



# Application of electro-discharge machining on $\text{Al}_2\text{O}_3$ particle reinforced aluminium composite

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## Abstract

Aluminium matrix composites are making inroads into various engineering applications. These materials required special tools for machining due to hard reinforcement which tends to wrap around tool bit leading to breaking of the tool during conventional machining process. This research explores the possibility of machining of alumina particle reinforced aluminum matrix composite (AMC) using Electro-discharge machining. The effects of various machining parameters on the surface roughness (Ra), material removal rate (MRR), tool wear rate (TWR), overcut (OC) and resulting surface morphology are investigated. Results showed that surface roughness and material removal rate (MRR) increase with increasing of current and ON-time and, decrease in surface roughness was showed with increasing of OFF-time. TWR tends to decrease with ON-time and high current value and it increases with OFF-time. Scanning electron microscope micrograph of machined surface showed crack, crater and these were more prominent at high peak current and ON-time. An increasing overcut (OC) was presented with increasing of peak current and ON-time.

**Key words:** EDM, ON-time Aluminium metal matrix composite, MRR, TWR

## 1. Introduction

Composite material is composed of two or more distinct phases to form a new material with enhance of properties (Chawla and Chawla, 2006). Application of aluminum metal matrix composite (AMC<sub>s</sub>) materials in various industrial and commercial applications such as aviation, automotive and marine is expanding. This application has been limited due to the difficulty of machining by conventional (Cichosz and Karolczak, 2008). In general machining of composite materials is difficult due to the anisotropic and non-homogeneous

structure and the high abrasiveness of their reinforcing constituents (Teti, 2002). This results in damage being introduced into the workpiece and in very rapid wear development in the cutting tool when composite materials are machined using conventional process. The application of electro-discharge machining (EDM), for material removal, might be a feasible option which have yet to be tested on aluminium metal matrix composite material (Al-A242/ $\text{Al}_2\text{O}_3$ ). Electro-Discharge Machining is a process uses a series of repeating spark erosion to remove material which has distinct advantages over conventional machining processes (Jameson, 2001; Hascalik and Cayday, 2007). Hard materials can be machined as long as