Influence of cutting edge microgeometry on the selected aspects of machining difficult-to-cut materials

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The paper presents research investigating the influence of cutting tools microgeometry on the cutting forces and machined surface roughness when milling different-to-cut materials. Austenitic stainless steel AISI 316L and nickel alloy Inconel 718 were machined with cemented carbide tools with various cutting edge rounding size while measuring the cutting forcess during the process and machined surface roughness after the machining. From the standpoint of milling difficult-to-cut materials lowering the cutting forces load on the tool as well as attaining sufficient quality of machined surface can be difficult to achieve. Previous research into the cutting edge microgeometry suggests that modification of the cutting edge of milling tools can substantially extend the effective tool life, reduce cutting forces in the process and ensure higher quality of the machined surface. Results of long term wear tests of tools with cutting edge rounding sizes of 15, 30 and 45 μm are compared to the results of a sharp unprepared cutting tool, and the results of each machined material are also compared. Possible influence of cutting edge radius on the process for both materials was tested for cutting conditions constituting finishing operation. The most effective cutting edge radius size differed between the materials, with 15 μm rounding performing the best for AISI 316L and the sharp unprepared tool performing the best for the Inconel 718 alloy.

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