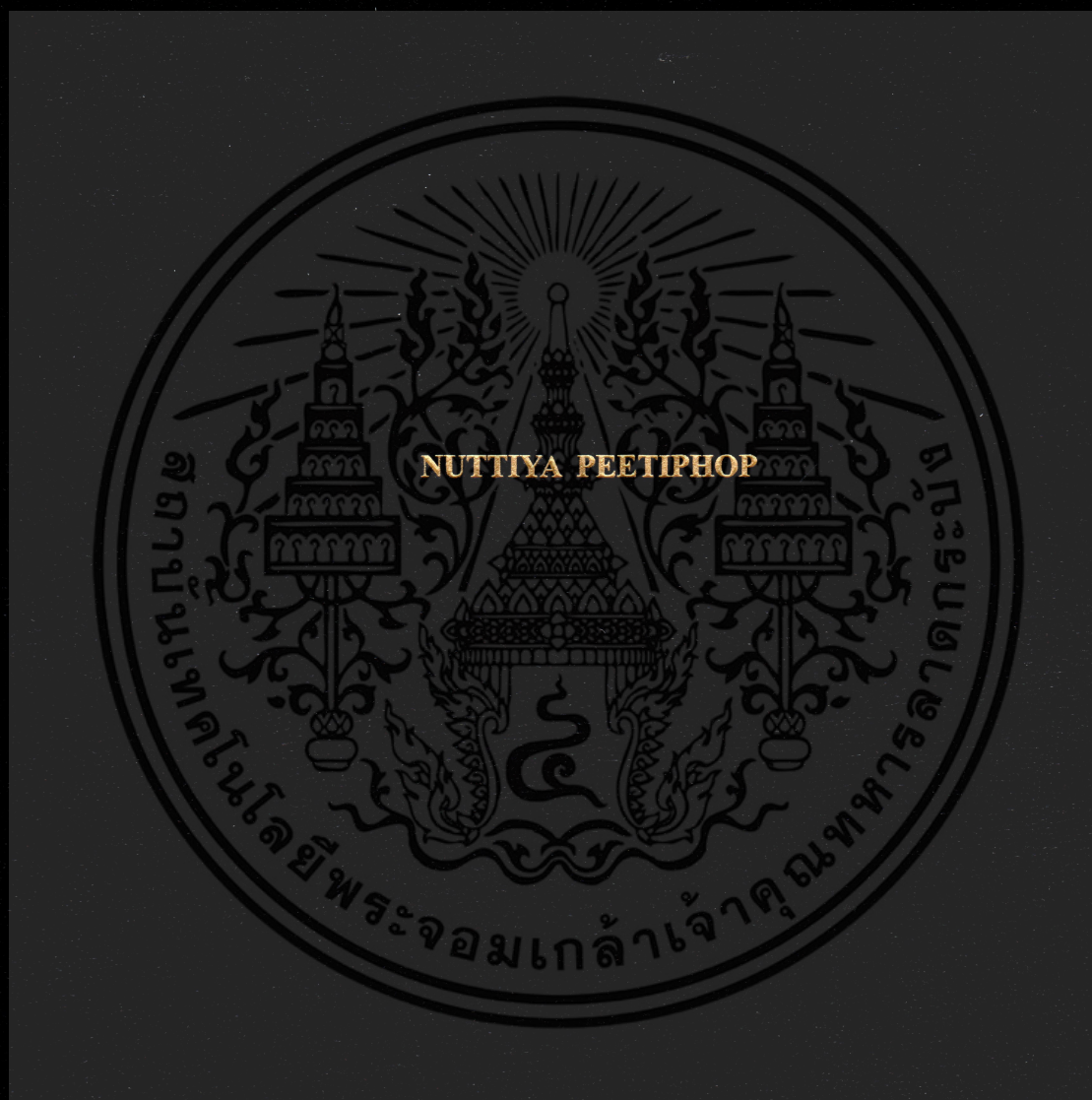


IMPROVING INVENTORY MANAGEMENT IN ELECTRONICS INDUSTRY

: A CASE STUDY



**AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENT FOR THE DEGREE OF
MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT**

**INTERNATIONAL COLLEGE
KING MONGKUT'S INSTITUTE OF TECHNOLOGY LADKRABANG
2017**

KMITL-2017-IC-M-002-006

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NUTTIYA PEETIPHOP



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เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้ภายใน KMUTL-2017-IC-M-002-006 เท่านั้น ไม่ให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้



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May 27th, 2017

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RESEARCH TITLE Improving Inventory Management in Electronics Industry: A Case Study
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ABSTRACT

The inefficient inventory management policy reduces the ability to control level of inventory, and fulfill customers' requirement. Eventually, it leads to high cost of inventory. Thus, the company needs to boost up their capabilities in order to reduce unnecessary costs and be able to compete with their competitors. If the company can adjust themselves and be able to respond the customer's requirement, they will outstanding among their business. This study investigates a case study in the electronic industry. The finding revealed that the problem that normally occurs in inventory management was high cost of inventory which results from improper inventory policy such as holding, ordering and dead stock policy. Therefore, the collected data was analyzed and inventory management tools including EOQ, ROP, Silver-Meal, Safety Stock and Dead Stock policy were used to propose inventory management policy in order to reduce the company's inventory cost and improve the company's inventory management.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In the current situation, there are many companies that are doing business such as manufacturing, designing, molding and selling steel furniture in Thailand. With considerable numbers of producers in the industry and increasing demand of the product, the market is highly competitive. This is a reason that makes a lot of competitions for both domestic and international. Nowadays, globalization trend has grown and also has a lot of influences in current business. Hence, running the business needs knowledge and capability to operate and manage business because it helps to cope with the changing of business and complexity that can occur all the time.

