MINIMIZING DEFECT USING DMAIC METHOD IN PACKAGING PRINTING PROCESS AT PT. X

UNDERGRADUATE FINAL PROJECT

Submitted as one of the requirements to obtain Sarjana Teknik (S.T.)

By
Listiyanti Puspa Agustina
ID No. 004201900005

FACULTY OF ENGINEERING
INDUSTRIAL ENGINEERING STUDY PROGRAM
CIKARANG
SEPTEMBER, 2023

SIMILARITY CHECKING RESULT

Minimizing Defect Using DMAIC Method in Packaging Printing Process at PT. X.pdf

ORIGINALITY REPORT

8%	6%	4%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

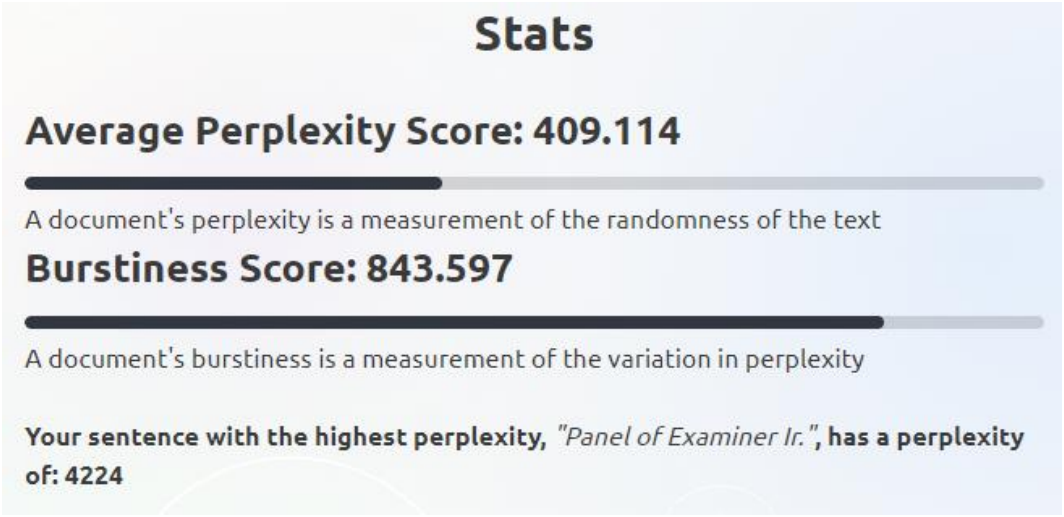
1	repository.president.ac.id Internet Source	2%
2	www.jurnal.teknologiindustriumi.ac.id Internet Source	1%
3	Fatma Pakdil. "Six Sigma for Students", Springer Science and Business Media LLC, 2020 Publication	1%
4	repo.ijiert.org Internet Source	1%
5	Submitted to President University Student Paper	<1%
6	"Reliability and Six Sigma", Springer Science and Business Media LLC, 2006 Publication	<1%
7	industri.fatek.unpatti.ac.id Internet Source	<1%

8	Maria Ulfah, Ratna Ekawati, Nafila Amalia. "Minimize the potential failures in the wire rod production process using six sigma and multi attribute failure mode analysis method", IOP Conference Series: Materials Science and Engineering, 2020 Publication	<1 %
9	www.coursehero.com Internet Source	<1 %
10	Submitted to East Carolina University Student Paper	<1 %
11	B.A.D. Putri, Qurtubi, D. Handayani. "Analysis of product quality control using six sigma method", IOP Conference Series: Materials Science and Engineering, 2019 Publication	<1 %
12	Submitted to University of Nottingham Student Paper	<1 %
13	"Intelligent Manufacturing and Mechatronics", Springer Science and Business Media LLC, 2021 Publication	<1 %
14	Submitted to Technological University Dublin Student Paper	<1 %
15	slideplayer.com Internet Source	<1 %

16	worldwidescience.org Internet Source	<1 %
17	Submitted to Strayer University Student Paper	<1 %
18	library.binus.ac.id Internet Source	<1 %
19	vdoc.pub Internet Source	<1 %
20	ojs.uok.edu.in Internet Source	<1 %
21	Muhammad Aslam, Aamir Saghir, Liaquat Ahmad. "Introduction to Statistical Process Control", Wiley, 2020 Publication	<1 %
22	pure.rug.nl Internet Source	<1 %
23	www.researchgate.net Internet Source	<1 %
24	Amitava Mitra. "Fundamentals of Quality Control and Improvement", Wiley, 2008 Publication	<1 %
25	qmsinoperations.blog Internet Source	<1 %
26	support.sas.com Internet Source	<1 %

