iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** V **Month of publication:** May 2017

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Evaluating An Electrical Discharge Machining Parameters With Using Titanium Nano Particle Mixed Dielectric Medium

D. Devendran[1], R. Boopathi[2]
[1] PG scholar, Department of Mechanical Engineering, Mahendra Engineering College, Namakkal, TN, India
[2]Professor, Department of Mechanical Engineering, Mahendra Engineering College, Namakkal, TN, India

Abstract: ***Electric discharge machining is un-conventional machining process. Electrical discharge machine is commonly used for machining for those materials which are cannot processed by conventional machining process. Electrical discharge machine parameters have a significant influence on machining characteristic like material removal rate (mmr) and tool wear rate (twr). In this paper, we compared with titanium powder and without titanium powder mixed diectric fluid used in material removal rate and tool wear rate. The piece used is inconel 718 and tool materials used brass electrode with current, pulse on time and flushing pressure was parameter.***
Keywords : edm, inconel 718, brass, mrr, twr.

I. INTRODUCTION

The (EDM) Electrical Discharge machining technique is now mainly found in fabrication developed, automobile industries and aerospace company, technical and modern mechanical industries. In more number of industrial applications of Electrical Discharge machining technique already existing market and that are simply waiting to be discovered and implemented. It will enlarged in use of Electrical Discharge machining technique in manufacturing will continue to grow and diversify though both a combination of process and awareness knowledge. In production sector always be a need to find a best way to make incredible, EDM will support the drive to quality cost and delivery. Awareness of Electrical Discharge machining will provide the ability to design parts that are not possible or cost effective to produce by any other method. The lookout of machining complex shapes in hardened materials will continue to attract engineers and designers to produce more challenging parts and profiles.

II. LITERATURE REVIEW

Analyses and finalized that Die- Sinker EDM using copper and graphite electrode can be used for optimizing Performance parameters and reducing cost of manufacturing and also found that a silver electrode give better performance in certain characteristics but the cost become high for machining so keeping in mind cost and other some characteristics a graphite electrode is more suitable than copper electrode in case of both MRR and TWR [1]. In the case of over cut the most important factor of discharge current then diameter of the tool and no effect on pulse on time[3]. The Taguchi method is used to formulate the experimental layout, to analyses the effect of each parameter on the machining characteristics, and to predict the optimal choice for each EDM parameter such as peak current, voltage and pulse duration and interval time [4]. It is found that these parameters have a significant influence on machining characteristic such as metal removal rate, electrode wear rate and surface roughness. Tungsten carbide ceramic using electro-discharge The analysis of the Taguchi method reveals that, in general the peak current significantly affects the EWR and SR, while, the pulse duration mainly affects the MRR.
Experimental results are provided to verify this approach [5]. The effect of different materials on surface roughness produced and also helped for choosing right type of electrode material for specific purpose has investigated to reveal the effects of various process parameters of wire electrical discharge machine like pulse on time, pulse off time, gap voltage, peak current, wire feed and wire tension on material removal rate of hot die steel using one variable at a time approach and also the optimal set of process parameters has also been predicted to maximize the material removal rate [6]. The process performance of electrical discharge machining with powder metallurgy tool electrode during the machining of hastelloy using positive polarity. Where current and voltage are taken as process input parameters and material removal rate, tool wear rate, percentage wear rate, surface roughness are taken as output parameters. The effects of the parameters on the responses were evaluated by response surface methodology, which is based on optimization result comparative analysis of the performance of copper and aluminum electrodes for machining stainless steel and

©IJRASET: All Rights are Reserved

carbide. It was found in MRR increases with high in current and voltage, but MRR is higher during machining of stainless steel than that of carbide. At the time of machining carbide, electrode wear and corner wear were higher than the during machining stainless steel.

