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Optimization of Machining Parameters of Wire Electric Discharge Machining (WEDM) of Inconel 625 Super Alloy

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Abstract : In this paper, WEDM has been used to investigate the machining characteristics of Inconel-625 alloy. The machining characteristics namely material removal rate (MRR) and surface roughness (SR) have been investigated along with surface microstructure analysis using SEM and EDS of the machined surface. Taguchi's L27 Orthogonal array design has been used by considering six varying input parameters viz. Pulse-on time (Ton), Pulse-off time (Toff), Spark Gap Set Voltage (SV), Peak Current (IP), Wire Feed (WF) and Wire Tension (WT) for the responses of interest. It has been found out that Pulse-on time (Ton) and Spark Gap Set Voltage (SV) are the most significant parameters affecting material removal rate (MRR) and surface roughness (SR) are. Microstructure analysis of workpiece was also done using Scanning Electron Microscope (SEM). It was observed that, variations in pulse-on time and pulse-off time causes varying discharge energy and as a result of which deep craters / micro cracks and large/ small number of debris were formed. These results were helpful in studying the effects of pulse-on time and pulse-off time on MRR and SR. Energy Dispersive Spectrometry (EDS) was also done to check the compositional analysis of the material and it was observed that Copper and Zinc which were initially not present in the Inconel 625, later migrated on the material surface from the brass wire electrode during machining

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