UNIVERSITI TEKNIKAL MALAYSIA MELAKA

USING VISUAL MANAGEMENT TOOL TO ERROR PROOF WIP LOTS WITHDRAWAL IN SEMICONDUCTOR MANUFACTURER

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

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DECLARATION

I hereby, declared this report entitled "Using Visual Management Tool to Error Proof WIP Lots Withdrawal in Semiconductor Manufacturer" is the results of my own research except as cited in the references.

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

……

(Associate Professor Dr. Chong Kuan Eng)

ABSTRAK

Dalam era teknologi yang terkini ini, sektor industri saling bersaing untuk meningkatkan produktiviti, kualiti, mengurangkan kos dan memenuhi keperluan pelanggan. Industri semikonduktor antara penyumbang utama kepada ekonomi Malaysia, industri semikonduktor seharusnya sentiasa mengekalkan prestasi dan mendapatkan alternatif yang lebik baik supaya boleh mengekalkan produktiviti mereka. Projek yang dijalankan ini adalah berkenaan dengan syarikat berasaskan semikonduktor yang sedang menghadapi masalah dalam kesilapan dalam pengendalian pemilihan produk WIP pada mesin yang menghadapi masalah kesempitan masa. Kesilapan pekerja dalam memilih produk telah memberi kesan kepada produktiviti pekerja dan meningkatkan masa kitaran pengeluaran. Tujuan kajian ini adalah untuk mengurangkan kesilapan pekerja dalam pemilihan produk dan memastikan pekerja memilih produk WIP berdasarkan jadual. Tujuan tersebut boleh dicapai melalui tiga objektif: (1) mengenalpasti punca yang boleh menyebabkan pekerja membuat kesalahan dalam pemilihan produk WIP, (2) mereka bentuk kabinet berkonsepkan FIFO sistem dan mengaplikasi alat pengurusan pelihatan untuk mengurangkan kesilapan pekerja dan (3) melaksanakan kabinet berkonsepkan FIFO dengan alat pengurusan pelihatan di tempat kerja dan mengenalpasti kebaikan yang boleh didapati berdasarkan applikasi yang dikendalikan. Kabinet yang berkonsepkan FIFO sistem dengan konsep lima S (5'S), kod warna dan SOP telah dipilih untuk dilaksanakan di syarikat untuk mengurangkan kesalahan pekerja dalam mengendalikan produk dan memastikan pekerja mengambil produk WIP dan masuk dalam mesin 'detapping' mengikut jadual yang telah ditetapkan. Keputusan bagi sebelum dan selepas perlaksanaan kabinet FIFO dengan konsept 5'S, kod warna dan SOP telah dikenalpasti dan dianalisis. Kepentingan kajian ini adalah untuk memberi cadangan serta menyelesaikan isu dalam syarikat

untuk mengurangkan kesilapan pekerja dan memastikan pekerja memasukkan produk ke mesin ‘detapping’ mengikut jadual yang telah ditetapkan.

ABSTRACT

In high technology world, the industry is competing against each other to increase productivity, quality, reduce cost and meet customer satisfaction. Semiconductor industry which is a major contributor to Malaysia's economy must stay abreast with challenges and find better ways to achieve perfection. This project is based in a back-end semiconductor manufacturing company which is facing problem with operators' errors in picking wrong lot (WIP product) at the bottleneck machine. The operators' error in picking wrong lot impact the production line run without based on schedule. It alters production efficiency and subsequently will increase cycle time of the production line. The aim of this study is to reduce operators' error in picking wrong WIP lot and ensure operator pick the WIP lot base on schedule, which is achieved by 3 objectives: (1) identify the causes of operators' errors in picking the wrong WIP lot, (2) redesign a FIFO cabinet and develop a visual management tool to reduce operators' errors in picking the wrong WIP lot and (3) implement the FIFO cabinet with visual management tool in case company and to validate the benefits. FIFO cabinet with five S, color code and SOP are chosen to be implemented in the case company as to reduce operators' error and ensure they are picking WIP lot base on schedule. The result for before and after implementation of FIFO cabinet with five S, colour code and SOP are collected, validated and discussed. The significance of this study is to reduce operators' errors in picking wrong WIP lot.