Therefore, increasing competitiveness in this business is rising up the quality of product and capability to meet the customer's requirement on time. Supply chain management skills such as inventory management is the aspect which the management needs to consider in order to achieve the cost deduction, establishing price leadership and enhancing capability to meet the customer's requirement effectively.

The company needs to develop themselves to boost up capability in order to compete with their competitors. If entrepreneurs can adjust themselves and be able to respond the customer's requirement, they will be able to stand out among their competitors.

Thus, this case study aims to improve the capability of company by improving their inventory management in order to compete with competitors and develop their organization.

1.2 Background and Problem Statement

Company A was established in February, 2012. They produce the product of metal furniture such as refrigerator, rack and making product as the customer's orders including electric cupboard.

Currently, inventory of company divided into 3 types including raw materials, finished goods, and Work-In-Process goods. The company has not operated system for managing these products efficiently, especially raw materials that are operated under experience of sales and procurement department.

Nowadays, the company does not have a proper inventory management policy. The procurement of raw materials relies on experience of employee in sales and procurement department. They use bill of materials method to check the raw materials, whether there is enough inventory in stock. With this method, the problem of lack of raw materials and over purchasing can happen.

From the company visit, the researcher found that the problem that normally occurs in inventory management is the high cost of inventory resulting from over purchasing. This is the cause of sunk cost and high total cost of inventory management. Moreover, the researcher had analyzed information and found that the high cost of inventory management partially resulted from the inappropriate material stock policy because some of the raw materials were either overstock or shortage.

From the problem finding, the researcher aims to build up the policy of inventory management in order to deal with problem for preventing high cost of

stock, over purchasing and lack of goods. Apart from this, another purpose is to reduce total cost of inventory management effectively.

1.3 Objective of the Study

1. To reduce total inventory cost
2. To study and improve inventory policy

1.4 Scope of the study

1. Data used in the study in 2015
2. Data was collected in 12 months

1.5 Research methodology

The project is divided into seven parts namely

1. Identification of the problem: The first step is to identify the problem.
2. Definition of the problem: After identifying what may be the problem from visiting the company, a clear definition of the problem is formulated.
3. Literature review: The next step is to review literature which includes studying of different models that can be implemented in solving the problem.
4. Data collection: The fourth step is data collection by gathering all the data which is needed in solving the problem. Data collection is done through the analysis of historical information, for example past sales data, inventory data and studying the operations.
5. Problem solving: By using several tools.
6. Solution and validation analysis: To propose suitable policy of inventory.
7. Implementation and recommendations: Comparing the total cost of inventory before and after proposing policy so that the company can apply and improve.

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CHAPTER 2

LITERATURE REVIEW

2.1 Supply Chain Management

Supply chain management is the grading of total process that brings the customer's satisfaction starting with procurement, manufacturing, storage, information technology, distribution and transportation where all of the processes are correlated with each other. Supply chain management is not concerned only the effectiveness within the organization, but it also associates with the external organization such as supplier, manufacturer, distributor, and customer.

Therefore, it can be seen that there is a relationship between working processes as a chain or network. Thus, to achieve the effectiveness in terms of production, service, and customer satisfaction, every function in a chain has to be related to each other. In supply chain, the company will share information between departments and allocate information to each department in order to do effective work among organizations.

According to Scott and Westbrook (1991), Supply chain is a chain which links all components of production processes and demand flow processes which raw materials would be produced for consumers. The international center for competitive excellence defined supply chain management as the synergy of business process from supplier to the final consumers. On the other hand, Council of supply chain management professionals gave a definition of supply chain management as the combination of planning and management in every activity which involve with procurement. Logistic management and cooperation of supply chain member include

managements pay more attention to the efficiency of inventory management. They try to lower inventory quantity which eventually can reduce cost. On the other hand, if the quantity of inventory is reduced too much, it may cause the stock-out. Hence, they need to control inventory in the optimal level to minimize the total inventory cost.

Effective inventory management is essential in the operation of any business (Bassin, 1990). Hakansson and Persson (2004) identified three different trends in the development of logistics solutions within the industry. The first trend concerns with the increased integration of logistics activities beyond organizational boundaries with the aim to reduce cost items such as capital costs for inventory and handling costs of flows.

According to Sharma (1999), inventory management is planning about the category and quantity of inventory as well as type of suitable inventory management control. The following are the importance of inventory management.

1. To meet the customers' need

To meet the customers' needs, it is necessary to maintain accurate inventory in order to avoid the stock-out. If the customers cannot wait, they will go to buy from competitors instead. This makes the company loses sales volume. Moreover, well inventory management can help in term of lead time which customers do not have to wait for product for a long time.