Wear of copper electrodes was less than that of aluminum electrodes. Volumetric wear ratio i.e., the ratio of the material removed from the work to the same removed from the electrode decreases with increase of current or voltage. That means, comparatively more material is removed from the electrode than that removed from the work. Investigations on work surface finish inform that aluminum electrodes produce smoother surface than copper electrodes during machining of both stainless steel and carbide. The surface was found to be nicy on carbide than on stainless steel [8]. comparision analysis of the performance of aluminum and copper electrodes for machining stainless steel and carbide[9]. It was found that MRR increases with increase in current and voltage, but MRR is higher during machining of stainless steel than that of carbide. During machining carbide, electrode wear and corner wear were higher than those during machining stainless steel. Wear of copper electrodes was less than that of aluminum electrodes[10].

III. SELECTION OF TOOL MATERIAL

The choice of the electrode depends upon the performance criteria require to increase and also depends upon high hardiness, harden rate of high work, presence of abrasive carbide particle, hardness and strong tendency to weld the tool to form build up edge in the required model. The electrodes at the size of 6 mm diameter and 50 mm length were designed out of the rods of brass for performing the experiments.

IV. SELECTION OF WORK MATERIAL

Inconel 718 is a high strength, ttemperature resistant (HSTR) nickel based super alloy and it raised toughness. It is expansively used in aerospace applications such as gas turbines, flight motors, spacecraft's equipment, pumps and tooling. Inconel 718 is difficult to machining the material for their pitiable thermal properties, high robustness and hardness, present period it has highly abrasive carbide particles and strong tendency to weld to the tool to form build up boundary. In this bond wide area of applications in various fields and better to know the behavioral properties of Inconel 718 with EDM. Inconel 718 Nickel Chromium Alloy Inconel 718 is a Nickel-Chromium alloy creature precipitation hard enable and having high creep- rupture strength at high temperatures to about 700°C.

V. EXPERIMENTAL DETAILS

The equipment used to perform the experiments is a die sinking EDM (Electronica-M100 MODEL) machine. The selected work piece material for the research work is Inconel 718. The tool electrode material used is brass. The brass electrode was the negative polarity and the specimen was the positive polarity. The dielectric fluid was of titanium powder particle suspended in kerosene. During EDM, the primary parameters are current, pulse-on time, and Flushing pressure. The work pieces was weighed before and after each experiment using an electric balance with a resolution of 0.001mg to determine the value of metal removal rate was measured as the weight loss.

VI. RESULT AND DISCUSSION

A. Effect of Current on MRR and TWR

Shown in fig.1 and 2 as current increases are increased each individual spark removes a larger crater of metal from the work piece. Although the net effect is an increases in material removal rate. With additive in kerosene, increases the electrode gap between the tool and work piece. As a result titanium powder in kerosene changes the ionization-deionization characteristic of the liquid to permit more spark discharges per unit time, leading to an increase in the metal removal rate and also increased tool wear rate.

