

Taguchi-Based Optimization of Surface Roughness and Dimensional Accuracy in Wire EDM Process with S7 Heat Treated Steel

Authors : Joseph C. Chen, Joshua Cox

Abstract : This research focuses on the use of the Taguchi method to reduce the surface roughness and improve dimensional accuracy of parts machined by Wire Electrical Discharge Machining (EDM) with S7 heat treated steel material. Due to its high impact toughness, the material is a candidate for a wide variety of tooling applications which require high precision in dimension and desired surface roughness. This paper demonstrates that Taguchi Parameter Design methodology is able to optimize both dimensioning and surface roughness successfully by investigating seven wire-EDM controllable parameters: pulse on time (ON), pulse off time (OFF), servo voltage (SV), voltage (V), servo feed (SF), wire tension (WT), and wire speed (WS). The temperature of the water in the Wire EDM process is investigated as the noise factor in this research. Experimental design and analysis based on L₁₈ Taguchi orthogonal arrays are conducted. This paper demonstrates that the Taguchi-based system enables the wire EDM process to produce (1) high precision parts with an average of 0.6601 inches dimension, while the desired dimension is 0.6600 inches; and (2) surface roughness of 1.7322 microns which is significantly improved from 2.8160 microns.

Keywords : Taguchi Parameter Design, surface roughness, Wire EDM, dimensional accuracy

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