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PARAMETRIC OPTIMIZATION OF WIRE ELECTRICAL DISCHARGE MACHINING (WEDM) PROCESS USING ANOVA

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ABSTRACT:

The material removal mechanism of WEDM is very similar to the conventional EDM Process involving the erosion effect of produced by the electrical discharge (sparks). In WEDM, material is eroded from the work piece by a series of discrete sparks occurring between the work piece and the wire separated by a stream of dielectric fluid, which is continuously fed to the machining zone. The WEDM process make use of electrical energy generating a channel of plasma between the cathode and anode, and turns into thermal energy at a temperature in the range between of 8000-12000°C or as high as 20,000°C initializing a substantial amount of heating and melting of material on the surface of each pole. In this thesis, to investigate and optimize the potential process parameters influencing the MRR, SR and Electrode Wear while machining of Aluminum alloy using WEDM process. This work involves study of the relation between the various input process parameters like Pulse-on time(Ton), Pulseoff time(Toff), Pulse Peak Current(IP), Wire material and Work piece material and process variables. Based on the chosen input parameters and performance measures ANOVA method is selected to optimize best suited values for machining for Aluminum alloy by WEDM.

INTRODUCTION TO EDM

A machining methodology generally used for Non Ferrous metals, discharge Machining (commonly referred to as "EDM Machining") makes it doable to figure with metals that historic machining techniques square measure ineffective. A critical purpose to don't forget with EDM Machining is that it'll completely paintings with substances that rectangular measure electrically semi conductive. With smart EDM Machining instrumentality it's manageable to cut tiny strange-shaped angles, elaborated contours or cavities in hardened metallic also as uncommon metals like Ti, hastelloy, kovar, inconel, and inorganic compound.

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018 ISSN: 2320-1363

DIE-SINK EDM: Two Russian scientists, B. R. Lazarenko and N. I. Lazarenko, were tasked in 1943 to research methods that of stopping the erosion of W electrical contacts because of sparking. They failing for the duration of this mission however observed that the erosion become additional precisely controlled if the electrodes have been immersed in an incredibly insulator fluid. The Lazarenkos' machine is concept as Associate in Nursing R-C-type system while the RC circuit accustomed rate the electrodes

Wire-reduce EDM: The cord-reduce type of gadget arose in the Sixties for the purpose of making equipment (dies) from hardened metallic. The tool conductor in wire EDM is purely a twine. To avoid the erosion of cloth from the twine causing it to break, the twine is wound among 2 spools so the lively part of the twine is usually dynamical. The earliest numerical managed (NC) machines were conversions of punched-tape vertical aspect machines.

WIRE CUT EDM MACHINE: Electrical discharge machining may be a machining methodology more often than not used for hard metals or individuals who would be terribly difficult to device with ancient strategies.

Figure1.1 Small EDM machine

MATERIAL REMOVAL MECHANISM

The first serious attempt of presenting a physical explanation of the cloth removal all through arc machining is probably that of Van Dijck.Van Dijck conferred a thermal version an extended side a technique simulation to clarify the phenomena between the electrodes at some stage in arc machining. However, as Van Dijck himself admitted in his study, the quantity of assumptions created to conquer the dearth of experimental statistics at that point was pretty crucial.

Figure1.2 Material Removal Mechanism

LITERATURE SURVEY

[1] Evaluation of Optimal Parameters for machining with Wire cut EDM Using Grey-Taguchi Method by S V Subrahmanyam, M. M. M. Sarcar

The main objective of this work is to demonstrate the optimization of Wire Electrical

ISSN: 2320-1363

Discharge Machining process parameters for the machining of H13 HOT DIE STEEL, with multiple responses Material Removal Rate (MRR), surface roughness (Ra) based on the Grey–Taguchi Method. taguchi'sL27(21x38) Orthogonal Array was used to conduct experiments, which correspond to randomly chosen different combinations of process parameter setting, with eight process parameters: TON, TOFF, IP, SV WF, WT, SF, WP each to be varied in three different levels. Data related to the each response viz. material removal rate (MRR), surface roughness (Ra) have been measured for each experimental run; With Grey Relational Analysis Optimal levels of process parameters were identified. The relatively significant parameters were determined by Analysis of Variance. The variation of output responses with process parameters were mathematically modeled by using non-linear regression analysis. The models were checked for their adequacy. Result of confirmation experiments showed that the established mathematical models can predict the output responses with reasonable accuracy.

