



**TECHNICAL UNIVERSITY OF MALAYSIA MALACCA**

**An Analysis of Product Quality by Using Quality  
Control Method in Manufacturing Industry**

Report submitted in accordance with the requirements of the National Technical  
University of Malaysia Malacca for the Degree of Bachelor of  
Engineering (Honors) Manufacturing (Management)

By

**Sim Chee Seng**

Faculty of Manufacturing Engineering

May 2008



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**BORANG PENGESAHAN STATUS LAPORAN\***

**JUDUL: AN ANALYSIS OF PRODUCT QUALITY BY USING QUALITY CONTROL METHOD IN MANUFACTURING INDUSTRY**

SESI PENGAJIAN: 2/2007-2008

Saya \_\_\_\_\_ **SIM CHEE SENG** \_\_\_\_\_

mengaku membenarkan laporan (PSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hak milik Universiti Teknikal Malaysia Melaka .
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\*Sila tandakan (√)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

\_\_\_\_\_  
(TANDATANGAN PENULIS)

\_\_\_\_\_  
(TANDATANGAN PENYELIA)

Alamat Tetap:  
NO. 28, TAMAN CAHAYA TIMUR,  
\_\_\_\_\_  
JALAN HAJI AHMAD,  
\_\_\_\_\_  
25300 KUANTAN, PAHANG.  
\_\_\_\_\_

Cop Rasmi:

Tarikh: \_\_\_\_\_

Tarikh: \_\_\_\_\_

\* Laporan dimaksudkan sebagai laporan bagi Ijazah Doktor Falsafah dan Sarjana secara penyelidikan, atau disertasi bagi pengajian secara keria kursus dan nenvelidikan. atau Laporan Projek Sarjana Muda (PSM).



**FAKULTI KEJURUTERAAN PEMBUATAN**

Rujukan Kami (Our Ref) :  
Rujukan Tuan (Your Ref):

10 MAY 2008

Pustakawan  
Perpustakaan Universiti Teknikal Malaysia Melaka  
KUTKM, Ayer Keroh  
MELAKA.

Saudara,

**PENKELASAN LAPORAN SEBAGAI SULIT/TERHAD  
- LAPORAN SARJANA MUDA KEJURUTERAAN PEMBUATAN (PENGURUSAN  
PEMBUATAN): SIM CHEE SENG  
TAJUK: AN ANALYSIS OF PRODUCT QUALITY BY USING QUALITY CONTROL  
METHOD IN MANUFACTURING INDUSTRY**

Sukacita dimaklumkan bahawa laporan yang tersebut di atas bertajuk "*An Analysis of Product Quality by Using Quality Control Method in Manufacturing Industry*" mohon dikelaskan sebagai terhad untuk tempoh lima (5) tahun dari tarikh surat ini memandangkan ia mempunyai nilai dan potensi untuk dikomersialkan di masa hadapan.

Sekian dimaklumkan. Terima kasih.

"BERKHIDMAT UNTUK NEGARA KERANA ALLAH"

Yang benar,

---

ENCIK HASOLOAN HAERY IAN PIETER,  
*Pensyarah,*  
*Fakulti Kejuruteraan Pembuatan*  
*(Penyelia)*  
☎06-2332421

AN ANALYSIS OF PRODUCT QUALITY BY USING  
QUALITY CONTROL METHOD IN MANUFACTURING  
INDUSTRY

SIM CHEE SENG

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## **APPROVAL**

This project submitted to the senate of UTeM and has been accepted as fulfillment of the requirement for the Degree of Bachelor of Manufacturing Engineering (Honors) (Management). The members of supervisory committee are as follows:

.....

Main Supervisor

Faculty of Manufacturing Engineering

.....

Second Supervisor

Faculty of Manufacturing Engineering

## **DECLARATION**

I hereby, declare this report entitled “An Analysis Product Quality by Using Quality Control Method in Manufacturing Industry” is the result of my own research except as cited in the references.

Signature : .....

Author's Name : Sim Chee Seng

Date : 10 May 2008

## **ABSTRACT**

This thesis aims to complete the product quality by using quality control method in outgoing quality inspection of XXX plastic industries. The area of research in this project is focused on the outgoing quality inspection for the product quality. The purpose of this study is to provide some implementation in outgoing process inspection to improve the product quality of XXX plastic industries.

