

Review Article

Role of Magnetic Field Assistance in Electric Discharge Machining

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A B S T R A C T

Electric discharge machining is an excellent culminating process that utilizes magnetic-field support and provides amended machining performance with both a high material removal rate and capable of excellent machining capacity of all involute geometries thus find wide applications in many industries including aero, automobile, medical, etc. This paper presents a basic review of the effect of Magnetic Field Assistance in the Electric Discharge Machining process (MFAEDM) and enlightens on how magnetic field assistance enhances the machining output/ efficiency of EDM.

Keywords: MFAEDM, EDM, MRR, TWR

Introduction

The main purpose of MFAEDM is to improve the debris extraction from machining zone. Mainly, two forces i.e. magnetic force and centrifugal force occur during Magnetic field assistance¹ which helps in improving the machine outputs.² The MFAEDM is expected to achieve the higher machining efficiency and higher MRR³ (Material removal rate) which are most important to meet the industrial demands⁴. A brief literature review on MFAEDM is presented here.

As shown in Figure 1, two opposite magnets are fastened close to the machining zone so that maximum effect of the magnets can be achieved. The workpiece must be an electrically conductive material but may be magnetic or non-magnetic. A resultant force occurs due to presence of centrifugal force and magnetic force⁴ of magnets and helps in expulsion of machined debris from the machining zone.⁵ This resultant force however improves the ejection of debris which further enhances the material removal rate as next spark in machining zone will occur quickly when compared to conventional EDM.⁶ The magnetic field is usually applied parallel to the workpiece surface but perpendicular to surface is also possible. Mostly, the

magnetic field is as close as possible to workpiece machining zone. The whole setup is immersed inside dielectric fluid.⁷

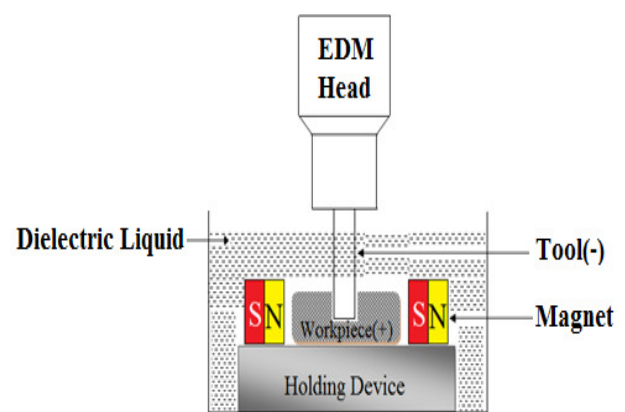


Figure 1. Schematic diagram of MFAEDM

Literature Review

The Figure 2, Shows various type of MFAEDM processes which were used by various researchers. The classified MFAEDM process, into such as conventional MFAEDM,^{8,9} Rotary Tool MFAEDM,¹⁰ Powder Mixed MFAEDM,¹¹ Near dry MFAEDM,¹² Hybrid Ultrasonic assisted MFAEDM,¹³ Water Dispersant MFAEDM.¹⁴

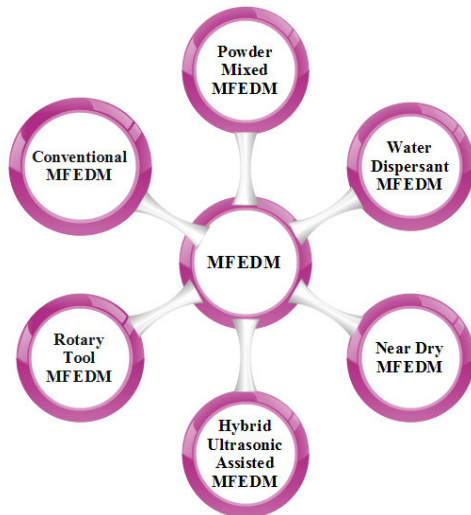


Figure 1. Classification of MFEDM

Conclusion

MFAEDM or Hybrid MFAEDM is the need of modern industry. Magnetic assistance in EDM yielded good results in comparison to conventional EDM in terms of better MRR, low TWR and precision in machining.

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