DEDICATION

Dedicated specially for my beloved family and friends

ACKNOWLEDGEMENT

I would like to express my gratitude to my academic supervisor, Associate Professor Dr. Chong Kuan Eng for his advice and guidance throughout the duration of this final year project. Without his kindly guidance, I might get lost in this final year project.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

USA	-	United States of America
FIFO	-	First In First Out
WIP	-	Work In Progress
TSNP	-	Model Name of Product
5S	-	Sort, Set in Order, Shine, Standardize and Sustain
SOP	-	Standard Operating Procedure
Etc	-	Et Cetera (and Other Things)
TPS	-	Toyota Production System
JIT	-	Just In Time
SMED	-	Single Minute Exchange Die
PDCA	-	Plan-Do-Check-Act
PDSA	-	Plan-Do-Study-Act
VSM	-	Value Stream Mapping
OSHA	-	Occupational Safety and Health Administration
ANSI	-	American National Standards Institute
UK	-	United Kingdom
VMT	-	Visual Management Technology
DJO	-	Company's Name
IP	-	Internet Protocol
GPSL	-	Company Team Name
FYP 1	-	Final Year Project 1
FYP 2	-	Final Year Project 2
BOM	-	Bill of Materials
DS Skynet	-	Software that Used for Auto Scheduling

CHAPTER 1
INTRODUCTION

This chapter defines the background of study, problem statement, objective, scope and organization for the whole project.

1.1 Background of study

In a high technology era, manufacturing industries faced strong competition with other organizations to maximize profit, productivity and customer satisfaction.

According to Nurul (2012), a high level of coherence between strategies and implementation of good practices are being developed and maintained at all industry due to the competitive pressure among them. Therefore, the industry try hard to improve their manufacturing practises or system continuously to reduce lead time in their operations, improve product quality and ensure the product at competitive selling price.

Semiconductor industry at Malaysia accounts for 25% of the industry‟s exports and 30% manufacturing output making it a major contributor to Malaysia economy (Ooi, 2007).

The project is a study at the world‟s second largest chip supplier to the automotive industry, is a semiconductor manufacturer company that is located at Melaka. Main products of the company include Discrete semiconductors, Power semiconductors, Logic and Sensor chips. This industry has its own subsidiaries which located at USA,

Singapore and Japan. In order to sustain in the markets, this company should continue to develop a good practices that can reduce waste in every sectors. However, operators‟ errors in choosing a wrong lot has impacted the fluency of production flow. This will give impact to production efficiency and subsequently will increase cycle time of the production line.

The focus of this study is to investigate the causes of operators‟ errors and through the implementation of the right methodology such as FIFO cabinet and visual management tool. FIFO cabinet aids in error proofing by allowing flows of WIP lots in the manner of first WIP lots to go in will be the first WIP lots to go out. Visual management tool, a tool that gives clear information in the way of highlight graphic rather than numbers and words, so that employees can understand the information at glance, communicate in ease way and perform jobs in an effective and efficient way FIFO cabinet with visual management tools will reduce operator‟s error in picking the wrong lot and ensure the operator take the right lot based on schedule.

1.2 Problem Statement

The case company is currently facing operators‟ errors in picking lots (WIP product) at the bottleneck machine. Figure 1.1 shows the percentage of operators‟ errors in picking WIP lots in one month period. The WIP products are kept inside a cabinet without proper arrangement according to schedule. Operators waste a lot of time in finding a right lot, and randomly pick an undesirable lot to put inside the detapping machine.

The production line run without based on schedule is one of the issues that affect production efficiency and subsequently will increase cycle time of the production line. “How to reduce operator error in picking wrong lot at cabinet located to detapping machine?” is the discussion question given by industry manager, supervisor and engineer.

