



EDITORS
ERRY YULIAN TRIBLAS ADESTA
AKM Nurul Amin
Mohamad Yeakub Ali

MANUFACTURING MANAGEMENT

From basic machining to quality product



IIUM Press

MANUFACTURING MANAGEMENT

From basic machining to quality product

EDITORS

ERRY YULIAN TRIBLAS ADESTA

AKM Nurul Amin

Mohamad Yeakub Ali



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Erry Yulian Triblas Adesta, AKM Nurul Amin & Mohamed Yeakub Ali: Manufacturing from Basic Machining to Quality Product

ISBN: 978-967-418-165-9

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

CONTENTS

Preface

PART I: MACHINING

Chapter 1 - Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Process development3

Mohammad Yeakub Ali¹, Asfana Banu², Adibah³, and Nur Atiqah⁴
1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia
✉ : mmyali@iium.edu.my

Chapter 2 - Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Experiment and Analysis 800 µm Diameter Tool11

Mohammad Yeakub Ali¹, Asfana Banu Mohamad Asharaf², Adibah Abdul Wahab³, and Nur Atiqah
Abdul Rahman Azmil⁴
1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia
✉ : mmyali@iium.edu.my

Chapter 3 - Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Experiment and Analysis 1.0 mm Diameter Tool18

Mohammad Yeakub Ali¹, Asfana Banu Mohamad Asharaf², Adibah Abdul Wahab³ and Nur Atiqah
Abdul Rahman Azmil⁴
1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia
✉ : mmyali@iium.edu.my

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

Ummu Atiqah Khairiyah 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 Tribblas Adesta¹ and Belal Ahmed Ghazal²
1, 2 Faculty of Engineering – International Islamic University Malaysia
E-mail: eadesta@iium.edu.my; belalghazal88@gmail.com

Chapter 6 - Characteristic of Powder Metallurgy Compacted Electrode for EDM.....40

Ummu Atiqah Khairiyah bt Mohamad¹
1. Faculty of Engineering - International Islamic University Malaysia
✉ : eika870126@gmail.com / eika_870126@yahoo.com / ☎ :

Chapter 7 - Recent Developments in EDM.....46

Norazah Binti Ishak¹ Prof. Ahsan Ali Khan²
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : nurozech86@yahoo.com ; aakhan@iium.edu.my / ☎ :

Chapter 8: Surface Study when Finish Grinding Silicon using Resin Bonded Diamond Cup Wheel53

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 Electrode61

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-STAR69

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 Machining76

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 Machine82

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 Hussain¹ and Erry Yulian Triblas Adesta²
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : eadesta@iium.edu.my; hussain@iium.edu.my / ✉ :

Chapter 14 - Project Management with PERT and CPM100

Aalya Banu
Faculty of Engineering – International Islamic University Malaysia
✉ : aalya.banu@gmail.com / ✉ :

Chapter 15 - Risk Management108

Siti Susilawati Kiswari
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : siskiswari@iium.edu.my / ✉ :

Chapter 16 – Development of Thermoselect Process in Waste Management System in Malaysia119

Hadi Purwanto¹, Rusila Zamani bt Jusoh @ Abd Rashid²
1,2. Faculty of Engineering – International Islamic University Malaysia
✉ : hadi@iium.edu.my; shilarashid21@yahoo.com / ✉ :

Chapter 17 - The Impacts of Using Plastic Bags125

Rusila Zamani bt Jusoh @ Abd Rashid¹
1. Faculty of Engineering – International Islamic University Malaysia
✉ : shilarashid21@yahoo.com /

PART III: MATERIALS

Chapter 18 - The Use of Hydroxyapatite (Ha) For Bone Implant Application132

Rusila Zamani Bt Jusoh @ Abd Rashid¹
1. Faculty of Engineering – International Islamic University Malaysia
✉ : shilarashid21@yahoo.com

Chapter 19 - Materials for Advanced Bio-Applications139

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 Aldzaluddin¹ and M.A Maleque²
1, 2 Faculty of Engineering – International Islamic University Malaysia
✉ : atiqahafdzaluddin@yahoo.com; maleq@iium.edu.my / 2

Chapter 23 - In-Situ Syntheses of High Wear Resistant Coating Reinforced Ti-6al-4v Matrix..... 173