EXPERIMENTAL SYSTEM

3.1 EXPERIMENTAL SETUP

The experiments were carried out on a wire-cut EDM machine (ELEKTRA SPRINTCUT 734) of DUN technologies, hyderabad, India.The WEDM machine tool has the following specifications

Design	Fixed Column With Moving Table
Table Size	440X650 mm
Max Workpiece Height	200mm
Main Table Transverse (X,Y)	300,400mm
Auxiliary table Transverse (U,V)	80,80mm
Wire Electrode Diameter	0.25mm (Standard), 0.15,0.20mm (Optional)
Generator	ELPLUS-40 A DLX
Controlled Axis	X,Y,U,V Simultaneous
Interpolation	Linear & Circular
Least Input Increment	0.0001mm
Input Power supply	3 Phase, AC 415 V,50 Hz
Connected Load	10KVA
Maximum Workpiece Weight	500Kg

Table 3.1 Experimental set up

3.2 WORKPIECE MATERIAL SELECTION

Due to the different melting point, evaporation and thermal conductivity, different materials show different surface quality and MRR at the same conditions of machining. aluminum is the work piece material which is used in this experiment. The aluminum plate of 200mm x 50mm x 15mm size has been used as a work piece material and a profile of 10mm x 50mm x 15mm is been cut with the wire(Brass and Brass coated Nickel) traversing the through the kerf made and the performance analysis of output parameters with respect to input parameters is measured.

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

3.3. METHODOLOGY

Taguchi Method Taguchi, a Japanese scientist, developed a technique based on Orthogonal Array(OA)of experiments. The assimilation of DOE with parametric optimization of the process can be accomplished in the Taguchi method. An OA give sa set of well-balanced experiments, and Taguchi's signal-to-noise. (S/N) ratios, that are logarithmic functions of the craved output, serve as an objective functions for optimization. It comforts to learn the whole parameter space with a small number (minimal experimental runs) of experiments. OA and S/N ratios are used to study the effects of control factors and noise factors and to determine the best quality characteristics for particular applications.

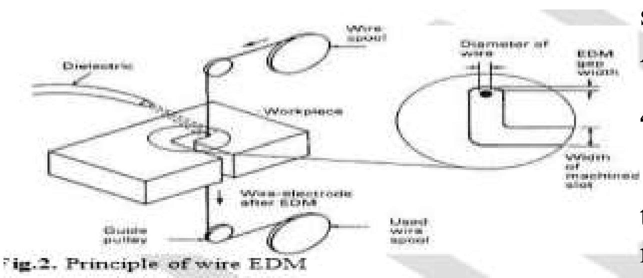


Figure 3.1 Working Principle of EDM

LEVEL VALUES OF INPUT FACTOR

EXPERIMENTS	TIME On	off	Peak current(IP)
1	90	50	205
2	90	52	215
3	90	54	225
4	95	50	205
5	95	52	215
6	95	54	225
7	100	50	205
8	100	52	215
9	100	54	225

Table 3.2 Input factors and values

EXPERIMENTAL PROCEDURE

4.1 EXPERIMENTAL SETUP AND PROCEDURE

Experiments have been performed in order to investigate the effects of one or more factors of the process parameters on the surface finish of the wire cut machined surface.The main aim of the project is to determine the influence of time on, time off, wire feed and input power. The investigation is based on surface roughness during machining of Aluminum alloy.

4.1.1 EXPERIMENTAL PROCEDURE

The selected work piece materials for this research work are Aluminum alloy materials. Experiments have been conducted on **wire cut edm**. The machine details are:

Figure 4.1 CNC Wirecut EDM Machine

4.1.2 TECHNICAL SPECIFICATION

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

Machine Tool	
Design	Fixed column, moving table
Table size	440 x 650 mm
Max. workpiece height	200 mm
Max. workpiece weight	500 kg
Main table traverse (X,Y)	300 x 400 mm
Aux. table traverse (u,v)	80 x 80 mm
Max. taper angle	± 30°/50 mm
Max. JOG speed	900 mm/min
Resolution	0.0005 mm
Max. wire spool capacity	6 kg (up to DIN 160 / P5)
Wire electrode diameter	0.25 mm (std.) 0.15, 0.20 mm (opt.)
Pulse Generator	ELPULS-40 A DLX
Pulse peak voltage	1 Step
CNC Controller	CMT 1009-5
Controlled axes	X,Y,u,v simultaneous
Interpolation	Linear & Circular
Least input increment	0.001 mm
Least command input (X,Y,u,v)	0.0005 mm
Max. programmable dim. (X,Y,u,v)	± 99999.999 mm
Input power supply	3 phase, AC, 415 V, 50 Hz
Connected load	10 kVA
Average power consumption	6 to 7 kVA

Figure 4.2 Technical Specifications of EDM

Material Properties of Aluminum Alloy 7075

Density	2.75 (g/cm³)
Specific capacity	880 (J/kg °k)
Thermal conductivity	140(W/m °k)
Electrical resistivity	0.0000045 Ω cm
Modulus of elasticity	72.3 G Pa

Table 4.1 Material Properties of Aluminum Alloy

RAW MATERIAL

Figure 4.3 Raw material(Alluminium alloy)

4.2 PROCESS PARAMETERS AND DESIGN

Input process parameters such as Pulse On time (TON), Pulse Off time (TOFF), Peak Current (IP), used in this thesis are shown in Table. Each factor is investigated at three levels to determine the optimum settings for the WEDM process. Wire feed is 3m/min, Wire Tension is 7 Kgf and Servo Feed is kept constant at 2.1 m/min.