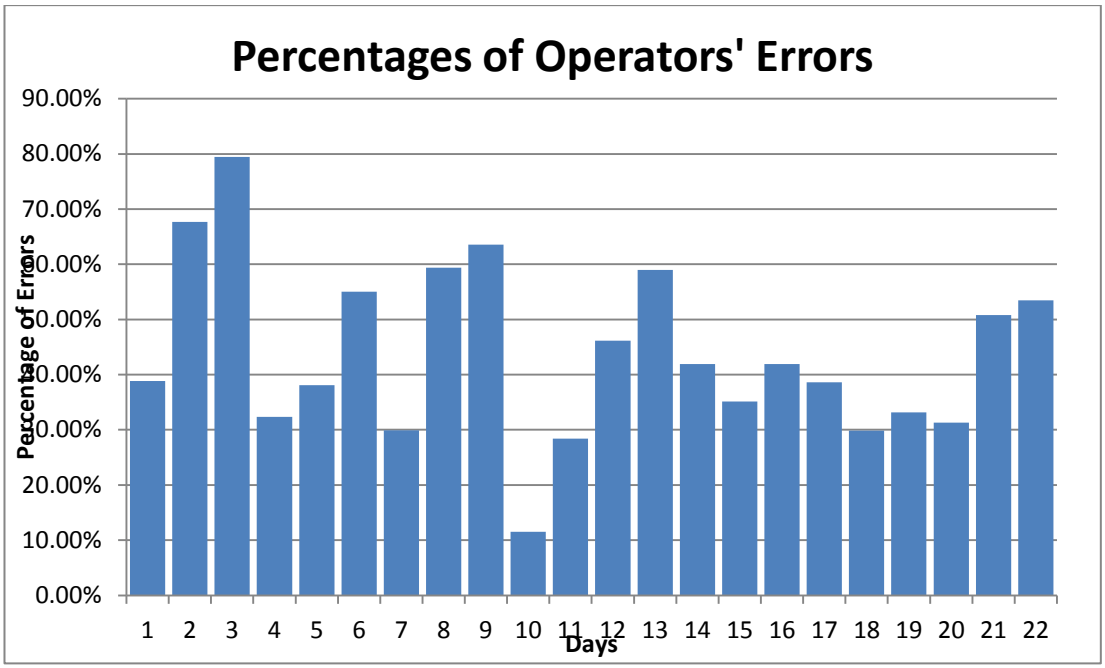

Figure 1.1: Percentages of Operators‟ Errors

1.3 Objectives

The aim of this project is to reduce the operators‟ errors in picking wrong WIP lots and ensure the operators pick the correct WIP lots according to schedule.

The objectives of this project are:

1. To identify the causes of operators‟ errors in picking the wrong WIP lots.
2. To redesign a FIFO cabinet and develop a visual management tool to reduce operators‟ errors in picking the wrong WIP lots.
3. To implement the FIFO cabinet with visual management tool in case company and validate the benefits.

1.4 Scope of Study

The scope of this project is focused to the application of visual management tool approach as a methodology for discrete department and end of line in case company. The study is conducted on the detapping machine and TSNP product.

1.5 Organization of Report

This report is constructed as follows:

I. Chapter 1- Introduction

It introduces the overall report with background study, problem statement, objective, scope and organization of the report.

II. Chapter 2-Literature Review

This chapter presents the literature review of lean and visual management tool according to journal, book, article and other resources. It discusses the implementation of visual management tool in various industries and benefit of applying visual management tool.

III. Chapter 3 – Methodology

This chapter describes the appropriate methodologies chosen to carry out this study.

IV. Chapter 4 – Redesigning a FIFO Cabinet and Proposals for Improvement

This chapter presents the operators‟ errors before the implementation of proposals, discusses the proposals such as redesign a FIFO cabinet together with implementation of 5S, colour code and SOP.

V. Chapter 5 – Result and Discussion

This chapter presents the result of implementing visual management tools in detapping machine, validates, analyses and discusses the result.

VI. Chapter 6 – Conclusion and Recommendations

This chapter will conclude the project and suggest recommendations for study.

CHAPTER 2
LITERATURE REVIEW

This chapter discusses literature review. It covers the work done such as journal, book, article, etc by previous researchers from various significant references. It reviews house of lean, various visual management tools, and benefits of applying visual management tools in a lean environment.

2.1 Introduction of Lean Manufacturing

Lean manufacturing is a best manufacturing strategy that is derived from Toyota production system (TPS) that can eliminate wastes and meet customer‟s satisfaction (Kriztina, 2011). There are many industries practice lean, number of lean transformation is increasing all around the world is the best proof of lean‟s significance and effectiveness.

Lean manufacturing is guided by five key principles which are identify the value of product by meeting customer‟s satisfaction, value stream mapping that helps better understanding of streamline work processes using relevant tools and techniques, work flows steadily and continuously without interruption from supporting activity to the next, response rate to the customer‟s rate of demand, keep the operations going on by constantly striving for perfection by a process of continuous improvement. According to Puvanasvaran (2014), lean highlights eight wastes which are the major loss to industry. The eight wastes:

I. Overproduction

   The production is over than needed.

II. Inventory

Carrying stock will increase cost and storage problems. All the activity performs at inventory areas such as racking, stacking, bar coding, etc. adds no value to the product.

III. Waiting

Waiting for products or services from previous operations, upstream activity does not deliver on time.

IV. Unnecessary motion

Movement of people that is unnecessary and it adds no value to the product.

V. Transportation

Cost is increasing through internal or external movement.

