ADVANCED MACHINING TOWARDS IMPROVED MACHINABILITY OF DIFFICULT-TO-CUT MATERIALS

Edited by:
A.K.M. Nurul Amin (Chief Editor)
Dr. Erry Yulian Triblas Adesta
Dr. Mohammad Yeakub Ali

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SECTION A: HEAT ASSISTED MACHINING 1

1. CHAPTER 1: INFLUENCE OF WORKPIECE PREHEATING ON CHATTER AND MACHINABILITY OF TITANIUM LOY - TI6AL4V 1

2. CHAPTER 2: MACHINABILITY IMPROVEMENT IN END OF MILLING TITANIUM ALLOY TI-6AL-4V THROUGH PREHEATING 9

3. CHAPTER 3: SOME ASPECTS OF IMPROVED MACHINABILITY IN PREHEATED MACHININING OF TITANIUM ALLOY TI-6AL-4V 19

4. CHAPTER 4: MACHINABILITY ASPECTS IN HEAT ASSISTED MACHINING OF HARDENED STEEL AISI H13 USING COATED CARBIDE TOOL 27

5 CHAPTER 5: TOOL WEAR AND SURFACE ROUGHNESS ASPECTS IN HEAT ASSISTED END MILLING OF AISI D2 HARDENED STEEL 35

6 CHAPTER 6: MODELING IN PREHEATED MACHINING OF AISI D2 HARDENED STEEL 43

7 CHAPTER 7: RELATIVE PERFORMANCES OF PREHEATING, CRYOGENIC COOLING AND HYBRID TURNING OF STAINLESS STEEL AISI 304 49

SECTION B: CHATTER AND SELECTED METHODS OF CHATTER SUPPRESSION 57

8 CHAPTER 8: ROLE OF THE FREQUENCY OF SECONDARY SERRATED TEETH IN CHATTER FORMATION DURING TURNING OF CARBON STEEL AISI 1040 AND STAINLESS STEEL 57

9 CHAPTER 9: INFLUENCE OF THE ELASTIC SYSTEM AND CUTTING PARAMETERS ON CHATTER DURING MACHINING OF MILD STEEL 65

10 CHAPTER 10: INFLUENCE OF CHATTER ON TOOL LIFE DURING END MILLING OF ALUMINIUM AND ALUMINIUM ALLOY ON VMC 75

11 CHAPTER 11: A NEW METHOD FOR CHATTER SUPPRESSION AND IMPROVEMENT OF SURFACE ROUGHNESS IN END MILLING OF MILD STEEL 83

12 CHAPTER 12: APPLICATION OF PERMANENT ELECTROMA GNET FOR CHATTER CONTROL IN END MILLING OF MEDIUM CARBON STEEL 91

13 CHAPTER 13: APPLICATION OF PERMANENT ELECTROMA GNET FOR CHATTER CONTROL IN END MILLING OF TITANIUM ALLOY - TI6AL4V 99

14 CHAPTER 14: CHATTER SUPPRESSION IN END MILLING OF TITANIUM ALLOY TI6AL4V APPLYING PERMANENT MAGNET CLAMPED ADJACENT TO THE WORKPIECE 107

SECTION C: MODELING AND OPTIMIZATION IN MACHINING 117

15 CHAPTER 15: A COUPLED ARTIFICIAL NEURAL NETWORK AND RSM MODEL FOR THE PREDICTION OF CHIP SERRATION FREQUENCY IN END MILLING OF INCONEL 718 117

16 CHAPTER 16: APPLICATION OF RESPONSE SURFACE METHODOLOGY COUPLED WITH GENETIC ALGORITHM FOR SURFACE ROUGHNESS OF INCONEL 718 123

17 CHAPTER 17: DEVELOPMENT OF A MATHEMATICAL MODEL FOR THE PREDICTION OF SURFACE ROUGHNESS IN END MILLING OF STAINLESS STEEL SS 304 133

18 CHAPTER 18: DEVELOPMENT OF AN ARTIFICIAL NEURAL NETWORK ALGORITHM FOR PREDICTING THE CUTTING FORCE IN END MILLING OF INCONEL 718 ALLOY 143

19 CHAPTER 19: DEVELOPMENT OF AN ARTIFICIAL NEURAL NETWORK ALGORITHM FOR PREDICTING THE SURFACE 149

20 CHAPTER 20: DEVELOPMENT OF TOOL LIFE PREDICTION MODEL OF TiAlN COATED TOOLS DURING PART C: HIGH SPEED HARD MILLING OF AISI H13 STEEL 155

