A REVIEW PAPER ON EVALUATION AN COMPARATIVE DESCRIBING THE OPITMIZATION OF INPUT MACHINING ATTRIBUTE IN MACHINING

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ABSTRACT

The present scenario is the advancement of manufacturing industry, and it requires for alloy substances having high level hardness, impact resistance and toughness. The EDM is used in specific cutting complex contours which are complex to machine using traditional machining methods. It is a non-touching non-regular machining method which is used for better quality of product which is complex to achieve by using of contacting EDM processes. The current study on EDM is performed on EN-24and EN-42 with copper as electrode to establish the influence and compare the process factors on material removal rate, tool wear rate and surface roughness. The experimental outcomes resulted that the material removal rate, tool wear rate and surface roughness are majorly effected by peak current

Keyword : - *EDM.Machining,Cooloing*

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1. INTRODUCTION

Electro Discharge Machining (EDM) process is generally an electrical-warm non-conventional material machining technique, which uses electrical energy to produce electrical spark and the material evacuation predominantly happens due to erosion caused by the heat energy of the spark.

EDM are generally applied to perform machining operation on hard substance which are not easy to machine and have more strength and are temperature contrary alloys. EDM may also be used for machining complex design in short batches or for on job-shop orient. Experimental substance which should be machined in EDM must be conductor of electricity

1.2 EDM Process

In EDM, generally a potential drop is tried across the electrode and substance. For this process, the tool and the experiment materialboth must good conductor of electricity and tool and working substance are submerged in a insulating environment to enhance the effectiveness of the process. Normally kerosene or deionizer water is providefor dielectric environmentbut in industries EDM oil is used. A spark clearance is occur in middle both of the electrode and the experimental substance. On Depending the provided potential drop across the electrodes and the clearance among the tool and work piece, there establishes an electric area. The working tool is attached to the minus polaritywhile the work substance is attached to plus polarity. When the electricity is supplied a field is produced, the unbounded electrons present upon the surface of the workingtool are aimed to electrostatic forces. If work task or the catching energy of the negative charge is less, electrons excitedtransferred from the tool (consider it would be attached with the minus polarity). Thistype of emission of negative chargeisknown as cold emission. The cold negative charge transferred and accelerate towards the job through the dielectric environment.. As the electrons obtain speed and energy, they start to transfer in direction of the work, there would be movement between the negative charge and insulating particles. Such movement result in formation of ion of the dielectric molecule based on the ionization energy of the non conductive molecule and the energy stored in the negative charge. Thus, negative charge get accelerated, more positive charge and electrons will generate a movement. Due to this increasing the constriction of negative charge and ions in the insulatingamong theelectrode and the work at the plasma clearance. The concentration would becomemore high that issue existing in that region known as “plasma”. There will be very less electrical contrary of such plasma channel.

Suddenly more electrons will transferredfrom electrode to work and charge from work to electrode. This is the avalanche movement of negative charge molecule and during such walking of negative charge and ions,it is seen by eye like spark. Here electrical energy is removed as spark in form of thermal energy.

