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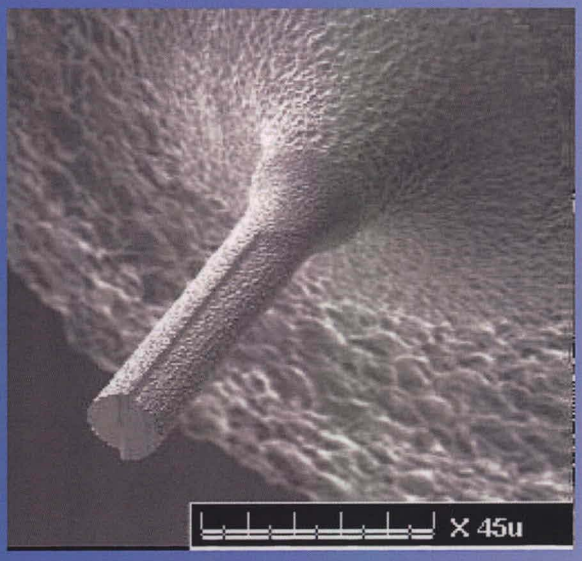

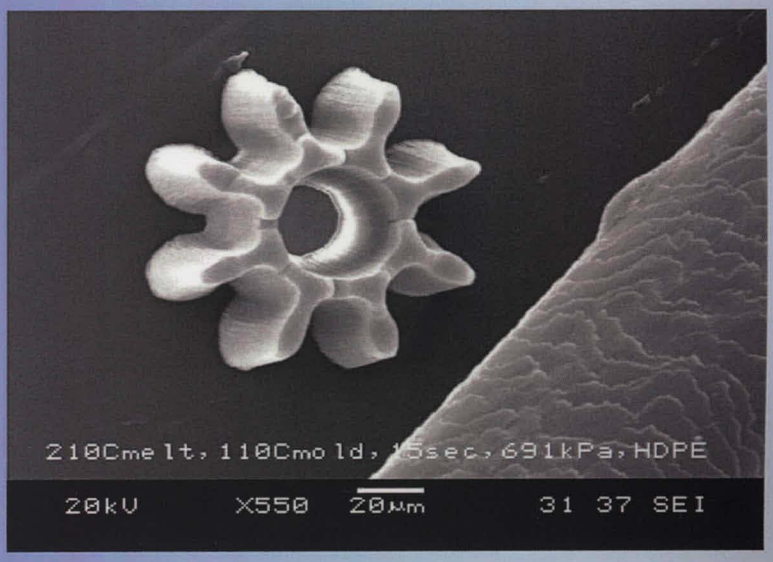

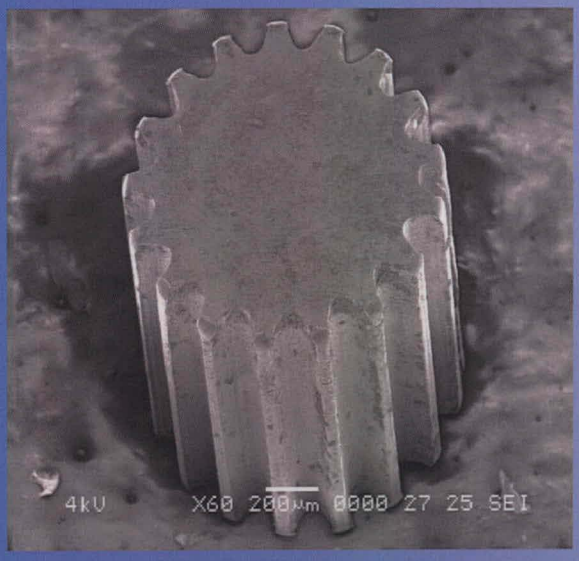

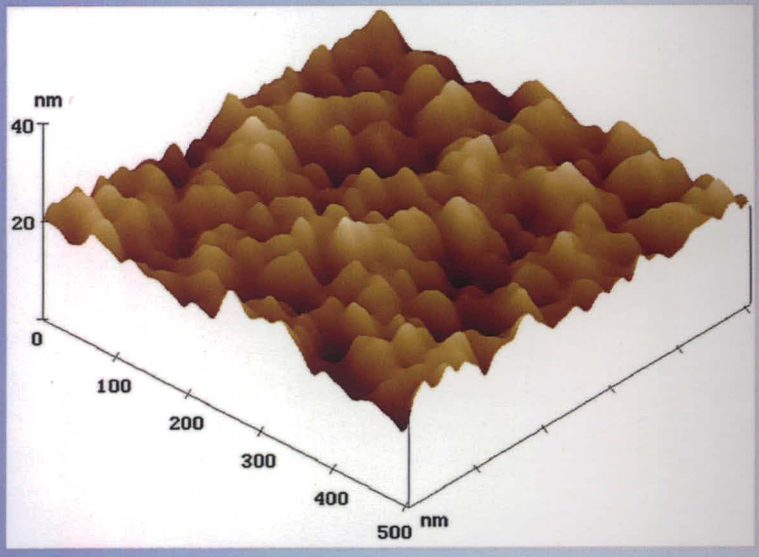

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Chapter 7

Influence of Machining Parameters on Surface Roughness during EDM of Mild Steel

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Keywords: EDM; Surface roughness; Current; Voltage; On-time; Off-time

Abstract. The present paper reports on the influence of process parameters on surface roughness of mild steel during EDM using a copper electrode. Surface quality was evaluated on the basis of work surface roughness, micro cracks and thickness of the recast layer. Current, pulse-on time, pulse-off time and voltage were the variable parameters for the present investigation. It was found that pulse-on time is the most significant factor for work surface roughness. With increase in pulse-on time the work material gets more time to absorb heat and more melting and vaporization of material takes place producing a rough surface. Work surface roughness was also found to increase with increase in current. A higher current produces a spark of higher energy removing more material and leaving a larger crater that results a rough surface. An increase in voltage also results a poorer surface, but voltage demonstrated to have a very small effect on job surface roughness.

Introduction

Electrical discharge machining (EDM) is the most common machining technique to produce molds and dies of difficult to machine materials. Since its introduction to manufacturing industry in late 1940s, EDM became a well-known machining method [1]. High quality surface of dies and molds is the prime requirement in order to produce parts with high precision. Surface quality of EDMed parts are evaluated by work surface finish (R_a), micro-cracks and thickness of the recast layer on the machined surface. The parameters influencing on the performance of EDM are current (A), voltage (V), pulse-on time (t_{on}) and pulse-off time (t_{off}). Machining process parameters have an important effect on the surface quality [2]. Efforts have been done by many researchers to draw the relationship of the machining parameters on the performance of EDM. During machining martensitic steel Rebelo et al. found that the dimensions of random overlapping surface craters increase with machining pulse energy [3]. Bhattacharyya et al. [4] developed mathematical model to correlate the relation of t_{on} and A with performance of EDM machining M2 die steel and optimized the machining parameters to minimize various criteria of machined surface integrity. In the present work the influence of EDM machining parameters on surface roughness of mild steel has been investigated.

Methodology

In the present study the material of the workpiece was taken as mild steel. The electrode material was pure electrolytic copper (99.9% Cu). It was of square section having the