International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072

ELECTRIC DISCHARGE MACHINE: REVIEW ON INCREASE AN EFFICIENCY OF METAL REMOVING RATE

Abinash Singh[1], Vishvjeet Mathuria[2], Pankaj Kumar[3]

[1]*Student, Dept. of Mechanical Engineering, Arya Institute of Engineering and Technology, Rajasthan, India.*
[2]*Student, Dept. of Mechanical Engineering, Arya Institute of Engineering and Technology, Rajasthan, India.*
[3]*Asst. Professor, Dept. of Mechanical Engineering, Arya Institute of Engineering and Technology, Rajasthan, India.*

Abstract - *Electric discharge machine (EDM) procedure is an unconventional and non-contact type machining operation which is in used in industry for greater precision products. It is known for machining hard, tough and brittle conductive materials since it can melt any electrically conductive material regardless of its hardness. The work piece machined by EDM depends on thermal conductive, electrical resistivity, and melting point of the materials. To improve the metal cutting rate efficiency by the coating of copper layer on the tool. As we known copper having high thermal conductivity which increase the metal removing rate as well as tools life time. Also overview on modeling of process parameters, and optimization of process parameter such as pulse on time, pulse off time, feed rate on EDM of copper coating tools part performances measures such as surface roughness and electrode wear rate. From the review results, it has been observed that the efficiency of the machining process can be improved by optimize electrical process parameter.*

Keyword: - EDM, MRR, COPPER COATING ON TOOLS, CONDUCTIVE MATERIALS, MACHINED COMPLEX SHAPE

1. INTRODUCTION

Electric discharge machine (EDM) has become an important non-traditional machining process; this is based on the principle of thermo electric energy between the work piece and tools. Since the thermal energy produced in electrical discharge machining process is due to the applied electrical energy. The work piece must be a conductive electrical material which is submerged into the dielectric fluid for better degradation. It has a wide range of application in production of die cavity with large components, deep small diameter whole and various intricate holes and other precision part

2. PRINCIPLE OF EDM

Electrical discharge process works on the general principle of spark and it's generation and metal removed by spark erosion. EDM spark erosion is same as electric spark which burn a small hole in a piece of metal through which it contacts. The spark generated by this it produces heat, which remove metal by erosion and evaporation. In this machining process both the job and tool must be made by conductive material. Work piece should be well electric conductive. Only electric conductive material can be machined by this method. In an EDM process a high frequency current used to generate spark between electrode and work piece. It causes heat and remove metal form job.

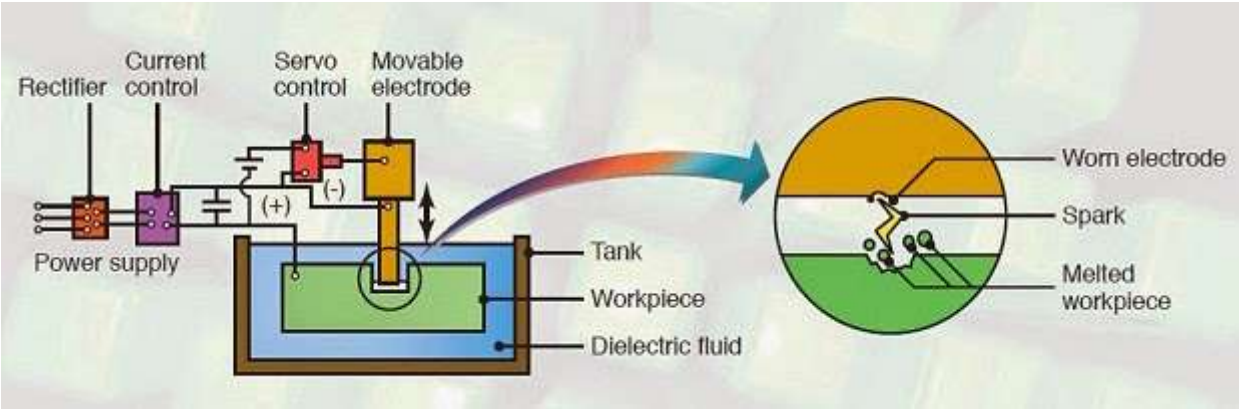

Fig -1: electric discharge machine

3. RESEARCH PROGESS

(a.) In [1] **K.H. HO** et al had published a paper titled a state of the art electrical discharge machining (EDM) in June 2003. They summarized EDM as a well-established machining option for manufacturing complex and hard or tough material parts that are extremely difficult to machine by conventional machining processes. A range of EDM applications are highlighted together with the development of hybrid machining processes. This paper discusses this development and outlines the trends for future EDM research.

(b.) In [2] **Anand pandey** et al does a review on current research trends in variants of electrical discharge machining. He wrote that present manufacturing industries are facing challenges from these advanced materials. Powder mixed EDM and ultrasonic assisted EDM has not only reduces tool wear but also increase the material removal rate as well as life time of tools which is benefit for us and also help to increase the production rate.

(c.) In [3] **M.Kunieda** et al is aims to show the prospects of EDM technology by interrelating recent achievement in fundamental studies on EDM with newly developed advanced application technologies. In this machine quite difficult to maintain the gap phenomena so we introduce computer and electronic measuring instruments are contributing to new discoveries and inventions in EDM technology.