21 CHAPTER 21: MODELING FOR SURFACE ROUGHNESS IN END-MILLING OF TITANIUM ALLOY Ti-6Al-4V USING UNCOATED WC INSERTS 161

22 CHAPTER 22: MODELING OF SURFACE ROUGHNESS DURING END MILLING OF AISI H13 HARDENED TOOL STEEL 167

23 CHAPTER 23: MODELING OF TOOL LIFE USING RESPONSE SURFACE METHODOLOGY IN HARD MILLING OF AISI D2 TOOL STEEL 175

24 CHAPTER 24: OPTIMIZATION OF SURFACE ROUGHNESS IN HIGH SPEED END MILLING OF TITANIUM ALLOY Ti-6Al-4V UNDER DRY CONDITION 181

25 CHAPTER 25: COMPARISON OF SURFACE ROUGHNESS IN END-MILLING OF TITANIUM ALLOY TI-6AL-4V USING UNCOATED WC-CO AND PCD INSERTS THROUGH GENERATION OF MODELS 189

26 CHAPTER 26: ASSESSMENT OF PERFORMANCE OF UNCOATED AND COATED CARBIDE INSERTS IN END MILLING OF TI–6AL–4V THROUGH MODELLING 195

SECTION D: CRYOGENIC AND HIGH SPEED MACHINING OF METALS AND NON METALS 203

27 CHAPTER 27: THE EFFECT OF CRYOGENIC COOLING ON MACHINABILITY OF STAINLESS STEEL DURING TURNING 203

28 CHAPTER 28: COMPARISON OF MACHINABILITY OF CERAMIC INSERT IN ROOM TEMPERATURE AND CRYOGENIC COOLING CONDITIONS DURING END MILLING INCONEL 718 209

29 CHAPTER 29: HIGH SPEED END MILLING OF SINGLE CRYSTAL SILICON SING DIAMOND COATED TOOL 217

30 CHAPTER 30: IMPLEMENTATION OF HIGH SPEED OF SILICON USING DIAMOND COATED TOOLS WITH AIR BLOWING 225

31 CHAPTER 31: ELIMINATION OF BURR FORMATION DURING END MILLING OF POLYMETHYL METHACRYLATE (PMMA) THROUGH HIGH SPEED MACHINING 233

32 CHAPTER 32: WEAR MECHANISMS IN END MILLING OF INCONEL 718 239

33 CHAPTER 33: PERFORMANCE OF UNCOATED WC-CO INSERTS IN END MILLING OF ALUMINUM SILICON CARBIDE (ALSiC) 247

34 CHAPTER 34: APPLICATION OF PCD INSERTS IN END MILLING OF ALUMINUM SILICON CARBIDE (ALSIC) 253

35 CHAPTER 35: EFFECTS OF SCRIBING WHEEL DIMENSIONS ON LCD GLASS CUTTING 259

Chapter 20

DEVELOPMENT OF TOOL LIFE PREDICTION MODEL OF TiAlN COATED TOOLS DURING THE HIGH SPEED HARD MILLING OF AISI H13 STEEL

A.K.M.Nurul Amin[1]; ,A.M. Khalid Hafiz.[1]; M. Amri LAJIS[2]

[1]Faculty of Engineering - International Islamic University Malaysia
[2]Faculty of Mechanical and Manufacturing Engineering- UTHM, Malaysia

e-mail address of corresponding author: *akamin@iium.edu.my*

1.0 INTRODUCTION

Considering the demand for reduced cycle time and increased productivity hard turning and milling have become a useful alternative when high material removal rate is an immense requirement. Advantages in hard machining incorporate the complete machining process with a single fixture setup, eliminating intermediate heat treatment and final grinding process while still meeting the dimensional and surface roughness specifications [1].

Over the last decade high speed machining has been used extensively to produce mould and die from hardened material like AISI H13 tool steel. Many progressive works have been carried out to improve the high speed machining performance of H13. Despite the widespread adoption of milling process in fabricating mould and die, most of the research works till to date concentrated on hard turning.

J. J. Junz Wang & M. Y. Zheng, 2003 et al [1], illustrated the machining characteristics of AISI H13 tool steels of hardness 41 and 20 HRC and found that the higher cutting and frictional energies are required in the chip shearing as well as in the nose ploughing processes of the softer tool steel. Poulachon et al. [2] , showed that the major influencing parameter on tool-wear happens to be the presence of carbides in the steel microstructure. Ghani et al. [3] applied Taguchi method to optimize cutting parameters in end milling of H13 steel at high speed cutting. They found that feed and depth of cut possess the most significant effect over tool life for a given range of cutting speed, feed and depth of cut.

Recently with the advent of new fabrication and coating technology, tool insert like TiAlN coated carbide is receiving increasing attention from both industrial and research communities. Coated carbide tools enjoy lower price than CBN tools, (normally used for hard machining) but have a shorter tool life with lower material removal in comparison to PCBN.