ABSTRACT

In the manufacturing industry, the conventional turning process is one of several machining processes that are often encountered. However, conventional turning has drawbacks, it produces poor surface roughness, one of which is Aluminum Alloy 6061-T6 material. Surface roughness can be affected by machining variables and tool wear. Tool wear is caused by cutting temperatures that are too high as a result of which the tool undergoes plastic deformation. Two-Dimensional Ultrasonic Vibration Assisted Turning (2D UVAT) is an alternative to overcome the shortcomings of conventional turning. This study aims to find the effect of 2D UVAT machining variables on surface roughness and cutting temperature and to find the optimal combination of machining variable values using the design of experiment (DOE) full factorial method (FFM). Based on the ANOVA test, the four machining variables spindle speed, feed rate, depth of cut, and frequency significantly affect surface roughness and cutting temperature. The feed rate variable significantly affects surface roughness with a contribution percentage of 86.01%. The feed rate variable also significantly affects the cutting temperature with a contribution percentage of 23.37%. This study also revealed that the higher the 2D UVAT machining frequency, the lower the surface roughness and cutting temperature. The most optimal combination of 2D UVAT machining variables for surface roughness and cutting temperature was achieved at spindle speed = 855 RPM, feed rate = 0.05 mm/rev, depth of cut = 0.25 mm, and frequency = 20,000 Hz.

Key Words*: *Aluminium Alloy* 6061-T6, *Surface Roughness, Cutting Temperature*, 2D *Ultrasonic Vibration Assisted Turning, Full Factorial Method