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## Influence of Input Parameters on MRS in EDM SKD11 Steel

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### Introduction

In this paper, the results of studying the influence of input parameters on the material removal speed (MRS) when electrical discharge machining (EDM) cylindrical shaped parts made from SKD11 steel have been introduced. To solve that problem, the Taguchi method was used to design the experiment and analyze the results. Besides, the input process parameters including the pulse time, the pulse off time, the current and the servo voltage were investigated. The influence of the input parameters on MRS was evaluated by Analysis of Variance (ANOVA).

### Experimental procedure

Table 1. Input parameters and their levels

Parameters	Code	Unit	Level		
			1	2	3
Pulse on time	T <sub>on</sub>	μs	6	16	26
Pulse off time	T <sub>off</sub>	μs	8	18	28
Peak current	IP	A	3	7	11
Servo voltage	SV	V	3	6	9

Table 2. Experimental plan and the MRR

No.	SPD	VM	T <sub>on</sub>	T <sub>off</sub>	MRS (g/h)	Mean	S/N
1	6	8	3	3	0.7693	0.76928	-2.27837
2	6	18	7	6	1.1348	1.13483	1.09861
3	6	28	11	9	0.9634	0.96341	-0.32376
4	16	8	7	9	2.6826	2.68258	8.57106
5	16	18	11	3	2.8785	2.87847	9.18324
6	16	28	3	6	0.6974	0.69744	-3.12992
7	26	8	11	6	0.7622	0.76217	-2.35901
8	26	18	3	9	0.5853	0.58532	-4.65216
9	26	28	7	3	1.6701	1.67014	4.45508

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### Results and discussion

Response Table for Signal to Noise Ratios

Larger is better

Level	Ton	Toff	IP	SV
1	-0.5012	1.3112	-3.3535	3.7867
2	4.8748	1.8766	4.7083	-1.4634
3	-0.8520	0.3338	2.1668	1.1984
Delta	5.7268	1.5428	8.0617	5.2501
Rank	2	4	1	3

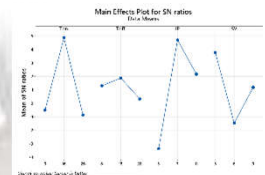


Table 3. Order of influence of input parameters on S/N

Fig. 3. Effect of input parameters on S/N

Source	DF	Seq SS	Adj SS	Adj MS	F	P	C (%)
Ton	2	77.802	77.8019	38.9009	*	*	53.60
Toff	2	23.467	23.4673	11.7337	*	*	16.17
IP	2	35.893	35.8927	17.9463	*	*	24.73
SV	2	7.982	7.9818	3.9909	*	*	5.50
Residual Error	0	*	*	*	*	*	*
Total	8	145.144					

Table 4. Analysis of Variance of input parameters on S/N

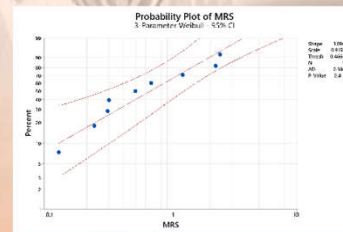


Fig. 5. Probability plot of MRR

### Conclusions

This paper presents a study on the effect of the EDM parameters on the MRS when processing cylindrical shaped parts made from SKD11 steel. To do that, four input process parameters counting the pulse on time, the pulse off time, the current, and voltage were investigated. Also, the Taguchi method was used to design and analysis experiments. The influence of input factors on the MRS were learned by ANOVA. Furthermore, the optimum EDM process parameters were proposed for getting the maximum MRS.