

Optimization of Metal-Matrix Composites by W-EDM with CNT

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Abstract – The EDM procedure is typically used to machining the Al6061 metal matrix composites with silicon carbide (SiC) with carbon nanotube reinforcement (CNT). The Metal Removal Rate (MRR), Surface Roughness (SR) as well as Tool Wear Rate (TWR) of the work piece material could potentially be measured using this method. Fundamental machining characteristics impacting the process's performance including pulse ON time, discharge current as well as duty cycle were input attributes using Taguchi's parameter formulation. For each possible arrangement, a performance criterion has indeed been computed. The MRR, SR and TWR for every combination were computed in this investigation. The acquired outcomes have been tabulated. The research indicates that by employing grey relational analysis (GRA) to optimise the EDM parameters, improved MRR, TWR, and SR could be attained. MRR, TWR, and SR were 0.301 g/mm^3 , 0.003 g/mm^3 , and 4.03 m , respectively, according to the optimum outcomes of this research.

Keywords - Al6061, metal matrix composites, SiC, EDM, CNT, Optimization.

I. INTRODUCTION

Electrical Discharge Machining (EDM) has improved remarkably in subsequent years to fulfill the demands among several manufacturing industries. It's a thermoelectric process wherein the electric sparks among the electrode and workpiece, insulated by a fine layer of dielectric, erode the material on the workpiece. To achieve the best set of input parameters, multi objective optimization [1] was performed using a hybrid approach comprising principal component analysis (PCA) as well as methodology for ordered priority by similarities to ideal solution. Multi-walled CNTs have favourable characteristics which including

increasing toughness as well as stiffness, enhanced strength, and good thermal conductivity, making materials an attractive alternative for strengthening surface features but also machining performance [2,3]. The contribution of this analysis is to investigate and optimise the performance characteristics of rectangular channels made beneath distinct EDM settings [4].

This approach prepares AA6061 oriented MMC utilising multi wall CNT for reinforcement employing stir casting procedures and Multi response optimization is done to improve the MRR and EWR in EDM with a copper wire electrode using GRA [5]. The paper's structure is as follows: section 2 outlines relevant works, section 3 presents the suggested work. Results were discussed on section 4, and conclusion was outline on section 5.

II. RELATED WORKS

Phate et al. [6] focused on the Adaptive neuro-fuzzy inference system (ANFIS), which has outstanding performance and is based on prediction and the Taguchi approach to examine the process. Dhandapani et al. [7] emphasis on characteristics relying on Material Removal Rate (MRR) Performance Measurement in Composite Used to Sink EDM with Drilling Operation. Powder metallurgy framework was presented by Parswajinan et al. for the material, Al 6063, containing CNT on various concentrations to be a reinforcing agent [8,9].