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A Review Paper on EDM Parameter of Composite material and Industrial Demand Material Machining

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Abstract

Electric discharge machining (EDM) the one type of Electrical energy based Machining process, in a modern world EDM is has lot of challenge against to machine hard material and complex shape structure. In this investigation, the input parameters such as Pulse on time, Pulse off time, Peak current and output parameters such as Metal removal rate (MRR), Surface roughness (SR), Tool or electrode wear ratio (TWR) are deeply focused in the past researchers and investigation. The objective of this paper to review the past researches and develop the way for advance Research.

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*Keywords:*EDM, MRR, EWR, surface roughness.

1. Introduction

Electric Discharge machining (EDM) is on type of non- traditional machining process i.e. where there is no mechanical conduct between tool and work piece. EDM is also known as a spark erodes thermo- electric unconventional machining process [1]. In conventional machining process the machining of complex shape like aircraft engine industry the cost of machining is high and also the surface finish is not obtain value. [2]. EDM machine the work material by means of spark erosion. When the work material (Anode) and electrode (Cathode) the spark is produced between them. The work material is dumped into the dielectric fluid. Die-electric fluid is liquid medium; it does not conduct electric current. There are various type of dielectric fluid like petroleum based, synthetic and vegetable based. Also Electric Discharge machine have various type which are based on the type of machining the work piece. The EDM types like micro EDM, Die- sinking EDM and Wire-cut EDM.

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Nomenclature	
DOE	Design of Experiment
MRR	Metal Removal Rate
SR	Surface Roughness
EWR	Electrode Wear Rate
ROC	Radial Over Cut
EDX	Energy Dispersive X-Ray Spectroscopy
EDS	Electro dispersive X-ray spectroscopy
PMEDM	Power Mixed Electric Discharge Machining
SEM	Scanning Electron Microscope
CEDM	Cryogenically Cooled Electrode
WECEDM	Wire Electro-Chemical Electric discharge machine

1.1. Various researches

Yan- Cherng Lin et al investigated the performance of machining of conductive (Al_2O_3 + 30 vol% TiC) by using EDM. They discussed about the EDM machining parameters like machining polarity, peak current, auxiliary current, pulse duration, no load voltage and servo reference voltage. The Taguchi experimental method based on L_{18} orthogonal array was chosen and statistically analyzed by ANOVA to determine the EDM machining characteristics. They conclude Conductive ceramic in machined by EDM process, Metal removal rate is increased with peak current and pulse duration because of more deliver in discharge energy to machining area to aware effect of thermal erosion like melting, thermal spalling, vaporization on EDM process [4]. Maninder Pal Singh et al investigated radial over cut (ROC) using rotary EDM by machining of Al/Al_2O_3 composite with single channel tube tool. To machine Al/Al_2O_3 composite, a brass single channel tube used as tool by electric discharge machining. Peak current, pulse on time, pulse off time and voltage are input parameter and machining method injectection type flushing. S/N ratio graphs and mean effect plot are used to optimize the parameters of Rotary EDM on Al/Al_2O_3 using Taguchi method. [8]

2. Effect of MRR and EWR in Spark EDM

A. Muttamara et al published the paper in title " Effect of electrode material on electrical discharge machining of Alumina" lots of industrial filed are demanded to machine the insulating ceramic materials but Si_3N_4, SiC, and Zro_2. are machined in Electrical discharge machining EDM successfully. Also while machining the Al_2O_3 ceramics indeterminate discharge is occurs and obtain the low quality machining properties. Electrode like Copper, graphite (Poco EDM-3) and copper-infiltrated-graphite (Poco EDM-C3) machine alumina. EDM-C3 very good result in machine 95% pure alumina by EDM and gives High MRR and less TWR over the EDM-3 and copper electrode. They found that 60% in EDM-3 and 80% in EDM-C3 is increase with the positive polarity in MRR. The conclusion is element of copper is not observed on with EDM-3 and EDM–C3 conductive layer and surface resistivity of conductive layer is less in EDM-3 over the EDM-C3. Positive polarity of EDM-C3 improve surface roughness 25µm [5].

S.Suresh kumar et al investigated the parameters like Pulse on time, pulse duty factor, pulse current and voltage by machining of EDM against the composite of Al (6351) - 5 wt% silicon carbide (SiC) 5 wt% boron carbide (B_4C). The aim of the paper to reduce Tool wears ratio (EWR), Power consumption (PC) and Surface roughness (SR). Their practical outcome response was good ability by pulse current with contribution of TWR- 33.08%, SR-76.65% and 48.08% of PC. They summarised that increases the pulse current the tool electric spark energy discharge is also increased and make TWR to increase. And while increase pulse current and pulse duty can less the power consumed [6].