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INVESTIGATION OF ELECTRICAL DISCHARGE MACHINING PARAMETERS FOR TUNGSTEN CARBIDE

Kamalkishor G. Maniyar[*1], Shubham B. Khumkar[2] & Prachi D. Jadhao[3]

[*1]Assistant Professor, Department of Mechanical Engineering, MGI-COET, Shegaon, M.S., India

[2,3]Students, Department of Mechanical Engineering, MGI-COET, Shegaon, M.S., India

ABSTRACT

The objective of this examination is to investigate the influence of Electrical Discharge Machining parameters on material removal rate of Tungsten carbide. The effectiveness of EDM process is determined by the material removal rate noted. Copper is most sensible for use as the cathode terminal in EDM of Tungsten carbide. In this examination, various experimental trials are taken on Tungsten carbide to examine influence of Electrical Discharge Machining parameters on material removal rate. The examinations are conducted by using Taguchi, Design of Experiments method and Analysis of Variance. This examination showed the optimal parametric combination of machining condition which can be used for enhancing material removal rate.

Keywords*: EDM Parameters, Material Removal Rate, Taguchi Method, ANOVA examination*.

I. INTRODUCTION

At present, EDM is widely used as non-conventional machining process for producing high precise machining components. The effectiveness of Electrical Discharge Machining (EDM) is determined by material removal rate noted. For this examination, the material used as a work piece is a tungsten carbide or hard metal. Generally, most of the machining tools are made up of carbide materials. [11, 12]

The goal of present research work is to investigate the influence of Electrical Discharge Machining parameters on material removal rate of Tungsten carbide.

II. LITERATURE REVIEW

Karthikeyan et al. [01] fabricated the aluminum-silicon carbide particulate composites and studied the impact of process parameters on MRR, TWR, SR in EDM of composites. They have utilized three level full factorial plan for the experimentation work and checked model by the ANOVA. Biing Hwa et al. [02] examined the possibility also, improvement of a turning EDM with ball polishing. They have connected three ZrO2 balls as extra parts behind the terminal apparatus offer prompt polishing after the performance of EDM. Author revealed t, his EDM procedure approaches both a higher machining rate and a lower surface harshness. Lee et al. [03] demonstrated the impact of the machining parameter in EDM of tungsten carbide on the machining attributes. They have found the EDM procedure with tungsten carbide better machining exhibitions with the terminal as the cathode and the work piece as anode. Authors revealed the instrument with negative extremity gave the higher material removal rate, bring down tool wear and better surface finish. B. Mohan et al. [04] assessed the impact of the EDM parameters on metal removal rate, TWR, and SR, in the EDM of Al-SiC with 20-25 vol. % SiC. They have found the polarity of the terminal and volume percent of SiC, the MRR expanded with expanded in release percent. Tsai et al. [05] contemplated the electrodes made by powder metallurgy innovation. Authors revealed the recast layer was thinner and fewer cracks were present on the machined surface. P. Narender Singh et al. [06] studied the advancement of impact of the EDM current (C), Pulse ON-time (P) and flushing pressure (F) on MRR, TWR, taper(T), OC, and surface roughness (SR) on machining as-cast Al with 10% SiCp. They have utilized ELEKTRAPULS start disintegration machine and stream flushing of the dielectric liquid for this purpose. ANOVA was performed and the ideal levels for augmenting the reactions were set up. The impacts of the machining parameters (MRR, TWR and SR) in EDM on the machining qualities of fast steel were examined by Yan-Cherng et al. [07]. Exploratory plan was utilized taguchi strategy. The trials were controlled by ANOVA and F - test. MRR increments with increase in peak

current. Dhar and Purohit [08] assessed the impact of current (c), pulse on time (p) and gap voltage (v) on MRR, TWR, OC of EDM with Al– 4Cu– 6Si alloy– 10 wt. % SiCP composites. They have checked models by utilizing strategy ANOVA and also found the MRR, TWR and OC increment huge in a non-straight mold with increment in current. Yan-Cherng Lin et al. [09] accounted for Electrical Discharge Energy on Machining of Solidified Tungsten Carbide utilized an electrolytic copper terminal. The machining parameters of EDM were changed to investigate the impacts of electrical release vitality on the machining attributes, for example, MRR, EWR, and surface roughness. Tool electrode material, for example, Al– Cu– Si– Tic composite created by powder metallurgy (P/M) system also, utilized as work piece material CK45 steel was appeared by Taweel et al. [10]. The central composite second-order rotatable design was used to design the investigations, and RSM was utilized for creating exploratory models. S. H. Tomadi et al. [11] contemplated the impact of the parameters such current, control supply voltage, pulse on time and pulse off time on Material removal rate (MRR) and Electrode wear (EW) in this examination. They have utilized STATISTICA software for analysis of experimental work. Puerto's et al. [12] studied the impact of the factors of intensity, pulse on time and duty factor over machining characteristics such as surface roughness, electrode wear and material removal rate.

