Advanced Machining Process

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Features of EDM of Mild Steel with Ta-Cu Powder Compacted Electrodes

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Keywords: Electro discharge machining, Surface roughness; electrodes, Tantalum carbide; Copper

Abstract. During EDM work surface roughness can be influenced by using powder compacted electrodes. The present study shows that surface roughness of workpiece is higher when using TaC/Cu green compacted electrode compared to that produced by pure copper electrode. When using TaC/Cu green compacted electrode, more material is deposited on the workpiece surface and a thick layer is formed on the surface. In addition, the particles from the electrode are randomly deposited on the workpiece surface. On the contrary, there will be only a very thin layer of material from electrode will be deposited on the workpiece surface when using pure copper electrode. A thick deposited layer with randomly deposited particles will create rougher surface rather than a thin layer. That is why surface roughness is high when using TaC/Cu green compacted electrode.

Introduction

In normal EDM process by using conventional electrode like copper and brass, the surface quality especially corrosion resistance of work material does not improve. It needs further processing to enhance the corrosion resistance and this will increase the machining cost. Powder metallurgy (PM) compacted electrode is the best method to overcome this problem because during machining operation, the material from the compacted electrode will be deposited on top surface of work material. Hence, it will increase the corrosion resistance of work material while machining cost is reduced. It is also reported by some investigators that work surface roughness can also be improved using PM compacted electrodes.

The level of workpiece modification or workpiece alloying in EDM can be greatly improved with the usage of PM compacted electrode. The speed to develop layer formation on the workpiece surface also can be increased. The thickness of recast layer also is increased by applying PM compacted electrode. Harder layers on the workpiece surface can be beneficial in providing increased abrasion and corrosion resistance to the workpiece [1, 2].

Green PM compacted electrode is the electrode made by mixing two or more metal powder and pressing it by the compression machine without going through the sintering process. Compacting pressure during in the fabrication of green PM compacted electrode give major effect to the electrical, thermal and mechanical properties of the electrode. When the compacting pressure is high, the electrical, thermal and mechanical properties will show significant improvements [3].