ABSTRACT

Micro-turning is a part of micro-machining that is used to cut cylindrical workpieces. Under cutting conditions where the depth of cut ratio is much smaller than the tool nose radius, micro-turning creates a ploughing phenomenon due to imperfections in the cutting of the workpiece that does not fully chip. This directly has a negative impact on the cutting force during the cutting process, so it needs to be minimized. Thus, this investigation is aimed at investigating the effect of changing machining parameters on cutting force in micro-turning.

A machining development to improve this issue is to insert a high-frequency vibration parameter in the cutting tool or in lathe machining known as Ultrasonic Vibration-Assisted Turning (UVAT). UVAT causes intermittent cutting during the cutting process, thereby reducing the direct contact between the cutting tool and the workpiece (tool-workpiece contact ratio) which can further improve the cutting results and mechanism. The 1D-UVAT cutting mechanism in the tangential vibration direction or Tangential Vibration-Assisted Turning (TVAT) is an alternative solution to reduce the ploughing effect in micro-turning. This study successfully reduced the cutting force more than 50% by TVAT in micro-tuning at frequencies of 24 & 26 kHz. The effect of changing feed rate and spindle speed was also observed in this study. Thus, information about the effect of changing TVAT machining parameters on cutting force in micro-turning can be used as a research reference.

Keywords: *Micro-machining, ploughing, vibration-assisted machining, machining parameters, cutting force, uncut chip thickness.*