

Study of oil flow rates effects on lubricant oil behaviour during minimum quantity lubrication milling process

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ABSTRACT

Minimum quantity lubrication (MQL) technology has been utilized extensively on these days as an alternative method to conventional cooling technique. A study to understand the know-how of tiny lubricant oil mists to effectively penetrate the cutting zone is important. However, such study is still scarce since the setup of the experimental probe during the machining process is on-going is difficult. The objective of this study is to analyse the lubricant oil film behaviour accumulated on AL6061 workpiece during MQL milling process by using a non-intrusive technique called as laser-induced fluorescence (LIF) method. The experiment was conducted under different oil flow rates to measure the thickness fluctuation of the lubricant oil film. Moreover, the surface roughness of workpiece after the milling process was also measured. As a result, the lubricant oil thickness was found to fluctuate in between 0.2mm and 0.4mm for two lower oil flow rates due to the tendency of evaporation. At higher oil flow rate, the lubricant oil fluctuated at higher thickness, i.e. 0.4mm and 0.5mm. On the other hand, the obtained mean surface roughness values did not reveal any remarkable difference from each other. However, lower mean surface roughness values were detected at 90mm distance from machining starting point due to the accumulation of lubricant oil towards the end of workpiece. Therefore, the results of the oil behavior were successfully confirmed and thus MQL milling performance under different oil flow rates condition was clarified.

KEYWORDS

Lubricant oil film thickness; Lubricant oil flow rates; Mean surface roughness; Minimum quantity lubrication

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