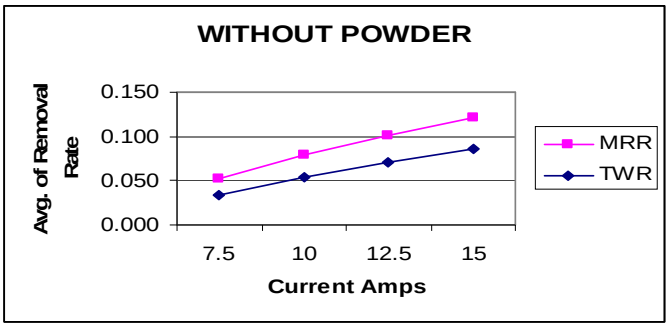


Figure 1. Relationship between current and average removal rate MRR & TWR

©IJRASET: All Rights are Reserved

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

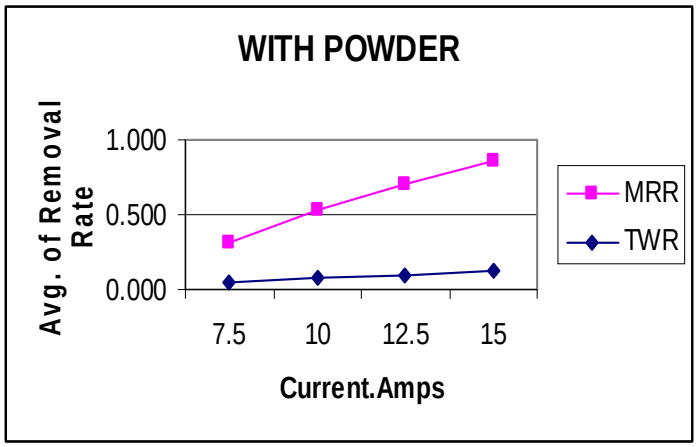


Figure 2 Relationship between current and average removal rate MRR & TWR

B. Effect of pulse on time on MRR and TWR

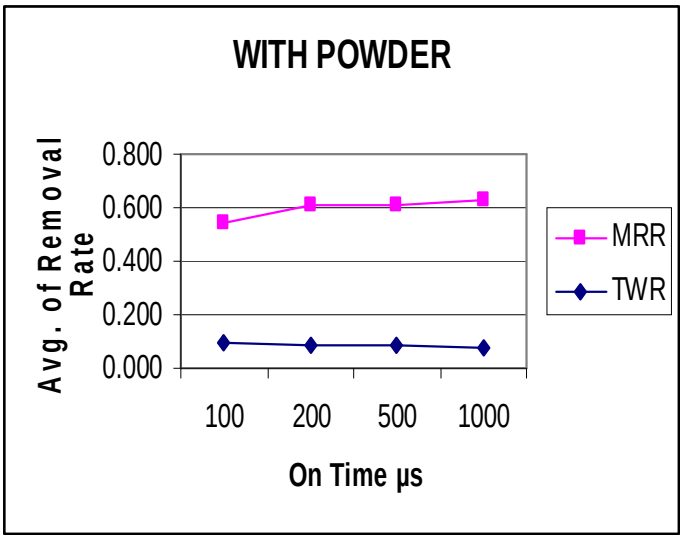


Figure 3 relationship between pulse on time and average removal rate MRR & TWR

Shown in fig. 3 Increase in pulse on time affect the MRR, which is dependent on the energy input and proportional to the pulse on time. Increases in pulse on time for all peak current settings, increases the MRR and also decreased TWR

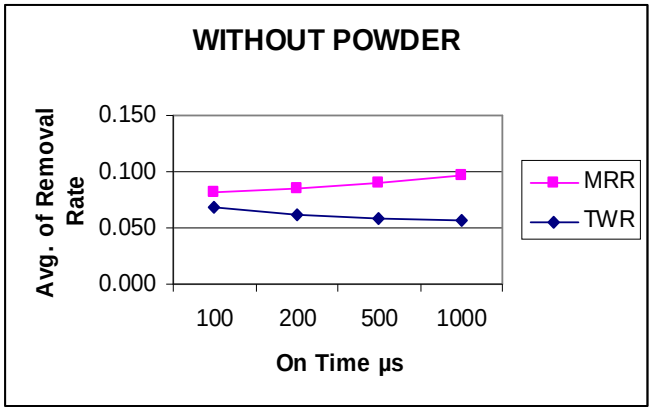


Figure 4 Relationship between pulse on time and average removal rate MRR & TWR.

©IJRASET: All Rights are Reserved

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

C. Effect of Flushing Pressure on MRR and TWR

The MRR, TWR does not change significantly with increase flushing pressure.

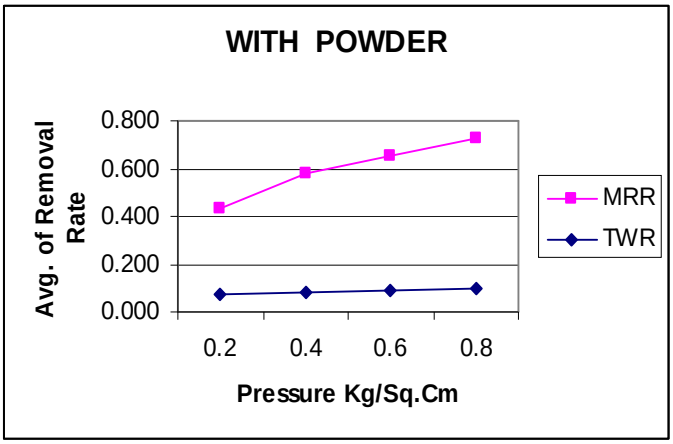


Figure 5 Relationship between flushing pressure and average removal rate MRR & TWR

