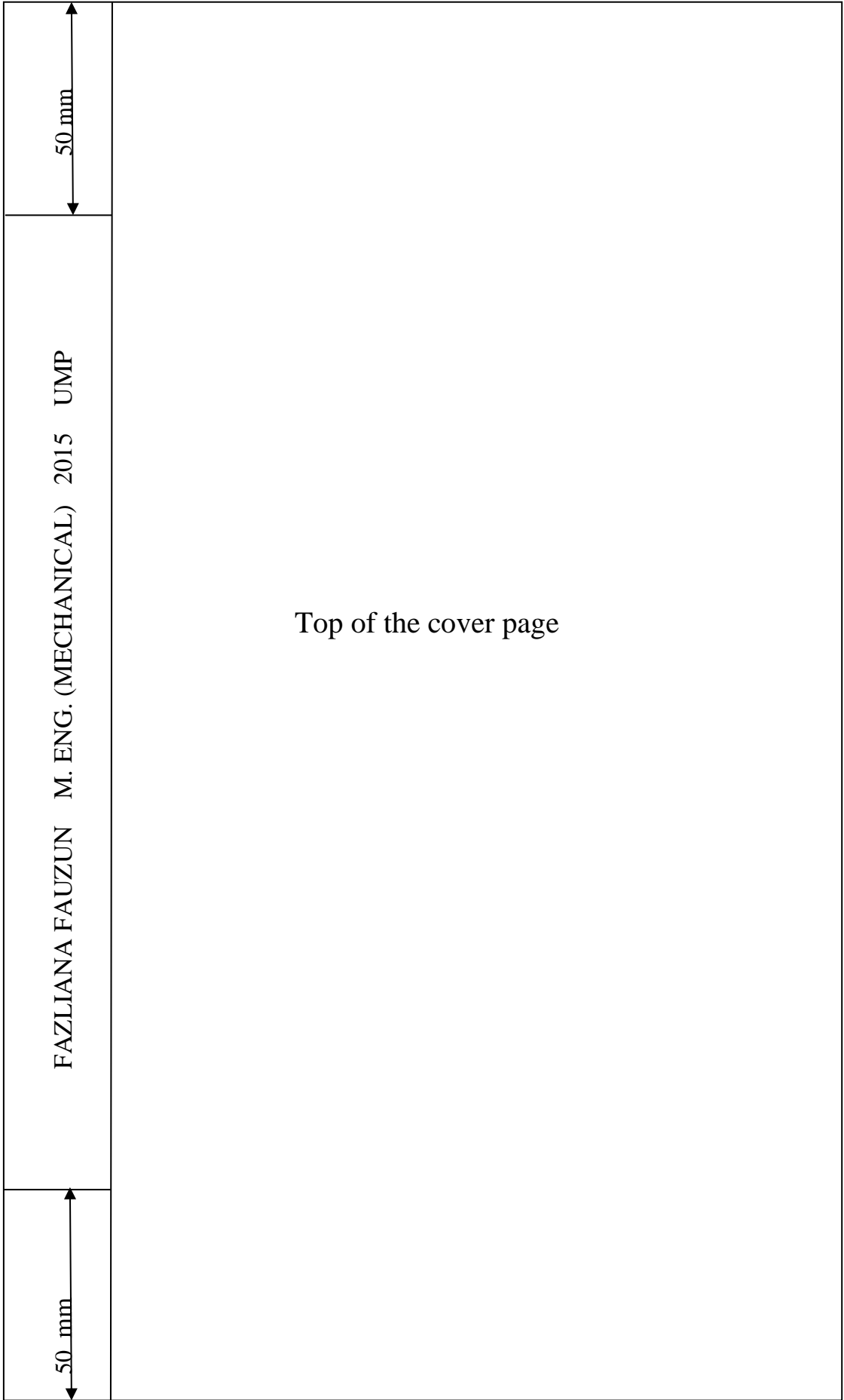


EXPERIMENTAL AND STATISTICAL
ANALYSIS FOR SURFACE MODIFICATION OF
STEEL AND CAST IRON USING Nd:YAG
LASER

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EXPERIMENTAL AND STATISTICAL ANALYSIS FOR SURFACE
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FAZLIANA BINTI FAUZUN

Thesis submitted in fulfilment of the requirements
for the award of the degree of
Master of Engineering in Mechanical Engineering

