Investigation of the Effect of Different Process Parameters in Wire-EDM for Aerospace Materials

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ABSTRACT

Advancement in the field of material science has led to development of sophisticated materials such as super alloys, composite materials and ceramics. These materials are tough to machine using conventional machining methods and non-conventional machining methods are being utilized to machine such superior materials. Wire cut electrical discharge machining is a non-conventional machining process which fulfils the demand for machining super alloys. Wire-EDM makes it possible to achieve complex geometric futures of work piece, dimensional accuracy, better surface roughness etc. The present work investigates the influence of machining parameters Pulse on time(Ton), Pulse off time (Toff) and wire feed rate (WF) on cutting speed (Cs), material removal rate (MRR) and surface roughness (Ra) of Inconel 718 with a brass electrode of 0.25 mm diameter. Inconel 718 is aNickel alloy which is widely used in aerospace industry due to its ability to resist extremely high temperature, corrosion and constant wear. This super alloyis one of the toughest materials available and a good conductor of electricity. It is frequently used in aerospace industry for jet engine and makes up for the 50% weight of it. It is also used in components such as engine cases, blisks, combustors, blades, seals etc. In this work Taguchi's methodology is used to determine the effect of each parameter such as Ton, Toff and WF. It is found that the parameters affect the Cs, MRR and Ra of Inconel 718. The analysis using Taguchi method reveals that Ton has greatest effect of Cs, MRR and Ra. Cs, MRR and Ra increases with increasing Ton and WF. Increasing WF further decreases Cs, MRR and Ra. Increasing Toff decreases Cs, MRR and Ra and the effect on the output responses is reversed when Toff is decreased.

Keywords: Wire-EDM, Inconel 718, Material removal rate. Cutting speed, surface roughness, pulse on time, pulse off time, wire feed rate, Taguchi method.