Examination of machining parameters on the surface roughness of stavax ESR materials using EDM

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Abstract

An experimental study was conducted to investigate the effect EDM die sinking machining parameters on surface roughness of Stavax material for mould insert. The spark gap, peak current and servo voltage were manipulated to find the best combination of EDM machining parameters. The surface roughness of the machined surface of each specimen was measured using Perthometer and the image of texture was observed by using optical microscope. It was observed that the surface roughness was highly affected by the spark gap and peak current whereas the servo voltage had little effect.

Key words: EDM; electrode; surface roughness; Stavax; spark gap.

1. Introduction

Electrical discharge machining (EDM) is a non-conventional material removal method based on the thermoelectric process where an erosion of the working material taken place in a series of discrete but controlled electric sparks between the work piece and electrode immersed in a die electric fluid [1, 2]. Heat energy is used to create a melt and vaporization on the work pieces so that material removal will take place by a dielectric explosion. In order to reduce the discharge craters formed on the machined surface, optimizing the machining set up is very important activity to control the surface finish of the material. There are critical zones on the surface where the EDM machining is taking place. The white layer is the re-solidified crater area which most of the time develops some micro cracks and residual stress. Directly below the white layer (recast layer) there is the heat affected zone (HAZ) which may be permanently affected for some surface distortion and permanent failure.

Due to the increasing demands of improved surface finish of tool steel, forming tools and mold materials, optimization of the EDM machining parameters are very important. Researches were done to study the effect of EDM parameters on the surface finish of different materials. The fact that varous EDM machining parameters affect the surface roughness of the work piece, it has been difficult to optimize the best surface finish. However, various attempts to study the effect of voltage [3, 4], pulse pause time [3], electrode material [5], and dielectric liquid pressure [5, 6] on the surface finish have been