

# CHAPTER 1

## INTRODUCTION



This chapter introduces a Flexible Printed Circuit manufacture as a case study concerning quality improvement. Firstly, background of problem is described. Also considerations are statement of problem, objective and scope of study. Next, expected results from this thesis will be proposed. Finally, procedure and methodologies of thesis is introduced and explained.

### 1.1 Background of Problem

Company A is a Flexible Printed Circuits manufacturer which fully support from its mother company in Japan by providing technical knowledge and sending key staffs to supervise manufacture in Thailand. As the company's product, a Flexible Printed Circuit is a patterned arrangement of copper foil. This Flexible Printed Circuit utilises a flexible base material that may be or may not be covered with a flexible overlay. The main products of the company are divided into three major types as follows:

#### 1.1.1 Flexible Printed Circuit

The company produces the Flexible Printed Circuit or bare FPC in 3 different categories that can be classified as the following: single sided, double sided and double excess (Back Bared).

#### 1.1.2 Surface Mounting Technology

This product uses the Surface Mounting Technology as an assembly technique to utilise FPC for component mounting and interconnecting purposes. In general, this technique uses surface-mounting devices instead of insertion-mounting devices.

#### 1.1.3 Automobile Flexible Printed Circuits

The company also produces the Automobile Flexible Printed Circuits for advanced automotive electronics. This product is used for automobile parts particularly instrument panels that enhance both comfort and vehicle safety.

The major advantages of the Flexible Printed Circuit are thin, lightweight, and excellent flexibility permitting freedom of equipment design so that it can be used to produce wide range products. The product types range from commercial purposes to industrial applications such as electronic parts of hard disk, floppy disk drive, CD drive, calculator LCD connector, motor controller, audio components and automobile parts, etc. Then the company is required to produce the products to meet the rapid increasing demand for electrical interconnections and the accelerating trend toward compact electronic devices.

To achieve customer's satisfaction, the standard quality of our products and good services will be the company's target. Furthermore, the company would like to be the best in serving customers worldwide. At the present, most of our products are mainly distributed to three corporate countries: Japan, Thailand, and Singapore. These three corporate countries are covered over than 80% of company's overall sale.

## **1.2 Statement of Problem**

According to high competition in present market, all manufacturers try to reduce manufacturing cost by employing different techniques to process their products. One method is to increase production capacity by adding more or improved machines, manpower, etc. However, this method is a long-term investment and it requires a huge initial investment. Another approach is to improve process performance such that the amounts of nonconforming parts as well as the processing time in manufacturing are reduced.

In this study, the company concentrates on the production line of Automobile Flexible Printed Circuit. The process flow of this product is started from image printing process (IMP), then solder-resist process (SRP), then auto piercing and blanking process (PAB), then inspection process (INS), and the last is manual punching and blanking process (MAS). The defective parts per million of Automobile Flexible Printed Circuit is shown as follows.

Year/01	IMP	SRP	PAB	INS	MAS	TOTAL REJECT
Jan	2912.91	1394.21	2962.70	1954.39	1705.42	10929.64
Feb	3163.63	1484.17	2538.72	2441.07	1269.36	10896.95
Mar	3272.19	1501.62	2498.96	1703.33	941.31	9917.41
Apr	4804.84	1659.85	2166.54	1834.57	1572.49	12038.30
May	4363.32	2521.36	2989.40	3215.87	1917.44	15007.40
Jun	5806.15	1415.07	2815.55	2159.07	714.83	12910.66
Jul	2914.35	2289.85	2784.25	1535.24	637.51	10161.20
Aug	2726.06	3918.71	3748.33	1216.99	1642.94	13253.01
Avg/month	3668.97	2061.83	2847.03	1955.15	1287.11	11820.09

Table 1.1 The defective parts per million of Automobile Flexible Printed Circuit

The data is demonstrated in Pareto chart as below.

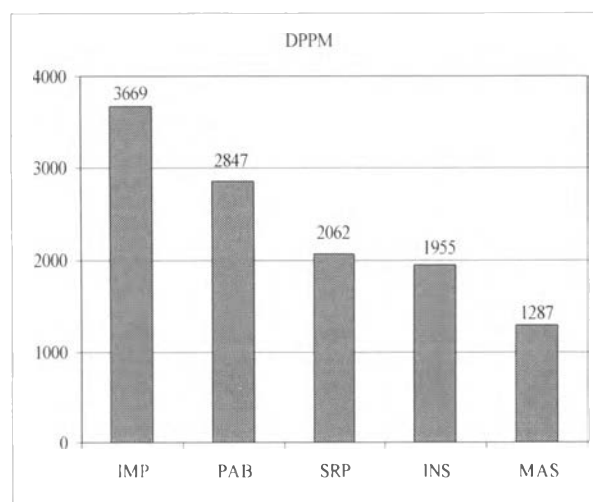


Figure 1.1 The defective parts per million of Automobile Flexible Printed Circuit

The data shows that the image printing process produces the highest amount of defective parts, followed by piercing and blanking process, then solder-resist process, then inspection process, then punching and blanking process, respectively. Refer to the average cost of this product, the DPPM per month of image printing process is 3,668.97 pcs. based on defective part per million. In this way, it is very high cost that the company should not be lost. Additionally, complaints from our important customer about in image printing defect meant that the company had to seriously set quality improvements in this process.

In this case, process performance improvement of an image printing process is considered. The image printing process is operated by automatic printing machines. Commonly, adjusting any parameters for increasing efficiency of these printing machines will affect the quality of the final products. For example, if printing ink on the circuit is incomplete, a critical quality problem such as open circuit, short circuit etc. will be occurred.

According to a quality control process, we are able to indicate that there are many factors influencing the image printing process. The methodology for thoroughly studying these factors, which affect the process, will take a long researching time and large cost. Then this approach is not suitable for the present competitive situation. However, design and analysis of experiments are more appropriated for the quality improvement so that an optimum condition of the image printing process can be achievable.

### **1.3 Objective**

The objective of the thesis is to determine the optimum condition for controlling the image printing defects in image printing process.

## 1.4 Scope of the Study

1.4.1 To consider relevant factors affecting the image printing defects in image printing process

1.4.2 To study model KSN-001S-0A in Automobile Flexible Printed Circuit product line

## 1.5 Expected Results

1.5.1 Ability to specify the influence factors affecting the defects of image printing process in Automobile Flexible Printed Circuit manufacturing

1.5.2 Ability to specify the appropriate condition in image printing process

1.5.3 Suggestion of the method in controlling the parameters in solder-resist printing process

## 1.6 Procedure and Methodologies of Thesis

1.6.1 Study related literatures and related theory

1.6.2 Study manufacturing process of Automobile Flexible Printed Circuit

1.6.3 Study influence factors affecting the image printing defects in image printing process

1.6.4 Analyse influence factors affecting the image printing defects in image printing process

1.6.5 Conduct the optimum condition for controlling the image printing defects in image printing process

1.6.6 Summary and suggestion

1.6.7 Thesis writes up and submit thesis