27	Submitted to Manipal University Student Paper	<1%
28	docksci.com Internet Source	<1%
29	elibrary.tucl.edu.np Internet Source	<1%
30	cbtsystems.net Internet Source	<1%
31	repository.ub.ac.id Internet Source	<1%
32	Nuur Apriliani Rahayu, Sugeng Santoso. "Implementation of Six Sigma to Minimize Reject Gusset Difference and Fold in the Blowing Process", European Journal of Business and Management Research, 2021 Publication	<1%
33	docplayer.info Internet Source	<1%
34	docshare.tips Internet Source	<1%
35	www.theabr.org Internet Source	<1%
36	beeindia.gov.in Internet Source	<1%
37	Internet Source	<1%
38	repository.upi.edu Internet Source	<1%

AI BASED PLAGIARISM CHECKING RESULT



ABSTRACT

PT. X is a company engaged in manufacturing flexible film packaging. In making packaging product through several processes, namely printing, lamination, slitting and sealing processes. The problem faced by the company is the high percentage of defects in January 2023 for the entire process, which is 7.17%. Whereas the defect standard for the entire process is 5%. The printing process produces the highest defect percentage of 4.56% when compared with other processes. The six sigma method with DMAIC stages is used to improve the quality of printing process to minimize defects in the process. Start from defining the problem using pareto diagram, SIPOC diagram, and critical to quality. Measuring current data using p-chart, DPMO, and sigma level to find out the performance level of current conditions. Analyze the root causes of defects using why why analysis. Develop suggestions for improvement using the 5W1H method. Lastly, determine the control process for implementation of improvements. After the implementation of improvement, the defect percentage in the printing process decrease become 1.72% in March 2023.

Keywords: Packaging, Printing, Defect, Quality, Six Sigma, DMAIC

TABLE OF CONTENTS

PANEL OF EXAMINER APPROVAL ..... **ii**

FINAL PROJECT ADVISOR ..... **iii**

STATEMENT OF ORIGINALITY ..... **iv**

SCIENTIFIC PUBLICATION APPROVAL ..... **v**

ADVISOR APPROVAL ..... **vi**

MINIMIZING DEFECT USING DMAIC METHOD IN PACKAGING PRINTING PROCESS AT PT. X ..... **vii**

SIMILARITY CHECKING RESULT ..... **viii**

AI BASED PLAGIARISM CHECKING RESULT ..... **xii**

ABSTRACT ..... **xiii**

ACKNOWLEDGEMENT ..... **xiv**

TABLE OF CONTENTS ..... **xv**

LIST OF TABLES ..... **xix**

LIST OF FIGURES ..... **xx**

LIST OF TERMINOLOGIES ..... **xxii**

CHAPTER I INTRODUCTION **1**

1.1 Problem Background 1

1.2 Problem Statement 2

1.3 Objectives 2

1.4 Scope 2

1.5 Assumption 3

1.6 Research Outline 3

CHAPTER II LITERATURE STUDY **5**

2.1 Lean Manufacturing 5

2.2 Quality Control 6
2.3 Six Sigma 7
2.4 DMAIC 7
2.4.1 Define 8
2.4.1.1 Pareto Diagram 9
2.4.1.2 SIPOC Diagram 10
2.4.1.3 Critical to Quality (CTQ) 11
2.4.2 Measure 11
2.4.2.1 P-Chart 12
2.4.2.2 DPMO and Sigma Level 13
2.4.3 Analyze 14
2.4.3.1 Why Why Analysis 15
2.4.4 Improve 16
2.4.4.1 The 5W1H Method 16
2.4.5 Control 16
CHAPTER III RESEARCH METHODOLOGY 18
3.1 Research Methodology 18
3.1.1 Initial Observation 19
3.1.2 Problem Identification 19
3.1.3 Literature Study 19
3.1.4 Data Collection and Analysis 20
3.1.4.1 Define 20
3.1.4.2 Measure 20
3.1.4.3 Analyze 20
3.1.4.4 Improve 21
3.1.4.5 Control 21