The selection of parameters for experimentation is done as per taguchi design. An orthogonal array for three controllable parameters is used to construct the matrix of three levels of controllable factors. The L9 orthogonal array contains 9 experimental runs at various combinations of three input variables.

CONTROL PARAMETERS	UNITS
PULSE TIME ON	(µsec)
PULSE TIME OFF	(µsec)
PEAK CURRENT	(Amper)

Table 4.2 Control Parameters and Design

The L9 orthogonal array for input parameters Pulse on time, pulse off time and peak current is shown in table below:

EXPERIMENTS	TIME		Peak current(IP)
	On	off	
1	90	50	205
2	90	52	215
3	90	54	225
4	95	50	205
5	95	52	215

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

6	95	54	225
7	100	50	205
8	100	52	215
9	100	54	225

Table 4.3 Process Parameters and Design

Figure 4.4 EDM machine CNC Programming Display 1

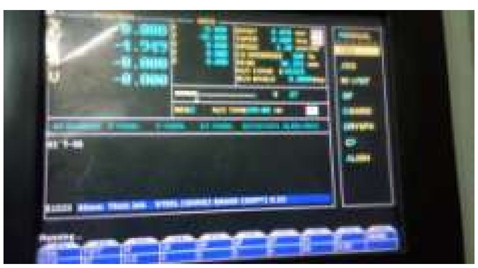


Figure 4.5 EDM machine CNC Programming Display 2

Figure 4.6 EDM machine CNC Programming Display 3

Figure 4.7 Workpiece Fixing Position WIRECUT EDM Macine

Figure 4.8 Fabrication Images

SURFACE FINISH RESULTS

In this project most important output performances in WEDM such as Surface Roughness (Ra) is considered for optimizing machining parameters. The surface finish value (in µm) was obtained by measuring the mean absolute deviation, Ra (surface roughness) from the average surface level using a Computer controlled surface roughness tester.

Surface Finish Tester – Model Surtronic 3+, Rank Taylor Hobson Ltd., Made in England which is periodically calibrated using Reference Specimen Type 112/1534. Lab Temperature 20 ±20^{0}C.

Experiments	Time	Peak current (IP)	Surface Finish Values R_a

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

	On	Off		
1	90	50	205	0.21
2	90	52	215	0.30
3	90	54	225	0.32
4	95	50	205	0.29
5	95	52	215	0.40
6	95	54	225	0.43
7	100	50	205	1.05
8	100	52	215	0.78
9	100	54	225	0.95

Table 4.4 Surface Finish Results

4.4 Material Removal Rate

MRR can be defined as the ratio of volume of material removed to the machining time.

MRR= Vf*t*d*x

where ,

V=feed rate(mm/min)

t= thickness of work piece (mm)

d=diameter of wire(mm)

x=gap between the wire and work piece (mm)

Vf=0.0133, 0.018, 0.014, 0.015, 0.019, 0.022, 0.0785, 0.0285, 0.025, 0.029

t=10mm

d = 5 mm

x = 2mm

Experiments	Time		Peak current	MRR(mm/min)
			(IP)	
	On	Off		
1	90	50	205	1.125
2	90	52	215	1.168
3	90	54	225	1.213
4	95	50	205	1.375
5	95	52	215	1.778
6	95	54	225	1.935
7	100	50	205	2.540
8	100	52	215	2.286
9	100	54	225	2.515

Table 4.5 Material Removal Rate

TAGUCHI TECHNIQUE

5.1 INTRODUCTION TO TAGUCHI TECHNIQUE

Taguchi defines Quality Level of a product because the Total Loss incurred with the aid of society due to failure of a product to carry out as preferred once it deviates from the delivered target performance ranges.

This includes charges related to negative overall performance, in operation expenses (which modifications as a product a while) and any in addition prices because of dangerous issue effects of the products in use.

5.1.1 TAGUCHI TECHNIQUES

- Help firms to carry out the usual Fix!
- Quality troubles rectangular degree due to Noises within the product or technique machine

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

- Noise is any unwanted result as a way to increase variability
- Conduct in depth disadvantage Analyses
- Employ Inter-disciplinary companies
- Perform Designed Experimental Analyses
- Evaluate Experiments victimization analysis of variance and Signal-to noise strategies

The Experimental results show the effect of three process parameters on surface roughness.

