

## Parametric Investigation of Wire-Cut Electric Discharge Machining on Steel ST-37

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**Abstract :** Wire-cut electric discharge machining (WEDM) is one of the advanced machining processes. Due to the development of the current manufacturing sector, there has been no research work done before about the optimization of the process parameters based on the availability of the workpiece of the Steel St-37 material in Ethiopia. Material Removal Rate (MRR) is considered as the experimental response of WCEDM. The main objective of this work is to investigate and optimize the process parameters on machining quality that gives high MRR during machining of Steel St-37. Throughout the investigation, Pulse on Time (TON), Pulse off Time (TOFF) and Velocities of Wire Feed (WR) are used as variable parameters at three different levels, and Wire tension, flow rate, type of dielectric fluid, type of the workpiece and wire material and dielectric flow rate are keeping as constants for each experiment. The Taguchi methodology, as per Taguchi's standard L9 (3<sup>3</sup>) Orthogonal Array (OA), has been carried out to investigate their effects and to predict the optimal combination of process parameters over MRR. Signal to Noise ratio (S/N) and Analysis of Variance (ANOVA) were used to analyze the effect of the parameters and to identify the optimum cutting parameters on MRR. MRR was measured by using the Electronic Balance Model SI-32. The results indicated that the most significant factors for MRR are TOFF, TON and lastly WR. Taguchi analysis shows that, the optimal process parameters combination is A2B2C2, i.e., TON 6 $\mu$ s, TOFF 29 $\mu$ s and WR 2 m/min. At this level, the MRR of 0.414 gram/min has been achieved.

**Keywords :** ANOVA, MRR, parameter, Taguchi Methode

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