The methodology of this thesis is conducted toward the results and the data collections that made based on the product performance against the customer rejects in 2006 and 2007. A calculation is carried out for finding the main major contribution of the defects. Problem related to product defects issue through data analysis by using different quality tools and techniques approaches in order to determine the major causes for the defects. From the data findings, a recommendation is being done to reduce the product defects based on the problem finding in outgoing quality inspection and customer complaint.

Some improvement for the future works is being implemented in order to reduce the product defects.

## **ABSTRAK**

Tesis ini bertujuan melengkapkan kualiti produk dengan menggunakan kaedah kawalan kualiti dalam pemeriksaan kualiti pengeluaran di XXX industri plastik. Kajian dalam projek ini menfokuskan pemeriksaan kualiti pengeluaran untuk kualiti produk. Pembelajaran ini bertujuan memberi beberapa pencapaian dalam pemeriksaan proses pengeluaran bagi meningkatkan kualiti produk di XX industri plastic.

Kaedah dalam tesis ini telah dilaksanakan melalui keputusan dan koleksi data berkenaan persembahan produk berlawanan dengan penolakan pelanggan tahun 2006 dan 2007. Pengiraan telah dijalankan untuk mencari kebanyakan yang ketara dalam kecacatan. Masalah berkenaan dengan isu kecacatan produk melalui analisa data menggunakan pelbagai peralatan kualiti dan teknik demi mengetahui kebanyakan sebab kecacatannya. Daripada penyelidikan data, satu cadangan telah buat untuk menurunkan kecacatan produk melalui penyelidikan masalah di pemeriksaan kualiti pengeluaran dan aduan pelanggan.

Beberapa kemajuan untuk kerja masa depan telah dilaksanakan bagi menurunkan kecacatan produk.



## **DEDICATION**

*For my beloved mom and siblings*

## **ACKNOWLEDGEMENTS**

I would like to extend my warmest gratitude and thankful to my supervisor, Mr. Hasoloan Haery Ian Pieter for his excellent supervision, invaluable guidance, trust, advice and constant help, support, encouragement, and assistance towards me throughout this project.

I would like to express my deepest appreciation to XXX plastic industries Sdn. Bhd. for providing me the place, time and always show their sincere kindness in helping and gave me useful information especially in contributing and sharing ideas toward this project.

Last, I would like to thank my family whose endless encouragement and support gave me added strength and inspiration to carry out this project to the best of my ability. At the same time, I would like to thank my course mates for haring their ideas and comments in order to accomplish my project.

# TABLE OF CONTENTS

Abstract.....	i
Abstrak.....	ii
Dedication.....	iii
Acknowledgements.....	iv
Table of Contents .....	v
List of Tables.....	viii
List of Figures.....	ix
List of Abbreviations, Symbols, Specialized Nomenclature.....	x
<b>1. INTRODUCTION.....</b>	<b>1</b>
1.1 Background.....	1
1.2 Problem statement.....	3
1.3 Objectives of the research.....	4
1.4 Scope of study.....	4
1.5 Organization of the thesis.....	5
<b>2. LITERATURES REVIEW</b>	
2.1 Introduction.....	7
2.2 History of Development in Quality Management.....	8
2.2.1 Walter Shewhart.....	8
2.2.2 W Edwards Deming.....	9
2.2.3 Dr Joseph M Juran.....	10
2.2.4 Kaoru Ishikawa.....	11
2.2.5 Philip B. Crosby.....	12
2.2.6 Genichi Taguchi.....	12
2.3 Definition Of Product Quality.....	13
2.3.1 The determinants of product quality.....	15

2.3.2	The consequences of poor quality.....	16
2.4	Quality Tools.....	16
2.4.1	Cause-And-Effect Diagram.....	17
2.4.2	Pareto Diagram.....	17
<b>3.</b>	<b>METHODOLOGY.....</b>	<b>18</b>
3.1	Introduction of Methodology.....	18
3.2	Planning of study.....	22
3.3	Data Collection.....	22
3.3.1	Primary resources.....	22
3.3.1.1	Archival Collections.....	22
3.3.1.2	Interview.....	22
3.3.2	Secondary resources.....	22
3.3.2.1	Books.....	22
3.3.2.2	Internet.....	23
3.4	Analysis techniques and methods.....	23
3.4.1	Statistical process control (SPC).....	23
<b>4.</b>	<b>RESULTS.....</b>	<b>24</b>
4.1	Company Background.....	24
4.2	Data Collection.....	27
4.2.1	Types of Defects.....	28
4.2.2	Types of Products.....	30
<b>5.</b>	<b>DISCUSSION.....</b>	<b>38</b>
5.1	Definition.....	38
5.1.1	Bag reddish colour and dimension out of specification.....	38
5.2	Data Analysis.....	39
5.2.1	Pareto Diagram.....	39
5.2.2	Cause-And-Effect Diagram.....	42