6.1 EXPERIMENTAL RESULTS

Experiments	Time		Peak current (IP)	Surface Finish Values R_a
	On	Off		
1	90	50	205	0.21
2	90	52	215	0.30
3	90	54	225	0.32
4	95	50	205	0.29
5	95	52	215	0.40
6	95	54	225	0.43
7	100	50	205	1.05
8	100	52	215	0.78
9	100	54	225	0.95

Table 6.1 Surface Finish Experimental Results6.2 DESIGN OF ORTHOGONAL ARRAY

First Taguchi Orthogonal Array is designed in Minitab17 to calculate S/N ratio and Means which steps is given below:

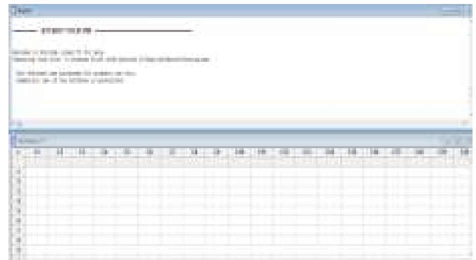


Figure 6.1 Stat – DOE – TAGUCHI – Create TAGUCHI Design

Number of factors - 3

Figure 6.3 Design of Orthogonal Array

6.3 DISPLAY AVAILABLE DESIGNS

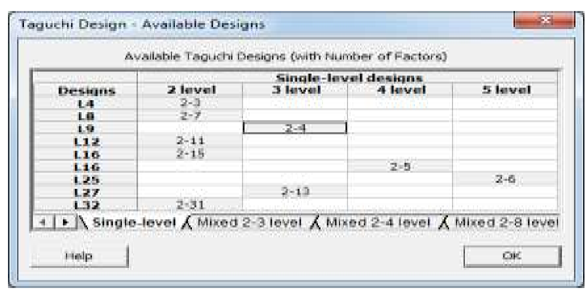


Figure 6.4 Select – L9 (2-4)

6.3 Select Designs

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

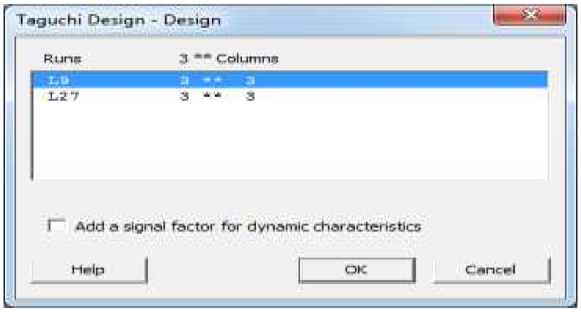


Figure 6.5 Select – L9

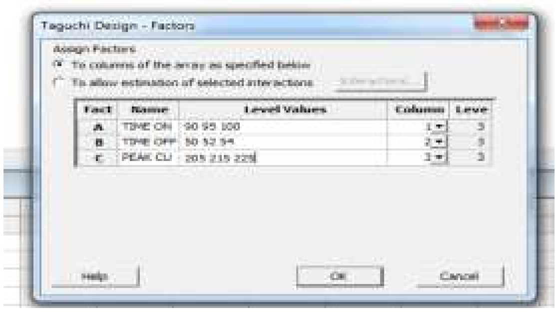


Figure 6.6 Select – Factors

↓	C1	C2	C3	C4
	TIME ON	TIME OFF	PEAK CURRENT	SURFACE FINISH
1	90	50	205	0.21
2	90	52	215	0.30
3	90	54	225	0.32
4	95	50	215	0.29
5	95	52	225	0.40
6	95	54	205	0.43
7	100	50	225	1.05
8	100	52	205	0.78
9	100	54	215	0.95

