Faculty of Mechanical and Manufacturing Engineering Technology

INVESTIGATION ON INCOMPLETE FILL PROBLEM OF QUAD FLAT PACKAGE IN SEMICONDUCTOR INDUSTRY

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BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PROCESS AND TECHNOLOGY)

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INVESTIGATION ON INCOMPLETE FILL PROBLEM OF QUAD FLAT PACKAGE IN SEMICONDUCTOR INDUSTRY

NURUL AMIZA BINTI MAZLAN SUPAWI

A thesis submitted
in fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Process and Technology)

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ABSTRAK

Hari ini, industry pembuatan sangat mengutamakan produktiviti. Peningkatan produktiviti sekali gus akan meningkatkan kualiti produk. Terdapat pelbagai alternative yang tersedia untuk untuk meningkatkan produktiviti. Dalam industry pembuatan semikonduktor, komponen yang dibentuk tidak penuh atau lengkap adalah salah satu kecacatan produk biasa yang memberi kesan kepada kualiti produk. Projek ini bertujuan untuk menganalisa dan menentukan punca masalah komponen yang dibentuk tidak lengkap yang dihadapi sebuah kilang pembuat semikonduktor di Muar yang mengalami jumlah kerosakan produk yang tinggi dalam proses pembuatan mereka dan merekomenkan penyelesaian untuk mengurangkan kecacatan produk. Untuk membaiki proses tersebut, kaedah DMAIC Six Sigma digunakan untuk menyelesaikan masalah ini. Projek ini dijalankan mengikut kesemua lima fasa DMAIC iaitu *define*, *measure*, *analyse*, *improve*, dan *control*. Kaedah ini adalah antara yang terbaik dan terbukti untuk mengurangkan kerosakan produk dan menaiktaraf sistem sejak berdekad yang lalu. Dalam fasa define, target projek ini untuk mengurangkan jumlah produk yang tidak menepati speksifikasi telah dibina dan didokumenkan. Fasa measure dilakukan dengan mengumpulkan data kecacatan dalam tempoh masa dua minggu dan telah diterjemahkan dalam graf Pareto. Dalam fasa analyse, rajah tulang ikan (fishbone) dan 5 Kenapa (5 Whys) digunakan bagi mencari punca kepada kecacatan komponen yang telah dibentuk. Setelah punca kecacatan komponen telah dikenalpasti, cadangan untuk mengatasi masalah dibuat mengikut setiap punca dalam fasa improve. Akhir sekali, control chart dicadangkan untuk diguna dalam fasa control.

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ABSTRACT

Nowadays, productivity is the main concern to manufacturing industry. Improving the productivity will improve the quality of the product. There are many alternative that available to improve the productivity. In semiconductor manufacturing industry, incomplete fill is one of the common defects in moulding process that affects product quality. This project is aimed to analyse and determine the root cause of incomplete fill defects faced by a semiconductor manufacturing company in Muar which experienced high number of defects in their production process and to recommend a solution to reduce the defects. In order to improve the process, Six Sigma DMAIC method was used to tackle the problem. This project was conducted according to all five phases of DMAIC which are define, measure, analyse, improve, and control. This method is powerful and proven to reduce defects and improve system since decades ago. In define phase, project goal statement to reduce the reject quantity is constructed and documented. Measure phase is done by collecting the incomplete fill defect for two week and translated into pareto chart. In analyse phase, fishbone diagram and 5 Whys are used to find out the root causes for incomplete fill defects. After root causes are found, suggestions to counter the problem according to the root causes is done in improve phase. Finally, control chart is suggested to be used in control phase.

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DEDICATION

To my beloved parents Mazlan Supawi bin Yusof, Siti Jariah binti Che Noh, my supervisor Ts. Dr. Kamarul bin Amir Mohamed, my Co-supervisor 1 Dr. Rohana binti Abdullah, Co-Supervisor 2 Ir. Ts. Mohd Syahrin Amri bin Mohd Noh and everyone involved especially STMicroelectronic staffs and UTeM lecturers.

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LIST OF SYMBOLS

σ	-	Sigma
Q	-	Quality
P	-	Performance
E	-	Expectation

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LIST OF ABBREVIATIONS

QFP	Quad Flat Package
DMAIC	Define, Measure, Analyse, Improve, Control
TQM	Total Quality Management
IE	Industrial Engineering
SOP	Standard Operation Procedure
DMADV	Define, Measure, Analyse, Design, Verify

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CHAPTER 1

INTRODUCTION

Chapter one will explain briefly about the outline of the project and main purpose of this study. This chapter also include introduction of six sigma and identification of problem statement, objective and scope of the study.