Faculty of Mechanical Engineering
UNIVERSITI MALAYSIA PAHANG

APRIL 2015

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TABLE OF CONTENTS

	PAGE
SUPERVISOR’S DECLARATION	ii
STUDENT’S DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
ABSTRACT	vi
ABSTRAK	vii
TABLE OF CONTENTS	viii
LIST OF TABLES	xii
LIST OF FIGURES	xiv
LIST OF SYMBOLS	xviii
LIST OF ABBREVIATIONS	xix
CHAPTER 1 INTRODUCTION	
1.1 Introduction	1
1.2 Problem Statement	2
1.3 Research Objectives	3
1.4 Scope of Study	4
1.5 Thesis Overview	5
CHAPTER 2 LITERATURE REVIEW	
2.1 Introduction	6
2.2 Dies Failure in Casting Processing	7
2.3 Laser Surface Modification Techniques	8
2.3.1 Types of Laser and Material Surface Absorption towards Laser Wavelength	8
2.3.2 Laser Surface Modification at Different Materials	12
2.3.3 Processing Mode: Continuous and Pulse Wave	15
2.3.4 Laser Processing Parameters	16

2.4	Laser Modified Surface Properties	18
2.4.1	Depth of Modified Surface	18
2.4.2	Hardness Properties	21
2.4.3	Surface Roughness Properties	24
2.5	Statistical Analysis	25
2.6	Thermal Stability	29
2.7	Conclusion	31

CHAPTER 3 METHODOLOGY

3.1	Introduction	33
3.2	Materials and Sample Preparation	34
3.3	Laser Surface Modification	36
3.4	Preliminary Sample Processing	38
3.5	Design of Experiment	40
3.5.1	AISI H13 Tool Steel	40
3.5.2	Cast Iron	42
3.6	Characterisation Techniques	44
3.6.1	Metallographic Study	44
3.6.2	Micro-Hardness	47
3.6.3	Surface Morphology	48
3.6.4	Surface Roughness	50
3.6.5	Thermal Stability	51
3.7	Statistical and Design Optimization	52

CHAPTER 4 RESULTS AND DISCUSSIONS

4.1	Introduction	54
4.2	Surface Morphology	55
4.2.1	Effects of scanning speed and peak power on overlapping laser spots in H13 tool steel samples.	55
4.2.2	Effect of scanning speed and PRF on overlapping laser spots in gray cast iron samples	56
4.3	Metallographic Study	58
4.3.1	Depth of Laser Modified Layer	58
4.3.2	Grain Size Analysis	64

4.4	Energy Dispersive X-Ray Spectroscopy (EDXS) Analysis	67
4.5	Hardness Properties	70
4.5.1	Hardness properties across different of depth from surface of modified layer for AISI 1025 low carbon steel.	70
4.5.2	Hardness differences of all materials at different depth from surface of modified layer.	71
4.6	Statistical Analysis	73
4.6.1	AISI H13 Tool Steel	73
4.6.2	Cast Iron	81
4.7	Design Optimisation	88
4.7.1	AISI H13 Tool Steel	88
4.7.2	Cast Iron	91
4.8	Thermal Stability Test	93
4.9	Conclusion	95

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5.1	Conclusion	96
5.1.1	Surface Morphology, Metallographic Study and Hardness Properties	96
5.1.2	DOE	97
5.1.3	Thermal Stability	98
5.2	Recommendation	98

REFERENCES		99
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APPENDIX

A	Final Equation of Actual Factors for AISI H13 Tool Steel DOE Responses	105
B	Final Equation of Actual Factors for Cast Iron DOE Responses	106
C	C1 Normal Plot Residuals of Hardness Response for H13	107
	C2 Normal Plot Residuals of Surface Roughness Response for H13	108
	C3 Normal Plot Residuals of Modified Layer Depth Response for H13	109
D	D1 Normal Plot Residuals of Hardness Response for Cast Iron	110

	D2	Normal Plot Residuals of Surface Roughness Response for Cast Iron	111
	D3	Normal Plot Residuals of Modified Layer Depth Response for Cast Iron	112
E	E1	Prediction Contour Plot of Hardness Response for H13 Tool Steel	113
	E1	Prediction Contour Plot of Surface Roughness Response for H13 Tool Steel	114
	E3	Prediction Contour Plot of Depth of Laser Modified Response for H13Tool Steel	115
F	F1	Prediction Contour Plot of Hardness Response for Cast Iron	116
	F1	Prediction Contour Plot of Surface Roughness Response for Cast Iron	117
	F3	Prediction Contour Plot of Depth of Laser Modified Response for Cast Iron	118
E		Research Work Schedule	119
G		List of Publications	120