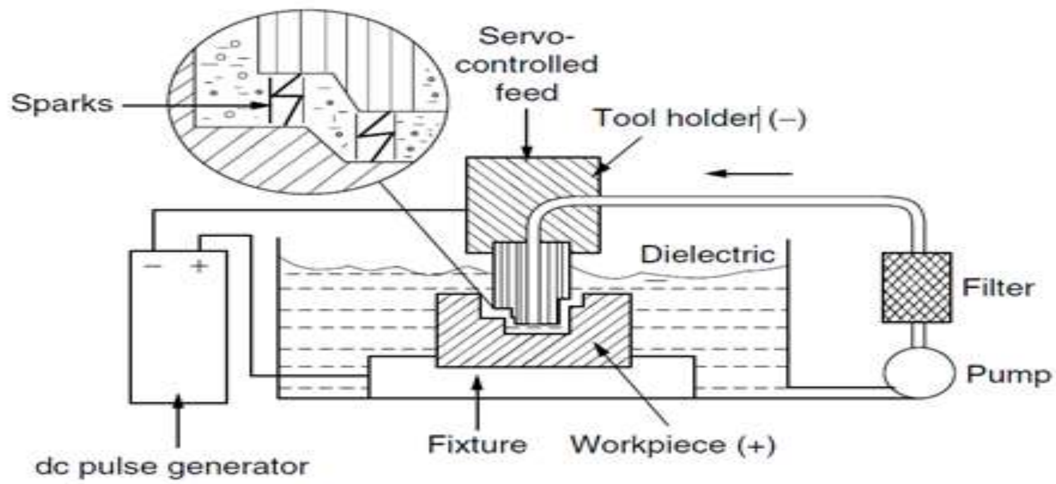

Figure 1.1 EDM Process

1.2 Conventional EDM

In the EDM process, continuous electric sparks are produced to machine the experimental substance, which acquires the shape different to that of the cutting electrode. The electrode and the experimental substance are both drown in a dielectric fluid to make the process more effective. A servomechanism is used to maintains a gap of low thickness between the tool and the work piece,resisting them from touching each other. This is called spark gap.
In EDM die-sink machining, a relatively soft copper or graphite electrode is used to machine hard material.The EDM process produces a cavity which is little bitlargerthan the feature of electrode because of the overcut or enlargement.

1.3 Wire EDM

The wire-cut EDM is aelectro discharge machine which useselectrode in form of wire togenerate thewanted contour or shape. It do not require a specific form of electrode, but it uses acontinuously traveling vertical electrode in form of wire in presence of tension as the electrode. In wire EDM process electrode is used about a thickness asminimumas a diameter of needle which produces the shape required.

1. 4 Dielectric Fluids - Conventional EDM

During the process EDM, the experimental substance and the electrode are drownin the nonconductive fluid, which is an insulator of electricity that provides a medium for controlled discharge of sparks. The dielectric fluid provides a means of flushing when pumped through the spark gap. This removes suspended debris particlesof work piece material and electrode from the spark gap.

1.5 The Servo Mechanism

Both of wire cut EDM and die-sinking EDM machines are equipped with a servo control mechanism which automatically maintains a constant spark clearance among the tool and the work piece. It is an important aspect for both machine types that there is no physical attachment between the electrode and the experimental substance, otherwise sparking may damage the work piece and the wire could break. The servomechanism serves the purpose of advancing the electrode into the work piece as the operation progresses and also senses the work-tool gap and controls it to maintain a proper spark gap which is necessary for a successful machining operation.
1.8Electrode Material
Electrode material used in the machining process that it have capacity of less tool wear when anode ion impact on tool.

Accordingly the climate danger will be few by fitting or appropriately picking its characteristics or notwithstanding the temperature increments, there would be less dissolving. Further, the dieted tempera vice ought to be effortlessly functional as perplexing form geometric figure are good machined in non conventional EDM.

2. LITERATURE REVIEW

D. K. Ojha et al. [1] conducted analysis with Taguchi approach and revealed that current significantly influences MRR, Dimensional Tolerance and surface roughness whereas TWR is mostly influenced by flow rate of the dielectric fluid used.

M M Sari et al. [2] by their experimental investigation foun that carbon nano-tubes give better surface finish as compared to the traditional EDM process. The thickness of recast layer is observed to be smaller when carbon nano-tubes are used. Tool Wear Rate and Material Removal Rate are enhanced and heat can be effectively absorbed by the carbon nano-tubes, if optimum machining parameters are set.

DeepuP.Nairet al. [3]conducted an experimental investigation for surface characteristics of M300 Steel and concluded that the parameter current was the most effective for surface roughness followed by the voltage and pulse on time. Another investigation conducted by

George et al. [4]to optimize the machining parameters, according to their relative significance, gap voltage, peak current were the main influencing parameters for the performance measures.

