stainless steel 316L

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ABSTRACT

Machining of nickel based alloys is in most of the times affected via high mechanical and thermal loads, causing high wear tendency of carbide tools, even at relatively low cutting speeds. On the other hand, ceramic as a cutting material, is more chemically stable and retains its hardness even at higher temperatures (> 800 °C) when machining difficult-to-cut materials. Therefore, to increase productivity, as an alternative to carbide tools, full body ceramic milling tools are proposed. In this paper, high speed milling process, using full body ceramic end milling tools, was analysed in parallel to carbide tools. Tool life of ceramic tools was compared with tool life of more widely used carbide tools when milling two different difficult-to-cut materials, i. e. nickel based alloy Inconel 718 and austenitic stainless steel 316L, under different cooling lubrication conditions. In addition, surface integrity and cost analysis were taken into account. Results are showing that ceramic milling tools are increasing material removal rate and productivity. However, the overall efficiency of ceramic tools can still be economically questionable.

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