Chapter 1

Optimisation of Machining Parameters in Electrical Discharge Machining of LM25–RHA Composites

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ABSTRACT

Aluminium composites are tough to machine by using conventional method. In order to increase machinability of aluminium-based composite a non-conventional method of machining has been used. Electrical Discharge Machining (EDM) is one of the kind of machining process which has often uses for machining of aluminium composites. The objective of this chapter is to determine the ideal setting of the process parameters on the electrical discharge machining while machining Aluminium–Rice Husk Ash (LM25-RHA) composites in which three different variation (4%, 8%, 12%) of Rice Husk Ash has been used. The parameters considered are pulse current (Ip), gap voltage (V) and pulse-on-time (Ton); whereas its effect are analysed on Electrode Wear Rate (EWR), Material Removal Rate (MRR) and Surface Roughness (Ra). The optimal setting of the parameters are determined through experiments planned, conducted and analysed using the Taguchi method.

INTRODUCTION

Composite Material

A composite material consists of two or more than two chemically and physically artificial phases. Composite materials, as name tells that it is the composition of materials also known as composition materials, these are the materials which has produced by mixing different constituent with significantly
different physical or chemical properties that, whose combination produces a material with properties
different from the individual materials. The constituent elements mainly consist of a reinforcement
material, fillers, and a composite matrix binder which varied in composition or in form on a macro
scale. Although constituent element remains mixture of constituent which are not dissolve completely.
It accommodate the requirement of particular function and design, imparted with ambitious properties
which seems that it restrict the range for classification of composites, but in the reality new varieties of
composites has discovered, each have their own specific features and purpose like the particulate, flake,
laminar and filled composites.

**Classification of Composites**

Composite is classified mainly into two categories, it is based on phases used in preparation:

1. **Matrix Phase:**
   b. Ceramic Matrix Composite (CMC).
   c. Metal Matrix Composite (MMC).
2. **Reinforcement phase:**
   a. Fiber Reinforced Composite.
   b. Laminated Composite.
   c. Particulate Composites.
   d. Filler Composite.
   e. Flakes Composite.

In this study our main focus is on the Metal Matrix Composite because machining has been done on
the LM25-RHA Composite which is a MMC. Before studying MMC, a brief knowledge of Matrix and
Reinforcement is necessary.

**Matrix**

Matrix is the complete continuous material into which reinforcement has implanted. It is a types of
monolithic material. It provides path through the matrix to any point in the material, unlike two materials
sandwiched together. Aluminum, magnesium and titanium due to its lighter weight can be used as matrix
material in structural application and provides an acquiescent support to the reinforcement. Cobalt and
its alloys matrices are usually applied as for high temperature application by Keneth kanyo et al. (2013).

**Reinforcement**

The reinforcement material has dispersed into a matrix. It is not necessary that reinforcement always
play role of only structural task (reinforcing the compound). Reinforcement is also capable of changing
physical properties of the composite such as resistance to wear frictional coefficient, or thermal conduc-
tivity. It may be continuous or discontinuous. In Discontinuous metal standard metal working technique
can be applied, such as extrusion, forging, or rolling due to its isotropic nature. Further, it is machinable
by using conventional techniques, but only problem is to use polycrystalline diamond tooling (PCD).
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