LIST OF TABLES

Table No.	Title	Page
2.1	Characteristics of several systems used in material processing.	10
2.2	Comparison of Nd:YAG laser surface processing of various materials.	31
3.1	Chemical composition of AISI H13 tool steel, AISI 1025 low carbon steel and gray cast iron.	34
3.2	The Nd:YAG laser machine specification.	37
3.3	Laser parameter for AISI 1025 low carbon steel processing.	39
3.4	Factors and factor levels of 3^3 full factorial DOE for AISI H13 tool steel samples.	40
3.5	DOE for AISI H13 tool steel laser processing	41
3.6	Factors and factor levels of 3^3 full factorial DOE for gray cast iron tool steel samples.	42
3.7	DOE for gray cast iron laser processing	43
3.8	Grinding and polishing process specification for high carbon steel alloys.	45
3.9	Thermal stability testing parameters.	51
4.1	Micrographs of laser modified AISI 1025 sample processed with spot size focusing on (a) and (b) sample surface, (c) and (d) -2.5 mm defocused from sample surface, and (e) and (f) -5.0mm defocused from sample surface.	60
4.2	Depth of laser modified layer in AISI H13 tool steel and AISI 1025 Low Carbon Steel sample.	64
4.3	The percentage of atomic and weight of elements in H13 tool steel laser modified area.	69
4.4	The ANOVA variance table (Partial sum of squares) for hardness properties.	73

4.5	The ANOVA variance table (Partial sum of squares) for surface roughness properties.	76
4.6	The ANOVA variance table (Partial sum of squares) for H13 depth of laser modified laser properties.	79
4.7	The analysis of variance (ANOVA) for cast iron hardness properties.	81
4.8	The analysis of variance (ANOVA) for cast iron surface roughness properties.	84
4.9	The analysis of variance (ANOVA) for cast iron depth of laser modified layer.	86
4.10	Solution yields from H13 tool steel optimisation setting conditions.	90
4.11	Solution yields from cast iron optimisation setting conditions.	93
4.12	The summary of laser modification processing of H13 tool steel, low carbon steel and cast iron.	95
5.1	Summarised results of enhanced laser modified properties.	97

LIST OF FIGURES

Figure No.	Title	Page
2.1	Process map of laser power density as a function of laser power and interaction time.	8
2.2	Absorption rate of different type of lasers for different materials.	11
2.3	Schematic diagram of laser hardening process with laser beam heating up the outer layer of the workpiece. Self-quenching allows the layer to get hardened.	13
2.4	Pulse frequency train of laser.	16
2.5	Laser spot overlapping schematic diagram.	18
2.6	Change of depth of melted zone with energy density.	19
2.7	Influence of focal position on the depth and width of hardened area.	20
2.8	Microhardness profiles as function of depth in laser melted surface at a 2 kW laser power and scan speed of (1) 1 m/min, (2) 1.5 m/min, (3) 1.75 m/min and (4) 2 m/min respectively.	21
2.9	Hardness of AISI H13 at different scan rates of different zone.	23
2.10	Longitudinal microhardness profile of melted zone of ductile iron material.	23
2.11	Measured and estimated average roughness as a function of energy density.	25
2.12	Schematic representation of the efficiency optimization process.	26
2.13	Effect of cutting speed and feed on power consumption.	27
2.14	Half normal plot to determine the effective variables.	28
2.15	Microhardness as function of the distance from surface at different annealing temperature.	29

2.16	Variations of microhardness at different thermal cycle temperature (a) 600 °C, (b) 650 °C, (c) 700 °C and (d) 750 °C.	30
3.1	Methodology flowchart of research study.	33
3.2	Laser surface modified samples on flat (a) AISI H13 tool steel plate, (b) AISI 1025 low carbon steel plate and (c) gray cast iron brake disc at different parameter settings.	35
3.3	The Nd:YAG laser machine used in laser surface modification.	36
3.4	Schematic diagram for Nd:YAG laser processing.	37
3.5	BUEHLER SimpliMet 1000 Automatic Mounting Press machine.	44
3.6	The IM7000 Series Inverted Optical microscopes.	46
3.7	The Field Emission Scanning Electron Microscopic (FE SEM) with Energy Dispersive X-Ray Spectroscopy (EDXS).	46
3.8	The Matsuzawa MMT-X7 Vickers Hardness Tester.	47
3.9	Micrograph of laser modified sample (sample 28) cross section with indentation marks.	48
3.10	MM-320 Mahr Optical Microscope with QUARDRA-CHECK-300.	49
3.11	ImageJ software for image analysis.	49
3.12	Mitutoyo SURFTEST SJ-410 Roughness Tester with home screen display.	50
3.13	Naberthem Furnace for thermal stability test.	51
3.14	Process flow of Response Surface Method (RSM) analysis.	52
3.15	Process flow of design optimization in Design Expert software.	53
4.1	Micrographs of overlapping laser spots on laser modified H13 surface at scanning speed range of 1000-1400 mm/min, constant PRF of 40 Hz and peak power of (a)(b)(c) 1.7 kW, (a)(e)(f) 2.0 kW and (g)(h)(i) 2.5 kW.	56