VI. Defects

Defects occur when a product fails to meet the expectation. Need wasting time to perform extra repairing operation.

VII. Inappropriate process

More steps in the process than required where it add cost but no value, customers do not want to pay for it.

VIII. Underutilized people

The talented people or the talent of employees are not fully being utilized.

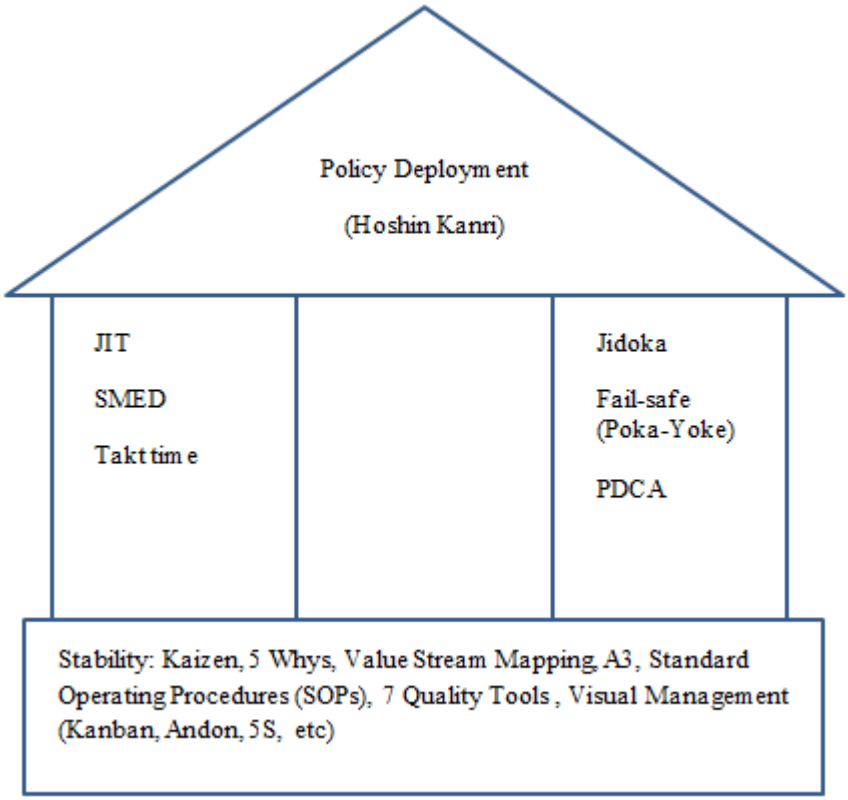

Figure 2.1: House of Lean (Michel, 2013)

Figure 2.1 shows the house of lean (Michel, 2013). There are two pillars: JIT and Jidoka, a basic element that regulate the mechanism of lean. However in order to make both pillars can stand strong, some fundamental tools can be used to support both pillars which are 5S, visual management, 7 quality tool, standard operation, Kaizen, 5 Whys, Value Stream Mapping, and A3.

2.2 First Pillar

There are two main pillars used to regulate the mechanism of lean. The first pillar is made up of JIT, SMED and takt time, these three elements will be discussed at follow section.

2.2.1 Just In Time (JIT)

JIT is not produce the product and keep inside inventory then pushes the product to customer. It is a pull system whereas it only produces the product when there is a demand. In other words, JIT means that production begins only when requested or as needed basis is made to delivery (David, 2003).

According to Lutfar (2002), not only manufacturers, suppliers and vendors also play an important role to practice JIT; as to minimize inventory holding costs for the buyer, they must supply small quantities of items frequently. In order to reduce retailer‟s holding cost, the manufacturer also need to deliver small quantities of product. It is essential to maximize both production lot size and material purchasing lot size simultaneously by estimating all the operating parameter in order to implement JIT practice optimally.

Ziaul (1999) states that JIT involves trailing a perfect journey that has no defect, no inventories, no disturbance and total standardization, all these factors make the JIT philosophy not an easy way to be implemented. However, JIT cannot work alone as to improve the system performance continually, it needs a good commitment between reduction of organizational slack, participatory management, continual education, and proper problem solving.

2.2.2 SMED

SMED means single minute exchange of dies; it is widely used for reducing set up time either internal set up time or external set up time in the industry. It is developed by Shigeo Shingo in Japan and was applied in the automotive industry (Vorne, 2010). The industry should ensure they understand clearly about where the productive time is missing before starting implements SMED. It has to be gone through several steps for a simple and practical SMED implementation: