Faculty of Manufacturing Engineering

WASTE REDUCTION BY IMPLEMENTING KAIZEN ACTIVITIES IN TEXTILE MANUFACTURING COMPANY

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WASTE REDUCTION BY IMPLEMENTING KAIZEN ACTIVITIES IN TEXTILE MANUFACTURING COMPANY

NURUSSHAHIDAH BINTI TAMBY SULEIMAN

A thesis submitted
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DECLARATION

I declare that this thesis entitled “Waste reduction by implementing Kaizen Activities in Textile Manufacturing Company” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have read this dissertation/report and in my opinion this dissertation/report is sufficient in terms of scope and quality as a partial fulfillment of Master of Manufacturing Engineering (Industrial Engineering).

Signature : ……..….

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Date : ……

DEDICATION

Tamby Suleiman Bin Tamby Abu Bakar (my beloved father)

Nurma Binti Hashim (my beloved mother)

Nurussalwa Binti Tamby Suleiman

Nurus Shuhada Binti Tamby Suleiman

Ahmad Zahiddin Bin Tamby Suleiman

Nurussalmi Binti Tamby Suleiman

Ahmad Zulkarnaen Bin Tamby Suleiman

Nurusshahadah Binti Tamby Suleiman

Ahmad Zulfakar Bin Tamby Suleiman

Ahmad Fak'rudin Bin Tamby Suleiman

Dr. Effendi Bin Mohamad (my supervisor)

All lecturers and staff of FKP UTeM

Universiti Teknikal Malaysia Melaka (UTeM)

ABSTRACT

Kaizen Activities (KA) is one of the Lean Manufacturing tools (LMT) usually being used to eliminate or reduce waste in manufacturing industries. KA is a continuous improvement method. This project was conducted to reduce waste by implementing KA in textile manufacturing industry. The company selected for this project is a textile manufacturing company located in Malacca. The company produces sewing and needlework products and one of the products is Pearliest Pin. This project was carried out in one of the process department of Pearliest Pin, head of pin dipping process. In head of pin dipping process of Pearliest Pin, there are four sub-processes involved and the first sub-process is mounting the pins on the boards using Carreone machine. There are two problems that occur in the pins mounting sub-process. The first problem is pin spillage problem, pins scattered around machine table and production floor during production. The second problem is bottleneck problem which involves the delay on action taken (by operator or supervisor) when processes have finished or when there are problems occurring. Based on the problems, three objectives have been generated for this project. The first objective of this project is to identify the problems that occur in the head of pin dipping process of Pearliest Pin. The second objective is to analyze the problems that occur in the head of pin dipping process of Pearliest Pin and the lastly, to propose solutions by implementing KA. The problems at head of pin dipping process of Pearliest pin were identified by the discussion with responsible personnel (workers involved in head of pin dipping process of Pearliest Pin), natural observational techniques, video recording and review of production history data. Then, to analyze the pin spillage problem, the data collected from natural observational techniques was converted into bar charts and Pareto Diagram. For the bottleneck problem, analysis on video recording and discussion with responsible personnel were done. Based on the analysis, the solutions for both problems were then generated by implementing KA. Pin spillage problem was solved in Mini Kaizen 1 and bottleneck problem was in Mini Kaizen 2. In Mini Kaizen 1, based on analysis of the problem, by creating new pins container the problem was solved. Three concept designs were generated and based on scoring method Design 2 was selected to be proposed for implementation. Prototype of Design 2 also has been tested in production line and shows that the total of pin spillage (waste) for Machine C reduced from 16.399g (before the implementation of prototype Design 2 based on observation and data collection in 2 hours) to 3.801g after the implementation of prototype of Design 2 (tested in2 hours). So, implementation of Design 2 is highly proposed to reducing pin spillage problem. In Mini Kaizen 2, based on analysis (brainstorming, and discussion), Andon board is proposed to be implemented in head of pin dipping process production line to reduce bottleneck problem. To fully eliminate pin spillage problem and bottleneck problem the KA should be performed continuously from time to time by the company.

