SIX SIGMA DMAIC IMPLEMENTATION AT MANUFACTURING COMPANY

LOO KIN HOE

B050910144

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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SIX SIGMA DMAIC IMPLMENTATION AT MANUFACTURING COMPANY

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

by

LOO KIN HOE

B0500910144

881212-05-5453

FACULTY OF MANUFACTURING ENGINEERING

2012

DECLARATION

I hereby, declared this report entitled "Six Sigma DMAIC implementation at Manufacturing Company" is the results of my own research expect as cited in references.

Signature : .....

Author's name : **LOO KIN HOE**

Date : 28th May 2012

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) (Hons.). The member of the supervisory committee is as follow:

…….....

(MR. NOR AKRAMIN BIN MOHAMAD)

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Six Sigma DMAIC Implementation at Manufacturing Company**

SESI PENGAJIAN: 2011/2012 Semester 2

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ABSTRAK

Enam Sigma ialah pendekatan penyelesaian masalah sistematik yang mengandungi lima fasa iaitu, Define (D), Measure(M), Analyse (A), Improve (I) dan Control(C). DMAIC ialah satu teknik berkesan yang digunakan untuk meningkatkan kualiti dan prestasi produktiviti secara sistematik. Kajian ini menumpukan kepada pelaksanaan metodologi DMAIC dalam barisan pengeluaran dalam syarikat pembuatan terpilih, Samsung Corning (M) Sdn. Bhd. yang menghasilkan gelas Panel dan Funnel untuk televisyen. Barisan Pengeluaran M23 menghadapi "Skirt Check" masalah kualiti kecacatan pada kaca Panel. Oleh itu, mengakibatkan kerugian kepada Syarikat. Dalam kajian ini, objektif ialah untuk mengenal pasti masalah kecacatan dalam barisan pengeluaran, menganalisis faktor-faktor yang menyumbang kepada masalah kecacatan dan mencadangkan cara-cara penyelesaian untuk masalah kecacatan. Berdasarkan kepada keputusan dalam menganalisis fasa, empat faktor telah dikenal pasti sebagai sebab asas kecacatan Skirt Check iaitu "Hot Belt", "Air Former", "7B Temperature" dan "Plunger Cooling Water Outlet Temperature". Tetapi, sumbangan utama bagi kecacatan ialah Hot Belt. Seterusnya, rancangan penambahbaikan telah dilakukan selepas mengesahkan tentang faktor- faktor sebagai punca kecacatan itu dengan menggunakan pelbagai alat statistik dan teknik. Sumbangan utama dalam kajian ini adalah mengurangkan kadar penolakan produk dan seterusnya meningkatkan produktiviti syarikat. Akhir sekali, penutup laporan ini adalah rumusan pencapaian objektif kajian dengan beberapa cadangan masa depan.

ABSTRACT

Six Sigma is a systematic problem solving approach that consists of five phases which are Define, Measure, Analyse, Improve, and Control (DMAIC). DMAIC is an effective technique that utilized to improve quality and productivity performance in a systematic way. The study focuses on the implementation of DMAIC methodology at the production line at a selected manufacturing company, Samsung Corning (M) Sdn. Bhd. which manufacturing Panel and Funnel glass for television. The production line M23 encountered Skirt Check defect quality problem on the panel glass. Thus, consequence loss to the company. In this study, the objective is to identify the defects problem in the production line, to analyze the factor that contributes to defects problem and to recommend a solution for the defects problem of production line. Based on the result in analyse phase, four factors were identified as root cause of Skirt Check defect which were Hot Belt, Air Former, 7B Temperature and Plunger Cooling Water Outlet Temperature. But, the major contribution to the defect is Hot Belt. Next, Improvement plan was done after validation on the factors as root cause of the defect by using variety statistical tool and technique. The major contribution in this study is reduced the rejection rate of product and subsequently increases productivity of the company.

DEDICATION

With lots of love and special dedicated to:

For my beloved parent

Loo Man Fook and Lee Yoke Yim

To all my beloved siblings

Loo Kin Wai and Loo Poh Theng

To my supervisor

Mr. Nor Akramin Bin Mohamad

All my friends that are always support me.

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LIST OF ABBREVIATIONS AND SYMBOLS

COPQ	-	Critical of Poor Quality
CRT	-	Cathode Ray Tube
USL	-	Upper Specification Limit
LSL	-	Lower Specification Limit
DFSS	-	Design for Six Sigma
VOC	-	Voice of Customer
CTQ	-	Critical to Quality
CEO	-	Chief Executive Officer
GE	-	General Electric
DPMO	-	Defect per Million Opportunities
DMAIC	-	Define, Measure, Analyze, Improve, Control
DMADV	-	Desine Measure, Analyse, Verify, Optimize, Validate
DMEDI	-	Define, Measure, Explore, Develop, Implement
MSA	-	Measurement System Analsis
FMEA	-	Failure Mode & Effect Analysis
DCCDI	-	Define, Customer, Concept, Design, Implementation
IDOV	-	Identify, Design,
FMEA	-	Failure Mode and Effect Analysis
DOE	-	Design of Experiment
C&E	-	Cause and Effect Matrix
Cpk	-	Process Capability Analysis
HR	-	Human Resources
FYP	-	Final Year Project
SOP	-	Standard of Procedure
ANOVA	-	Analysis of Variance
KPOV	-	Key Process Output Variables
KPIV	-	Key Process Input Variables
PSM	-	Projek Sarjana Muda
QA	-	Quality Assurance
SPC	-	Statistical Process Control