Table 6.2 Enter Factors and Their Values

6.4 TAGUCHI – ANALYZE TAGUCHI DESIGN – SELECT RESPONSES

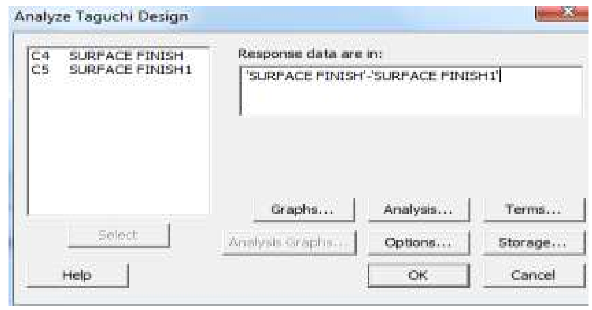


Figure 6.7 Taguchi – Analyze Taguchi Design – Select Responses

6.5 Terms

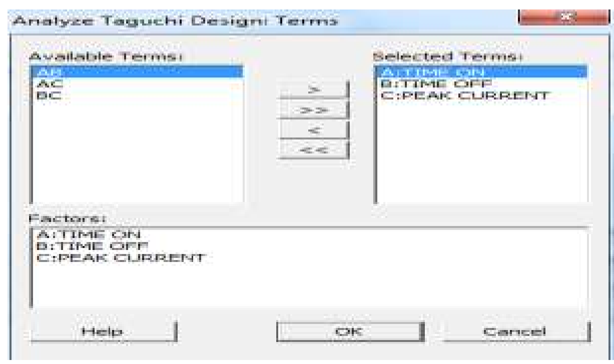


Figure 6.8 Analyze TAGUCHI Design Terms

6.6 Analysis

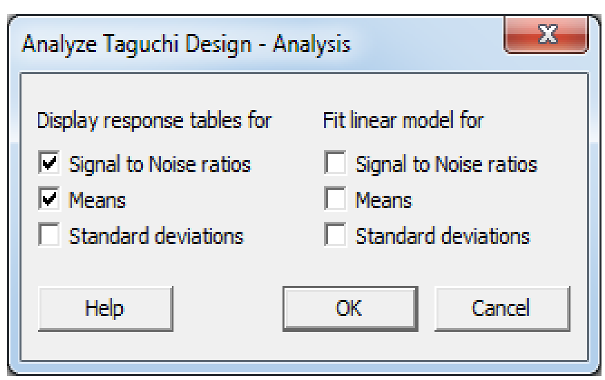


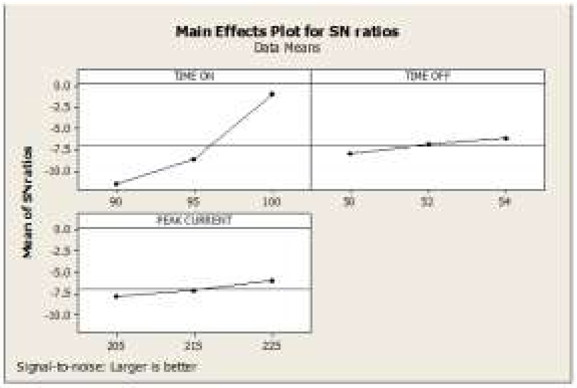
Figure 6.9 Analyze Taguchi Design Analysis

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

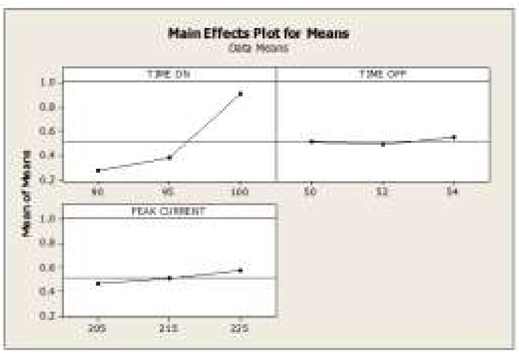
ISSN: 2320-1363

Options – larger is better

6.7 RESULTS



Graph6.1 Effect of parameters surface roughness for S/N ratio



Graph 6.2 Effect of parameters on surface roughness for Means

6.8 Signal to Noise Ratio:

Taguchi method stresses the importance of studying the response variation using the signal–to–noise (S/N) ratio, resulting in minimization of quality characteristic variation due to uncontrollable parameter. The surface roughness is considered as the quality characteristic with the concept of "the smaller-the-better". The S/N ratio for the smaller-the-better is:

$$S/N = -10 * \log(\Sigma(Y^2)/n))$$

Where n is the number of measurements in a trial/row, in this case, n=1 and y is the measured value in a run/row. The S/N ratio values are calculated by taking into consideration above Equation. with the help of software Minitab 15.

The surface roughness measured from the experiments and their corresponding S/N ratio values are listed in Table

Worksheet 1 ***

↓	C1	C2	C3	C4	C5	C6	C7
	TIME ON	TIME OFF	PEAK CURRENT	SURFACE FINISH	SURFACE FINISH 1	SNRA1	MEAN1
1	90	50	205	0.21	0.20	-13.7727	0.205
2	90	52	215	0.30	0.31	-10.3175	0.305
3	90	54	225	0.32	0.29	-10.3455	0.305
4	95	50	215	0.29	0.31	-10.4721	0.300
5	95	52	225	0.40	0.41	-7.8529	0.405
6	95	54	205	0.43	0.42	-7.4340	0.425
7	100	50	225	1.05	1.03	0.3395	1.040
8	100	52	205	0.78	0.75	-2.3318	0.765
9	100	54	215	0.95	0.90	-0.6867	0.925

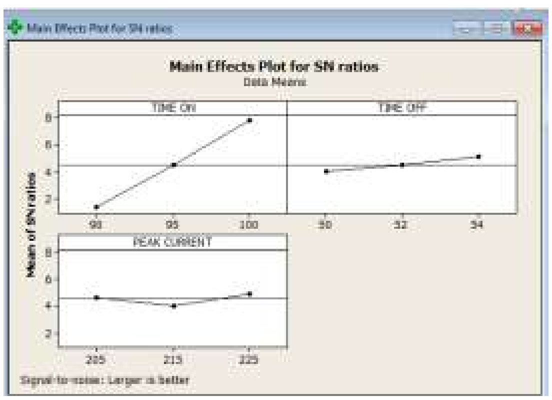
Table 6.3 Surface roughness values and S/N ratio results