2. To buffer against the uncertain situation in the future.

Inventory management prevents stock-out in uncertain situation which can occur in the future. For example, sometime vendors may order material in advance to keep price at that time which it might be more expensive in the future. Moreover, there is a possibility that supplier may get problem in delivery as well.

Thus, inventory management is the way to avoid the risk of stock-out, if the company needs material for production.

The main structure of inventory had been classified into 4 types.

1. Inventory level: It is the amount of existing inventory.
2. Demand: It is the demand for goods which can be expected and non-expected.
3. Reordering: When inventory is failed below the reorder point, the company needs to make an order to replenish inventory.
4. Stock-out: Company does not have enough inventory to serve customer demand.

Type of inventory can be divided into 3 types. Firstly, raw materials which are materials and goods that come from suppliers for production. This can be ordered by direct ordering or other methods. Secondly, work-in-process are goods in the production process or pending for transformation to finished goods. Lastly, finished goods are the result of production, which are ready to sell or delivery to customers.

The reasons to hold inventory are as follows:

1. Responding for inconstant demand or customer's need in the different seasonal need.
2. Maintaining production rate at the same level as well as employees' working rate and machine working rate by keeping goods which could not sell in any season to sell in another season.
3. Reducing delivery cost and bulk purchasing cost in order to avoid the impact of inflation and price fluctuation.

4. Avoiding the risk of stock out by using safety stock when lead time is too long and urgent order occurs.

5. Running production process smoothly without disruption from a stock out. Because of a stock out, it will cause unemployment and no finished goods for customers.

2.4 Inventory Control System

1. Continuous Inventory System

According to Simchi-Levi et al. (2004), Continuous Inventory System is the system that needs to record every transaction happened in the warehouse such as receiving and selling out. It will show the real record of the inventory amount frequently. This is very important for inventory control that helps the company to continuously monitor the goods which cannot run out of stock. However, this system is quite expensive for documentary cost and requires for many employees to monitor. Presently, the company uses computer to apply for this job which is very helpful. By using barcode or Universal product code (UPC), can be labeled to the products and uses laser to read a code (Laser scan). This method is very accurate and the information could be used in database for inventory management.

2. Periodic Inventory System

According to Simchi-Levi et al. (2004), Periodic Inventory System is a system that recording and counting at the specific time. For example, it counts and records weekly or by the end of the month. When goods are put away, new goods will be replenished at the required level. This system is suitable for goods which have a certain demand in an exact time. Normally, at the end of period, the actual level of inventory will be higher than the level of inventory in the system. Because company

reserves for a stock out in advance. Thus, this system will adjust the new level of ordering.

Benefit of Continuous Inventory System and Periodic Inventory System are shown as follows:

Table 2.1 Benefits of Continuous Inventory System and Periodic Inventory System

Continuous Inventory System	Periodic Inventory System
1. Having less safety stock	1. Spending less time and less cost to control.
2. Having a certain amount of orders which can get a discount easier.	2. Less cost on documentary, less ordering cost and easy to check.
3. Inventory could be checked freely.	3. Less cost of collecting inventory data.

2.5 Cost of Inventory

To achieve efficiency in inventory management, managements initially need to understand about any cost that involved with inventory. Because the main purpose of inventory management is to manage inventory level that minimizes the total inventory cost. There are 4 types of inventory cost as follows:

1. Ordering cost

Ordering cost is the cost of procurement that happens when company orders goods and depends on frequency of ordering. It does not matter how many units company makes an order each time, the cost will be constant. If the company orders frequently, ordering cost will increase. This involves the expenses of ordering

such as, documentary expense, procurement employee's wage, telephone expense, delivery expense, and payment fee.

2. Holding cost

Holding cost is inventory storage cost. Holding cost is the cost that needs to pay for existing inventory to keep it and be ready to use. It depends on inventory quantity and timing. Holding cost is a sunk cost. The interest also can occur in case of the company loans money. In addition, other factors such as electricity cost, maintenance cost, taxes, insurance expense and salary of warehouse employee can impact to the holding cost.

For those mentioned costs, they are difficult to calculate actual cost. Mostly company will use approximate numbers. Those costs would be identified annually or displayed in percentage of average of inventory.

3. Shortage cost or Stock-out cost

Stock-out cost occurs when a company becomes out of stock for production or sale. This makes customer cancel the order, then the company loses the potential income, and reputation. The production process will be stuck, after that out of work for the machine and also employees. This cost depends on quantity of inventory on hand. If the company has fewer inventories, it will have more risk of stock-out. On the other hand, if the company holds too much inventory, there will be no stock-out. This cost will fluctuate because of the quantity of stock-out units and time period that the stock-out occurs. The stock-out cost includes air freight cost for emergency, delay delivery cost and opportunity cost of sale. Due to the difficulty in calculating the stock-out cost, the company should determine service level. For example, the stock-out should be less than 2 percent all time.

