ABSTRACT

Electric discharge machining (EDM) is one of the modern non-conventional machining methods for manufacturing geometrically complex or hard materials parts that are extremely difficult to machine by conventional machining process. The objective of this research is to study the influence of operating parameters of EDM of hardened tool steel (SKD 11) with aluminium, copper and copper coated aluminium as electrodes. The effectiveness of the EDM process with these three different electrodes is evaluated in terms of the material removal rate (MRR), electrode wear ratio (EWR), diameteral overcut and the surface finish quality of the hardened tool steel. EDM machining parameters could not achieve maximum MRR and minimum surface finish simultaneously. Higher MRR is accompanied with a worse surface finish. In contrast, if machining parameters were set to finer machining conditions, a finer surface integrity would result. However, the MRR would be relatively worse. Therefore, it is important to find the optimum machining conditions based on the target function chosen. In this study, Taguchi Parametric Robust Design is used to plan the experiments and Pareto ANOVA is used to find the optimum machining parameters for maximum MRR and minimum surface roughness. The electrode wear ratio (EWR) and diameteral overcut were investigated under these optimum conditions.

This study has shown that machining performance in the EDM process can be improved effectively by using optimum combination of input variables for the objective function chosen. Aluminium electrode is a better choice of electrode for finish machining and copper electroplated aluminium electrode is a better choice of electrode for rough machining of the SKD 11 tool steel workpiece.