Selection of optimal parameter combination for better material removal rate in wire cut edm using TAGUCHI technique

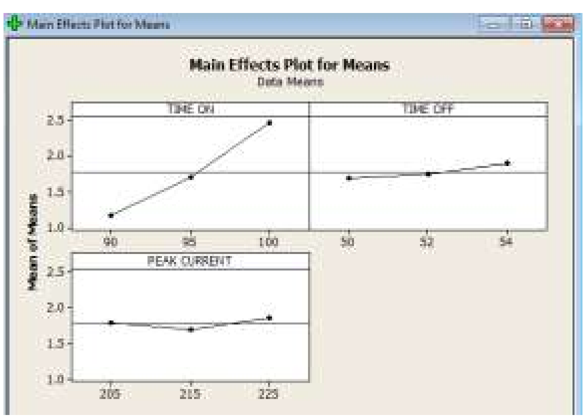
Worksheet 1 ***

↓	C1	C2	C3	C4	C5
	TIME ON	TIME OFF	PEAK CURRENT	MRR	MRR1
1	90	50	205	1.125	1.129
2	90	52	215	1.168	1.170
3	90	54	225	1.213	1.215
4	95	50	215	1.375	1.380
5	95	52	225	1.778	1.780
6	95	54	205	1.935	1.975
7	100	50	225	2.540	2.640
8	100	52	205	2.286	2.285
9	100	54	215	2.515	2.520

Table 6.4 TAGUCHI Method for MRR



Graph6.3 Signal-to-Noise Ratio



Graph6.4 Means

Worksheet 1 ***

↓	C1	C2	C3	C4	C5	C6	C7
	TIME ON	TIME OFF	PEAK CURRENT	MRR	MRR1	SNRA2	MEAN2
1	90	50	205	1.125	1.129	1.03844	1.1270
2	90	52	215	1.168	1.170	1.35628	1.1690
3	90	54	225	1.213	1.215	1.68436	1.2140
4	95	50	215	1.375	1.380	2.78179	1.3775
5	95	52	225	1.778	1.780	5.00351	1.7790
6	95	54	205	1.935	1.975	5.82157	1.9550
7	100	50	225	2.540	2.640	8.26114	2.5900
8	100	52	205	2.286	2.285	7.17962	2.2855
9	100	54	215	2.515	2.520	8.01938	2.5175

Table 6.5 TAGUCHI Method for Surface Roughness

ANOVA METHODANOVA METHOD

7.1 INTRODUCTION TO ANOVA TECHNIQUE

- Analysis of variance is a statistical method used to test differences between two or more means.
- It may seem odd tha the technique is called "Analysis of Variance" rather than "Analysis of Means"

7.2 COMPARISON BETWEEN THE ANOVA AND TAGUCHI DESIGN

Selection of optimal parameter combination for better material removal rate in wire cut EDM using ANOVA technique

7.3 Material Removal Rate

MRR can be defined as the ratio of volume of material removed to the machining time.

MRR= Vf*t*d*x

where ,

V=feed rate(mm/min)

t= thickness of work piece (mm)

d=diameter of wire(mm)

x=gap between the wire and work piece (mm)

Vf=0.0133, 0.018, 0.014, 0.015, 0.019, 0.022, 0.0785, 0.0285, 0.025, 0.029

t=10mm

d = 5 mm

x = 2mm

ANOVA	TAGUCHI
ANOVA is a method of data analysis. The relationship – one can be used to analyze what the other one dictated should be gathered	As for the issues concerning traditional DOE vs. Taguchi – they are really more form than substance.
analysis of variance (ANOVA) are applied to study performance characteristics of machining parameter	Taguchi method is applied to find optimum process parameters
ANOVA method was utilized to understand the percentage of contribution of each parameter	In the Taguchi method, the term 'signal' represents the desirable value (mean) for the output characteristics and the term 'noise' represents the undesirable value for the output characteristics.

