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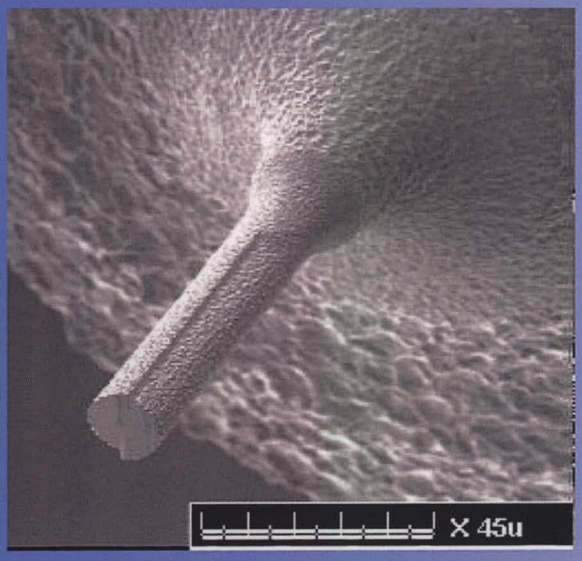

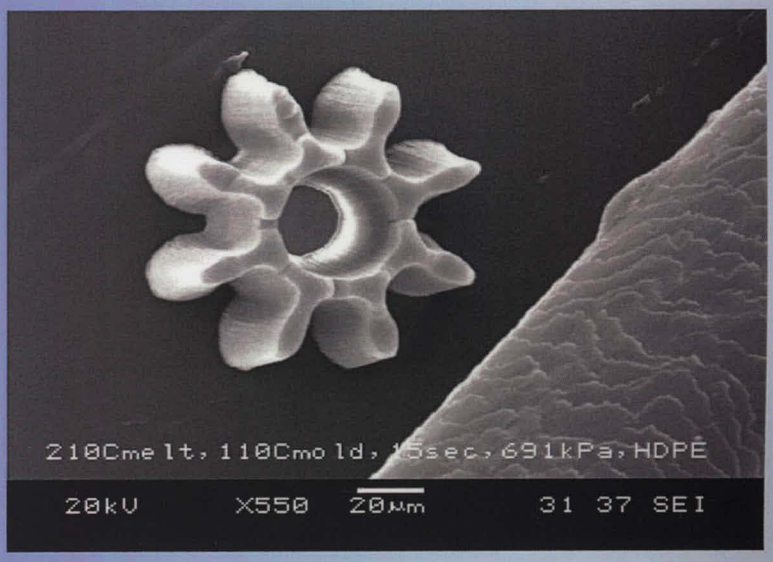

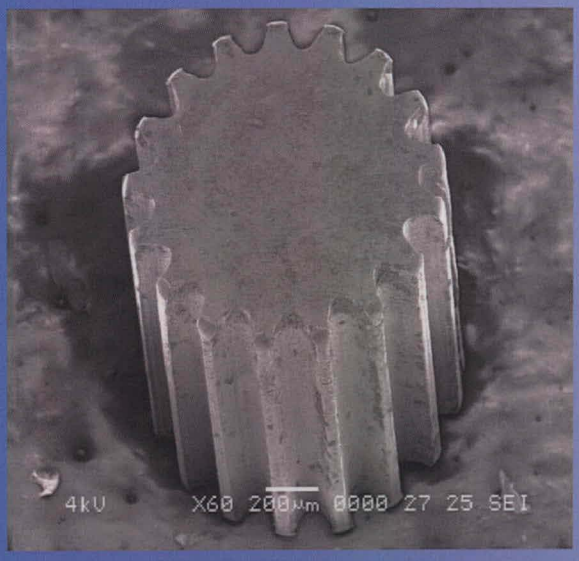

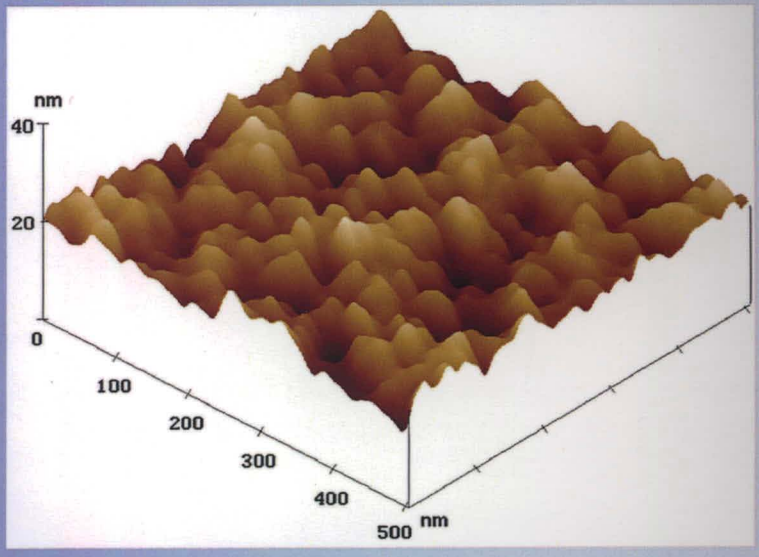

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Chapter 24

Micro Wire Electrical Discharge Machining of Tungsten Carbide: Analysis of Material Removal Rate

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Abstract. This chapter presents a experimental study to develop mathematical model for material removal rate that relate the machining parameters. The basic objective is to achieve highest possible material removal rate. A micro wire electro discharge machine is used on tungsten carbide workpiece. The electrode material was also tungsten. Taguchi analysis was used to analyze the effect of each parameter on the machining output. Design Expert Version 6.0.8 was used for this analysis. It is found that these parameters have a significant influence on surface roughness. Mathematical model has been developed and the model is found to be adequate.

Analysis of Material Removal Rate

The highest order model was selected where the additional terms are significant. That's why the ANOVA for Response Surface Reduced Quadratic Model was selected as the logical choice model. Table 1 presents the ANOVA for MRR. Low slandered deviation, R-square near 1 and relatively low PRESS are the best. The Model F-value of 92510.55 implies the model is significant. There is only a 0.25% chance that a "Model F-Value" this large could occur due to noise.Values of "Prob > F" less than 0.0500 indicate model terms are significant.In this case A, B, C, A^2, B^2, C^2, AB are significant model terms.Values greater than 0.1000 indicate the model terms are not signficant. The "Pred R-Squared" of 0.9997 is in reasonable agreement with the "Adj R-Squared" of 1.0000."Adeq Precision" measures the signal to noise ratio.A ratio greater than 4 is desirable. our ratio of 849.479 indicates an adequate signal. The developed model is expressed by Eq 1. As it left without any simplification to take into account the contribution of all possible considered effect. After the model is developed, a set of test are made using the predicted and actual values to determine how well the equation fit for predicting the response variable and to detect any hidden variable that effect the response variable. Figure 1 shows the interaction between capacitance and feed rate on the response variable MRR. Figure 2-4 show the estimated response of the parameter MRR as a function of two parameters where the left parameter is constant.

$$MRR=-2112.8+244.7*A-77.4*B+32.9*C-20*A^2-0.2*C^2-6.2*A*B. \quad (1)$$