1.1 Background

Every manufacturing industry growing awareness of the need to improve quality in the industrial sector. There is a huge pressure on organizations to improve the customer satisfaction and quality in the organization, and at the same time to decrease ineffectiveness and reduce the number of errors. Customer is expecting to have a good product with higher quality and better service at a lower price. At industry, productivity will improve with a great operation, good production planned and higher quality product.

Efficiency of manufacturing production is measure through assorted types to define productivity. Productivity is the value of service or product produced divided by the values of input resources. A productivity expressed the ratio of the output and inputs used in manufacturing production. Increment in productivity enable organization and company to produce greater output for the same level of input, win higher incomes, and eventually create higher quality output. However, increasing productivity are important in operation to perform the high-quality operation.

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Nowadays, there are too many quality issues found in manufacturing company. However, quality problems have two faces in manufacturing which is process and product. Quality issues or defect occur in production operation because of the mistake in the way its produce and quality control. All the product must follow the specification given to pass the quality check. All the quality issues and defect must be eliminated to enhance the product quality and productivity of the company. One of the way to improve productivity is to use six sigma methodology to resolve the quality problem and improve the productivity.

In the course of the most recent years, the six-sigma program has turned out to be progressively famous and used in assorted company as well as in several types of industries. This study will gain in depth knowledges about six sigma and its methodology of DMAIC will be used to complete this study.

1.2 Problem Statement

STMicroelectronics Sdn. Bhd. is a global semiconductor company. STMicroelectronics is international company focus on application approach in smart driving, smart industry, smart home and city, and smart things. In this project research focusing in QFP (Quad flat package) department, in producing quad flat package. Quad flat package has faced many quality and defect problems. These quality defect have contributed increase rate rejected for outgoing inspection for every month. The increasing rate for rejected product will cause more extra money needed to spend for new raw material for the product. If this happen in long term it will cause loss to the company. Poor product quality that does not fulfil customer requirement and may cause customer to choose competitors product.

All semiconductor industry worldwide is trying to satisfy their customer by producing a good product with high quality. These quality problem make the manufacturer to use many technique and step to control and solve the quality issues for their product and

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its application in production line. The focus in this project is to develop a six sigma techniques to reduce the incomplete fill defect of QFP in moulding process and increase the productivity.

1.3 Project Objective

The objectives of this study are as follows:

i. To study the incomplete fill problems of the Quad Flat Package of TQ10 production line at semiconductor company.
ii. To analyse main factors that contribute to the incomplete fill defect of quad flat package of TQ10.
iii. To propose improvement method to overcome and reduce the incomplete fill defects of Quad Flat Package TQ10.

1.4 Project Methodology

Project methodology started with two phase. One is referring the overall of the project and another is referring the method that used to conduct this research. In overall of this project, the project started with define the title, literature review, visit the factory, identify the problem, research methodology, data and information gather, data analysis, improvement and recommendation and last is discussion and conclusion.

For the method that used to conduct this research have five phase. First is define phase that include to get approval to conduct research at STMicroelectronics, problem identification and six sigma methodology planning. Second is measure phase which is data

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and information gathering. Analysis phase is consisting of data analysis and identify the root cause of the problem. Next is improve which include the suggestion for the improvement and lastly is control which is to suggestion to control the improvement.

1.5 Scope of Study

The scope of this project is focused or reducing the incomplete fill defect that occur during molding process for producing quad flat package raw product. This research study develops six sigma methodology and the raw data was collected at STMicroelectronic company Sdn. Bhd.

1.6 Thesis Structure

Structure of report is like the flow the report to study the productivity improvement by using six sigma techniques. Each of the chapter have specific end goal to accomplish the comprehension of the proposal. Chapter 1 introduces the project which are including project background, problem statement, objective, project methodology, scope of study and last was thesis structure. In this chapter show the background of the research.

Chapter 2 presents the literature review on theoretical background of the development in six sigma. The definition of the productivity also be highlighted in this chapter. The subchapter in this chapter are started with introduction, manufacturing industry, quality, productivity, productivity input, productivity output, six sigma, company background and selected of product.

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