INVESTIGATION ON MACHINING PERFORMANCE OF POWDER MIXED ELECTRIC DISCHARGE MACHINING OF AA7050 HYBRID COMPOSITES

ABSTRACT

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ABSTRACT

In this research work, AA7050 aluminum alloy was reinforced with Silicon Carbide and Aluminium Oxide particle of size 5µm through liquid stir casting route. The wettability of the composites was attained by adding magnesium powder as flux. The reinforced particles are preheated at 250^{o}C before adding to the melt. Uniform distribution of composites was confirmed through SEM with EDS mapping and the results revealed that the particles are homogeneously distributed over the matrix material. The density was determined through liquid immersion technique and compared with experimentally calculated value to compute the void fraction. The void fraction was within the prescribed range, according to the findings.

Die Sink electric discharge machining were performed on the composites by varying powder concentration, current and pulse on time. silicon carbide, aluminium oxide and graphite are the distinct powders mixed with the dielectric fluid to enhance the machining performance. Taguchi orthogonal approach was used to design the experimental runs whereas material removal rate, tool wear ratio, machined surface hardness and surface roughness were recorded as response. The results revealed that MRR increases with the addition of particles in the dielectric medium owing to the bridging effect. The composites machined under PMEDM condition showed least R_a value owing to the increase in spark gap. The spark gap increment facilitates the complete flushing of machined debris which eliminates the formation of remelted layer on the surface. The surface topography showed remelted layer, micro pits, craters and pock marks and some of the above mentioned features were eliminated under PMEDM condition. Owing to the elimination of the remelted layer the PMEDM machined surface offers least machined surface hardness compared to that of the EDM machined surface. The addition of powder has trivial impact on TWR, as maximum

improvement of 5% reduction in TWR was achieved. The parameters were optimized using TOPSIS optimization technique. A mathematical model was developed and experimental results were compared with the theoretical values. From the ANOVA table it was found that Powder concentration, current and interaction impact of current and powder concentration was found as most significant factor followed by the discharge current.