SQC	-	Statistical Quality Control
UTeM	-	Universiti Teknikal Malaysia Melaka
GR&R	-	Gauge Repeatability & Reproducibility
σ	-	Sigma

CHAPTER 1
INTRODUCTION

This report describes a project on improving quality in manufacturing industry. This chapter gives an explanation on the background of project, problem statement, objectives and scope of the study.

1.1 Background of Project

Six Sigma is a measure of quality that strives for near perfection. It is a highly disciplined methodology that helps focus on the developing, eliminating defects and delivering products and services of near perfection. Six Sigma has been recognized as the most successful business performance. Six Sigma is first invented by the Motorola Company in 1986. Initially, Six Sigma was only use as a quality tool but Motorola brought it to the next stage by implementing it in reducing defect rate of processes. This was performed through the effective utilization and practical statistical tools and techniques. Thus, it leading to improved productivity, improved customer satisfaction, enhanced quality of service, and reduced costs of poor quality (COPQ).

Six Sigma is a business improvement approach, which continues to seek and eradicate causes and defects or mistakes in business processes by emphasizing on the output that are of critical importance to customers (Snee, 2000). It is also a proven methodology and strategic initiative that most corporations benefit from implementing Six Sigma. Today, it is described as the fastest developing business management system in the industry. The application of Six Sigma method has

achieved great performance in customer satisfaction in some well -known company such as Motorola, Texas Instrument, John Deere and Citi Group (Hoerl et al, 2004).

This project is focusing mainly on the Six Sigma philosophy that would be implemented to identify the current problem or rejection criteria face by Samsung Corning Sdn. Bhd. This company is manufactures and supplies Panel and Funnel glasses for major manufacturers of Cathode Ray Tube (CRT). The company realizes that in order to maintain and build upon its competitive advantage, it must continue to look for ways to improve efficiencies. The quality of the product is very important since it related to manufacture cost such as rework, defects and complaints. The major challenge of the company is increasing productivity while minimizing costs at the same time.

The importance of this study is to investigate the impact of quality to cost, through implementation of the methodology to reduce rejection rate of the product, which subsequently increases the productivity of the company. Apart from that, it is necessary to acquire knowledge to deploy projects effectively by having common concepts for accurate understanding such as basic idea Six Sigma in Samsung, deducing the selecting project which is customer-orientated and by applying the right methodologies. An extensive research on related literature reviews was carried out in order to enhance more knowledge on the related field of study.

1.2 Problem statement

Most companies will encounter the problem of producing highly variable results. Due to this variability, which could lower the profit of the company, can be produced. In Samsung Corning, there are currently three production lines for Panel Production, namely M21, M23 and M24.As can be seen from the bar graph in Figure: 1.1, the number of defect produced by production line M23 has been increasing at an alarming rate which raises attention. Under normal circumstances the defect rate per month should be around 450 pieces. However in April 2011, the amount of defect accumulated up to 760 pieces which is slightly higher than

expected. The following month did not show a decrease in number of defects but instead increase even higher to 1373 pieces. This trend requires immediate attention for if it continues, the consequences would be unimaginable. Product that is processes in production line M23 is the 21inch"USO". This study will reveal the factors that are causing this situation and will provide a suitable solution to control the situation.