Experiments	Time		Peak current (IP)	MRR(mm/min)
	On	Off		
1	90	50	205	1.125
2	90	52	215	1.168
3	90	54	225	1.213
4	95	50	205	1.375
5	95	52	215	1.778
6	95	54	225	1.935
7	100	50	205	2.540
8	100	52	215	2.286
9	100	54	225	2.515

Table 7.1 Material Removal Rate

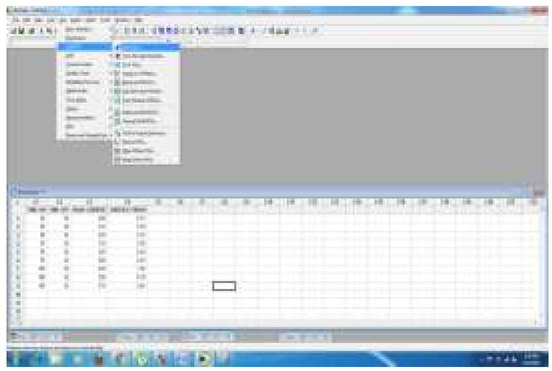


Figure 7.2 Material Removal Rate

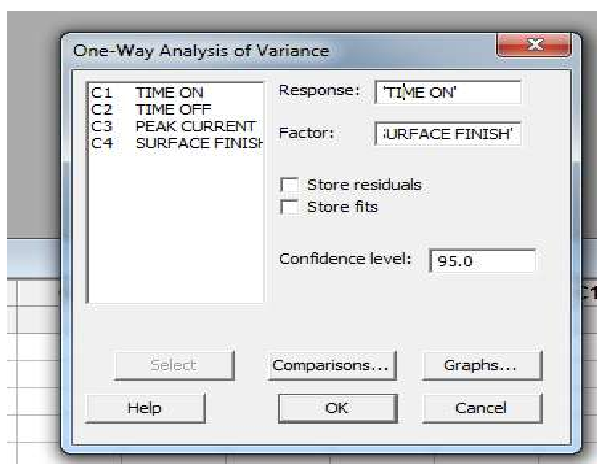
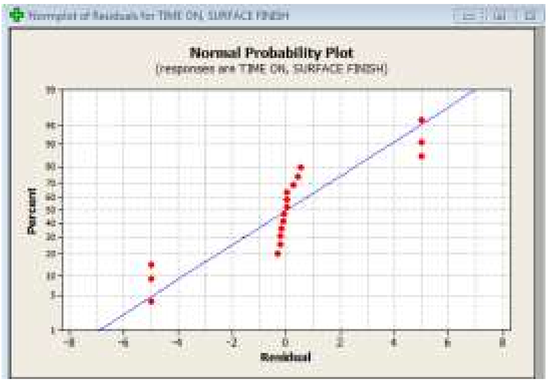


Figure 7.2 One-Way Analysis of Variance

ISSN: 2320-1363



Graph7.1Residuals for TIME ON, SURFACE FINISH

Worksheet 1 ***

↓	C1	C2	C3	C4	C5	C6	C7	C8
	TIME ON	TIME OFF	PEAK CURRENT	SURFACE FINISH	RESI1	RESI2	FITS1	FITS2
1	90	50	205	0.21	-10	-0.315556	215	0.525556
2	90	52	215	0.30	0	-0.225556	215	0.525556
3	90	54	225	0.32	10	-0.205556	215	0.525556
4	95	50	215	0.29	0	-0.235556	215	0.525556
5	95	52	225	0.40	10	-0.125556	215	0.525556
6	95	54	205	0.43	-10	-0.095556	215	0.525556
7	100	50	225	1.05	10	0.524444	215	0.525556
8	100	52	205	0.78	-10	0.254444	215	0.525556
9	100	54	215	0.95	0	0.424444	215	0.525556

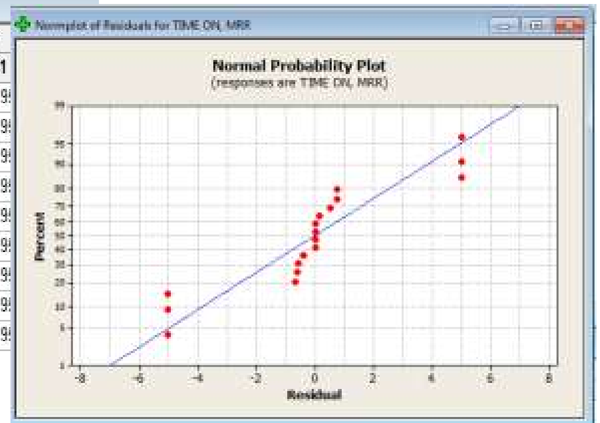
Table 7.2 Surface Finish in ANOVA Method

