

**QUALITY IMPROVEMENT BY USING TAGUCHI METHOD
IN DISK MANUFACTURING**

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**QUALITY IMPROVEMENT BY USING TAGUCHI METHOD IN
DISK MANUFACTURING**

This report submitted in accordance with requirement of the
Universiti Teknikal Malaysia Melaka (UTeM) for the
Bachelor Degree of Manufacturing Engineering (Manufacturing Management)
with Honours.

By

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Management). The members of the supervisory committee are as follow:



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DECLARATION

I hereby declare that this report entitled "Software Development of in-line Quality Control in Small and Medium (SMI) Manufacturing Company" is the result of my own research except as cited in the references.

Signature : 
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Date : 20th May 2009

ABSTRACT

“Quality improvement by using Taguchi Method in Disk Manufacturing” is the title of this project. This project was implemented to employ the Taguchi Method approach in the disk manufacturing, where an actual production shop-floor performance will be analyzed through Taguchi Method and as a result, alternative solution will be proposed in order to improve the product quality, efficiency and to enhance the performance of the manufacturing system. The company that has been chosen is Ohara Disk Malaysia Sdn. Bhd (ODM), located at Merlimau Industrial Zone, Melaka. The scope of this project focused on the section which Awa (bubble in disc) reject rate in the production shop floor. In conducting this project, a methodology based on the Taguchi design was used for achieving the objective. In the planned project flow chart, factory visit was carried out for observing the production system. From the visit, some necessary data regarding the production flow of whole system was collected. The data collected from the previous studies in the same company together with the one from textbooks, journals, and internet was use as additional input into the newly collected data from the latest visit to the company. Based on all the data collected, the experiment was conducted using the Orthogonal Array design to find optimum solution of the problem. The analysis was done to find the best combination of parameters and factors in order to achieve the research objectives.

ABSTRAK

“Peningkatan kualiti menggunakan Taguchi Method di dalam perusahaan disk” merupakan tajuk projek ini. Projek ini dijalankan untuk melaksanakan Taguchi Method di perusahaan disk, dimana bahagian penghasilan akan dianalisis menggunakan Taguchi Method dan beberapa cadangan alternatif lain untuk meningkatkan kualiti produk, kecekapan dan meningkatkan produktiviti dan keuntungan syarikat. Syarikat yang dipilih ialah Ohara Disk Malaysia Sdn. Bhd (ODM), terletak di kawasan perindustrian Merlimau, Melaka. Skop projek ini hanya fokus kepada bahagian yang mana mempunyai kadar buangan yang paling tinggi. Untuk menjalankan projek ini, beberapa kaedah berdasarkan reka bentuk Taguchi telah dirancang untuk mencapai objektif. Dalam rancangan tersebut, lawatan kilang telah diadakan untuk memerhati sistem penghasilan produk. Di samping itu, beberapa data penting dikumpul. Kemudian, data akan disokong dengan data yang telah diambil dari buku, jurnal dan juga internet. Data dikutip dari kajian terdahulu dalam syarikat bersama-sama yang sama disokong oleh buku-buku teks, jurnal, dan internet adalah penggunaan sebagai input tambahan kepada dikutip baru data daripada lawatan terbaru kepada syarikat. Menggunakan semua data yang dikumpul, eksperimen menggunakan reka bentuk susunan ortogon telah dikendalikan untuk mencari penyelesaian optimum bagi masalah. Analisis data dilakukan bagi mencari gabungan terbaik parameter dan faktor selaras untuk mencapai objektif-objektif penyelidikan.

DEDICATION

For my beloved dad, mom, family and my beloved friend

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I sincerely hope that this thesis will prove to be very useful in efficiently utilizing my study. I believe that I able to realize it, Inshaallah.

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LIST OF ABBREVIATIONS AND SYMBOLS

A, B, \dots	-	Variables used in the design of experiment
A_i	-	The average of observation under condition A_i
DOE	-	Design of experiment
e	-	Experimental error
f	-	Degrees of freedom
F	-	Variance ratio
L	-	The Taguchi loss function
L_8	-	An orthogonal array has 8 experiments
MSD	-	Mean square deviation
N	-	The number of experiments
OA	-	Orthogonal array, L_4, L_8, L_{16} , etc.
P	-	The percent contributions of a variables
S	-	The sum of squares
S/N	-	The signal of noise ratio
T	-	The sum of all observation
V	-	The variance
Y	-	Result measured in term of quality characteristic

CHAPTER 1

INTRODUCTION

This chapter commences with the background which introduces the concepts of eliminating waste and thereafter associated problems are highlighted. The objectives and scope are outlined and they make way for the purpose of this project report. The chapter ends with the organization of the report.

1.1 Background

Mankind has always had an interest with quality. Today's technology bears declaration to man's continual desire to provide a higher level of quality in product and services to increase market share and profits. Sometimes, quality is essential (Ranjit Roy, 1990). Driven by the need in order to compete on price, performance and to maintain profitability, quality conscious manufacturers are increasingly aware of the needs to optimize product and process. Quality achieved by means of design optimization is founded by many manufactures to be cost effective in gaining and maintaining a competitive position in the world market.

When the expression of quality is used; base to our perception about quality, we usually think in term of excellent product and service in order to fulfill or exceed our expectations. These expectations are depends on the intended use and the selling price. When the product surpasses our expectations, we consider that quality.

