

PARAMETRIC OPTIMIZATION OF WIRE-CUT EDM PROCESS USING GREY BASED TAGUCHI METHOD FOR MACHINING TITANIUM ALLOY (TI-6AL-4V)

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Abstract

Enabling and developing the required 'Process' efficiency in an Input-Process-Output System, is bound to provide effective solutions for today's need for maximized production especially in dwindling Input conditions. Process optimization is a significant and contributing step towards such process efficiency as it paves way for improved overall productivity. In this paper, the optimization of parameters used in the CNC Wire-Cut Electrical Discharge Machining (Wire-Cut EDM) process, for the Titanium Alloy (Ti-6Al-4V) by utilizing the Taguchi method and Grey Relational Analysis (GRA) are studiously reported. Performance Characteristics such as MRR (Material Removal Rate) and Surface Roughness (which are normally used in the evaluation of 'machining effects') are chosen to evaluate the machining 'effects' in this study. The correlated input parameters such as Gap Voltage, Pulse On-time, Pulse Off-time and Wire Feed are included in this study. Taguchi's L9 Orthogonal Array (OA-L9) method was used in this experimentation for optimizing the parameters of the Wire-Cut EDM process. Optimal levels of process parameters were identified using Grey Relational Analysis (GRA) and the relatively significant parameter/s were determined by Analysis Of Variance (ANOVA). Optimization Process parameters simultaneously leading to a higher MRR (Material Removal Rate) with a decreased Surface Roughness were also verified through a confirmation experiment, for validation of the test results. Experimental results have shown that the conventional responses experienced in the traditional Wire-Cut EDM process can be effectively improved by adopting the Grey based Taguchi approach technique.

Keywords: Wire-Cut Electrical Discharge Machining Process (Wire-Cut EDM process), Taguchi method, Grey Relational Analysis, Titanium Alloy, Analysis of Variance