ABSTRACT

In today’s era of advanced manufacturing technology world requires unique and exact methodology for drilling a deep and small hole. There can be many solutions to this, each having their own advantage and disadvantage. One of them is spark erosion technology.

EDM drilling performance depends on a number of factors including Input current, on-off time, Drill Diameter, Drill Depth, Dielectric and Flushing Pressure, Workpiece Material and Electrode material. In this research work four factors are taken as input factors viz. current, pulse on time, diameter and depth. Taguchi’s methodology of design of experiment is used to optimise the parameters for outputs of technological and dimensional characteristics. L16 orthogonal array is used for four factors four levels of input parameters. Technological outputs studied are material removal rate, surface roughness and electrode wear ratio. Dimensional characteristic outputs studied are deflection, circularity, cylindricity and hole taper. Also increase in hardness is studied. The experimentations are carried out for three important work materials viz. H11, Brass and EN31. The hollow electrode used is of Brass material.

Through Taguchi’s analysis optimum levels of input parameters are found out for all above outputs. Also ranks of input parameters are defined in sequence in order of its affect on respective output for particular material. This data can be used by industries to increase the EDM drilling process capabilities.

Analysis of Variance (ANOVA) of the data revealed the significance and percentage contribution of the four factors on respective output for particular material. The comparison is also made for all factors effect on all materials. Parametric analysis for each output is also carried out.

First order empirical models are developed through the regression analysis and simple logarithmic transformation for MRR, SR, EWR and I.H. The proposed empirical models are validated to conclude as well fit for predictions of machining output such as metal removal rate, surface roughness and electrode wear ratio with low prediction error. It is concluded that optimisation of outputs cannot be achieved simultaneously with a particular combination of control parameters settings.