

## CHAPTER I

### INTRODUCTION



#### 1.1 Background

The company in this case study has introduced the strategy of outsourcing to gain the competitive advantage in cost effectiveness operation and moving fast into new technology. The headquarters of the company in Japan that currently controls all businesses of all display products like Television, Projector, Computer Monitor has decided to outsource printed wiring board assembly (PWBA) from the branches in UK (Pencoed) & USA (Pittsburgh) to the company in Thailand. This is to reduce the product cost because of lower manufacturing cost in Thailand. It also allows utilizing the current resources at the final assembly plants in the new product & technology introduction for strategic movement. Actually, the labor cost is much cheaper in China but the product quality is not so reliable in the viewpoint of the end users such as IBM, DELL, COMPAQ. Anyway, China's subcontractors are still our high potential competitors.

The PWBA business has been started in August 1999 and drastically increased in volume with rapid growth. The manufacturing operation has to be improved to keep competitive position in the market.

The price strategy is the key success factor in this outsourcing business whereas the quality is basic need in the product that gives the company an opportunity in this new business. To survive/maintain the position in the market, the next step improvement is a must. As this is the assembly process, the operational productivity is the key index that reflects on how much effectiveness the operation is being run. The high productivity is meant that the manufacturing cost is low.

The next improvement step in terms of operation is to introduce the supply chain management. To achieve this new management, the flexibility of operation is necessary

to respond the customer's demand quickly. It needs a lot of improvement activities from procurement through manufacturing and distribution. Anyway, the manufacturing is the center of all functions. To make a change in manufacturing process is automatically to change the whole operation. Therefore, the manufacturing process has to have ability to produce the product to serve the fluctuation of customer's demand. It needs to change the production concept from the economic of scale to flexible quantity build in order to optimize the whole cost of supply chain.

In combination those purposes, the new production line shall be considered instead of the traditional conveyor line to get better productivity and support the supply chain management.

### **Company background**

The company of this research is a manufacturing plant that produces television, audio as finished product and key part as sub-assembly products for internal use, namely tuner, fly-back transformer, auto-mount printed wiring board assembly.

Since 1988, the company has produced color television so we have long experience with assembly process. PWBA is just only front process of the television production and the company also owns auto-mount process that can run radial, axial, jumper and SMT parts (Surface Mounting Technology). So, sub-assembly operations for UK & USA branches can be successful with high potential to become PWBA base operation in South East Asia as the headquarters (Japan) intended.

## 1.2 Production process

1. Hand-mount process : operators mount electronic components such as resistor, capacitor, coil etc. onto the board.
2. Dipping process : the mounted board has been passed through the Dip Machine by conveyor belt.
3. Touch up process : this is an inspection process and do the necessary fast rework i.e. solder bridging. no solder etc.
4. In-Circuit-Test (ICT) : the ICT equipment is designed to detect the defects that are escaped from Hand-Mount & Touch-Up process such as missing parts, reverse polarity, floating parts etc. Anyway, it cannot detect all parts for all defects due to the component circuit constraint like the capacitor connected to ground.
5. Circuit Board Adjustment (CBA) : this equipment is used to set the bias value to be ready for use at customer side.
6. Packing : the finished board is packed into the carton box to prevent any damage from transportation.

The process flow is shown in the figure 1.1.

