MANUFACTURING MANAGEMENT
From basic machining to quality product

EDITORS
ERRY YULIAN TRIBLAS ADESTA
AKM Nurul Amin
Mohamad Yeakub Ali

IIUM Press
Contents

Preface

PART I: MACHINING

Chapter 1 - Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Process development ................................................................. 3

Mohammad Yeakub Ali¹, Asfana Banu², Adibah³, and Nur Atiqah ⁴
1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia
✉️: mnyali@iium.edu.my

Chapter 2 - Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Experiment and Analysis 800 μm Diameter Tool ..................................... 11

Mohammad Yeakub Ali¹, Asfana Banu Mohamad Ashara³, Adibah Abdul Wahab³, and Nur Atiqah Abdul Rahman Azmil¹
1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia
✉️: mnyali@iium.edu.my

Chapter 3 - Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Experiment and Analysis 1.0 mm Diameter Tool ....................................... 18

Mohammad Yeakub Ali¹, Asfana Banu Mohamad Ashara³, Adibah Abdul Wahab³ and Nur Atiqah Abdul Rahman Azmil¹
1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia
✉️: mnyali@iium.edu.my

Chapter 4 - Machining With Absent of Coolant ................................................................. 26

Umnu Atiqah Kairiyah bt Mohamad
1. Faculty of Engineering – International Islamic University Malaysia
✉️: eika870126@gmail.com /eika_870126@yahoo.com/ ✉️:

Chapter 5 - The Effect of deep cryogenic treatment on the properties of AISI D2 Tool steel ........................................................................................................... 32

Erry Yulian Triblas Adesta¹ and Belal Ahmed Ghazi²
1, 2 Faculty of Engineering – International Islamic University Malaysia
E-mail: eadesta@iium.edu.my/belalghazi188@gmail.com

vii
Chapter 6 - Characteristic of Powder Metallurgy Compacted Electrode for EDM

Ummu Atiqah Khairiyah bt Mohamad
1. Faculty of Engineering - International Islamic University Malaysia
☎️: eika870126@gmail.com / eika_870126@yahoo.com

Chapter 7 - Recent Developments in EDM

Norazah Binti Ishak
1, 2. Faculty of Engineering - International Islamic University Malaysia
☎️: nurozeh86@yahoo.com / aikhan@iium.edu.my

Chapter 8: Surface Study when Finish Grinding Silicon using Resin Bonded Diamond Cup Wheel

Mohamed Konneh and Abdul Halim
Faculty of Engineering - International Islamic University Malaysia
☎️: mkonneh@iium.edu.my

Chapter 9: Surface Roughness Studies in Die-sink EDM of Tungsten Carbide using Copper Tungsten Electrode

Mohamed Konneh, and Muhammad Mukhtar
Faculty of Engineering, International Islamic University Malaysia
☎️: mkonneh@iium.edu.my

Chapter 10: Study of the Effect of different Electrodes on Material Removal Rate, Electrode Wear Rate and Surface Roughness in the EDM of S-STAR

Mohamed Konneh, Nur Jannah Shad and Noor Fazlin Saharudin
Faculty of Engineering, International Islamic University Malaysia
☎️: mkonneh@iium.edu.my

Chapter 11: Kerf in Micro Wire Electro Discharge Machining

Abdus Sabur and Mohammad Yeakub Ali
Department of Manufacturing and Materials Engineering
Faculty of Engineering, International Islamic University Malaysia
☎️: asbur72@yahoo.com

Chapter 12: Investigation of Corner Radius using Micro Wire Electro Discharge Machine

Abdus Sabur and Mohammad Yeakub Ali
Department of Manufacturing and Materials Engineering
Faculty of Engineering, International Islamic University Malaysia
☎️: asbur72@yahoo.com
PART II: MANAGEMENT

Chapter 13 - Crashing a Project in PERT/CPM network ................................................. 91
Zahir Hussain \(^1\) and Erry Yulian Triblas Adesta \(^2\)
1. 2. Faculty of Engineering – International Islamic University Malaysia
\(\inbox: \) cadesta@iium.edu.my; hussain@iium.edu.my / \(\inbox: \)

Chapter 14 - Project Management with PERT and CPM ................................................... 100
Aalya Banu
Faculty of Engineering – International Islamic University Malaysia
\(\inbox: \) aalya.banu@gmail.com / \(\inbox: \)

Chapter 15 - Risk Management ....................................................................................... 108
Siti Susilawati Kiswari
1, 2. Faculty of Engineering – International Islamic University Malaysia
\(\inbox: \)

Chapter 16 – Development of Thermoselect Process in Waste Management System in Malaysia ........................................................................................................... 119
Hadi Purwanto\(^3\), Rusila Zamani bt Jusoh \(^@\) Abd Rashid\(^4\)
1, 2. Faculty of Engineering – International Islamic University Malaysia
\(\inbox: \) hadi@iiun.edu.my; shilarashid21@yahoo.com / \(\inbox: \)

Chapter 17 - The Impacts of Using Plastic Bags .............................................................. 125
Rusila Zamani bt Jusoh \(^@\) Abd Rashid\(^1\)
1. Faculty of Engineering – International Islamic University Malaysia
\(\inbox: \) shilarashid21@yahoo.com /

PART III: MATERIALS

Chapter 18 - The Use of Hydroxyapatite (Ha) For Bone Implant Application .................. 132
Rusila Zamani bt Jusoh \(^@\) Abd Rashid\(^1\)
1. Faculty of Engineering – International Islamic University Malaysia
\(\inbox: \) shilarashid21@yahoo.com
Chapter 19 - Materials for Advanced Bio-Applications ........................................ 139
Abreeq Rashid Naqshbandi
International Islamic University Malaysia
✉: naqshbandiabreeq@gmail.com