4. Setup cost

Set up cost is the cost that occurs when the machine is changed from one function to another function. There will be no work for the machine. Thus, the inventory which has prepared will be pending for next operation. During this process, the opportunity cost will occur while setting up the machine. It is a constant cost per time and depends on the size of production lot. If the company produces a big lot, there will be low in the setup cost. At the same time, pending inventory will increase. On the other hand, if the company produces small lot and often sets up the machine, there will be high in setup cost. However, there will be a low level of pending inventory which consequently the company can deliver product to customer faster.

For all inventory costs, the carrying cost will be high when the company has a high level of inventory. In contrast, inventory cost will be low when the inventory level is low. In terms of ordering cost, stock-out cost and setup cost, they are different from carrying cost. This indicates that if the inventory level is low, those costs will be high.

Whenever the company decides to order, they should consider about the lowest total inventory cost. So, the company needs to do the simulation in mathematic for analyzing the suitable order quantity.

In a study of DeScioli (2005), the objective of the research was to develop an inventory policy to optimize the total material management costs, which associated with inventory carrying costs, ordering costs, and stock out costs. For any given product, total cost, TC, could be expressed by the formula listed below:

$$TIC = \left(\frac{Q}{2} C_H\right) + \left(\frac{D}{Q} C_O\right) + S \cdot C_H \quad (2.1)$$

Where	Q	=	Economic order quantity
	D	=	Annual demand
	S	=	Safety stock
	C_H	=	Per-unit annual holding cost
	C_O	=	Annual ordering cost

2.6 Cause and effect diagram

Cause and effect diagram (also called fishbone diagrams or Ishikawa diagrams) is created by Dr. Kaoru Ishikawa in 1953. Cause and effect diagram is used to identify potential factors causing a specific problem. It has a definition in JIS Standard (Japanese Industrial Standards) as it is the diagram which shows the relationship between quality characteristics and related factors.

Quality Characteristics are the results of the causes. They are the factors which cause the characteristics. It uses to analyze the continuously relating causes which consequently show the result of brainstorming in quality control groups. The benefits of fishbone diagram include use as the tool for brainstorm the conception of quality control member which is the most effective method, shows the cause of the ongoing problems and allows us to find the significant cause which can be solved and improved and can be used in other purpose such as working, social and daily life.

Cause and Effect diagram consists of two components which are fish skeleton and fish head. The fish skeleton gathers various possible causes of the problem and fish head is the main problem to be solved. The fish head is always written on the right-hand side and the fish tail on the left-hand side as shown in Figure 2.1.

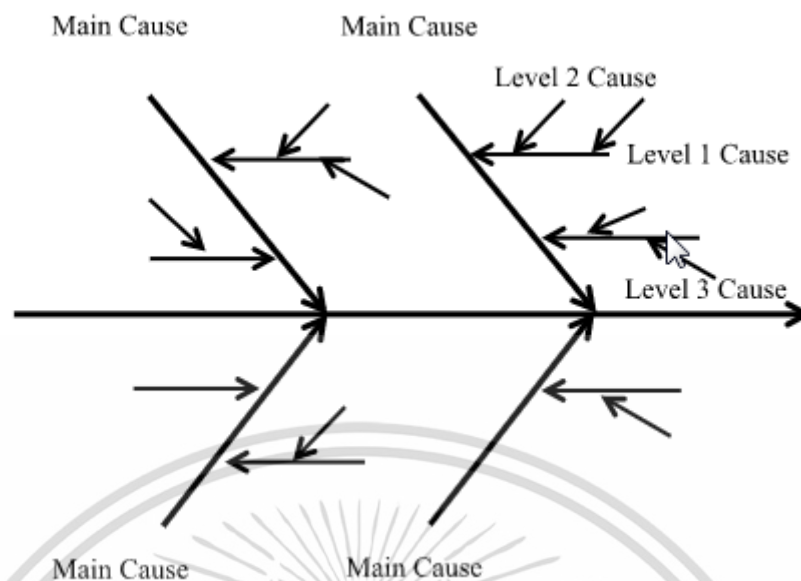


Figure 2.1 Fishbone Diagram

2.7 ABC Analysis

ABC analysis is an inventory categorization method which aims to minimize the total inventory cost. Basically, the company has many different types of inventory. If the company over-monitors and over controls all inventories, it will waste cost and time. Thus, Inventory control should consider the suitability of the type of inventory. The ABC analysis is the suitable method to classify the inventory which divides an importance of inventory into three categories: A, B and C regarding their estimated importance.

There is no fixed percent for each class; the proportion can be applied and base on the objective of the company. According to Magee and Boodman (1974), the principle in determining the group of inventory is categorized as follows:

Group A – 75-80% of the annual consumption value of the inventory.

Group B – 20-30% of the annual consumption value of the inventory.

Group C – 5-10% of the annual consumption value of the inventory.

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According to Dickie (1951), ABC analysis is used to categorize and prioritize inventory. It is based on Pareto's Law which states that important group usually be a small portion (Duffuaa, Raouf, & Campbell, 1999). ABC uses dollar usage; the production of demand volume and unit price as a primary metric (Collier and Evans, 2010). Because there is an exact number of dollars available for inventory and the dollars must be used carefully. Dollars usage can use either volume or price because it is not necessary to spend high investment or strict controls for either a low volume of high-price or a high volume of low-price. A "70-10-10" breakdown of inventory's percent dollar value and percentage of inventory items is shown in Figure 2.2.