Genichi Taguchi was a Japanese mathematician and proponent of manufacturing quality engineering. He focused on methods to improve the quality of manufactured goods through both statistical process control and specific business management techniques. Taguchi developed many of his key concepts outside of the traditional Design of Experiments (DOE) framework and only learned of it later. His main focus was on robustness, how to develop a system that performed reliably even in the presence of significant noise or variation. In traditional DOE, the goal is to model the best-performing recipe. In other words, the higher the value of the output variable (e.g., the conversion rate), the better. So the goal is to find the highest *mean*. When taking repeated samples, any variation is considered a problem or a nuisance.

For the past five decades, Taguchi led what has been called the "quality revolution" in manufacturing around the world. In this comprehensive reference, which includes over 90 complete case studies, Taguchi and his co-authors explain his concepts, starting from his theories on managing for quality engineering from an historical perspective, the "signal-to-noise ratio" technique, robust engineering, the Mahalanobis-Taguchi System, testing, on-line quality engineering, experimental regression, and the design of experiments. After the presentation of all the case studies, which are sorted by concept as well as industry, Taguchi compares his methods to those of other "quality philosophers" such as Deming.

Taguchi address quality in two main areas: off-line and on-line quality control (QC). Both of this area are very cost sensitive in the decision that are made with respect to the activities in each. Off-line QC refers to the improvement of quality in the product and process development stages. This phase of Taguchi methods addressed the positive impact on cost that is obtained by improving quality at the earliest times in a product life cycle. On-line QC refers to the monitoring of current manufacturing processes to verify the quality levels produced. The Taguchi on-line QC approach is a cost quality perspective ad someday should be recognize as an alternative quality control system.

1.2 Problem Statement

In a disk manufacturing, there are a many problem occur due to reject rate. There are a lot of products that have been produce in Production Department. Besides that, there are some reject products in production line or process such as Outer Kake, Inner Kake, Nokori, Ware, Kan, ID small, OD small, Outer chipping, Inner chipping, Awa, Dummy and others. This company organizes a team to improve the reject quantity of disk. The improvement focuses on Awa reject type. Awa means bubble inside the disk that produced. There are few adjustment on parameter that influence the reject rate. The research is focus in reject product in the productions. This research try to reduce the higher percentage of reject product per production rate to lowest percentage per productions and try to improve the productivity in this company.

1.3 Objective

1. To determine and identify the root cause of quality problem faced by production line.
2. To establish the best or the optimum condition for a process of discs production shop-floor
3. To optimize the production of shop-floor by increasing the quantity of good product through minimizing the waste with new setting parameter.
4. To recommend a new improved production parameters from the finding of research analysis.

1.4 Importance of the Project

1. Development of method or solution to improve the production.
2. Increase efficiency and reduce the reject material in production system.
3. To reduced mistakes by the process or system in discs production shop-floor.
4. To recommend the best method in order to achieve the high quality of product in production.

1.5 Scope and Limitations

There are many departments in the company. This project tries to apply the Taguchi method to one department of Ohara Company. Since the major contributor to root cause of reject came from Pressing Section in a Production Department, this section was chosen for conducting the research. Due to limitation of time and energy, only one product ie glass substrate type TS-10X was taken as the object of research. The focus of this research is also limited to Awa (Bubble) reject type to improve the production and reduce the quantity of reject product.

1.6 Organization of the Thesis

Based on the thesis for Projek Sarjana Muda (PSM) I & 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:

Chapter 1: Introduction

This chapter covers the background of quality and Taguchi Method, objectives of study, problem statement, scope of study and the organization for the thesis.

Chapter 2: Literature review

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

Chapter 3: Methodology

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.

Chapter 4: Case Study

This chapter illustrates the company background; it is primarily focused on the production line of chipset manufacturing. Then, it describes the process at NGBA module in detail.

Chapter 5: Process Development

This chapter provides the process to construct the Taguchi Design of quantity reject product in disk manufacturing. This chapter also explains about the process to construct the Taguchi Design step by step.

Chapter 6: Result & Analysis

This Chapter begins with presenting the data collected through this project. Thereafter, the data on current state is discussed in order to achieve improvement in future state. A comparison of the data set at current state and future state is presented as well. The optimum solution obtained for the solution. Finally, the reduction of waste is discussed in terms of cost saving.

Chapter 7: Conclusion & Recommendation

This chapter concludes the whole project and at last reflections around the project together with suggestions for further project are discussed.

CHAPTER 2

LITERATURE REVIEW

In terms of a literature review, "the literature" means the works that consulted in order to understand and investigate the research problem. The review should describe, summarize, evaluate and clarify. This literature review explores the dominant themes includes study and research of published materials like journals, thesis, case study, technical document, and online library. Generally, the purpose of a review is to analyze critical segment of a published body of knowledge through summary, classification and comparison of prior research studies, reviews of literature, and theoretical articles.

2.1 Introduction

This chapter will describe topics that related to quality such as definition of quality, type of quality, quality dimensions, Taguchi Method methodology, Taguchi method approach, and other relevant quality topics. Emphasize is more on Taguchi methodology since the study conducted in a Taguchi method manner.

Taguchi Method will describe more on the definition of that phase, the background and basics of Taguchi method, the characteristics of Taguchi method, the benefit on implementing or using Taguchi method, the Taguchi test, and the relevant topics that related with Taguchi method.