ABSTRAK

Aktiviti 'Kaizen' (KA) adalah salah satu daripada alat 'Lean' pembuatan (LMT) yang biasanya digunakan untuk menghapuskan atau mengurangkan sisa dalam industri pembuatan. 'KA' adalah satu kaedah peningkatan berterusan. Projek ini dijalankan untuk mengurangkan sisa dengan melaksanakan 'KA' di industri pembuatan tekstil. Syarikat yang telah dipilih untuk projek ini adalah sebuah syarikat pembuatan tekstil yang terletak di Melaka. Syarikat tersebut menghasilkan produk alatan menjahit dan barang jahitan dan pin 'Pearliest'salah satu daripadanya. Projek ini dijalankan di salah satu jabatan proses pin 'Pearliest', iaitu di proses mencelup kepala pin. Di dalam proses mencelup kepala pin 'Pearliest', terdapat empat sub-proses yang terlibat dan sub-proses yang pertama adalah mencucuk pin diatas papan menggunakan 'Carreone' machine. Terdapat dua masalah yang berlaku didalam sub-proses mencucuk pin. Masalah yang pertama adalah masalah tumpahan pin, banyakpin yang bersepah diatas meja mesin dan lantai semasa proses pengeluaran. Masalah kedua adalah masalah kesesakan dimana terdapat penangguhan dalam mengambil tindakan (oleh operator atau penyelia) setelah proses telah tamat atau apabila terdapat masalah berlaku. Berdasarkan masalah yang terjadi, tiga objektif telah dirangka untuk projek ini. Objektif yang pertama adalah untuk mengenal pasti masalah yang berlaku di proses mencelup kepala pin 'Pearliest'. Objektif yang kedua adalah untuk menganalisa maslah yang berlaku di proses mencelup kepala pin 'Pearliest' dan terakhir sekali untuk mencadangkan penyelesaian dengan melaksanakan 'KA'. Masalah yang berlaku di proses mencelup kepala pin 'Pearliest' dikenalpasti melalui perbincangan dengan pihak yang berkaitan (pekerja yang terlibat dalam proses mencelup kepala pin 'Pearliest'), teknik peerhatioan semulajadi, rakaman video, dan kajian terhadap sejarah data pengeluaran. Seterusnya, untuk menganalisa masalah tumpahan pin, data yang di kumpul melalui teknik pemerhatian semulajadi diterjemahkan ke dalam carta bar dan rajah Pareto. Untuk masalah kesesakan pula, analisa rakaman video dan perbincangan dengan pihak yang terlibat dijalankan. Seterusnya berdasarkan analisa, penyelesaian bagi kedua-dua masalah dirangka dengan pelaksanaan 'KA'. Masalah tumpahan pin diselesaikan melalui Mini Kaizen 1 dan masalah kesesakan diselesaikan dalam Mini Kaizen 2. Didalam Mini Kaizen 1, berdasarkan analisa terhadap masalah, penyelesaiannya adalah dengan mereka bekas tadahan pin yang baru. Tiga konsep reka bentuk telah dirangka dan berdasarkan kaedah pemarkahan Reka bentuk 2 dipilih untuk dilaksanakan. Prototaip Reka bentuk 2 juga telah di uji di bahagian pengeluaran dan keputusan menunjukkan jumlah tumpahan pin (sisa) Mesin C berkurang daripada 16.399g (sebelum penggunaan prototaip Reka bentu 2 berdasarkan pemerhatian dan pengumpulan data selama 2 jam) kepada 3.801g selepas penggunaan prototaip Reka bentuk 2 (di uji selama 2 jam). Oleh itu, pelaksanaan penggunaa Reka bentuk 2 di cadangkan untuk mengurangkan maslah tumpahan pin. Dalam Mini Kaizen 2, berdasarkan analisa

(sumbangsaran dan perbincanagn),penggunaan papan Andon di bahagian pengeluaran proses mencelup kepala pin dicadangkan bagi mengurangkan masalah kesesakan. Untuk menhapuskan masalah tumpahan pin dan masalah kesesakan secara menyeluruh, syarikat harus menjalankan 'KA'secara berterusan dari semasa ke semasa.