Belal Ahmed Ghazal¹ and Erry Yulian Triblas Adesta²
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : belalghazal88@gmail.com ; eadesta@iium.edu.my / 2

Chapter 24 - Effects of HA Loading of Porous Alumina-Hydroxyapatite Biocomposite Scaffolds..... 181

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

Chapter 25 - Natural Fiber Reinforced Polymer Composites..... 189

Mohd Romainor Manshor¹
1. Faculty of Engineering – International Islamic University Malaysia
✉ : romainor@gmail.com

Chapter 26 - Study of Zinc Corrosion Behavior in Various Potassium Hydroxide Electrolyte Concentrations..... 195

Zul Hafiz Husni¹ and Noraini Mohamed Noor²
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : mysid86@yahoo.com; norainimnoor@gmail.com

Chapter 27 Mechanical and Morphological Characterization of Porous Alumina-Hydroxyapatite Composite: Effects of Sintering Temperature.....202

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..... 212

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..... 220

Nurizan Omar¹ and Zuraida Ahmad²
1,2 . Faculty of Engineering – International Islamic University Malaysia
✉ : izan_286@yahoo.com.my; zuridaa@iium.edu.my / ✉

Chapter 30 - Powder Coating Has Potential In Developing Several Industries..... 230

Suryanto¹ and Nurul Azhani Yunus²
1,2. Faculty of Engineering – International Islamic University Malaysia
✉ : surya@iium.edu.my; nuraz3510@gmail.com / ✉

Chapter 31 - Ultrasonic for Non-Destructive Testing of Materials..... 237

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

PART IV: QUALITY

Chapter 32 - Quality Management System: In light of Project Management..... 251

Ferry Yulian Triblas Adesta¹ and Sharmila Fathima²
1, 2. Faculty of Engineering – International Islamic University Malaysia
E-mail : eadesta@iium.edu.my; sharmi.hameed@gmail.com

Chapter 33 - Quality Management System.....259

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

Chapter 34 - The Implementation of Total Quality Management (TQM) In Kulliyah of Engineering, International Islamic University Of Malaysia..... 269

Mohd Radzi Haji Che Daud¹, Khairul Adzha Bin Abu Tahar², 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 Kulliyah of Engineering of International Islamic University Malaysia.....275

Mohd Radzi Haji Che Daud¹, Ummi Huraizah Binti Ramin²
1, 2 Faculty of Engineering – International Islamic University Malaysia

Investigation of Minimum Chip Thickness in Micro End Milling of PMMA: Experiment and Analysis 800 μm Diameter Tool

Mohammad Yeakub Ali¹, Asfana Banu Mohamad Asharaf², Adibah Abdul Wahab³, and Nur Atiqah Abdul Rahman Azmil⁴

1, 2, 3, 4 Department of Manufacturing and Materials Engineering
Faculty of Engineering – International Islamic University Malaysia

✉ : mmyali@iium.edu.my

1. Introduction

Micro end milling is characterized by mechanical interaction of a sharp tool with the workpiece material, causing breakage inside the material along defined paths, eventually leading to removal of the useless part of the workpiece in the form of chips. The tool edge radius must be in the order of the dimension of the cut thickness or smaller. The minimum possible thickness of cut has been estimated less than 1 nm for copper and aluminium with a diamond tool having an edge radius of less than 10 nm using the molecular dynamics simulation [1].

In micromachining, due to the limited strength of the micro tool, the uncut chip thickness is constrained to be similar or even less than the tool edge radius. As a result, a chip will not be generated if the uncut chip thickness is less than critical values which is called as the minimum chip thickness. Cutting forces, tool wear, surface integrity process stability and et cetera plays a vital role in affecting the production of the minimum chip thickness. Thus, in order to select appropriate machining conditions, the knowledge of the minimum chip thickness is really important [2].

The tool edge radius and small feed per tooth makes the phenomenon of minimum chip thickness predominant in the micro end milling. A minimum chip thickness is formed when the tool is engage with workpiece which will effect in chip formation. In full immersion micro end milling uncut chip thickness of $t_u(\theta)$ varies from zero to feed per tooth of f_t . Thus, the minimum chip thickness for micro end milling ($t_{c\ min}$) can be defined as formation of chip