5.2.3 Comparison between the defects for internal and the external in 2006 and 2007.....	44
<b>6. CONCLUSION.....</b>	<b>50</b>
6.1 Recommendation on correction action for non conformance in 2006 and 2007.....	50
6.2 Recommendation based on military standard table(MTD-STD-105E).....	52
6.3 Recommendation by using template for dimension out of specification.....	53
6.4 Summary.....	54
<b>REFERENCES.....</b>	<b>55</b>

**APPENDICES**

**Appendix A: Gantt chart**

A1 Gantt Chart For PSM I and PSM II

**Appendix B: Military Standard Table (MTD-STD-105E)**

B1 Sample size code letters

B2 Single sampling plans for normal inspection (Master table)

**Appendix C: Others**

C1 Blow film extrusion process flow

C2 Converting process flow

## LIST OF TABLES

2.1	The trilogy by Juran	10
4.1	Total cases for Customer reject and non conformance report in 2006 and 2007	27
4.2	Types of defects for different products in 2006 and 2007	28
4.3	Summary in percentage for defects for NCR and GR	30
4.4	Yearly non conformance summary report 2006(Internal)	31
4.5	Yearly non conformance summary report 2007(Internal)	31
4.6	Percentage of reject per year	33
4.7	The total reject per pieces by units for NCR in 2006 and 2007	34
4.8	Total pieces reject by units for NCR and in 2006 and 2007	36
5.1	Yearly customer good returned in 2006(External)	45
5.2	Yearly customer good returned in 2007(External)	45
5.3	Percentage for customer reject in 2006 and 2007	46
5.4	Percentage for bag reddish colour and dimension out of specification for the customer rejects(external) and non conformance report(internal)	46
5.5	The overall percentage for NCR and GR	47
5.6	Master table for internal normal inspection	47
5.7	Comparison between sample size on MTL-STD-105E and actual value	48
5.8	Normal inspection based on the sample size	49
6.1	The corrective action for non conformance in 2006	51
6.2	The corrective action for non conformance in 2007	51
6.3	Customer goods returned in 2008(External)	52
6.4	Non conformance report in 2008(Internal)	52

## LIST OF FIGURES

2.1	PDSA cycle	8
2.2	Cause-and-effect diagram	11
2.3	Quality by Conformance(Taken from Howard S. Gilton, p.23, 2005)	14
2.4	Quality by Performance(Taken from Howard S. Gilton, p.23, 2005)	15
2.5	Sample of pareto diagram	17
3.1	Flowchart of methodology	21
4.1	Flowchart for PE Plain bag, PP Plain bag and HM Plain bag	25
5.1	Sample of bag reddish colour	38
5.2	Pareto Diagram for non conformance in 2006	39
5.3	Pareto Diagram for non conformance in 2007	40
5.4	Pareto Diagram for goods returned in 2006	41
5.5	Pareto Diagram for goods returned in 2007	41
5.6	Cause-and- effect diagram for PE plain bag (bag reddish colour)	43
5.7	Cause-and- effect diagram for PE plain bag (dimension out of specification)	44
6.1	Template for measuring the dimension	53

# **LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE**

NCR	-	Non Conformance Report
GR	-	Goods Returned
%	-	Percentage
QC	-	Quality Control
SPC	-	Statistical Process Control
UTeM	-	Universiti Teknikal Malaysia Melaka
AQL	-	Acceptance Quality Level
PP	-	Polypropylene
PE	-	Polyethylene
HDPE	-	High Density Polyethylene
MIL-STD	-	Military Standard
Pcs	-	Pieces
PSM	-	Projek Sarjana Muda



# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Quality Control (QC) is the implementation of regular testing procedures against your definitions of quality and more specifically the refinement of these procedures. Quality control is concerned with checking and reviewing work that has been done.

Juran (1988) define Quality Control is the regulatory process through which we measure actual quality performance, compare with its standards, and act on the difference. Under traditional quality control, inspection of products and services (checking to make sure that what's being produced is meeting the required standard) takes place during and at the end of the operations process.