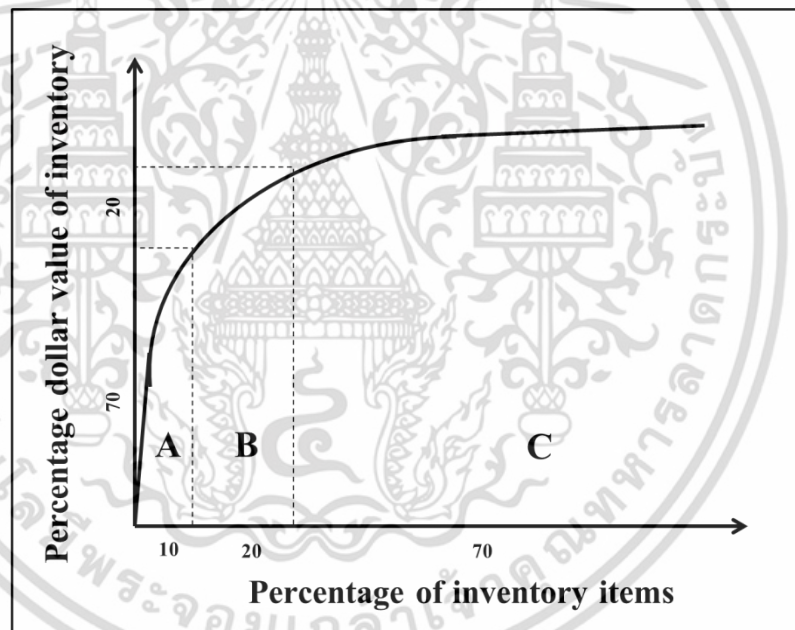


Figure 2.2 Pareto Diagram

Large inventory is difficult and expensive to manage. The ABC analysis can help to categorize and prioritize. Group A is the major business drivers. It is the largest portion of sales and should be assigned tight control. Group B is larger than the Group A and needs looser controls. Group C consists of 70% of all inventory items, but low return on investment. So, the resources should be allocated as required.

The ABC method allows business to significantly increase return on capital by decreasing inventory costs and minimizing stock-out rates. Fuerst (1981) summarized the process to do the ABC analysis: first, calculating the total value of each kind of product; second, ranking items by the total value in descending order; third, calculating the percentage of the total value of each item; last, dividing products into three groups according to certain classification criteria.

2.7.1 Inventory Control Characteristics in each class

Following is the guideline for inventory control in each class in order to get the benefits either in operation or cost saving.

1. Group A

- 1.1 Need to have tight inventory control
- 1.2 Record all activities, especially high value item
- 1.3 Report status and movement to senior manager
- 1.4 Ordering and picking activities should be recorded
precisely
- 1.5 Accurate forecasting
- 1.6 Strictly monitor
- 1.7 Safety Stock level should be stocked properly and should
not be out of stock.
- 1.8 Always follow-up supplier for on time delivery
- 1.9 Use appropriate technique to set the inventory policy

2. Group B

- 2.1 Ordering frequency is less than group A.
- 2.2 Periodic monitoring such as every 3-4 months, which are
set by q senior manager

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2.3 Mostly use EOQ (Economic Order Quantity) method

3. Group C

3.1 Low value, but has many inventories

3.2 The controlling is not too much strict and use easy method.

3.3 Monitor and check twice per year or once a year

3.4 Mostly use Two-Bin method.

For made to order company, inventory management is to manage the inventory to meet customer demand. Thus, for the inventory management, the entrepreneur should know when to order and how much to order.

2.8 Economic Order Quantity

According to Heizer and Render (2005), Economic Order Quantity (EOQ) is the order quantity that minimizes the total cost including ordering cost and holding cost, which are inversely related to each other. Inventory holding cost increases along with the higher order quantity. This also means that the ordering cost declines, if ordering frequency decreases. A smaller order quantity results in a lower holding cost. In contrast, a higher ordering cost occurs when the company increases ordering frequency. The behavior of the two costs is shown in Figure 2.3.

