

THESIS

**SHAPE INFLUENCE OF THE CUTTING TOOLS IN MILLING PROCESS ON ITS
ENDURANCE AND SURFACE ROUGHNESS IN DRY CUTTING**

By

Agatha Amidya Putra

2-1752-026

MASTER'S DEGREE

In

MASTER OF MECHANICAL ENGINEERING – MANUFACTURING
CONCENTRATION
FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY



SWISS GERMAN UNIVERSITY
The Prominence Tower
Jl. Jalur Sutera Barat No. 15, Alam Sutra,
Tangerang 15143
Indonesia

Revision after thesis defense on 1 August 2018

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Agatha Amidya Putra, S.T

Student

Date

Approved by:

Dr. Ary Syahriar

Thesis Advisor

Date

Dr. Ir. Gembong Baskoro, M.Sc

Thesis Co-Advisor

Date

Dr. Irvan S. Kartawiria, S.T, M.Sc

Dean

Date

Agatha Amidya Putra

ABSTRACT

SHAPE INFLUENCE OF THE CUTTING TOOLS IN MILLING PROCESS ON ITS ENDURANCE AND SURFACE ROUGHNESS IN DRY CUTTING

By

Agatha Amidya Putra
Dr. Ary Syahriar
Dr. Ir. Gembong Baskoro, M.Sc

SWISS GERMAN UNIVERISTY

Cutting tool used in the milling process has a variety of functions and functions. One type of cutting tool commonly used in ATMI Cikarang is a face mill cutter insert used for cutting the face of work piece. Type face mill insert with tip insert there are two types of tip that is square and octagonal. Through this research, author will compare between square tip shape and octagonal tip shape in terms of tool wear and surface roughness. The method which used in this research is experimental research. Test cut is being done with square tipped face mill insert and octagonal tip face mill insert then collect the result. Test cut parameters are cutting speed, spindle speed, feed rate, depth of cut, and chip formation. This research is successfully done when author can find which shape of tip is better in terms of tool wear and which shape of tip is better in terms of surface roughness on the work piece. And finally as the result of this research, author can conclude that, for work piece with CK45 material, Square and octagonal shape has better result in Ra, on high RPM. Octagonal shape has better result in Wear, on low RPM. Square shape has better result in Wear, on high RPM. Square shape has better result in Ra, on high DOC. Octagonal shape has better result in Ra, on low DOC.

Keywords : Cutting tool, face mill cutter insert, milling process, cutting speed, spindle speed, feed rate, depth of cut, chip formation, surface roughness, tool wear



DEDICATION

I dedicate this works for the parents, brother , girlfriends as well as for my mother in heaven.



ACKNOWLEDGEMENTS

I give thanks to the Lord, so that I can finish Adjustable Pallet for frais Machine with Load Cell Sensor properly. Thank you for:

1. Dr. Ary Syahriar as my advisor is a serious Guide and very patient.
2. Dr. Ir. Gembong Baskoro, M.Sc as my co-advisor is a fun and relax at the time guide.
3. My father Amy Prayogo
4. My Brother Harya Adi Mulya
5. My Girlfriend Natalia Destyan Deo Fiftianti
6. My Mother Natalia Mardiyati in Heaven
7. My students in ATMI Cikarang Elmo



SWISS GERMAN UNIVERSITY

TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR	2
ABSTRACT	3
DEDICATION	5
ACKNOWLEDGEMENTS	6
TABLE OF CONTENTS	7
LIST OF FIGURES	9
LIST OF TABLES	11
CHAPTER 1 – INTRODUCTION	12
1.1 Background	12
1.2. Research Problems	13
1.3. Research Objectives	13
1.4. Significance of Study	13
1.5. Research Questions	13
CHAPTER 2 - LITERATURE REVIEW	14
2.1 Previous Studies	14
2.1.1 Previous Studies 1	14
2.1.2 Previous Studies 2	19
2.1.1.2 Experimental procedures	19
2.1.2.2 Results and discussion	21
2.1.2.2.1 Cutting force	21
2.1.2.2.2 Surface roughness	22
2.1.2.2.3 Chip formation	23
CHAPTER 3 – RESEARCH METHODOLOGY	24
3.1 Research Method	24
3.2 Research Framework	24
3.3 Experimental Research	25
3.3.2 Materials and Equipments	25
3.3.2.1 Material Test	25
3.3.2.2 Material Cutting Tool (Cemented Carbides)	26
3.3.2.3 Machine	29
3.3.3 Preliminary Research	31
3.3.4 Design of Experiments	31

3.3.5 Experimental Procedure.....	32
3.3.6 Observations.....	33
3.3.7 Analytical Procedure.....	33
3.3.7.1 Analysis Tool Wear with DMG ECO 210 Microset	33
3.3.7.2 Measure the surface roughness with electric roughness tester.....	34
3.3.7.3 Tool Wear	35
CHAPTER 4 – RESULTS AND DISCUSSIONS	37
4.1 Research Process	37
4.1.1 Calculation RPM and Feeding	37
4.2. Result Face Mill Cutter Square	38
4.2.1 Machining process 1 with the influence of depth of cut on the face mill cutter insert square	39
4.2.2 Process work 2 influence of RPM to Face Mill Cutter Insert Square	47
4.3. Result Face Mill Cutter Octagonal	55
4.3.1 Processing Process 1 with the influence of depth of cut on face mill cutter insert octagonal.....	56
4.3.2 Process work 2 influence of RPM to face mill cutter insert octagonal	63
4.4 Comparison Between Face Mill Cutter Insert Square Vs Face Mill Cutter Insert Octagonal.....	70
4.4.1 Effect Depth Of Cut in Face Mill Cutter Insert Square and Face Mill Cutter Insert Octagonal to Surface Roughness (Ra) and Width Of Chip	70
4.4.2 The Effect n (RPM) in Face Mill Cutter Insert Square and Face Mill Cutter Insert Octagonal to Surface Roughness (Ra) and Width Of Chip	71
CHAPTER 5 – CONCLUSIONS AND RECCOMENDATIONS.....	73
5 CONCLUSIONS AND RECOMMENDATION	73
5.1 Conclusion	73
5.2 RECOMMENDATION	74
REFERENCES	75
CURRICULUM VITAE.....	78