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‹ Back to results | 1 of 1

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International Journal of Advanced Manufacturing Technology
Volume 106, Issue 9-10, 1 February 2020, Pages 4247-4261

Stability of micro dry wire EDM : OFAT and DOE method (Article)

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Abstract

View references (62)

Micro dry wire electrical discharge machining (μDWEDM) is an environmental-friendly machining process where gas is used as the dielectric fluid instead of liquid. In this process, certain modifications of wire electrical discharge machining (WEDM) are required during the machining operation for stable machining. In μDWEDM, the process is considered stable if the machining is continuous without any interruption due to wire breakage or wire lag. However, in the present state of the arts, stable and smooth machining process using μDWEDM remains a critical issue. Hence, the objectives of this research are to establish a stable μDWEDM process using two different experimental approaches: one-factor-at-a-time (OFAT) and design of experiment (DOE) method . The investigation was performed on a stainless steel (SS304) with a tungsten wire as the electrode using integrated multi-process machine tool, DT 110 (Mikrotools Inc., Singapore). Types of dielectric fluid, dielectric fluid pressure, polarity, threshold voltage, wire tension, wire feed rate, wire speed, gap voltage, and capacitance were the controlled parameters. The machining length of the microchannels was measured using scanning electron microscope (SEM) (JEOL JSM-5600, Japan). Analysis based on these two experimental approaches shows that stable μDWEDM process is achievable when the types of dielectric fluid, dielectric fluid pressure, polarity, threshold voltage, wire tension, wire feed rate, and wire speed remain as the fixed parameters while the capacitance and gap voltage remain as the controlled parameters.

SciVal Topic Prominence

Topic: Electric Discharge Machining | Inconel (Trademark) | Tool Wear

Prominence percentile: 99.322

Chemistry database information

Substances

W

Author keywords

DEDM DOE Dry EDM DWEDM OFAT Plackett-Burman design μDWEDM

Indexed keywords

Engineering controlled terms: Capacitance | Design of experiments | Electric discharge machining | Electric discharges | Machining centers | Scanning electron microscopy | Threshold voltage

Engineering uncontrolled terms: DEDM | DWEDM | Environmental-friendly | Experimental approaches | Multi-process machines | OFAT | Plackett-Burman designs | Wire electrical discharge machining

Engineering main heading: Wire

Funding details

Funding sponsor	Funding number	Acronym
Kementerian Sains, Teknologi dan Inovasi	SF15-016-0066	MOSTI

Funding text

This research was funded by MOSTI under Research Grant SF15-016-0066.

ISSN: 02683768
CODEN: IJATE
Source Type: Journal
Original language: English
DOI: 10.1007/s00170-020-04923-9
Document Type: Article
Publisher: Springer

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