Experimental investigation on surface roughness and tool wear in dry machining of TiC reinforced aluminium LM6 composite

ABSTRACT

With increasing quantities of applications of Metal Matrix Composites (MMCs), the machinablity of these materials has become important for investigation. This paper presents an investigation of surface roughness and tool wear in dry machining of aluminium LM6-TiC composite using uncoated carbide tool. The experiments carried out consisted of different cutting models based on combination of cutting speed, feed rate and depth of cut as the parameters of cutting process. The cutting models designed based on the Design of Experiment Response Surface Methodology. The objective of this research is finding the optimum cutting parameters based on workpiece surface roughness and cutting tool wear. The results indicated that the optimum workpiece surface roughness was found at high cutting speed of 250 m min-1 with various feed rate within range of 0.05 to 0.2 mm rev-1, and depth of cut within range of 0.5 to 1.5 mm. Turning operation at high cutting speed of 250 m min-1 produced faster tool wear as compared to low cutting speed of 175 m min-1 and 100 m min-1. The wear minimum (VB = 42 εm) was found at cutting speed of 100 m min-1, feet rate of 0.2 mm rev-1, and depth of cut of 1.0 mm until the length of cut reached 4050 mm. Based on the results of the workpiece surface roughness and the tool flank wear, recommended that turning of LM6 aluminium with 2 wt % TiC composite using uncoated carbide tool should be carried out at cutting speed higher than 175 m min-1 but at feed rate of less than 0.05 mm rev-1 and depth of cut less than 1.0 mm.

Keyword: Aluminium composites; Dry turning; Surface roughness; Tool wear