

**OPTIMIZING LOW PRESSURE DIE CASTING PARAMETERS USING
SIX SIGMA TO MINIMIZE POROSITY IN THE FACE MILLING AREA
OF TYPE A CYLINDER HEADS AT PT. XYZ**

By

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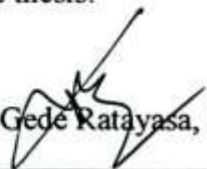


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STATEMENT BY THE AUTHOR

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.


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ABSTRACT

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Cylinder head manufacturing is a critical process in the automotive industry where product reliability and production efficiency are highly dependent on casting quality. One of the most persistent quality issues in this process is the occurrence of porosity defects, which compromise structural integrity and engine performance. To address this problem, the present study applied the six-sigma methodology to systematically reduce porosity defect levels. The research employed a Design of Experiments (DoE) approach through a full factorial design, testing three process parameters, aluminium temperature, pressure, and press-up time each at three levels (low, medium, high). The analysis followed the DMAIC (Define, Measure, Analyze, Improve, Control) framework, the study identified root causes, prioritized improvements, and optimized machine settings. The experimental results revealed that the optimal parameter combination aluminium temperature of 700 °C, pressure of 18,000 Pa, and press-up time of 8 seconds. The research results show that by using these parameters the resulting porosity defect is 0,64% and the six-sigma level value is 2,49. These findings demonstrate that structured process optimization using six-sigma can significantly enhance casting quality and reduce porosity defects in cylinder head production.

Keywords: Cylinder head manufacturing, Porosity defects, Six-sigma, DMAIC, Design of Experiments (DoE).

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DEDICATION

I dedicate this work to my beloved family, all my friends and companions, and to Indonesia with the hope that it may serve as a meaningful contribution to the advancement of knowledge.



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TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR.....	Error! Bookmark not defined.
ABSTRACT.....	3
DEDICATION.....	5
ACKNOWLEDGEMENTS.....	6
TABLE OF CONTENTS.....	7
LIST OF FIGURES	9
LIST OF TABLES.....	10
CHAPTER 1 - INTRODUCTION.....	11
1.1 Background.....	11
1.2 Research Problem.....	14
1.3 Research Objective.....	14
1.4 Significance of Study	14
1.5 Research Questions	15
1.6 Hypothesis	15
1.7 Research Scope and Limitation.....	15
CHAPTER 2 - LITERATURE REVIEW.....	17
2.1 Theoretical Perspective.....	17
2.2 Previous Studies	42
CHAPTER 3 – RESEARCH METHODS	50
3.1 Materials and Equipment.....	50
3.2 Analytical Method	50
3.3 Research Framework	50
3.4 Flowchart.....	51
3.5 Time Frame of Research.....	61
CHAPTER 4 – RESULTS AND DISCUSSIONS.....	62
4.1 Initial Evaluation	62
4.2 Define	62
4.3 Measurement	66
4.4 Analysis	79
4.5 Improvement.....	106

4.6 Control	115
CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS	121
5.1 Conclusions	121
5.2 Recommendations	122
GLOSSARY	123
REFERENCES	126
CURRICULUM VITAE	132
APPENDICS	133



LIST OF FIGURES

Figures	Page
Figure 1. 1 Flow process production of motorcycle (PT. XYZ, 2022).....	12
Figure 2. 1 Illustration of LPDC system	19
Figure 2. 2 Schematic representation of an LPDC system	20
Figure 2. 3 Aluminum cylinder head	21
Figure 2. 4 Typical pressure curve of a LPDC process	22
Figure 2. 5 Some typical trapped gas porosity	25
Figure 2. 6 Typical shrink porosity in a die casting.....	26
Figure 2. 7 Surface from poor flow	27
Figure 2. 8 Flowchart of DMAIC process	36
Figure 2. 9 Standard of a hierarchical structure	40
Figure 3. 1 Flowchart for research	54
Figure 4. 1 SIPOC diagram.....	63
Figure 4. 2 Cross function process map	65
Figure 4. 3 Assessment agreement for the R&R gage	68
Figure 4. 4 Normality test for machine capability index	71
Figure 4. 5 Machine capability index.....	72
Figure 4. 6 Pareto defect cylinder head type A.....	75
Figure 4. 7 P-chart of porosity defect	76
Figure 4. 8 Binomial capability process.....	78
Figure 4. 9 Fishbone diagram	79
Figure 4. 10 Hierarchical structure, criteria and alternative AHP models	93
Figure 4. 11 Analysis of variance	108
Figure 4. 12 Pareto chart of the standardized effects	108
Figure 4. 13 Residual plots for defect	109
Figure 4. 14 Main effects plot for porosity defect	110
Figure 4. 15 Interaction plot for porosity defect	111
Figure 4. 16 Multi response prediction optimization for porosity defect	112
Figure 4. 17 Optimizing parameter combination for porosity defect	113
Figure 4. 18 P- chart control	115
Figure 4. 19 Binomial process capability	116
Figure 4. 20 Visual face milling before improvement	118
Figure 4. 21 Visual face milling after improvement.....	118
Figure 4. 22 Visual face milling before improvement (X -Ray).....	119
Figure 4. 23 Visual face milling after improvement (X -Ray)	120

LIST OF TABLES

Table	Page
Table 1. 1 Data statistic distribution of motorcycle in Indonesia (AISI, 2025).....	11
Table 1. 2 Data of cylinder head porosity defect.	13
Table 2. 1 Sigma quality levels and defect rates.....	33
Table 2. 2 The example of action priority table.....	39
Table 2. 3 Comparison of previous research	45
Table 3. 1 Time frame of research	61
Table 4. 1 Observation results for product weight dimensions	70
Table 4. 2 Casting area defect category	74
Table 4. 3 Fishbone matrix	80
Table 4. 4 Why-why analysis matrix	82
Table 4. 5 Definition of severity rating value for all types of defects	84
Table 4. 6 Definition of occurrence rating values for all types of defects.....	85
Table 4. 7 Definition of detection rating values for all types of defects.....	86
Table 4. 8 FMEA matrix for porosity defect	89
Table 4. 9 Continual improvement prioritization	90
Table 4. 10 AP (Action Priority) matrix for porosity defect.....	91
Table 4. 11 Alternative options to determine the most influential factors.....	94
Table 4. 12 Couple comparison rating scale	95
Table 4. 13 Criteria comparison matrix	96
Table 4. 14 Matrix dividing of each element by number of column values	96
Table 4. 15 Criteria priority matrix.....	97
Table 4. 16 Decision support systems.....	98
Table 4. 17 Consistency ratio value	98
Table 4. 18 Criteria for influence on porosity.....	99
Table 4. 19 Matrix priority for influence on porosity	99
Table 4. 20 Criteria for ease of control of process parameters	100
Table 4. 21 Matrix priority for ease of control of process parameters.....	101
Table 4. 22 Criteria for correlation with other parameters	101
Table 4. 23 Matrix priority for Correlation criteria with other parameters.....	102
Table 4. 24 Assessment table of priority matrix	102
Table 4. 25 Consistency ratio value for each criterion and alternative.....	103
Table 4. 26 Conversion of the classic AHP scale into triangular fuzzy numbers.....	104
Table 4. 27 Defuzzification values	104
Table 4. 28 Assessment table of priority matrix using fuzzy-AHP	105
Table 4. 29 Consistency ratio value for each criterion and alternative.....	106
Table 4. 30 Factor & level factor for DoE	107
Table 4. 31 Optimizing parameter result	113
Table 4. 32 Comparation sigma level.	117