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AN EXPERIMENTAL INVESTIGATION AND COMPARISON OF PMEDM WITH CONVENTIONAL EDM PROCESS

M. Rajesh[1*], M. Sudhahar[2] and P. Vijayakumar[1]

[1]Department of Mechanical Engineering, PRIST University, Thanjavur, India. [2]Department of Mechanical Engineering, PREC, Thanjavur, India. E. Mail: *m.rajeshmanohar@gmail.com

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ABSTRACT

This present experimental work is to find out the optimize input process parameters of powder mixed electrical discharge machining (PMEDM)on OHNS-O2 with graphite powder. Taguchi design is used to found out the optimized value and to analyze the experiments. Analysis were done to investigate the effects of the process parameters viz. pulse on time (Ton) , pulse off-time (Toff)& current and concentration of the Sic powder in IPOL dielectric (C) and its effects on material removal rate (MRR), surface roughness (Ra),and process parameters were optimized for high MRR, low Ra and machining timing using Taguchi function approach of MINITAB software.optimal factor for Surface Roughness was obtained, and conventional EDM process is undergone for the obtained surface roughness factor.Both process Roughness value are compared and found that the PMEDM process is better than conventional EDM process.

INTRODUCTION

In PMEDM, powder is added to the EDM process, it helps to minimize the surface roughness. Rajesh [2018] discussed that Machinablity Evaluation and Parameter Optimization of PMEDM Process of OHNS-O2. Initially high carbon steel is heat treated to increase its hardness from 205 BHN to 535 BHN and then hardened steel is sliced into 9 pieces with help of wire EDM, finally pieces are machined in PMEDM using constant graphite powder and optimized value are found. The present study is the continuation of that work. In this study optimized sample input parameter for surface roughness (Ra) have been chosen from the 9 samples of PMEDM and conventional EDM process undergone for the same sample input parameter which have been choose from PMEDM, output response value from EDM is compared with PMEDM and found that PMEDM is better than conventional EDM process. Singh and Sharma [2016] discussed and he concluded that Graphite powder is found to be more suitable for improvement in surface characteristics of WC-Co. Vijaykumar and Shivraj [2017] discussed and concluded that the FE model would give better prediction of material removal rate. Chethan et al., [2016] discussed and concluded that Frequent short circuiting, addition of Al powder to the dielectric fluid reduces the MRR whereas TWR decreases for low peak current. Ryota and Okadaa [2016] discussed and concluded that Chromium containing layer can be formed on the EDM finished surface by using a chromium powder mixed fluid. Tripathy and Tripathy [2016] discussed and concluded that that adding conductive powder to the dielectric fluid improves the surface topography with less defects, cracks and surface roughness. Gangadharudu et al., [2015] discussed and concluded that PMEDM process has better MRR when aluminum suspended kerosene dielectric is used for machining. A significantdecrease in Ra is also observed. Satishkumar and Sugumaran [2018] discussed and conclude that hardening of materials increase the life time of the material. Jayabharathy and Mathia -zhagan [2018] discussed and concluded that corrosion plays a vital role in material removal rate.

EXPERIMENTAL DETAILS

PMEDM process with work material OHNS-O2, size – 30 X 12mm, with Copper Electrode which has 20 dia X 15mm thickness. I POL Fluid is used as a Dielectric Fluid, Ampere Rate Min. Rate-2 amps, Max. Rate-20amps, in Machine Electronica PSR35, 9 pieces have been machined before, it is shown in fig 1 and the process was discussed in Rajesh [2018].

Fig 1: Machined 9 pieces of PMEDM

Table 1.1: Experimental Data (surface roughness) of the PMEDM process (from Rajesh [2018])

S.NO	Design	T ON	T OFF	AMPS	RA µm
1	$A_1B_1C_1$	8	4	10	5.027
2	$A_1B_2C_2$	8	6	12	5.360
3	$A_1B_3C_3$	8	8	14	4.703
4	$A_2B_1C_2$	10	4	12	5.516
5	$A_2B_2C_3$	10	6	14	7.024
6	$A_2B_3C_1$	10	8	10	6.028
7	$A_3B_1C_3$	12	4	14	4.389
8	$A_3B_2C_1$	12	6	10	3.196
9	$A_3B_3C_2$	12	8	12	2.005

To compare PMEDM process with conventional EDM process, from the above table 1.1 three sample input parameters have been chosen 3,6,9. These input parameters are chosen because of it has +2 surface roughness value in difference.

Fig 2: PMEDM (3, 6, 9) machined pieces

INPUT PARAMETERS FOR EDM PROCESS.

Table 1.2: Input Parameter for conventional EDM process.