(d.) In [4] **Michael F.W** An experiment is a procedure for collecting scientific data in order to answer a assumption, or to provide material for generating new thought, and differs from a survey because the scientist has control over the treatments that can be applied. They used parametric method for the t-test or analysis of variance is usually more powerful than non-parametric methods.

(e) In [5] **J.L. Lin** et al they use of the grey-fuzzy logic based on orthogonal array for optimizing the EDM process with multi-response has been reported. Fuzzy logics are used to improve the process responses like mmr, wear ratio, surface roughness in the electric discharge machining process. They studied the performance character of the machine process, and parameter like duty factor, discharge current, pulse on time.

(f.) In [6] **Prof. Dr. Ing. A.Behrens** et al, A paper was presented under the title "new arc detection technology for highly efficiency to electro discharge machining" control of electro-discharge machining is aimed at a stable process, with maximum removal rate in addition with high quality surface. Electro machining is known for its statistic and non-linear and is therefore difficult to control.

(g.) In [7] **C.K. Biswas** et al, Optimization of EDM process with fuzzy logic. Technique in December 26-27, 2012 in Dubai (UAE).IN this analysis, the optimization of multiple responses of electric discharge machining (EDM) utilizes fuzzy logic coupled with taguchi method is attempted. Fuzzy logic is a technique which is used to convert multiple responses into a single characteristics index. Fuzzy logic in edm to control the system under the stable and efficient manner.

(h.) In [8] **Samar Singh** et al , they had do a parametric optimization of electric discharge drill machine using taguchi approach review in journal of engineering ,computer and applied sciences (JEC&AS),ISSN NO:2319-5606,olume 1,No.3,December 2012.they use best parameters such as pulse on-time, pulse off-time. Taguchi method use for better machined and accuracy in an effective way.

(i.) In [9] **Yih-fong Tzeng** et al, they had a‟ multi-objective optimization of high-speed electrical machining process using a taguchi fuzzy-based approach" materials and design 28(2007)1159-1168, science direct. They comparing to the initial trial, the MCPIs of the optimal design are increased by 52.58%.the dimension are precision and accuracy are improved by 24.9% and 0.9%, respectively.

(j.) In [10] **J.L. Lina** et al, they do optimization of the electrical discharge machining process published in journal of materials processing technology 102(2000) 48-45. A multi –response performance index is used to solve the EDM process with multiple performance characteristics. The machining parameter (the work piece polarity, dielectric fluid, pulse on-time, discharge current and discharge voltage) are optimized.

4. CONCLUSION

It is one of the modern machining methods that utilize electric discharge to machine the surface and to provide a high quality machined surface.

It is very handy and can be utilized to save time and material and so the money invested in machining.

But certainly provide high accuracy and conformation to the design as well.

They used fuzzy logics methods to increase the accuracy and material removing rate of tools, which is benefits for organization.

5. FUTURE SCOPE

(1.) EDM used for manufacturing hydraulic valve spools.

(2.) It's used for blanking, forging etc.

(3.) It's used for making of complicated geometrical forms.

6. REFERENCES

[1] **K.H. Ho** and **S.T. Newman,** *"The State of the art electrical discharge machining (EDM)"* International Journal of Machine Tools & Manufacture 43 (2003) 1287–1300

[2**] Anand pandey** and **Shankar Singh** for *"review on Current research trends in variants of Electrical Discharge Machining"* International Journal of Engineering Science and Technology Vol. 2(6), 2010, 2172-2191

[3] **M, B. Lauwers, K. P. Rajurkar, B. M. Schumacher** *"Advancing EDM through Fundamental Insight into the Process"*

[4] **Michael F. W**."*Guidelines for the Design and Statistical Analysis of Experiments"* ATLA, 2001

[5] **J.L. Lin** and **C.L. Linz** It are used for drilling fine deep holes like in fuel injecting nozzles. *"Grey- fuzzy for the optimization of the manufacturing process"* Journal of Materials 2005)

[6] **Prof. Dr.-Ing. A. Behrens and Dipl.-Ing. M.P. Witzak** *"New arc detection technology for highly efficient electro-discharge machining"* Universität der Bundeswehr Hamburg Laboratorium Fertigungstechnik (LFT) - Holstenhofweg 85 - 22043 Hamburg.

[7**] C.K Biswas** and **Shailesh dewangan** investigate optimization of EDM process with Fuzzy logics technique, manufacturing and mechanical engineering (ICMMME'2012) DECEMBER 26-27, 2012 Dubai (UAE)

[8] **Samar Singh** and **Mukesh verma** had do a parametric optimization of electric discharge machine using taguchi approach published in journal of engineering, ISSN NO: 2319-5606, Volume 1, No.3, and December 2012.

[9] **Yih-fong Tzeng** and **Fu-chen**, multi-objective optimization of high-speed EDM process using a taguchi fuzzy-based approach material and design 28(2007)1159-1168, science direct.

[10] **J.L.Lina, K,S, Wangb, B.H.Yan** and **Y.S. Tarng** optimization of the EDM process journal of materials processing technology 102(2000)48-45.