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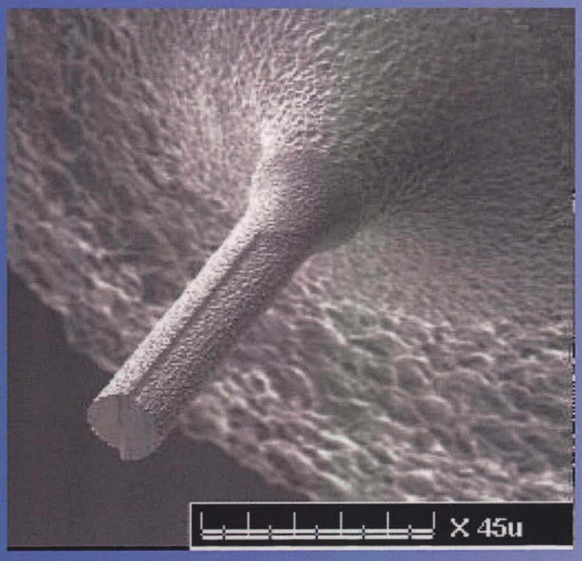

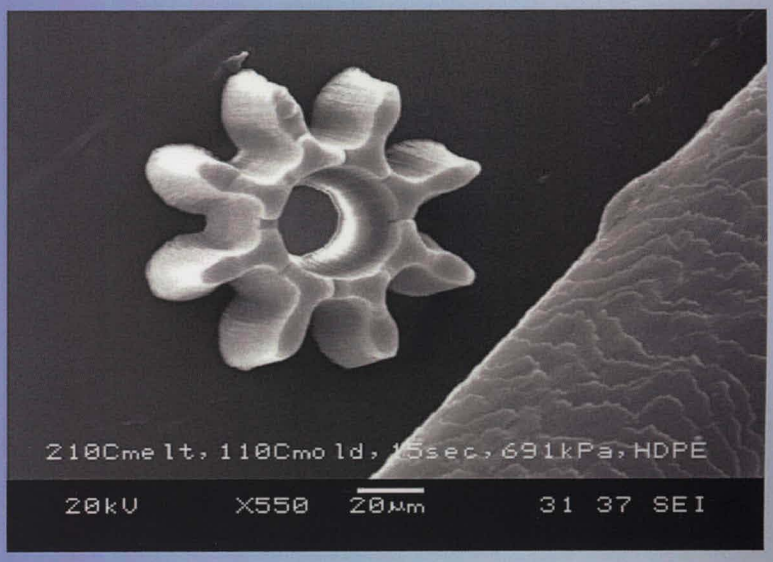

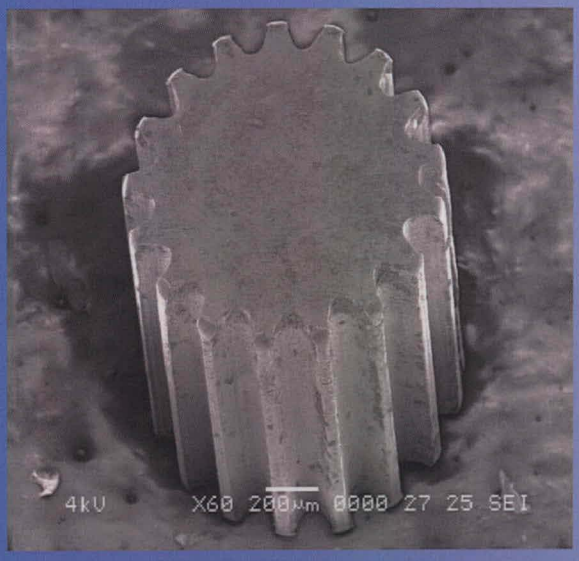

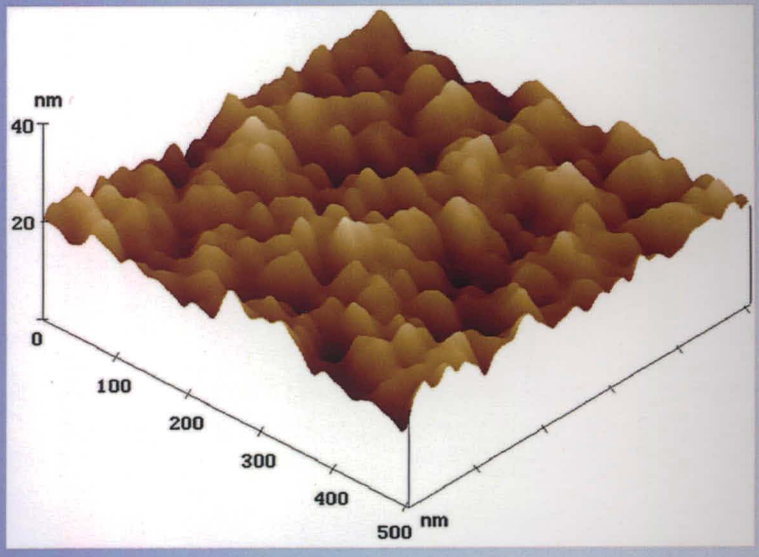

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Chapter 2

Wear Ratio and Work Surface Finish during Electrical Discharge Machining (EDM) with Eccentric Electrode

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Keywords: EDM; Wear ratio; MRR; Electrode wear rate

Abstract. In the present work the performance of eccentric electrode during EDM has been studied. Material removal rate and tool wear rate increase with increase in spindle speed and feed rate. It was found that higher feed rate increases the wear ratio. Spindle speed values determined the flushing efficiency. A higher spindle speed improves the flushing efficiency and thus improves the surface roughness.

Introduction

In electrical discharge machining (EDM) materials is removed by heat energy created by electric sparks between an electrode and the workpiece in a dielectric medium. In this chapter, it was focused on electric discharge milling by using eccentric electrode which means that the electrode with fix diameter will be rotating with different centre offset with the spindle. This will cause the electrode to travel in bigger area from its own diameter. This movement also known as orbit or planetary motion and it will improve the flushing conditions and also has several important functions in EDM. Planetary technology can also be used to compensate for the errors produced during the process, which results in a better accuracy of the final part. For this type of EDM milling with eccentric electrode, the electrode will be setup as face milling on the EDM machine and equipped by spindle, so that while rotating as milling operation, it can cut the surface by using EDM mechanism. Because of EDM characteristic that the electrode will not touch the work material, there is no need of the electrode to have sharp cutting edge as in normal milling operation. The electrode just needs to be of cylindrical shape and rotate to remove the material. The tool used in this particular study is shown in Fig.1. Copper electrode has the higher material removal rate and lower electrode wear rate compared to graphite tool electrode [1]. Therefore, the tool material was taken as copper. The work materials were copper and mild steel.

Material Removal Rate and Feed Rate

During EDM process not only the workpiece is melted and vaporized, but the electrode also undergoes wear. It is desirable that more material is removed from the work while less amount of material is removed from the tool. Material removal rate at different feed rate is shown in Fig.2. El-Taweel et al [2] in his research claims that as the tool eccentricity increases, MRR decreases for all planetary motion modes (spiral and helix). It can be observed from Fig.2 that material removal rate increases with increase in spindle speed and feed rate. Tool wear rate at different feed rate is illustrated in Fig.3. It is evident from Fig.3 that tool wear rate increases with increase in spindle speed and feed rate. Newman et al. [3]