3.1.5 Conclusion and Recommendation 21
3.2 Research Framework 21
3.2.1 Defining Problem 22
3.2.2 Measurement Analysis 23
3.2.3 Root Cause Analysis 23
3.2.4 Improvement Analysis 23
3.2.5 Control 23
CHAPTER IV DATA ANALYSIS 25
4.1 Define 25
4.1.1 Product Identification 25
4.1.2 Problem Identification 25
4.1.3 Problem Statement, Objective, Scope, and Assumption 28
4.1.4 SIPOC Diagram 28
4.1.5 Critical to Quality 32
4.1.6 Type of Defects 32
4.1.7 Project Team and Timeline 34
4.2 Measure 35
4.2.1 Data Collection 35
4.2.2 P-Chart 36
4.2.3 DPMO and Sigma Level 39
4.3 Analyze 40
4.3.1 Why Why Analysis 40
4.4 Improve 45
4.4.1 Improvement Plan Using 5W1H Method 45
4.4.2 Implementation of Improvements 48
4.4.3 Improvement Result 54

4.4.4 Comparison Before and After Improvement..... 58
4.5 Control 60
CHAPTER V CONCLUSION AND RECOMMENDATION..... 63
5.1 Conclusion 63
5.2 Recommendation..... 63
REFERENCES..... 64
APPENDIX..... 66

LIST OF TABLES

Table 2.1 Relationship Between Sigma Level and DPMO……...……..14

Table 4.1 Defect Percentage of Each Process in January 2023……...…….26

Table 4.2 Defect Percentage in Printing Process…..…….……...…….....27

Table 4.3 Critical to Quality of Printing…….....32

Table 4.4 Defect Data in January 2023……..…….35

Table 4.5 P-Chart Calculation in January 2023…….…….36

Table 4.6 Why Why Analysis of Defects……...…….……40

Table 4.7 Improvement Solution Using the 5W1H Method……46

Table 4.8 Defect Data in March 2023……...……..54

Table 4.9 P-Chart Calculation in March 2023……..…..……..55

LIST OF FIGURES

Figure 2.1 Pareto Diagram…...9
Figure 2.2 SIPOC Diagram…….10
Figure 2.3 P-Chart……..12
Figure 3.1 Research Methodology……..18
Figure 3.2 Research Framework…….....22
Figure 4.1 Packaging……..25
Figure 4.2 Defect Percentage of Each Process in January 2023……..26
Figure 4.3 Defect Percentage in Printing Proces……27
Figure 4.4 SIPOC Diagram in Printing Process……..29
Figure 4.5 Flow Process of Printing……30
Figure 4.6 Packaging Roll……...32
Figure 4.7 Streak Defects...…….…33
Figure 4.8 Color Off Defects...……...33
Figure 4.9 Misprint Defects……...…….33
Figure 4.10 Dragging Defects…..……..…….....34
Figure 4.11 Non-Standard Color Defects…..…….…..34
Figure 4.12 P-Chart in January 2023……..…….....38
Figure 4.13 Worn Out Doctor Blade…….……..…42
Figure 4.14 Clogged Cylinder…….42
Figure 4.15 Dirty Filter…….…..43
Figure 4.16 FCSP……...44
Figure 4.17 Viscolor Display……..……....45
Figure 4.18 Monitoring Form of Doctor Blade……...……....48
Figure 4.19 Cylinder Scrubbing……..51
Figure 4.20 Filter Bag…….52
Figure 4.21 New Filter……...…….52

Figure 4.22 FCSP Monitoring Data…….....53
Figure 4.23 P-Chart in March 2023…..……..…...…..57
Figure 4.24 Defect Percentage Comparison…….....58
Figure 4.25 DPMO Comparison…….……59
Figure 4.26 Sigma Level Comparison…….....59
Figure 4.27 Cost Comparison…….……60
Figure 4.28 Quality Control Check Sheet……...61

LIST OF TERMINOLOGIES

Packaging	:	A package that protects products from physical damage, contamination, and other environmental factors.
Printing	:	A process of transferring designs in the form of images from cylinder to a film substrate.
Defect	:	Product quality conditions that do not meet standards or below the level expected by customers.
Article	:	The name of the customer's product that will be used as an identity by PT. X during the packaging process.
Running Process	:	A series of stages carried out during the product production process.
Change Over	:	The process of changing production activities from one article to another.
Surat Uraian Produksi (SUP)	:	Documents contain product information, specifications, and process parameters in accordance with established standards to produce products with the expected quality.
Form Cylinder Selesai Proses (FCSP)	:	Document containing information on the use of cylinders that have been used with conclusions about the quality of the cylinders during the printing process.