COMPARATIVE ANALYSIS OF THE APPLICATION OF LUBRICANT COOLANT BY THE MQF TECHNIQUE IN THE FACE MILLING MACHINING PROCESS OF HARDENED D2 STEEL ALLOY

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RESUMO

This work presents a comparative evaluation of the results obtained in machining, between the application of lubrication cooling by means of the minimal quantity fluid (MQF) technique and cutting machining, on the dimensional variation, the roughness of the machined surface and the cutting tool wear generated by the face milling of D2 steel hardened to 57 HRC. In the process, the tool from the manufacturer KORLOY was used, with XNKT-MM insert of PC2510 grade with layer of TiAlN (titanium-aluminium-nitride coating) of high hardness, oxidation resistance and stabilized hardness, ideal for interrupted cutting of highly hardened and lubricated steel. Featuring an ultrafine substrate with high toughness that generates a better wear resistance, the surface treatment on the tool gives a better surface finish on the machined part. In addition to the two machining conditions, cutting and lubricated-cooled, the cutting parameters were determined according to the recommendations of the tool manufacturer, totaling two combinations. The roughness values were obtained from laboratory analysis with rugosimeter Mitutoyo - SJ201, the wear of the tool was evaluated with the aid of the microscope Kontrol and the dimensional variation with the use of external micrometer Mitutoyo scale with precision of thousandth of a millimeter. The results showed that both machining operations with MQF obtained lower efficiency losses in material removal, better roughness values and lower wear on the tool flank when compared to those obtained by cutting machining. The roughness values generated with the application of the MQF technique showed a relevant reduction, where the average of the values in cutting roughing have Ra of 2.06 µm , Rz of 10.72 µm and in roughing with MQF have Ra of 1.02 µm , Rz of 5.04 µm; in the cutting finishing operation we have the mean values of Ra 0.94 µm, Rz 4.74 µm and in the MQF operation the values of Ra 0.45 µm and Rz 3.02 µm, besides the reduction of tool wear and loss of efficiency in material removal. Therefore, it is possible to conclude that machining with MQF can be a good alternative when milling hardened steels, especially with regard to surface roughness and cutting tool life.

PALAVRAS-CHAVE: MQF Finishing operation Thermal Conductivity Lubrication

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