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LIST OF SYMBOLS

g	-	gram
mm	-	milimeter

LIST OF ABBREVIATIONS

AF	-	Angle Feeder
BoP	-	Ball of Pins
IP	-	Innovation Performance
KA	-	Kaizen Activities
KE	-	Kaizen Event
LED	-	Light Emitting Diode
LM	-	Lean manufacturing
LMT	-	Lean manufacturing tool
LW	-	Lean Waste
MT	-	Moving Table
PC	-	Pins Container
PFB	-	Pins Feeding Bowl
QCO	-	Quick Change Over
RS	-	Rotary Spiral
UP	-	Un-Mounted Pins

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CHAPTER 1

INTRODUCTION

1.0. Introduction

This chapter starts with explanation on the field of industry that is explored in this project. The company selected for this project is a textile manufacturing company located in Peninsular Malaysia. This project will focus on one product, Pearliest Pin and this chapter will continue by explaining the process flow of the Pearliest Pin manufacturing process. Then, this chapter will explain the problems that occur in the process of manufacturing Pearliest Pin. Only the selected area of department will be studied. Next, this chapter will state the objective for this project and last but not least the scope.

1.1. Background

This project is done in a textile manufacturing company located in Peninsular Malaysia that produces sewing and needlework products. All the products produced by this company are delivered to the Malaysian and Asian markets. The company produces many sewing and needlework products and one of them is the Pearliest Pin. To produce the Pearliest Pin there are several processes involve and Figure 1.1 shows the process flow of the Pearliest Pin manufacturing process. The manufacturing process of Pearliest Pins starts with the pointing process where the steel wire (in rolls) is straightened and cut according to set-up measurement (according to the Pearliest Pin size). Then, one side of the pin is sharpened.

