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EXPERIMENTAL STUDIES ON THE ELECTRIC DISCHARGE MACHINING OF ALUMINIUM METAL MATRIX COMPOSITES

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Abstract: Metal Matrix Composites (MMCs) are one of the recent advanced materials having the properties of light weight, high specific strength and high wear resistance. MMCs are composed of metallic base material called matrix, which is reinforced with a hard ceramic reinforcement. Aluminum 7075 (Al-Zn-Mg-Cu alloy) is used as the base matrix alloy. Its applications are in Aircraft fittings, gears and shafts, missile parts, regulating valve parts, aerospace and defense applications.
In the present work, MMCs are fabricated by stir casting method. The reinforcement material used in MMCs is Aluminum oxide (Al2O3) with various weight percentages such as 5%, 10% and 15%. Due to possession of higher hardness and reinforcement strength, composite materials are difficult to be machined by traditional techniques. Hence Electrical Discharge Machining (EDM) process becomes viable method to these kinds of composite materials. Since the EDM process does not involve mechanical energy, the material removal rate is not influenced by the material properties like hardness, strength, toughness etc.

It is found that the predicted R2 values concur well with the experimental results. Pulse current has been observed to be the most important factor that affects all the output parameters such as MRR and EWR. The pulse current and pulse on time have statistical significance on both EWR and MRR. The higher pulse off time lowers the MRR value, whereas EWR increases with increase in pulse current and pulse on time. The optimum parameter of combination setting has been identified for the MMCs. The results obtained from the confirmation experiments were in good agreement with the experimental results.

Keywords*: EDM, MMC, Taghuchi method, MRR, EWR*

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