7.3ANOVA METHOD FOR MRR

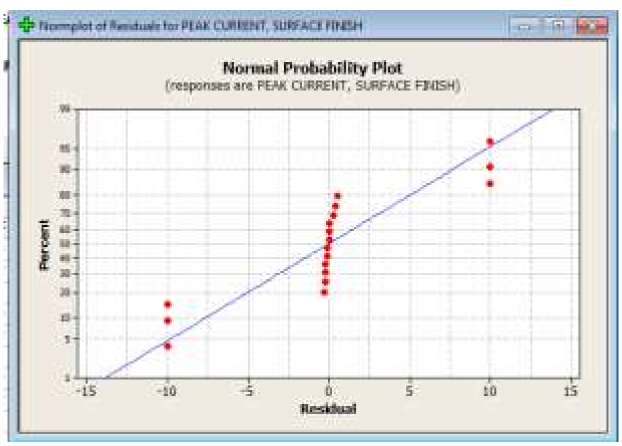
Worksheet 1 ***

↓	C1	C2	C3	C4	C5	C6	C7
	TIME ON	TIME OFF	PEAK CURRENT	SURFACE FINISH	RESI1	RESI2	FITS1
1	90	50	205	0.21	-5	-0.315556	9
2	90	52	215	0.30	-5	-0.225556	9
3	90	54	225	0.32	-5	-0.205556	9
4	95	50	215	0.29	0	-0.235556	9
5	95	52	225	0.40	0	-0.125556	9
6	95	54	205	0.43	0	-0.095556	9
7	100	50	225	1.05	5	0.524444	9
8	100	52	205	0.78	5	0.254444	9
9	100	54	215	0.95	5	0.424444	9

Table 7.2 Surface Finish in ANOVA Method



Graph7.3 Responces are TIME ON and MRR



Graph7.2 Residuals for PEAK CURRENT, SURFACE FINISH

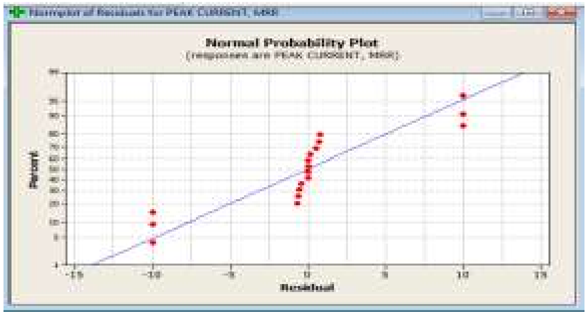
Worksheet 1 ***

↓	C1	C2	C3	C4	C5	C6	C7	C8
	TIME ON	TIME OFF	PEAK CURRENT	MRR	RESI1	RESI2	FITS1	FITS2
1	90	50	205	1.125	-5	-0.645556	95	1.77056
2	90	52	215	1.168	-5	-0.602556	95	1.77056
3	90	54	225	1.213	-5	-0.557556	95	1.77056
4	95	50	215	1.375	0	-0.395556	95	1.77056
5	95	52	225	1.778	0	0.007444	95	1.77056
6	95	54	205	1.935	0	0.164444	95	1.77056
7	100	50	225	2.540	5	0.769444	95	1.77056
8	100	52	205	2.286	5	0.515444	95	1.77056
9	100	54	215	2.515	5	0.744444	95	1.77056
10								

Table 7.3 Responces are TIME ON and MRR

IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363



Graph7.4 Responces are PEAK CURRENT and MRR

↓	C1 TIME ON	C2 TIME OFF	C3 PEAK CURRENT	C4 MRR	C5 RESI1	C6 RESI2	C7 FITS1	C8 FITS2
1	90	50	205	1.125	-10	-0.645556	215	1.77056
2	90	52	215	1.168	0	-0.602556	215	1.77056
3	90	54	225	1.213	10	-0.557556	215	1.77056
4	95	50	215	1.375	0	-0.395556	215	1.77056
5	95	52	225	1.778	10	0.007444	215	1.77056
6	95	54	205	1.935	-10	0.164444	215	1.77056
7	100	50	225	2.540	10	0.769444	215	1.77056
8	100	52	205	2.286	-10	0.515444	215	1.77056
9	100	54	215	2.515	0	0.744444	215	1.77056
10								

Table 7.4 Responces are PEAK CURRENT and MRR

CONCLUSION

The objective of the present work is to investigate the effects of the various Wire cut EDM process parameters on the machining quality and obtain the optimal sets of process parameters so that the quality of machined parts can be optimized. Experiments are conducted on the pieces varying parameters. The materials used for machining are Aluminum alloy. The process parameters considered are Pulse Time on, Pulse Time off, Input Power, Wire Feed, Servo Voltage and Wire Tension. The range of values varied are Time on – 90µsec, 95 µsec and 100 µsec, Time off – 50 µsec, 52 µsec, 54 µsec, Input power – 205amp, 215amp, 225amp. Wire feed, wire tension and servo voltage are kept constant. The optimization is done by using taguchi technique by considering L9 orthogonal array. Optimization is done using Minitab software.

Analysis of variance (ANOVA) is applied to study performance characteristics of machining parameters are Time on and peak current. So we can concluded that Time on -100 µsec and peak current -225 amp.

We can conclude that at Time on -100 µsec, Time off – 50 µsec and Input power-225amp to get better surface finish values.

By observing the MRR results, to get better MRR values at Time on -100 µsec, Time off – 50 µsec and Input power-225amp

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IJMTARC – VOLUME – V – ISSUE – 23, JULY-SEP, 2018

ISSN: 2320-1363

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ISSN: 2320-1363

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