S. Ben Salem et al.[5]conducted experiments and found that a fewer number of experiments is required to optimize the surface roughness and it was found that the current intensity is the major dominating parameter for surface roughness. In a research conducted by

V. Chandrasekaran et al. [6]through their investigation revealed that the MRR is highest for all compositions. As the percentage of nickel increases the thermal conductivity of the composition increases since the nickel material is easily removed from the surface of the parent material. Hence the MRR increases with increase in the percentage of nickel. It is also found that the surface roughness increases with current and flushing pressure and doesn’t depend on percentage of Ni. The optimum Ra values decreased with increasing electrode rotation.

Francesco Modica et al. [7]investigation throw light on relation between the material removal technique, identified during the evaluation of MRR and TWR. The selected parameters were voltage, discharge current, pulse width and frequency,so as to experimentally quantify the waste of material produced and optimize the technological process in order to decrease it.

Kumar Sandeep et al. [8]investigated surface quality and metal removal rate which are the utmost important factors for selecting the optimum condition of processes and also the economical aspects. The research reported the trend of research in EDM.

Lau et al. [9] established the feasibility of using Electrical Discharge Machining for machining carbon fiber composite materials. Parameters selected were currents, pulse durations, tool materials and polarities and it concluded that it is totally feasible for EDM to machine carbon fiber composite. Copper is found to be better than graphite electrodes for tool wear and surface finish. They suggested that positive polarity must be opted for machining carbon fiber composite materials so as to achieve low tool wear ratio.

Navdeep Malhotra et al. [10]conducted experiments on EN-31 and found that surface roughness of EN-31 Die Steel was majorly influenced by the current and pulse on time. Lower the value of current better the surface finish and same effect in case of pulse on time.

H.T. Lee et al. [11] found the relationship between the EDM parameters and surface cracks formation on the basis of discharge current and pulse on time parameters for EDM machining of D2 and H13 tool steel and concluded that surface roughness increases when pulse on time and pulse current increases. He also found that increased pulse-on duration will increase both the average white layer thickness and also the induced stress which promote crack formation.

Pravin R. Kubade et al. [12]studied the dominance of EDM parameters on tool wear rate, material removal rate and radial overcut of AISI D3 using acopper electrode. The results revealed that MRR is mainly dominated by peak current while other factors were less effective. Tool wear rate is majorly influenced by both peak current and pulse on time, while duty cycle and gap voltage were very less effective on it. Peak currentalso has the major influence on radial overcut followed by duty cycle and pulse on time while almost very less influence was observed by gap voltage.

Harpuneet et al. [13]Investigating the Effect of Copper Chromium and Aluminum Electrodes on EN-31 Die Steel and concluded that Metal removal rate is better for copper chromium except at 6A current when compared to brass electrode. Maximum MRR was achieved at 12A for both brass and copper chromium.

Singh et al. [14]through their study found that the negative polarity of tool is esential for minimizing the surface roughness and increasing the pulse on time produces more rough surfaces. Addition of powder particles in dielectric fluid will decreases the level surface roughness of EDMed specimen while higher peak currents offers more rough surfaces.

Ojha et al. [15]reviewed for MRR improvement in Electrical Discharge Machining and found that the basis of controlling and improving MRR mostly relies on empirical methods. This is majorly because of the stochastic nature of the sparking phenomenon that involves both electrical and non-electrical process parameters. They also concluded that MRR has been getting overwhelming research potential from the invention of EDM process, and it requires more experimentation in future.

3. 1 CONCLUSIONS

- Both Ip and Ton are the major influencing alternatives and have direct influence on MRR for both materials.
- MRR shows and increasing trend with Ip and Ton for both EN-24 and EN-42 because at top level of Ip and Ton, the intensity of spark is high and hence large amount of material transfer from upper layer of workpiece is noticed..
- Ip and Ton approximately similar influence on MRR for both the materials.
- Pulse duty factor is found to be the least influencing parameter for MRR in both the cases
- Both Ip and Ton are the major influencing alternatives and have direct influence on TWR for both materials. It is seen that TWR follows an increasing trend with pulse on time for both EN-24 and EN-42. This is because at top level of pulse on time, the intensity of spark is high. This produce in outcome in form of large transfer of material from the surface of the tool and hence higher MRR is obtained at higher level of Ton.

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