### PWBA Process Flow

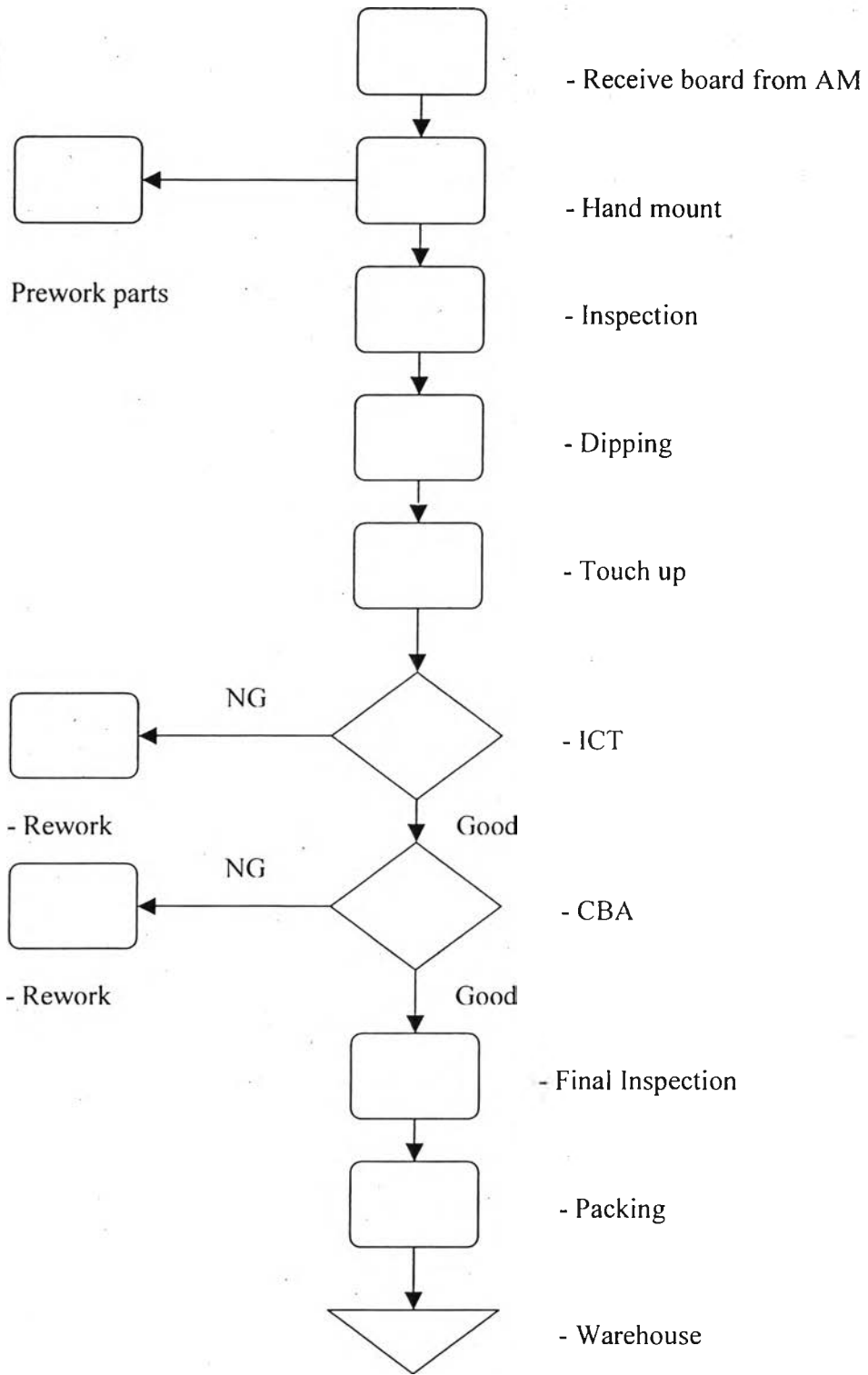


Figure 1.1 Process Flow

### 1.3 Statement of problems

The PWBA production line is designed to use the conveyor belt. This is based on original idea that the conveyor can have a better line performance because the output can be controlled by the belt speed and operators tend to do job more specific so that the job is simpler. Anyway, the conveyor line has many disadvantages as follows:

- The flexibility : the output rate is fixed by the belt speed. To adjust the belt speed needs a big change in the production line such as re-layout of the facilities, re-design the process. As a result, the fluctuation of the orders causes the idle time if the production demand is lower than the current capacity.
- The waiting time waste : operator is standing-by for a job from the previous Process.
- The movement waste : picking up and lying down the work piece.
- The overproduce waste : the large lot production causes finished goods Oversupply.
- Different operators are at the start and end line so it is harder to prevent the defects escaped to downstream.
- It tends to get used as a storage place for work-in-process.

These would affect to the productivity. In this research, Operational Productivity (OP) is used to indicate the productivity value and OP is defined in Sony standard as following formula.

$$\text{Operational Productivity} = \frac{\text{Headquarters Standard Time} * 100 \%}{\text{Production Hour}}$$

Sony Standard Time = the amount of time that needs to produce one PWBA per standard process defined by each design centre.

