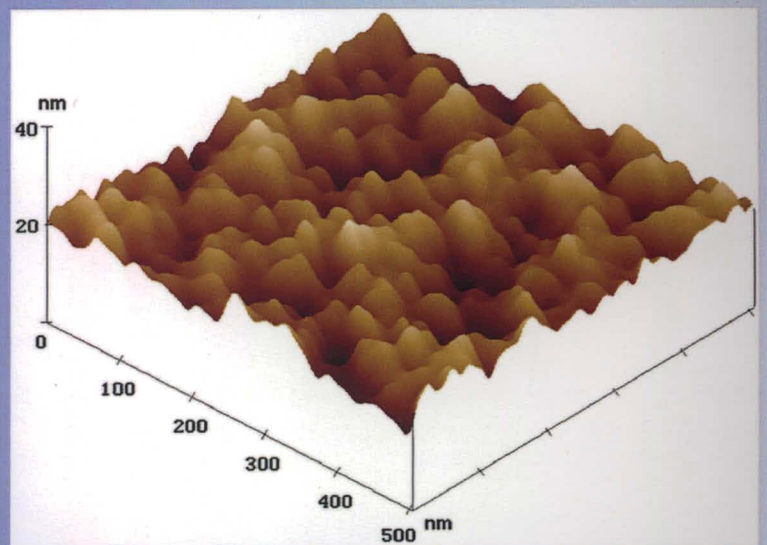
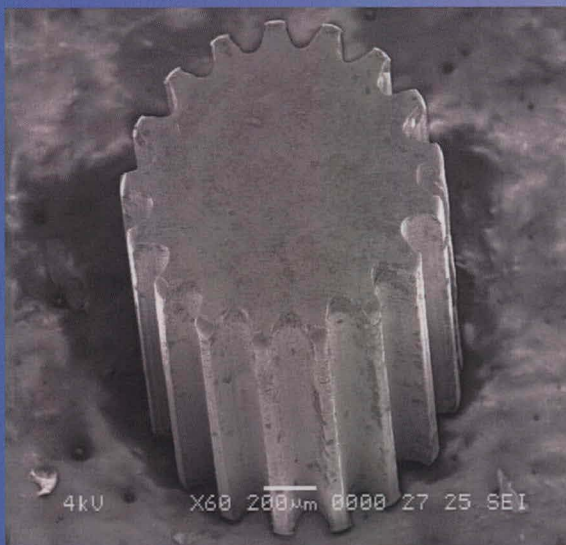
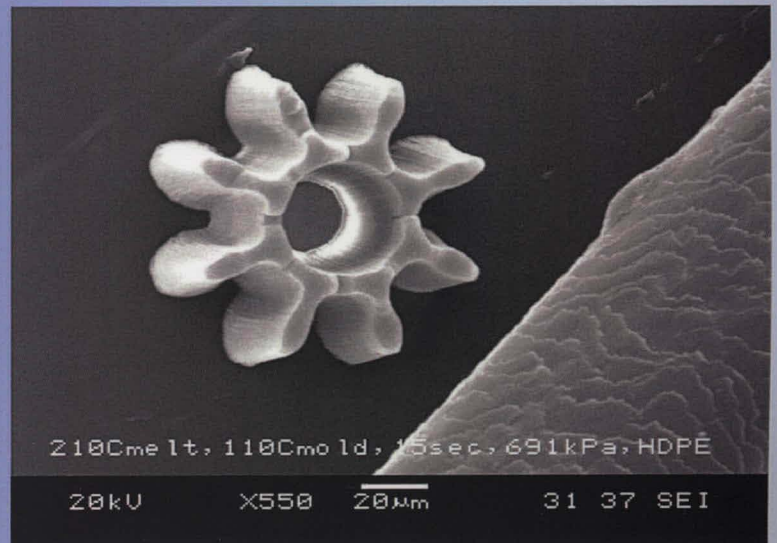
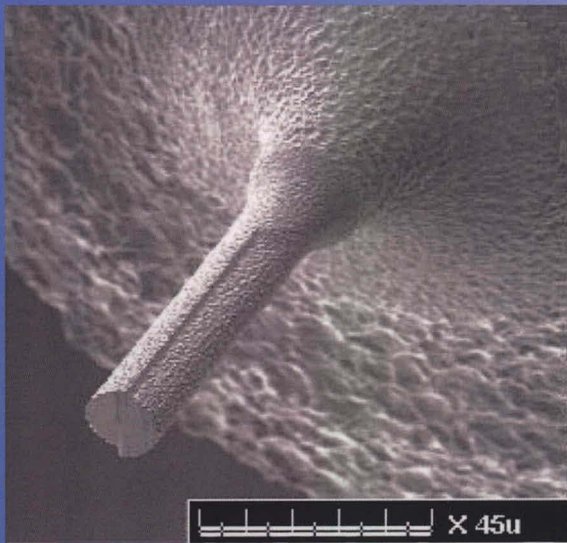


Advanced Machining Process



Editors

Mohammad Yeakub Ali

AKM Nurul Amin

Erry Yulian Triblas Adesta

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA



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**Mohammad Yeakub Ali
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IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
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Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Mohammad Yeakub Ali, AKM Nurul Amin & Erry Yulian Triblas Adesta: Advanced Machining Process

ISBN: 978-967-418-162-8

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed By:
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

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Relationship between Machining Variables and Process Characteristics during Wire EDM

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Keywords: Wire EDM; Surface roughness; Microstructure; Wire breakage

Abstract. Wire EDM is in use for a long time for cutting punches and dies, shaped pockets and other machine parts. Surface finish of the machined surface mainly depends on current and voltage used during machining. In the present work experimental investigations have been conducted to establish relationships job surface finish with current and voltage. Brass wires of diameters 0.3 mm, 0.25 mm, 0.20 mm and 0.15 mm were used. Work materials tested were mild steel, aluminium, cemented carbide, copper and stainless steel. After machining each material with specific current and voltage the hardness and the job surface roughness were measured and their surfaces were observed under a scanning- electron microscope. Results of the experiments show that in general the machined surface becomes rougher with increase in current and voltage. Microstructures of the specimens also show that craters on the finished surface become larger as a result of using higher current and voltage. It was also found that wires of smaller diameters give smoother surface than those cut with larger diameters. It has been established that machining of carbides should be limited to wires with diameter equal to or less than 0.15 mm. Use of wires of greater diameters causes frequent wire breakage.

Introduction

Wire EDM, a modification of EDM, is widely used for cutting complex profiles on conductive work materials. For Wire EDM consumable electrode is mostly used since non-consumable wires are expensive. Precision dies and profiles require smooth surface finish. As a result of each spark during cutting process a tiny volume of material is vaporized, which leaves a cavity on the machined surface. Thus smoothness of the machined surface depends on the depth of cavities produced during a series of sparks. The depth and size of these cavities depend on the intensity of the sparks and the intensity of the sparks mainly depends on current and voltage used during cutting process. Surface smoothness also depends on the characteristics of the work materials, wire tension, electrode wire material, dielectric fluid, etc. Different authors like Brown, Kalpakjian, Panday, Tlustý, Trend, and others have analyzed the wire EDM process and have shown the relationship between surface smoothness and different cutting parameters. They have also given recommendations on cutting parameters to be used during cutting different work materials.

Methodology

The machine used for cutting different work materials was model FX-K with a maximum capacity of work dimension 800x575x215 mm. The dielectric material used during