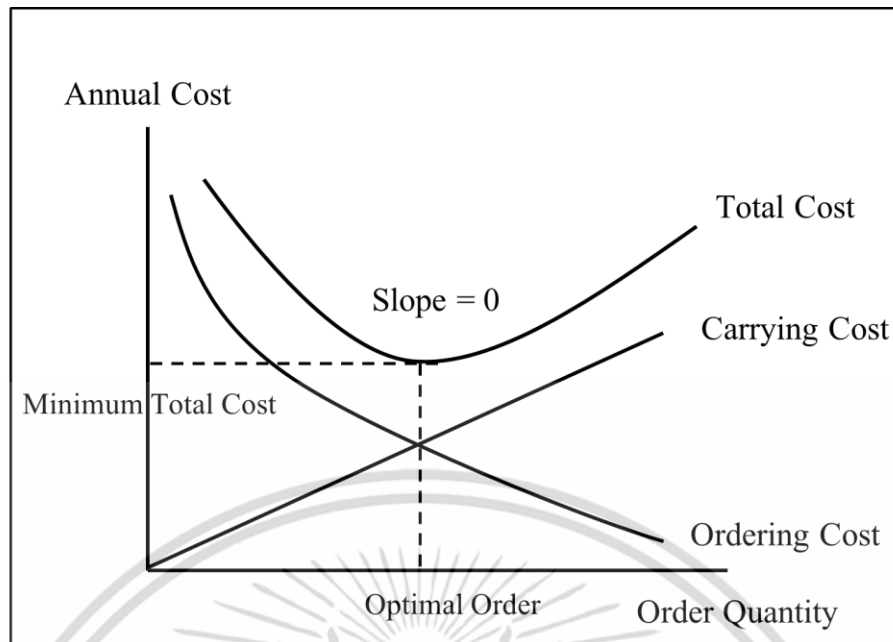


Figure 2.3 EOQ Model

The underlying assumptions for the EOQ formula are as follows:

1. The demand is constant and demand rate for the year is known.
2. The lead time does not fluctuate.
3. The ordering and holding cost remain constant.
4. The order is delivered in the right quantity and there is no delay in replenishment of the stock.
5. No discount is available.
6. Price per unit is constant for every raw material.

According to Heizer and Render (2005), the EOQ formula is used to calculate the optimal order quantity that can be purchased to minimize the ordering and holding costs. The variables can be defined as below:

- Q = Optimal order quantity
D = Unit of annual demand
P = Ordering cost per time

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$$H = \text{Annual per unit carrying cost}$$

The annual ordering cost is computed by multiplying the cost per order with the number of ordering per year as given by (2.2)

$$\begin{aligned} \text{Annual ordering cost} &= \text{Number of ordering per year} \times \text{ordering cost per time} \\ &= (\text{Annual demand} / \text{Order quantity per time}) \times \text{ordering cost per time} \\ &= \frac{Q}{2}H \end{aligned} \quad (2.2)$$

The annual holding cost is computed by multiplying the annual per unit holding cost with the average annual inventory level as given by (2.3)

$$\begin{aligned} \text{Annual holding cost} &= \text{Average annual demand} \times \text{annual per unit holding cost} \\ &= (\text{Order quantity} / 2) \times \text{annual per unit holding cost} \\ &= \frac{Q}{2}H \end{aligned} \quad (2.3)$$

The point where the holding cost curve intersects the ordering cost curve is where the optimal order quantity occurs. It can determine the optimal value of Q by equating the holding and ordering cost formula as given by (2.4)

$$\frac{D}{Q}P = \frac{Q}{2}H \quad (2.4)$$

After that, determine the optimal order quantity by using EOQ formula as follows:

$$\begin{aligned} 2DP &= Q^2H \\ Q^2 &= \frac{2DP}{H} \\ Q &= \sqrt{\frac{2DP}{H}} \end{aligned} \quad (2.5)$$

2.9 Reorder Point

Reorder point (ROP) is a minimum amount of raw material that the company holds in stock. When the stock decreases to this amount, the raw material must be reordered to replenish the stock. Reorder point is used to determine when to order.

The lead time and average demand rate are the factors that determine the suitable reorder point under 4 situations as follows:

1. Average demand rate is constant, it is the situation that no risk of stock-out due to the constant of demand and lead time.

$$ROP = d \times LT \quad (2.6)$$

Where d = Demand rate

LT = Lead time

2. Average demand rate is inconstant and lead time is constant. It is the situation that the stock-out may occur due to the fluctuation in demand. Therefore, it needs to determine safety stock that held as a protection against stock-out.

$$ROP = (\bar{d} \times LT) + z\sqrt{L(\sigma_d)} \quad (2.7)$$

Where d = Average demand rate

LT = Lead time

Z = Service level

σ_d = Standard deviation of average demand rate

3. Average demand rate is constant. The lead time is inconstant and the lead time has a normal distribution.

$$ROP = (d \times \bar{LT}) + z\sigma_{LT} \quad (2.8)$$

Where

d = Demand rate

\bar{LT} = Average lead time

Z = Service level

σ_{LT} = Standard deviation of average demand rate

4. Average demand and lead time are fluctuating and distribution of demand and lead time are normal.

$$ROP = (d \times \bar{L}) + z\sqrt{\bar{L}\sigma_d^2 + \bar{d}^2\sigma_L^2} \quad (2.9)$$

Where

d = Demand rate

\bar{LT} = Average lead time

Z = Service level

σ_{LT} = Standard deviation of average demand rate

σ_d = Standard deviation of average demand rate

2.10 Safety Stock

Safety stock is the additional quantity of materials that the company held in

inventory in order to protect against stock-out and uncertainties in demand. Safety

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stock is used when the quantity of raw material decreases to the reorder point (ROP). For computing the safety stock, there are many factors have to be considered as follows:

1. Service Level

Service level can be defined as the probability that demand will not exceed supply during lead time. It is the desired probability of no stock-out. If service level is set as high, the safety stock is high as well. The holding cost is higher because of the higher in safety stock.

2. Inventory management policy

If the quantity of ordering is constantly set, determining the safety stock is the way to protect against stock-out due to fluctuating demand.

