World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:9, No:01, 2015

Application of Taguchi Techniques on Machining of A356/Al2O3 Metal Matrix Nano-Composite

Authors : Abdallah M. Abdelkawy, Tarek M. El Hossainya, I. El Mahallawib

Abstract : Recently, significant achievements have been made in development and manufacturing of nano-dispersed metal matrix nanocomposites (MMNCs). They gain their importance due to their high strength to weight ratio. The machining problems of these new materials are less widely investigated, thus this work focuses on machining of them. Aluminum-Silicon (A356)/ MMNC dispersed with alumina (Al2O3) is important in many applications include engine blocks. The final finish process of this application depends heavily on machining. The most important machining parameter studied includes: cutting force and surface roughness. Experimental trails are performed on the number of special samples of MMNC (with different Al2O3%) where the relation between Al2O3% and cutting speed, feed rate and cutting depth with cutting force and surface roughness were studied. The data obtained were statistically analyzed using Analysis of variance (ANOVA) to define the significant factors on both cutting force and surface roughness and their level of confident. Response Surface Methodology (RSM) is used to build a model relating cutting conditions and Al2O3% to the cutting force and surface roughness. The results have shown that feed and depth of cut have the major contribution on the cutting force and the surface roughness followed by cutting speed and nano-percent in MMNCs.

Keywords : machinability, cutting force, surface roughness, Ra, RSM, ANOVA, MMNCs
Conference Title : ICMMME 2015 : International Conference on Mechanical, Mechatronics and Manufacturing Engineering
Conference Location : Singapore, Singapore
Conference Dates : January 08-09, 2015