S.NO	T ON	T OFF	Amps
1	8	8	14
2	10	8	10
3	12	8	12

The same Hardened specimen OHNS-O2 is machined with conventional EDM process for the input parameter shown in table 1.2, machined pieces of EDM are shown in fig 3, Surface roughness values obtained from these EDM pieces 1,2,3 (figure 3) are compared with surface roughness of PMEDM pieces 3,6,9 (figure 2) values.

Fig 3: Conventional EDM machined pieces

RESULT AND DISCUSSSION

OUTPUT RESPONSE ANALYSIS

Table 1.3: Output response analysis

Sample no	Process	T ON	T OFF	Amps	Ra value
3	PMEDM	8	8	14	4.703
1	EDM	8	8	14	5.647
6	PMEDM	10	8	10	6.028
2	EDM	10	8	10	6.735
9	PMEDM	12	8	12	2.005
3	EDM	12	8	12	3.123

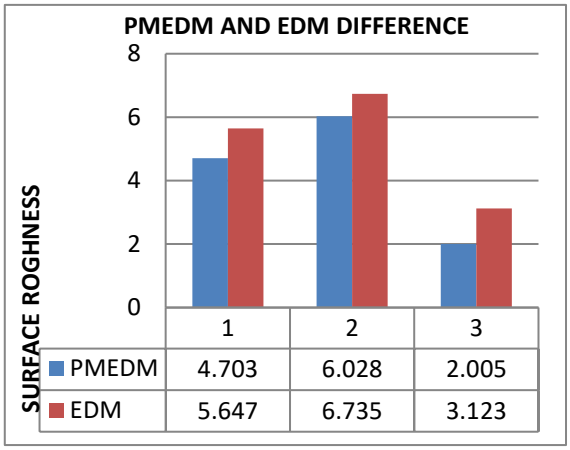

Fig 4: PMEDM and EDM DIFFERENCE

Parameter 3, 6, 9 sample only executed through conventional EDM process and analyzed. Both process Roughness value are compared and found that the PMEDM process is better than conventional EDM process. Medium level pulse on and pulse off time and higher ampere rating only can achieved lower level surface finish.

In PMEDM powder plays a vital role in surface roughness, this is the main reason PMEDM surface roughness is lower compare to conventional EDM surface roughness. From this am concluding that PMEDM is better than conventional EDM process.

4) CONCLUSION

The aim of the research work was to investigate the machinability of OHNS-O2 through powder mixed EDM and to compare PMEDM with conventional EDM. Experimentally analyzed using three process parameters were varied viz. Pulse on time, Pulse off time and ampere rating constant with dielectric pressure and constant Sic powder mixed with fluid to study the influence on the responses Ra. Based on the experimental results the following conclusions are drawn:

Both process Roughness value are compared and found that PMEDM process is better than conventional EDM process, result also shows graphically. Medium level pulse on and pulse off time higher ampere rating only can achieved lower level surface finish.

5) REFERENCES

Chethan R., K.H. Syeda and P.A. Kuppan, Machinablity of AL/10%SIC/2.5%TIB2 metal matrix composite with powder-mixed electrical discharge machining. Procedia Technology 25: 1056–1063 (2016)

Gangadharudu T., D.K. Sahoo, S. Gangopadhyay and C.K. Biswas, Modeling and multi-objective optimization of powder mixed electric discharge machining process of aluminum/ alumina metal matrix composite. Engineering Science and Technology, an International Journal 18: 369e373 (2015)

Singh J. and R.K. Sharma, Implementation of Taguchi method withhybrid decision making tools for predictionof surface characteristics for powder-mixed EDM of WC. Perspectives in Science 8: 455-458 (2016)

Rajesh M., Machinability Evaluation and Parameter Optimization of PMEDM Process of OH-NS-O2. International Journal of Emerging Technologies in Engineering Research 6(3): 44-50 (2018).

Satishkumar R. and V. Sugumaran, Estimation of remaining life of bearings using rotation forest and random committee classification models – a statistical learning approach. Pak. J. Biotechnol. vol. 15 (special issue icrame 17) pp. 1-5 (2018)

Ryota Toshimitsua and A. Okadaa, RyojiKitadab and Yasuhiro Okamotoa, Improvement in Surface Characteristics by EDM with Chromium Powder Mixed Fluid. Procedia CIRP 42: 231 – 235 (2016)

Tripathy S. and D.K. Tripathy, Multi-attribute optimization of machining process parameters in powder mixed electro-discharge machining using TOPSIS and grey relational analysis. Engineering Science and Technology An International Journal 19: 62–70 (2016)

Jayabharathy S. and P. Mathiazhagan, study of erosion corrosion behaviour of magnesium and its alloys. Pak. J. Biotechnol. Vol. 15 (Special Issue ICRAME 17) Pp. 71-74 (2018)

Vijaykumar S. Jatti and B. Shivraj, Thermo-electric modelling, simulation and experimental validation of powder mixed electric discharge machining (PMEDM) of BeCu alloys. Alexandria Engineering Journal (2017).