

Cutting force analysis in micromilling of Al6061-SiC_p composite

Satyendra Kumar Patel¹, Ashwani Pratap², Priyabrata Sahoo², Binayaka Nahak¹ and Tej Pratap^{1*}

¹Department of Mechanical Engineering, Motilal Nehru National Institute of Technology Allahabad, Prayagraj, Uttar Pradesh-211004, India.

²Micro-fabrication Laboratory, Department of Mechanical Engineering, Indian Institute of Technology Patna, Bihta, Bihar-801103, India.

* Corresponding author

ABSTRACT

Background:

The micro-featured aluminium metal matrix composites (Al-MMC's) have attracts interest of industrial community due to their extremely good material properties and enhanced surface functionality based on different applications. However, the economical production of such micro- features on Al-MMC's is very challenging due to distribution of hard abrasive particles in the soft metal matrix and the differences in material processing methods. Micromilling with different tool geometry has shown extremely good process capabilities for creating such precise micro-features on different materials. However, the analysis of cutting force in micromilling of Al-MMC's is limited and it is very much essential to avoid any surface defect caused by machining of different grains and premature tool breakage due to downscaling of the machining process.

Objectives:

Here, an extensive study of micromilling cutting force analysis is performed on Al6061-SiC_p composite made by stir casting process with different range of reinforcement (0, 5, 10 and 15 % of SiC_p by weight). The cutting force trend is further correlated with reinforcement percentage and machining parameters to study the cutting mechanics of composites.

Keywords: Micromilling; Cutting force; Al-MMC's; Spindle speed; Feed per tooth.