Chapter 20 - Advanced Corrosion Detection Techniques .................................... 148
Abreeq Rashid Naqshbandi
International Islamic University Malaysia
✉: naqshbandiabreeq@gmail.com

Chapter 21 - Biosynthesis of Nanoparticles ......................................................... 156
Abreeq Rashid Naqshbandi
International Islamic University Malaysia
✉: naqshbandiabreeq@gmail.com

Chapter 22 - High Density Polyethylene (HDPE) as an Alternative Material in Fuel Tank Production ............................................................... 164
Atiqah Alzulaudin ¹ and M.A Maleque ²
1, 2 Faculty of Engineering – International Islamic University Malaysia
✉: atiqahalzulaudin@yahoo.com; maleque@iium.edu.my

Chapter 23 - In-Situ Syntheses of High Wear Resistant Coating Reinforced Ti-6al-4v Matrix ................................................................. 173
Belal Ahmed Ghazali ¹ and Erry Yulian Triblas Adeza ²
1, 2 Faculty of Engineering – International Islamic University Malaysia
✉: belalghazali88@gmail.com; cadesta@iium.edu.my

Chapter 24 - Effects of HA Loading of Porous Alumina-Hydroxyapatite Biocomposite Scaffolds ................................................................. 181
Nur Izzati Zulkifli
Faculty of Engineering – International Islamic University Malaysia
✉: n.izzati86@gmail.com

Chapter 25 - Natural Fiber Reinforced Polymer Composites ............................ 189
Mohd Romainor Mansor ³
1. Faculty of Engineering – International Islamic University Malaysia
✉: romainor@gmail.com
Chapter 26 - Study of Zinc Corrosion Behavior in Various Potassium Hydroxide Electrolyte Concentrations

Zul Hafiz Husaini and Noraini Mohamed Noor
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉️: myside86@yahoo.com; norainimnoor@gmail.com

Chapter 27 Mechanical and Morphological Characterization of Porous Alumina-Hydroxyapatite Composite: Effects of Sintering Temperature

Nur Izzati Zulkifli
Faculty of Engineering – International Islamic University Malaysia
✉️: n.izzati86@gmail.com

Chapter 28 - Study of Starch Addition on Porous Bioceramics Scaffolds: Effects on Strength and Porosity

Nur Izzati Zulkifli
Faculty of Engineering – International Islamic University Malaysia
✉️: n.izzati86@gmail.com

Chapter 29 - SEM Analysis of Coir Fiber and Coir Fiber-Albumen-Concrete Before and After Surface Treatments

Nurizan Omar and Zuraida Ahmad
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉️: izaran_286@yahoo.com.my; zuraidaa@iiium.edu.my

Chapter 30 - Powder Coating Has Potential In Developing Several Industries

Suryanto and Nurul Azhani Yunus
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉️: surya@iiium.edu.my; nuraz3510@gmail.com

Chapter 31 - Ultrasonic for Non-Destructive Testing of Materials

Siti Susilawati Kiswari
Faculty of Engineering – International Islamic University Malaysia
✉️: ctsusic@hotmail.com

PART IV: QUALITY

Chapter 32 - Quality Management System: In light of Project Management
Chapter 33 - Quality Management System

Siti Susilawati Kiswari
Faculty of Engineering – International Islamic University Malaysia
E-mail: etsusie@hotmail.com

Chapter 34 - The Implementation of Total Quality Management (TQM) In Kuliyyah of Engineering, International Islamic University Of Malaysia

Mohd Radzi Haji Che Daud, Khairul Adzha Bin Abu Tahir, Mohd Rujhan B Sulaiman
1, 2, 3. Faculty of Engineering – International Islamic University Malaysia

Chapter 35 - Culture Assessment on Value Based Total Performance Assessment in Kulliyyah of Engineering of International Islamic University Malaysia

Mohd Radzi Haji Che Daud, Umni Huraizah Binti Ramin
1, 2 Faculty of Engineering – International Islamic University Malaysia
Investigation of Corner Radius using Micro Wire Electro Discharge Machine

Abdus Sabur and Mohammad Yeakub Ali
Department of Manufacturing and Materials Engineering
Faculty of Engineering, International Islamic University Malaysia

1. Introduction
Micro Wire EDM is a method to machine conductive materials with a thin electrode that follows a programmed path. The electrode is a thin wire. As the wire been set, it uses sparks of electrical energy to progressively erode an electrically conductive workpiece along a path determined by the relative motion of the machine axis. There is no physical contact between the wire and the part being machined. Rather, the wire is charged to a voltage very rapidly. This wire is surrounded by de-ionized water. When the voltage reaches the correct level, a spark jumps the gap and melts a small portion of the work piece. The de-ionized water cools and flushes away the small particles from the gap. The wires are usually made of Brass, Copper or Tungsten, Zinc or Brass coated. Multi coated wires are also being used. Micro wire diameters range can be from 0.25mm to 20 micrometers although smaller and larger diameters are available. The wire must have sufficient tensile strength and fracture toughness as well as high electrical conductivity and capacity to flush away the debris produces during the cutting. The hardness of the work piece material has no damaging effect on the cutting speed. However, cutting speed can varies according to the conductivity and the melting properties of materials. For example, aluminum, a good conductor with a low melting temperature, cuts faster than steel. On the other hand, carbide, a nonconductor, cuts much slower than steel.

Although the micro wire-EDM process has been a key process for the tooling and manufacturing industry, especially for the production of punches and dies, the exact mechanism of the machining process is not yet clearly understood by many in the manufacturing community. The metal removal process of micro wire-EDM involves complex, stochastic and time-varying characteristics. Moreover, the process features change