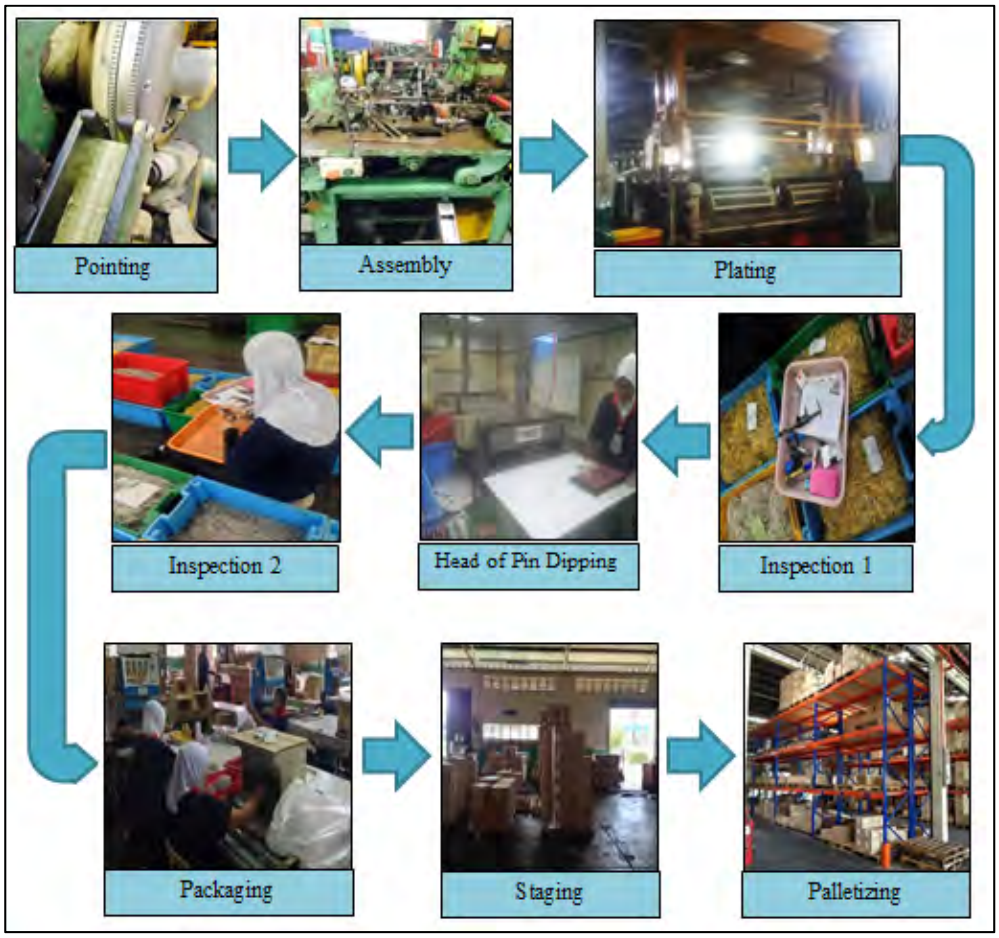

Figure 1.1: Manufacturing process flow of Pearliest Pin.

The process continues with the assembly process where the wire (on the side that not being sharpened) is assembled with a ball pin (usually white in color) using an assembly machine (type ASP with the speed of 123 RPM). Next is the plating process. The pins are coated (steel part only) with few type of chemicals to prevent corrosion. Then, the pins are sent to the Inspection 1 department for inspecting the quality of the pins based on the company's requirement. After Inspection 1, the pins are sent to the head of pin dipping process for the coating process where the ball pins are coated with Pearliest colorant coating. Then, the pins are sent to the Inspection 2 department for inspection on the quality

of the Pearliest coating. After that, all the pins are sent to the packaging department for the packaging process. The pins are packed in plastic (the weight and size of the plastic packaging are based on customer's demand) and then sealed in the boxes. The boxes are sent to the staging area for the operator to segregate the boxes based on quantity and shipping date. Lastly, the boxes that are ready for shipment are stored in the palletizing area.

1.2. Problem Statement

A problem occurred in head of pin dipping process of the Pearliest Pin (product as shown in Figure 1.2). In this process, the ball head of the Pearliest Pin (that is originally in white color) is dipped with colorant (Pearliest coating).

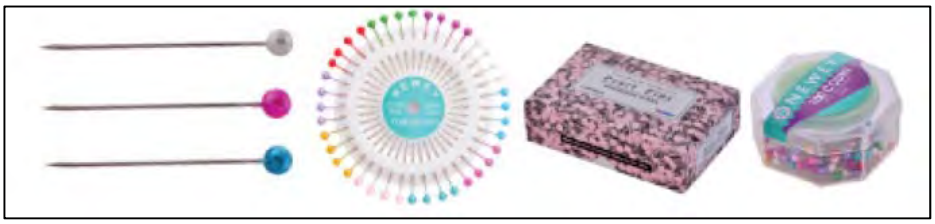

Figure 1.2: Pearliest Pin

The head of pin dipping process consists of several sub-processes. Figure 1.3 shows the process flow of the head of pin dipping process. Problems occurred in the first sub-process, which is mounting the pins on the board process. The processes of mounting the pins onto the boards are done using Carreone machines (semi-automated machine) and there are five Carreone machines at the head of pin dipping production floor. Two problems occurred in this sub-process. The first one is the pin spillage problem, where the

pins are scattered all around the machines and production floor. This situation makes the production floor look dirty and messy. Furthermore, all the spilled pins will be collected by the operator and will be considered or classified as waste. This situation has reduced the productivity of the head of pin dipping process and the waste needs to be reduced.

