

Studies on Recast-layer in EDM using Aluminium Powder Mixed Distilled Water Dielectric Fluid

Khalid Hussain Syed¹, P. Kuppan²

School of Mechanical & Building Sciences, VIT University, Vellore
Tamil Nadu, India, 632014

¹ khalidhussains@gmail.com

² pkuppan@vit.ac.in

Abstract—In this paper, an attempt has been made to study the effect of aluminium powder when mixed in the distilled water dielectric fluid. The work and tool electrode materials used are W300 die-steel and electrolytic copper respectively. Pulse peak current, pulse on-time and concentration of aluminium powder are taken as the process parameters. The output response considered is white layer thickness (WLT). The experiments are planned using face centered central composite design procedure. Empirical model is developed for WLT using response surface methodology (RSM) to study the effect of process parameters. Optical microscopy results show that low thickness of white-layer 17.14 μm is obtained at high concentration of powder of 4 g/l and low peak current of 6 A.

Keyword-PMEDM, Distilled water, Al powder, W300 die-steel, white-layer

I. BACKGROUND

Powder Mixed Electric Discharge Machining (PMEDM) is one of the techniques used in EDM to improve the machining efficiency and surface finish in the presence of powder suspended dielectric fluid. Electrically conductive powder suspended in the dielectric fluid reduces the insulating strength of the dielectric and increases the spark gap between the tool and workpiece. As a result, the process becomes more stable, increases machining efficiency and reduces the surface defects.

The working principle of PMEDM is different from conventional EDM. A series of voltage pulses of magnitude about 20-120 V and frequency on the order of 5 kHz is applied between the two electrodes, which are separated by a spark gap typically 10-200 μm . The spark gap filled up with powder particles suspended in the dielectric fluid, get energized due to the electric field. These charged particles are accelerated by the developed electrical field and act as conductors. The powder particles arrange themselves under the sparking area and gather in clusters. The chain formation of particles helps in bridging the gap (Fig. 1b) between the electrodes and decreases the insulating strength of the dielectric fluid. This results in several discharging paths creating multiple discharges within a single input pulse [1]. Thus a single input pulse creates several discharging

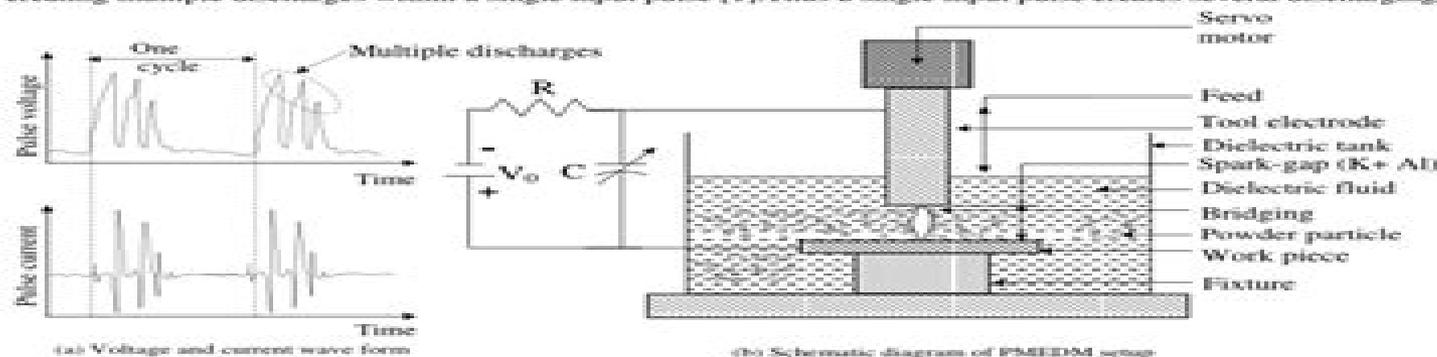


Fig. 1 PMEDM principle

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Abhishek Das



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Electric Discharge Hybrid-Machining Processes Basil

Kuriachen,Jose Mathew,Uday Dixit,2022-03-30 This book provides the knowledge and insight into the fundamental aspects of Electric Discharge Machining EDM processes and various hybrid machining technologies derived to improve the machining efficiencies Fundamental theory of material removal recent research trends and future research directions have been covered in each chapter After explaining EDM Dry and Near dry EDM processes Electrochemical Spark Machining Arc Machining processes Electric Discharge Hybrid Turning processes Electrical Discharge Grinding Electric Discharge Milling and various assisted EDM processes have been discussed Finally modeling and simulation of hybrid machining processes are also included The book reflects the recent developments and trends in electric discharge hybrid machining processes It covers in detail the basics of EDM various hybrid and assistive technologies in EDM It includes the updated discussion on the significance of process parameters in various hybrid EDM processes An overview of modelling and simulation of hybrid EDM process is provided This book is aimed at Graduate students researchers in manufacturing engineering production engineering and materials engineering

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Hloch,Dagmar Klichová, Frank Pude,Grzegorz M. Krolczyk,Somnath Chattopadhyaya,2021-03-16 This book reports on cutting edge research and technologies in the field of advanced manufacturing and materials with a special emphasis on unconventional machining process rapid prototyping and biomaterials It gathers contributions to the International Conference on Manufacturing Engineering and Materials ICMEM 2020 which was originally planned in June 2020 but will actually take place in 2021 in Nov Smokovec Slovakia because of the Covid 19 pandemic Despite the challenging times submitted contributions were peer reviewed and upon a careful revision included in this book which covers advances that are expected to increase the industry s competitiveness with regard to sustainable development and preservation of the environment and natural resources Condition monitoring industrial automation and diverse fabrication processes such as welding casting and molding as well as tribology and bioengineering are just a few of the topics discussed in the book s wealth of authoritative contributions A special emphasis is given to problems connected to climate change and solution

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