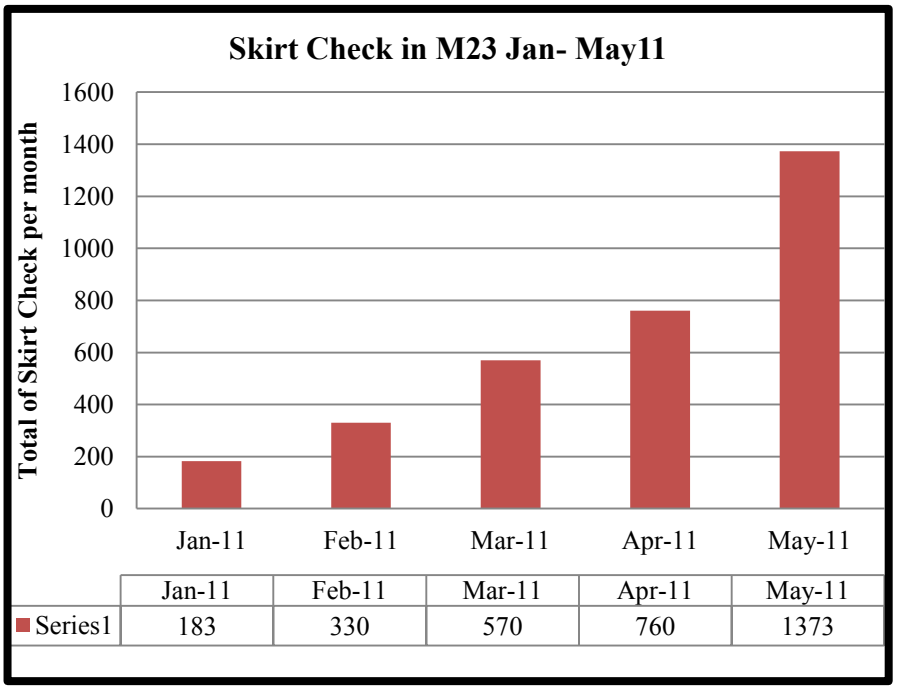

Figure 1.1: The trend of skirt check in M23 from January 2011 to May 2011.

1.3 Objective

The main objective of this research are:

1) To use Six Sigma methodology in manufacturing company.
2) To identify the defects problem in the production line.
3) To analyze the factors that contributes to defects problem.
4) To recommend a solution for the defects problem of production line.

1.4 Scope of Study

The project is based on the Six Sigma (DMAIC) implementation in Samsung Corning (M) Sdn. Bhd. The scope of this Six Sigma implementation study is limited to:

1) Application of approach of Six Sigma (DMAIC) methodology.
2) Focus on production line M23.
3) Transformation of production process input into desired output.

CHAPTER 2
LITERATURE REVIEW

This chapter will review the Six Sigma that has been done by researchers, experts and authors from relevant reference. It includes published materials on the study and research such as journals, case studies, books, technical documents and internet sources that has been selected relevant to this review. This chapter also describes about the background of Six Sigma including introduction, history and evolution, definition and application of Six Sigma in industries. Furthermore, discussion also includes identifying Six Sigma infrastructure and methodology along with challenges and benefits.

2.1 History of Six Sigma

The history of Six Sigma begins with statistical term dated back to the (1777-1855) Carl Frederick Gauss who introduced the concept of the normal curve. In 1920, engineers and mathematicians used the term "Sigma (σ)" as a symbol that indicates the measurement in product quality variation. The development of Six Sigma brought by Mikel Harry who is known as the "Godfather" of Six Sigma. He is acknowledged as the leading authority on theory as practiced. The evolution began in late 1970s, when Motorola factory, which manufactured television sets in the United States was taken over by a Japanese firm. The different method of the Japanese operation caused defects to occur in the television sets, which, led to the poor reputation of Motorola products. Soon after, Motorola management decided to take quality control seriously. In 1981, when Bob Galvin became Motorola's CEO, challenged the company to achieve a tenfold improvement in performance over a five year period. Thereby introduce Six Sigma in the mid- 1980 (Rancour and

McCracken, 2000). It was invented by Bill Smith who worked alongside Mikel Harry who joined Motorola in 1984 as senior engineer and scientist within Motorola's Communication Division. At that time, he wrote an internal quality research report that caught the attention of Bob Galvin. Through the research he discovered the correlation between product life cycle and rework that had been required during the manufacturing process. Apart from that, he also discovered that, which were built with less nonconformity that performed the best after delivery to the customer. Even though Motorola executive has agreed with this idea, however the challenge in creating practical ways to eliminate defects. The concept comes in with the "logic filter" it is one of the Mikel Harry's with Bill Smith papers at Arizona State University. Mikel Harry has developed a four stage problem solving approach , namely: Measure, Analyze, Improve, and Control (MAIC). Later on, MAIC steps became the roadmap for achieving Six Sigma quality. Bob Galvin Chief Executive Officer(CEO)'s of Motorola, had launched a long term quality program, called "The Six Sigma Quality Program" in 1987. Through the corporate program which established Six Sigma as the required capability level the standard of 3.4 Defects per Million Opportunity (DPMO). The standard was applied in everything which included products, processes, services and administration.

Motorola is among the first recipients of the Malcom Baldrige National Quality Award in 1988 after implementation of Six Sigma, which led to an increased interest of Six Sigma in other organization (Pyzdek, 2001). Jack Welch, the Chairman and CEO of General Electric (GE) began his interest in Six Sigma. He discovered that the current quality system was running at three to four sigma, of which by adopting Six Sigma they could reap benefit of $7 to $10 billion. Six Sigma is adopted later on with the intention of learning from past experience to reduce the time to meet goal. In order to gain incentive for Six Sigma, Jack Welch decided to set Six Sigma as target for the employees and made training a requirement for progression. Hence, GE obtained great confidence and success through Six Sigma. In the mid-1990s, AlliedSignal's Larry Bossidy and GE's Jack Welch saw Six Sigma as a way to lead their organizations' cultural change through initiatives and also achieve significant cost savings. Hence, in 1995, Jack Welch's CEO of GE successfully established and published Six Sigma in his organisation. Business Week reported that GE had saved