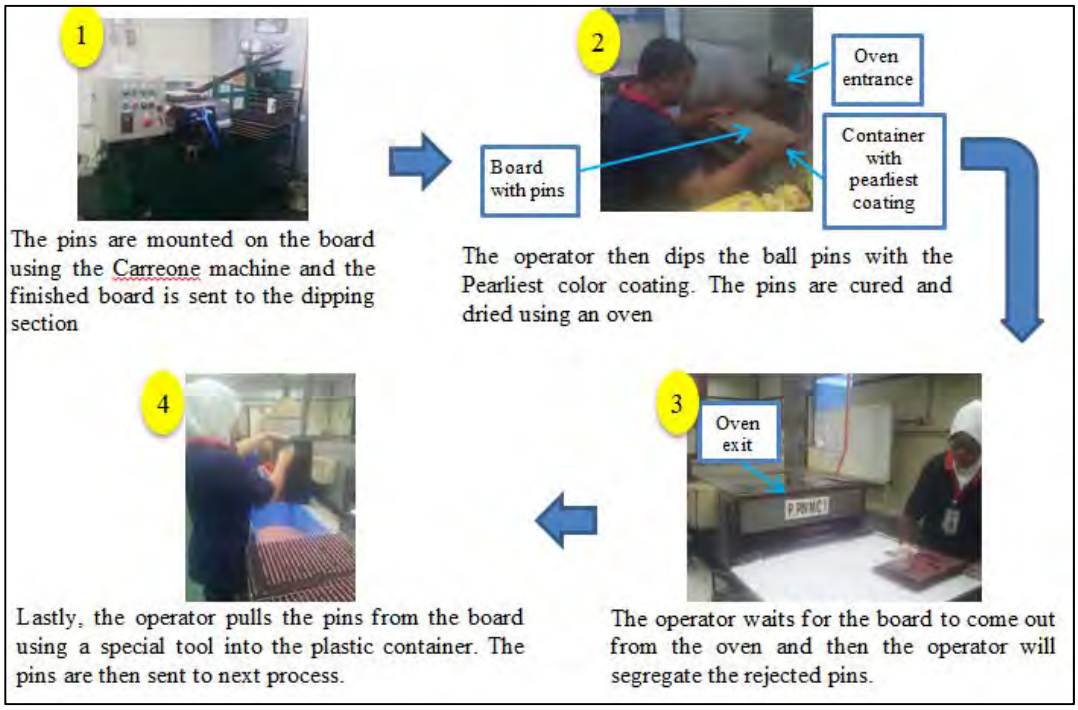

Figure 1.3: Process flow of the head of pin dipping process

The second problem is the bottleneck problem. There are five Carreone machines on the production floor and all the Carreone machines do the same job (mounting the pins on the boards). However, all the five Carreone machines are monitored and handled by only one operator. The operator is responsible for loading (the new boards) and unloading (the boards full of with pins) from the Carreone machines when the processes of mounting the pins on boards have finished. The operator is also responsible for solving the machines

problems when problems occur. There was a situation where the operator was busy on handling one of the Carreone machines and did not realize that the processes at the other machines have finished; the process of loading and unloading that machines have been delayed. The detail of the pin spillage problem and bottleneck problem will be explained further in Chapter 4.

1.3. Objective

The objectives of this project are:

a. to identify problems that occur in the head of pin dipping process of Pearliest Pin.
b. to analyze problems that occur in head of pin dipping process of Pearliest Pin.
c. to propose solutions by implementing Kaizen Activities (KA).

1.4. Scope

The manufacturing process of Pearliest Pin starts with the pointing process and finishes with the palletizing process (as mentioned in Section 1.1). This project only covered the head of pin dipping process. In the head of pin dipping process of Pearliest Pin, four sub-processes are involved (as mentioned in Section 1.2). In the first sub-process, mounting the pins on boards using Carreone machines two problems occurred. The first problem is the pin spillage problem and the second problem is the bottleneck problem. This project will start with identifying the problem that occurs (detailed study on the problems) and analyzing the current problems. Then, the problems will be solved by implementing KA. Based on KA, this project will then be split into two parts: Mini Kaizen

1 to solve the pin spillage problem and Mini Kaizen 2 to solve the bottleneck problem. At the end of this project, the solution for solving both problems will be proposed.