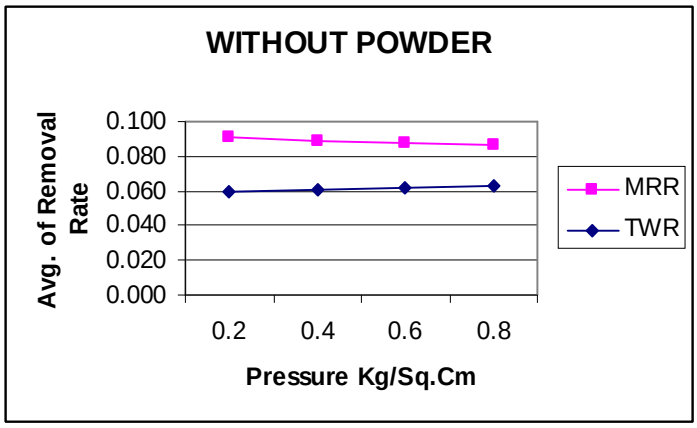


Figure 6 Relationship between flushing pressure and average removal rate MRR & TWR

VII. CONCLUSION

As current increases there is an increase in high energized spark, due to this the MRR and TWR increases with increase in current.As increase in pulse on time for all top level peak current settings, increases the MRR and there is also a considerable decrease in TWR.The MRR and TWR do not change significantly with increase flushing pressure. When comparing titanium powder with and without mixed diectric fluid, material removal rate increases with the powder mixed dielectric medium.

VIII. ACKNOWLEDGEMENTS

Authors would like to thank the Research Centre of Annamalai University, Chidambaram for carrying out these experiments and for their technical support. They also thank the faculties of Mechanical Engineering, Mahendra Engineering College, Namakkal for their sincere support and help throughout the research work.

