

TABLE OF CONTENTS

ABSTRACT.....	ii
ABSTRAK	iii
APPROVAL PAGE	iv
ORIGINALITY STATEMENT	v
PREFACE	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES.....	x
LIST OF TABLES.....	xiii
LIST OF SYMBOLS	xiv
GLOSSARY	xv
LIST OF APPENDICES	xvii
CHAPTER I INTRODUCTION	1
I.1 Background	1
I.2 Problem Formulation	7
I.3 Objective	7
I.4 Significance of the study	7
I.5 Limitations and Assumptions	8
I.6 Writing Structure	8
CHAPTER II LITERATURE REVIEW	10
II.1 Overview of Machining Thermal Behavior	10
II.2 Machining of Polymers and PTFE.....	11
II.3 Trochoidal Milling vs. Conventional Milling.....	11
II.4 Influence of Machining Parameters on Temperature.....	12
II.5 Predictive modeling in machining processes.....	13
II.6 Reasoning for Chosen Methods and Problem-Solving Theories.....	14

II.7 State of the Art	15
CHAPTER III METHODS	17
III.1 Problem Solving Systematic	17
III.1.1 Experimental Parameter Selection and Justification.....	18
III.1.2 Identifying factors and levels based on the parameter	18
III.1.3 Design of Experiment (DOE) with Full Factorial method.....	19
III.1.4 Equipment and material used in the experiment	20
III.1.5 Conducting experiments of trochoidal milling	21
III.1.6 Preliminary Equipment Testing.....	22
III.1.7 Temperature Measurement Methodology	23
III.1.8 Data Training and Validation Partition.....	25
CHAPTER IV DATA COLLECTION AND PROCESSING	27
IV.1 Data Presentation and Initial Trends.....	29
IV.1.1 Impact of Change in Feed Rate (fr) to Thermal Generation	30
IV.1.2 Impact of Change in Spindle Speed (n) to Thermal Generation...	31
IV.1.3 Impact of Change in Stepover (ae) to Thermal Generation.....	32
IV.1.4 Predictive Model Performance Evaluation and Selection.....	33
CHAPTER V ANALYSIS.....	36
V.1 Effects of Feed Rate (fr) To Thermal Generation in Trochoidal Slot Machining.....	36
V.2 Effects of Spindle Speed (n) to Thermal Generation in Trochoidal Slot Machining.....	38
V.3 Effects of Stepover (ae) to Thermal Generation in Trochoidal Slot Machining	41
V.4 Linear Regression Model: Parameter Effects, Comparative Analysis, and Industrial Applications	43

IV.4.1 Comparative Analysis on Parameters Between Conventional and Trochoidal Milling	43
IV.4.2 Industrial Application of the Predictive Model and Parameter Sensitivity Insight	45
CHAPTER VI CONCLUSION.....	46
VI.1 Final Project Summary.....	46
VI.2 Recommendations	46
REFERENCES.....	48
APPENDICES	51
Appendice A - Machining Parameter Design and Experimentation Results.....	52
Appendice B - Tutorial on How To Use Flir Temperature Camera and Regression Analysis Using Minitab18 FLIR Temperature Camera Usage Tutorial.....	54
Appendice C - Captured Tool's Temperature on Flir Tools+	69