3. Variability of demand

Because of fluctuating demand, the variability of demand can be measured by the standard deviation of demand. If it is high, there is a possibility of higher of stock-out. In order to cope with a stock-out, high level of safety stock should be prepared.

4. Variability of lead time

If the lead time does not vary, the order will be received on time and no inventory on hand. If the lead time varies, the risk of stock-out is high.- Therefore, a high level of safety stock should be prepared.

Hence, Safety stock is computed by (2.10)

$$SS = z \sqrt{\sigma_d^2 LT + \sigma_{LT}^2 \bar{d}^2} \quad (2.10)$$

Where SS = Safety stock level
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- \bar{LT} = Average lead time
 \bar{d} = Average demand
 Z = Service level
 σ_{LT} = Standard deviation of average demand rate
 σ_d = Standard deviation of average demand rate

And

$$\bar{LT} = \frac{1}{N} \sum_{i=1}^n LT_i \quad (2.11)$$

$$\bar{d} = \frac{1}{N} \sum_{i=1}^n d_i \quad (2.12)$$

$$\sigma_{LT}^2 = \frac{1}{N} \sum_{i=1}^n (LT_i - \bar{LT})^2 \quad (2.13)$$

$$\sigma_d^2 = \frac{1}{N} \sum_{i=1}^n (d_i - \bar{d})^2 \quad (2.14)$$

Determining the safety stock has an effect on the total inventory cost formula.

It has to cover the carrying cost of safety stock as well.

2.11 Variability Coefficient

According to the limitations of Economic Order Quantity model, it can be used when the demand is constant. Variability Coefficient (VC) was developed by Silver and Peterson (1985) and is used to measure the fluctuation of demand. It examines whether the demand is constant enough to use EOQ model or not as given by (2.15).

$$VC = \frac{\text{Est.var } D}{\bar{d}^2} \quad (2.15)$$

$$\bar{d} = \frac{1}{n} \sum_{i=1}^n d_i \quad (2.16)$$

$$\text{EST. VAR D} = \left(\frac{1}{n} \sum_{i=1}^n d_i^2 \right) - \bar{d}^2 \quad (2.17)$$

Where d_i = Demand in each period
 n = Research period

According to (2.15), if the variability coefficient is less than 0.20, it means that the demand is constant and can use the EOQ model to calculate the optimal order quantity. If the variability coefficient is more than 0.20, it means that the demand is inconstant and cannot use the EOQ model to calculate the optimal order quantity.

2.12 Heuristic Method

For the variability coefficient test of demand, if the result is equal to 0.20, this means that the demand is inconstant and the EOQ model cannot be used to calculate the optimal order quantity. There is another method to find the optimal order quantity which is heuristic method. Heuristic method has three techniques as follows:

1. Silver-Meal

Silver Meal (SM) method is used for determining the order quantity of the demand in advance (m) for each period. It aims to find the order quantity which has the lowest cost in total period for advance purchase (m-period). The variable costs are ordering cost and holding cost. When the demand in each period is D_1, D_2, \dots, D_m and $K(m)$ and equal to the average variable cost in total period. It assumes that holding cost will occur after the end of each period (Silver and Meal, 1973). If the order quantity is D_1 in order to meet the customers' demand in period 1, the variable cost can be computed by using (2.18) as follows:

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$$K(1) = A \quad (2.18)$$

Where $A =$ Ordering cost

If the order quantity is $D_1 + D_2$ in order to meet the customers' demand in period 1 and period 2, the variable cost can be computed by using formula (2.19) as follows:

$$K(2) = \frac{1}{2}(A+hD_2) \quad (2.19)$$

Where $A =$ Ordering cost
 $H =$ Per-unit holding cost in each period

Thus, the variable cost of all periods can be computed by following formula:

$$K(m) = \frac{1}{m}(A+hD_2+2hD_3+\dots+(m-1)hD_m) \quad (2.20)$$

Compute $K(m)$ continuously from $m = 1, 2, \dots, m$ and stop computing when the variable cost increases.

The ordering quantity is the sum of demand in the period, which the variable cost in each period still does not increase from the previous period. So, the ordering quantity of period 1 can be computed by (2.21) as follows:

$$Q_1 = D_1 + D_2 + \dots + D_m \quad (2.21)$$

After that, calculate other period (m+1) as above method to the end of the study period.

2. Lease Unit Costing

Lease Unit Costing (LUC) method is similar to Silver-Meal method, but the average variable cost per unit is considered in the lease unit costing instead of average of cost per period. Where $K'(m)$ is the average variable cost per unit in total m period.