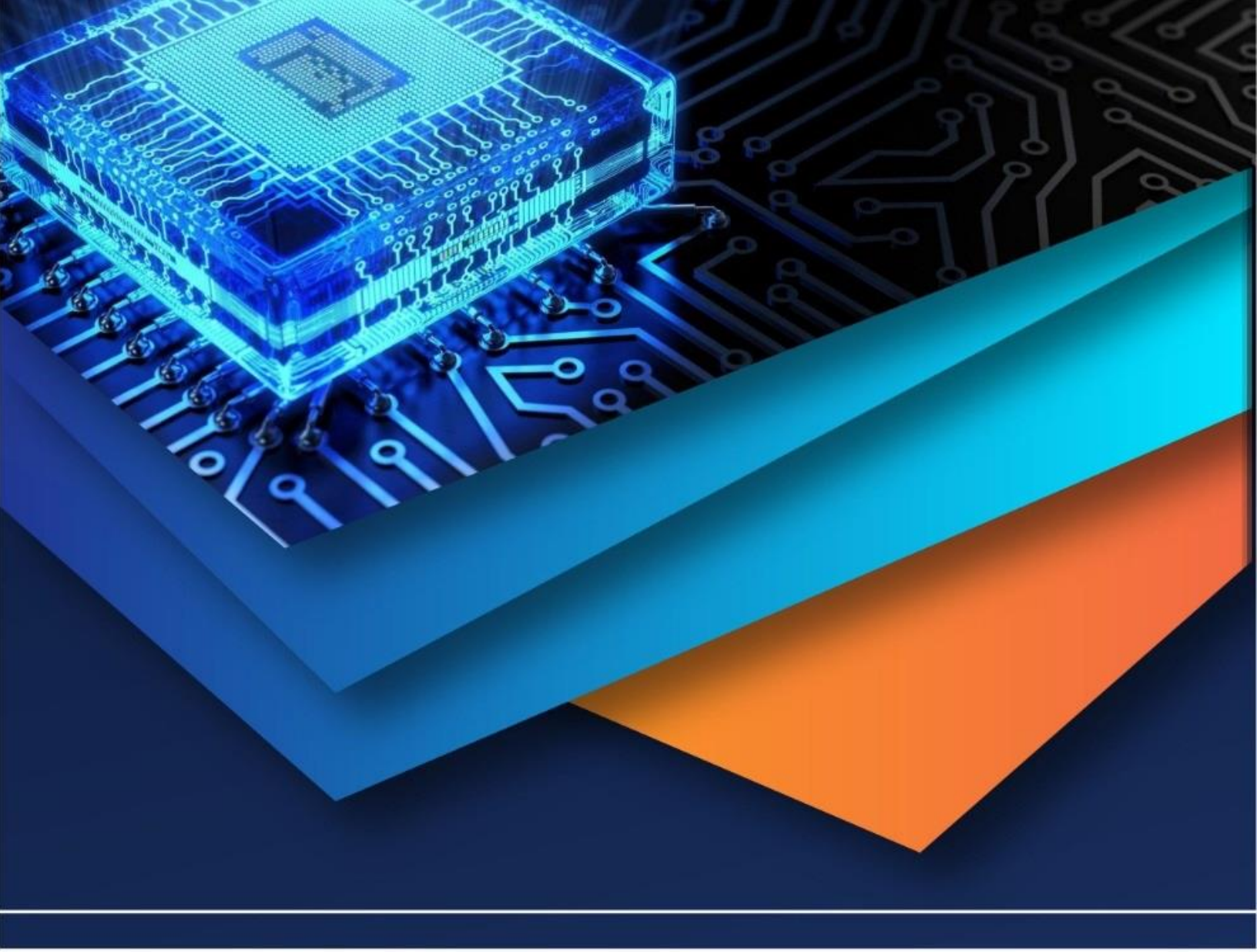
REFERENCES

[1] Wang, C. and Lin, Y.C., Feasibility study of electrical discharge machining for W/Cu composite. International Journal of Refractory Metals and Hard Materials, Vol. 27(5), (2009) 872-882.
[2] Bleys, P., Kruth and Lauwers, B., Sensing and compensation of tool wear in milling EDM. Journal of Mate-rials Processing Technology, Vol. 149(1-3), (2004), 139-146.
[3] Saha, S.K. and Choudhury, S.K., 2009. Experimental investigation and empirical modelling of the dry electric discharge machining process. International Journal of Ma-chine Tools and Manufacture, 49(3-4), 297-308.

©IJRASET: All Rights are Reserved

[4] Mohan, B., Rajadurai, A. and Satyanarayana, K.G., 2002. Effect of sic and rotation of electrode on electric discharge machining of Al-sic composite. Journal of Materials Processing Technology, 124(3), 297-304.
[5] Vijay kumar , Naveen Beri, Anil and Paramjit singh, jully- sept. 2010some study of electric discharge machining of hastelloy using powder metallurgy electrode, International journal of advanced engineering technology, E-ISSN 0976-3945.
[6] H.K Kansal, sahijpal singh & Pardeep kumar, 13 june 2006,International journal of engineering & material sciences, performance parameters optimization(multi-characteristics) of powder mixed electric discharge machining through taguchi's method and utility concept, vol. 13.
[7] Yan, B.H., Wang, C.C., Chow, H.M. and Lin, Y.C., 2000. Feasibility study of rotary electrical discharge machining with ball burnishing for Al2O3/6061Al composite. International Journal of Machine Tools and Manufacture, 40(10), 1403-1421.
[8] Yan-Cherng Lin, Yuan-feng chen, Ching-tien Lin, AND Hsinn-jyh Tzeng Feasibility study of rotary electrical discharge machining with ball burnishing for Al2O3/6061Al composite 2008, vol.23: 391–399,.
[9] Puertas, I. And Luis, C.J., 2004. A study of optimization of machining parameters for electrical discharge machining of boron carbide. Materials and Manufacturing Processes, 19(6), 1041-1070.
[10] Tsai, H.C., Yan, B.H. and Huang, F.Y., 2003. EDM performance of Cr/Cu-based composite electrodes. International Journal of Machine Tools and Manufacture, 43(3), 245-252.
[11] Saha, S.K. and Choudhury, S.K., 2009. Experimental investigation and empirical modeling of the dry electric discharge machining process. International Journal of Machine Tools and Manufacture, 49(3-4), 297-308.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)