III. METHOD & MATERIAL

A. Work piece and electrode material

In this examination, work piece material is selected as Tungsten carbide and electrode as copper. Copper is most conductive and strong material as electrode for Electrical Discharge Machining Processs.

B. Evaluation of MRR

The Material removal rate is determined by weight loss process. It is ratio of difference of weight of the work piece to the machining time and density of the material.

C. Experimental Trails

In this examination, Electrical Discharge Machining process is used to machine tungsten carbide material for different the experimental trials. EDM oil is most commonly used as dielectric fluid for machining process.

Figure 1: Electrical Discharge Machine

IV. RESULT & DISCUSSION

According to figures 2-4, it is noted that material removal rate of tungsten carbide is highly influenced by machining parameters considered for this study. From figure2, it exhibits that the material removal rate increase as the value of current increases so, current is directly proportional to material removal rate. According to Figure3, it shows that when the voltage is extended then material removal rate is also extended. From figure4, it gives pulse on time is

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linearly proportional to material removal rate at some extent. The results obtained from the experimentation as shown in figures 2-4.

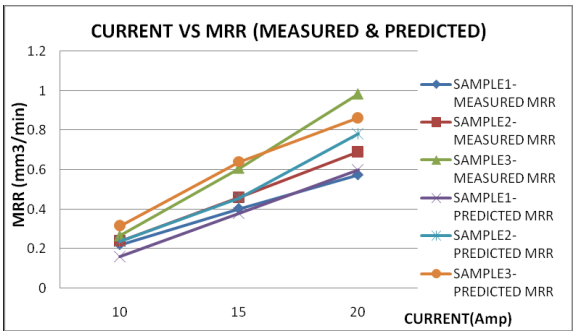

Figure 2: Relationship between Material Removal Rate and Current

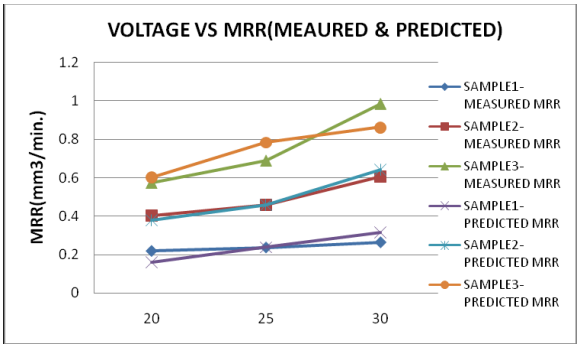

Figure 3: Relationship between Material Removal Rate and Voltage

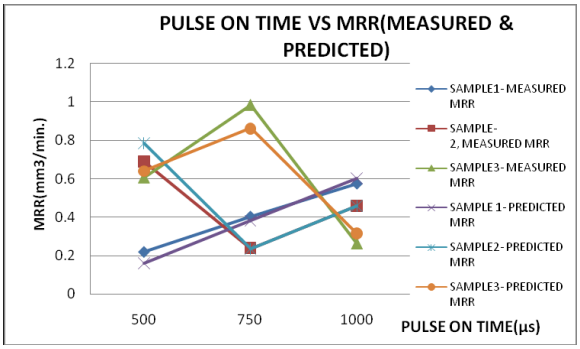

Figure 4: Relationship between Material Removal Rate and Pulse on Time

V. CONCLUSION

According to experimental trails, DOE, Signal to Noise Ratio, Analysis of Variance and Confirmation Test, the conclusion is summarized into following points:

The Copper is most appropriate material for electrode during machining of Tungsten Carbide. It is observed that, Current is mostly significant parameter as compared to voltage and pulse on time. Optimal parametric combination has been selected during the examination of present research work for enhancing values of material removal rate of tungsten carbide using Electrical Discharge Machining Process.

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