Production Hour = the amount of time that includes actual operating work hours, repairs work hours, preparing work hours, idle time, modification work hours. Please refer the productivity index in the appendix 1.1: Technical Standards

The flexibility is the most critical to the future plan as the strategy of the supply chain management or even the current condition that faces the un-smooth supply of the raw material. As above mentioned, the conveyor line characteristic is fixed in output rate. It is fully run in order to achieve the monthly quantity per customer order. The production responsibility is to build the product to achieve the production plan. This is the traditional production system. Based on the flexible production, the production concept shall be changed from small variety and large lot builds to a wide-variety with small lot production. So, the operation can be changed from planning centre oriented to market oriented. The flexible production line can produce the products to serve the customers demand at the right model, quantity & time. The concept of production is changed from the push to the pull system.

Figure 1.2 shows a push system that production produces the products without care of the customer requirement. The production is just to produce to achieve the daily plan.

The pull system as shown in the figure 1.3 is to produce the products as necessary. To introduce this system needs the flexible production line that can produce multi-models & variable output rate. The conveyor line that fix the output rate cannot be adjusted the output so the conveyor line design is not appropriate to this kind operation.

The concept of supply chain that will be introduced to the PWBA operation by setting up the standard stock of finished goods and continuously replenish the standard stock level. The concept of operation is shown in the figure 1.4.

