A B S T R A C T

The established theoretical model for material removal per pulse in Electro-Discharge Machining, based on the 'bulk boiling' concept, was suitably modified to make analytical studies on the effect of hydrostatic dielectric pressure on the process. The studies revealed that the material removal per pulse, increased with the dielectric hydrostatic pressure (range studied - upto 4 atmospheres) for the common square wave type electric discharge pulses. Further, the relative wear was found to be sensitive to the surrounding hydrostatic pressure. Experiments performed in a pressure cell where the dielectric hydrostatic pressure could be varied keeping the same flow rate, showed that the general trend in the material removal per pulse and the relative wear is in the same direction as predicted by the above model. An electronic discriminating and counting circuit was incorporated in the set up, to count the effective pulses.

The relationship between the surface topography parameters like root mean square, centre line average, process correlation length, etc. and the process parameters such as pulse current and pulse duration was studied with the help of a 3 x 5 experiment, when copper and graphite were used as tool electrodes. With the help of multiple linear regression analysis, the effect of process parameters on the surface topography was quantified. Further, a linear relationship was established between the process correlation

length and the estimated 'equivalent' crater radius. Scanning Electron Microscope photomicrographs were taken for qualitative support, and to study the fine features such as local irregularities and globules.

Following the method of Box and Jenkins, an autoregressive model of order two (AR(2)) was fitted for representing the surface topography. The model parameters were determined for various conditions of machining and electrode materials and the model was found to be statistically adequate to represent the eroded surfaces. The comparison of the model and actual autocorrelograms showed that they matched well. Further, based on the results of AR(2) model, some of the statistical parameters of the Electro-Discharge machined surface profiles were estimated. These were found to be close to the direct measurements of these parameters and thus it was confirmed that AR(2) model was capable of reproducing faithfully, characteristics of EDMed surfaces, obtained using square pulse type generator, with copper and graphite tools.