The QC system is designed to:

- a) Provide routine and consistent checks to ensure data integrity, correctness, and completeness;
- b) Identify and address errors.
- c) Document and archive inventory material and record all Quality Control activities

Quality Control activities include general methods such as accuracy checks on data acquisition and calculations and the use of approved standardized procedures for emission calculations, measurements, estimating uncertainties, archiving information and reporting. Higher tier Quality Control activities include technical reviews of source categories, activity and emission factor data, and methods. Quality control can be applied incorrectly but its principles and technique are very flexible. How effective it is in providing customer satisfaction, creating greater markets, and reducing overall cost resulting from improved quality is reasonable measure of the correctness.

Nowadays, Quality Control is playing an important role in order to improve the product quality to satisfy the customers need. Quality control is a strategy can bring better quality, price, delivery, and sales, leading to economic prosperity. Below are the benefits of applying the Quality control in industry area:

- a) Improving the quality of products and services to meet the customer needs.
- b) Increasing the productivity of manufacturing processes and commercial business.
- c) Determining and improving the market of products and services.
- d) Reducing manufacturing and service costs.
- e) Reducing customer prices of products and services.
- f) Ensure on-time deliveries and availability.

Commonly, under traditional quality control, inspection of products and services (checking to make sure that what's being produced is meeting the required standard) takes place during and at the end of the operations process. There are three main points during the production process when inspection is performed:

- a) When raw materials are received prior to entering production
- b) The products are going through the production process
- c) When products are finished - inspection or testing takes place before products are dispatched to customers

For the global industry area, in fact, many management have learn that commonly a drive to enhance quality in manufacturing facilities is accompanied by a decline in costs. They had determine that the control of quality from conception to consumer means the output must be right in the first time- without scrap or rework. In the other way, quality problem diminish, and with them the need for corrective action, materials and labor are saved, following by that the costs also decrease. However, more significant gain from good quality control of manufacturing processes. Variation in each process diminishes as effective control is exercised. Besides, the American people are taking increasing interest in quality control of all manufacturing and its extension to all operations.

In our country, almost all the manufacturing industry is applying the quality control concept in checking the outcome of the product. Furthermore, the most important thing to do is to know what the customer wants and expects. Often expectations are left unsaid, resulting in dissatisfaction and perceived poor quality. Also, making promises to fulfill unreasonable specifications can result in low quality in the eyes of the customer.

Nowadays, the quality control is important for all industrials area because the research has been done by American that almost all service companies spend over 40% of their operating funds doing things over. Besides, they also prove that high quality products and service can be priced higher and greater profits.

## **1.2 Problem statement**

Nowadays, there is no doubt the importance of quality control has been growing faster than ever before. In many industrial areas, however, the quality and quantity of the products are both equally important.

Also, on this project, there are several problems in quality control shown as below:

- a) The inspection process does not add any value to the product quality.

- b) The customer still find and complaint about the defects though the company has checked the product before shipped out to the customer.
- c) There is different perception about quality of product due to the colour requirement.
- d) There is often disagreement as to what constitutes a "quality product". For example, to meet quotas, inspectors may approve goods that don't meet 100% conformance.

For the problem that identified as above, the inspection should be improved in order to produce the good quality of the product.

### **1.3 Objective of the research**

- a) To understand the concept of product quality in the outgoing process.
- b) To identify the current problem in the product quality in manufacturing industry.
- c) Provide some recommendation in outgoing process inspection to improve the product quality in manufacturing industry.

### **1.4 Scope of study**

In this study, in order to understand the current problem about the product quality in manufacturing industry, a research on the XXX plastic industries was done in outgoing quality inspection. The area of research in this project is focus on the product quality by using quality control method in the manufacturing industry. Quality control is the critical issue in the manufacturing industry and need to be focus to improve the effectiveness and efficiency of the outgoing process.

Besides, by focusing on how to implement the suitable method in measuring and controlling the quality of the product, a quality control concept is apply for the measurement output of a product. Besides, the inspection of quality control to the outgoing process is the main area of research in this project.