4.2	Micrographs of overlapping laser spots on laser modified cast iron surface at PRF of 50 to 70 Hz, constant peak power of 1250 kW and scanning speed of (a)(d)(g) 1000 mm/min, (b)(e)(h) 1200 mm/min and (c)(f)(i) 1400 mm/min.	57
4.3	Micrographs of laser modified layer [A] on AISI 1025 low carbon steel substrate [B] in sample S1 (a) and S2 (b).	58
4.4	Irradiance as a function of residence time with corresponding micrograph at (a) 1.03×10^{-4} ms, (b) 1.50×10^{-4} ms and (c) 2.16×10^{-4} ms..	61
4.5	Micrographs of H13 laser modified layer depth at peak power of 1.7 kW to 2.5 kW, constant PRF of 50 Hz and scanning speed of (a)(d)(g) 1000 mm/min, (b)(e)(h) 1200 mm/min and (c)(f)(i) 1400 mm/min.	63
4.6	FE SEM micrograph of H13 sample cross section (a) with substrate (b), and molten zone (c) at 2500x magnification.	65
4.7	FE SEM micrograph of laser modified layer in sample 26 with grain structure changes in (b) upper region (c) middle region and (c) lower region of the molten pool 3500x magnification.	66
4.8	The schematic diagram on cooling rate of overlapped laser spots.	67
4.9	EDX peaks obtained in (a) substrate zone and (c) molten zone with the corresponding micrographs in (b) and (d).	68
4.10	Hardness of laser modified AISI 1025 steel surface across sectional area.	70
4.11	Hardness profile of laser modified of samples across their sectional area.	72
4.12	Contour plot of hardness properties responding to peak power and PRF.	75
4.13	Contour plot of surface roughness properties responding to peak power and PRF.	78
4.14	Depth of laser modified layer as function of peak power and PRF.	80
4.15	Cast iron hardness response as function of peak power and scanning speed.	82

4.16	Cast iron surface roughness response as function of peak power and scanning speed.	85
4.17	Depth of cast iron laser modified layer response as function of peak power and scanning speed.	87
4.18	Ramp report of H13 tool steel DOE optimisation.	88
4.19	Desirability contour plot of H13 tool steel DOE.	90
4.20	Ramp report of cast iron DOE optimisation.	91
4.21	Desirability contour plot of cast iron DOE.	92
4.22	Hardness as a function of heating temperature.	94
5.1	The schematic diagram on cooling rate of overlapped laser spots.	95

LIST OF SYMBOLS

v	Laser Scanning Speed
τ	Pulse width
η	Overlapping rate
T	Laser period pulse
P_p	Peak power
P_{ave}	Average power
E	Laser energy
T_R	Laser residence time
I	Irradiance
F	Fluence
d	Spot size diameter
D	Thermal diffusivity
k	Thermal conductivity
C_p	Specific heat capacity
ρ	Density
DC	Duty cycle
A	Area of laser spot size
Ra	Roughness unit
Hz	Frequency unit
W	Watt
Hv	Vickers hardness unit

LIST OF ABBREVIATIONS

AISI	American Iron and Steel Institute
ANOVA	Analysis of Variance
CNC	Computer Numerical Control
CO ₂	Carbon dioxide
COILs	Chemical Oxygen Iodine Lasers
CVLs	Copper Vapour Lasers
CW	Continuous mode laser
DC	Duty Cycle
DOE	Design of Experiment
DN-PSO	Neighbourhood-Particle Swarm Optimization
EDXS	Energy Dispersive X-Ray Spectrometry
FE SEM	Field Electron Scanning Microscopic
HAZ	Heat Affected Zone
HDPL	High power diode lasers
HPDD	High-power direct diode
LSM	Laser Surface Modification
Nd:YAG	Neodymium-Doped Yttrium Aluminium Garnet
PRF	Pulse Repetition Frequency
RSM	Response Surface Method
2D	Two dimensional
3D	Three dimensional
2FI	Two factors interaction