

Optimisation of end milling machining parameters using the Taguchi method and ANOVA of AlSi/AlN metal matrix composite material

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Abstract

The purpose of this research is to determine the optimum machining parameter for Aluminium silicon alloy (AlSi) matrix composite, which has been reinforced with aluminium nitride (AlN), with three types of carbide inserts present. Experiments were conducted at various cutting speeds, feed rates and depths of cut, according to the Taguchi orthogonal array L_{27} . The signal-to-noise (S/N) ratio and analysis of variance are applied to study the characteristic performance of cutting speeds, feed rates, depths of cut and types of tool in measuring the tool life during the milling operation. The analysis of wear was done using a Sometech SV-35 video microscope according to ISO 3686. Through Taguchi analysis, it is concluded that a combination of high feed rate, high depth of cut, low cutting speed and insert TiB₂ give a longer tool life. Therefore, the cutting speed of 230 m/min, feed rate of 0.8 mm/tooth, depth of cut of 0.5 mm and type of insert of TiB₂ were the optimum machining parameters. These optimum parameters will help the automotive industry to have a competitive machining operation from both economical and manufacturing perspectives.

Keywords: AlSi / AlN metal matrix composite (MMC), Optimum machining parameter, Taguchi method, Tool life

DOI: 10.4028/www.scientific.net/KEM.701.200