## **1.5 Organization of the thesis**

Based on the thesis for Projek Sarjana Muda (PSM I and PSM II), an organization has been constructed for the process flow of completion in order to fulfill course of Degree in UTeM. Below shows the format of the organization:

a) Chapter 1 : Introduction

Formally, this chapter covers the background of quality control, objectives of study, problem statement, scope of study and the organization for the thesis.

b) Chapter 2 : Literature review

Firstly, this chapter begins in explanation of the history of development of quality management, following by the definition of product quality. Then, summarized all the journals finding that related to the product quality based on quality control is done. Last, different types of tools are used in order to overcome the current problem that occurs in the journals' finding.

c) Chapter 3 : Methodology

Generally, this chapter represents the flow chart that carried out for the whole process of the methodology. Besides, the data collection

that includes the primary resources and secondary resources is done in order to obtain all the related information for analysis the problem.

d) Chapter 4 : Results

Again, this chapter covers the company background and the flow chart for producing the plain bag. Then, the data collections is made based on the product performance against the customer rejects in 2006 and 2007. A calculation is carried out for finding the main major contribution of the defects.

e) Chapter 5 : Discussion

This chapter discuss the data analysis based on the calculation obtain in chapter 4. The pareto diagram and cause-and-effect diagram is used to determine the major causes for the defects. Then, using the military standard table to make an improvement by tightening the inspection in outgoing process.

f) Chapter 6 : Conclusion

Last, this chapter concluded the main findings for the thesis. Besides, the recommendation for the further study that related to the product quality on in manufacturing industry will be done at the same time.

## **CHAPTER 2**

### **LITERATURES REVIEW**

#### **2.1 Introduction**

*“Quality refers to the ability of a product or service to consistency meet or exceeds customer requirement or expectations. Besides, different customers will have the different requirement, so a working definition of quality is customer-dependent”*(Stevenson, 2007, p.397). Nasreddin Dhafr (2006) say that quality means” fitness for use”, “conformance for requirement” and ‘the totality of characteristic of ability to satisfy the implied need’. Webster’s dictionary determines the quality means the degree of the excellent thing. Swewhart (1931) argues that quality is often described as “qualities”, that it is quantifiable, form this perspective, but that there is both an objective and a subjective side to quality. Deming (1986) determine that quality should be aimed for the needs of the customer, present and future.

For customer’s definition, quality means how well the products or service can perform well to meet their expectations. A quality guru should have a concept and approach to quality within business that has made a major and lasting impact. The gurus mentioned in this section have done, and continue to do, that, in some cases, even after their death. There are seven gurus who gave their contribution to the quality are Swewhart, Deming, Juran, Feigenbaum, Crosby , Kaoru Ishikawa, and Genichi Taguchi.

Nowadays, the quality is important for all industrials area because the research has been done by American that almost all service companies spend over 35% of their operating

funds doing things over. If compare to previous business strategy, market share is equal to price while for now business era, market is equal to their price and quality outcome. This means high quality products and service can be priced higher and greater profits.

## 2.2 History of Development of Quality Management

### 2.2.1 Walter shewhart

Dr Walter Shewhart became known as “ father of statistical quality control”. Dr. Shewhart believed that lack of information greatly hampered the efforts of control and management processes in a production environment. In order to solute this problem, he developed Statistical Process Control methods. Besides, he also developed Shewhart Cycle Learning and Improvement cycle, combining both creative management thinking with statistical analysis. This cycle contains four continuous steps: Plan, Do, Study and Act. These steps (commonly referred to as the PDSA cycle). Furthermore, he developed control chart theory with control limit, assignable and chance causes of variation, and rational subgroups.

*“First, plan carefully what is to be done. Next, carry out the plan (do it). Third, study the results- did the plan work as intended, or were the results different? Finally, act on the result by identifying what worked as planned and what didn't” (Besterfield, 2003, p.134).*

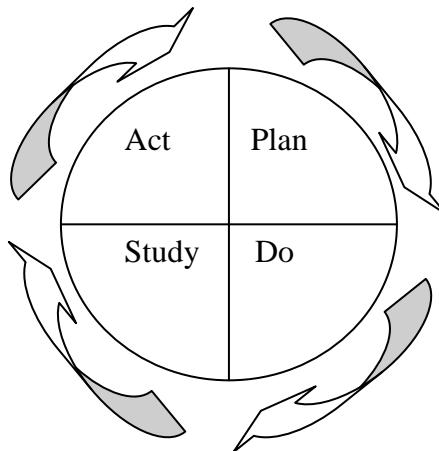


Figure 2.1: PDSA cycle