

Chapter 8

MICRO-ELECTRICAL DISCHARGE MACHINING EMPLOYING POWDER MIXED DIELECTRICS

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ABSTRACT

Micro-electro-discharge machining (μ EDM), a non-contact machining process that remove material from the workpiece, has been gaining ground as a new alternative method to fabricate micro-structures. Since micro-EDM process is performed into a dielectric fluid, the type of dielectric fluid influences the machining performance criteria. Typically, in EDM, hydrocarbon oil or kerosene is used as the dielectric fluid. However, in micro-EDM, the use of kerosene dielectric creates several problems. These problems include deposition of carbide layer on workpiece surface that reduces material removal rate, adhesion of carbon particles on micro-tool surface that makes the discharge inefficient, formation of harmful vapours such as CO and CH₄ that create toxic environment around the machining area, etc. To promote better micro-machining performances and safe machining environment, experimental investigations are going on employing different non-hydrocarbon based dielectric oils. The oxy-based fluid, i.e., distilled as well as de-ionized water is one of them that can be applied as dielectric liquid during micro-machining in EDM. Several experimental studies on powder-mixed EDM process have been performed by researchers across the globe to investigate their influences on electrical discharge machining performances. The researches include powders of Al, Cr, Cu, graphite, silicon, silicon carbide etc in some of the dielectrics such as kerosene and de-ionized water. The chapter deals with overview of micro-EDM process using conventional dielectric fluids and problems associated with hydrocarbon oil as dielectrics. Moreover, the machining principle of powder mixed EDM process is described. Furthermore, a well planned research study is conducted for exploring the influence of de-ionized water as dielectric during micro-hole machining on Ti-6Al-4V

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