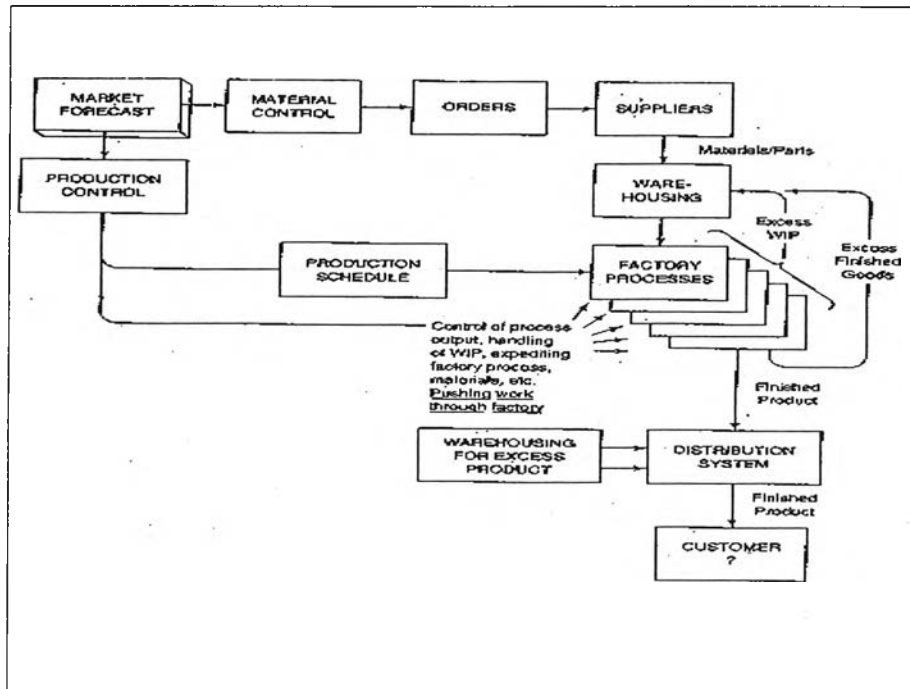


Figure 1.2 : Push System

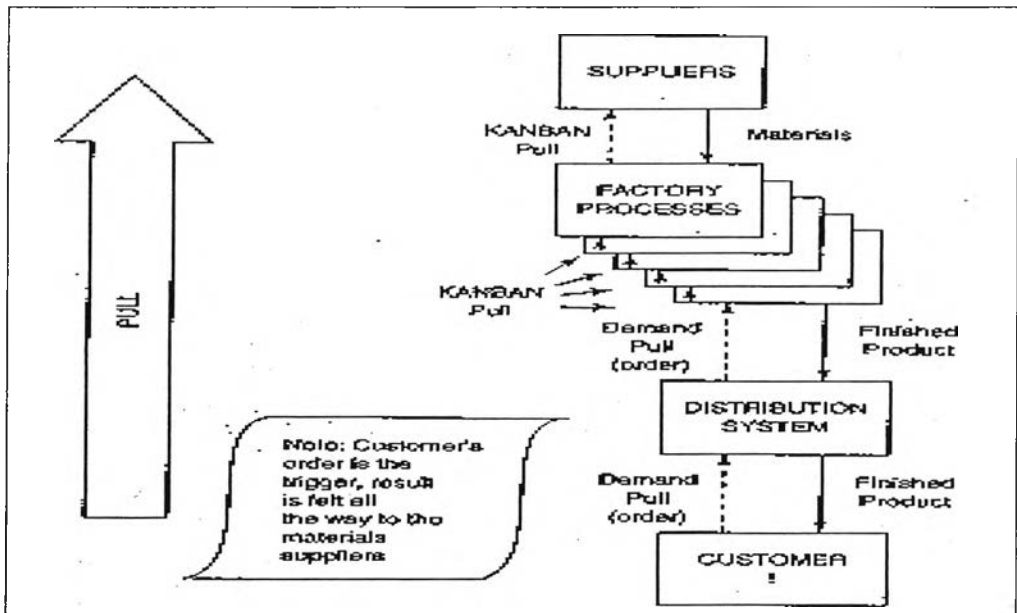


Figure 1.3 : Pull System

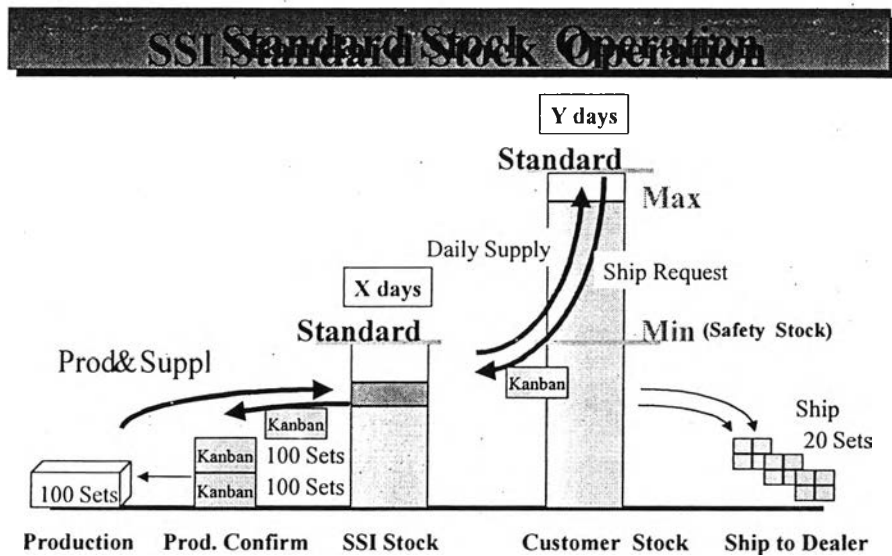


Figure 1.4 : Standard Stock Operation

Figure 1.4 is to show the whole idea how this actual operation is like. As the actual stock is fluctuated according to the market condition, our production line has to stabilize the stock level by flexible output rate. To introduce the standard stock operation, the existing conveyor line is not suitable and would be resulting in low productivity.

The PCD TV-AE5 production is selected to be studied in this research.

#### 1.4 Objective of the research

To improve the productivity of the PWBA production line by Cellular Manufacturing implementation.



### **1.5 Scope of the research**

This research is intended to focus the production line as follows:

- 1.Line Layout.
- 2.Job Design.
- 3.Material Handling.

### **1.6 Research procedure**

- 1.Study related literature and theory.
- 2.Develop flow concept.
- 3.Draft new layout plan.
- 4.Estimate development result.
- 5.Implement the new line and Evaluate its performance.
- 6.Summarize and recommend for further research.
- 7.Prepare report and presentation.

### **1.7 Expected results**

- 1.Increase Operational Productivity by minimizing the non-value added jobs.
- 2.Able to produce Multi-models/Output rate.

3.Reduce Inventory.

4.Multi-skilled operators.

5.Reference for any further development.