Thus, if the ordering quantity is D_1 for responding the customer need in period 1, the variable cost can be computed by using (2.22) as follows:

$$K'(1) = \frac{A}{D_1} \quad (2.22)$$

Where $A =$ Ordering cost

If the ordering quantity is $D_1 + D_2$ for responding the customer need in period 1 and period 2, the variable cost can be computed by using (2.23) as follows:

$$K'(2) = \frac{(A+hD_2)}{D_1 + D_2} \quad (2.23)$$

Where $A =$ Ordering cost

$H =$ Holding cost per each period

Thus, the total variable cost can be computed by using (2.24) as follows:

$$K'(m) = \frac{(A+hD_2+2hD_3+\dots+(m-1)hD_m)}{D_1+D_2+\dots+D_m} \quad (2.24)$$

Compute $K'(m)$ continuously from $m = 1, 2, \dots, m$ and stop computing when the variable cost increases.

$$K'(m+1) > K(m)$$

The ordering quantity is the sum of demand in the period, which the variable cost in each period still does not increase from the previous period. So, the ordering quantity of period 1 can be computed by using (2.25) as follows:

$$Q_1 = D_1 + D_2 + \dots + D_m \quad (2.25)$$

After that, it needs to calculate other period ($m+1$) as above method until the end of the study period as Silver-Meal method. Limitation of either Lease Unit Cost or Silver-Meal method is the consideration in demand in one period. Thus, the variable cost per period and the variable cost per unit are different in each study period.

3. Part Period Balancing

Part Period Balancing (PPB) is the method to determine lot size by attempting to decrease total variable costs in all periods to the lowest. Part Period

Balancing tries to make ordering cost equal to holding cost. It is used when one part is

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stored for one period. If 10 parts are stored in 1 period, it is equal to 10 part periods or equal to 5 parts are stored in 2 periods.

$$PP_1 = 0$$

$$PP_2 = D_2$$

$$PP_3 = D_2 + 2D_3$$

$$PP_m = D_2 + 2D_3 + \dots + (m-1)D_m \quad (2.26)$$

Where

PP_m = Part period of m period

Thus, holding cost is equal to $h(PP_m)$ and selects the period that the holding cost is the closet to the ordering cost.

$$A = h(PP_m) \quad (2.27)$$

Or

$$(PP_m) = \frac{A}{h} \quad (2.28)$$

The equation (2.28) is stopping rule which $\frac{A}{h}$ is called the economic part period factor. The ordering quantity can be computed by (2.29) as follows:

$$Q_1 = D_1 + D_2 + \dots + D_m \quad (2.29)$$

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After that, calculate other period (m+1) as above method to until the end of the study period. Moreover, Part Period Balancing method is also known as Least Total Cost method (LTC).

2.13 Inventory Management System

To manage inventory under the fluctuation of demand, the company needs to know status of inventory in order to manage and plan. This is to ensure that items are available when they are needed and can meet customer's need at the right time, at the right quantity and in the right cost because ordering quantity has an effect to holding and ordering costs.

Inventory management system can divide into four different levels of management as follows:

1. Order Point and Order Quantity System (s, Q)

Order Point and Order Quantity System is a continuous inventory review. Order quantity in each time is Q unit which is the constant order quantity. When the inventory decreases and reaches to the reorder point (s) or lower, level of inventory is equal to actual inventory quantity – demand + safety stock during lead time. This inventory controlling system is known as Two-Bin System, because inventory will be kept in two bins. Replenished inventory will be ordered when first bin is out of inventory. While waiting for replenished inventory, inventory in second bin will be used. After new inventory arrives, second bin will be replenished first and the rest will be fulfilled in first bin as shown in Figure 2.4.

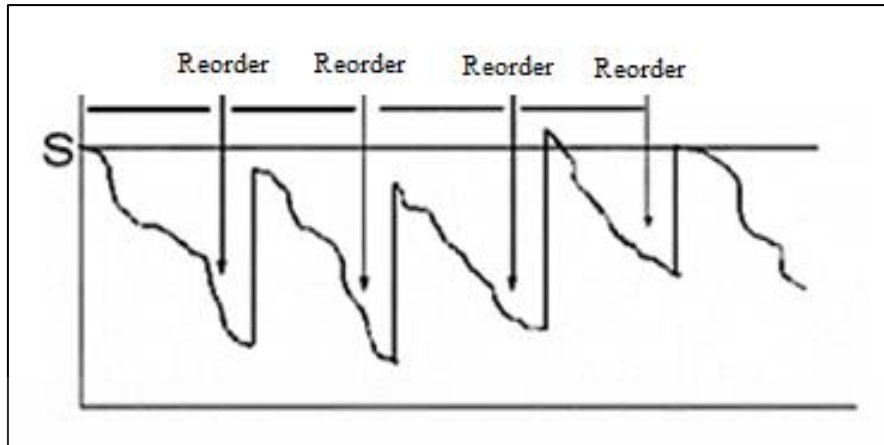


Figure 2.4 Order Point and Order Quantity System

2. Order Point, Order Up-to-Level System, (s, S)

This system is used for inventory management which is controlled consistently same as the re-order point and ordering quantity system which make order when the inventory reaches the ordering point or lower. This system is different from re-order point and ordering quantity system. The replenished inventory is always changes. Thus, ordering will increase from inventory level to ordering point (s) and demand for inventory occurs when inventory is equal (s) so that : $S = s + Q$.

This system is also known as Min-Max system. It is a system for additional order which sets a minimum quantity of goods (s) to be ordering point and maximum quantity of goods level to be additional order. Therefore, ordering quantity will not be constant. Level of inventory will be lower than ordering point where is between a lowest level s and highest level S as shown in the Figure 2.5.

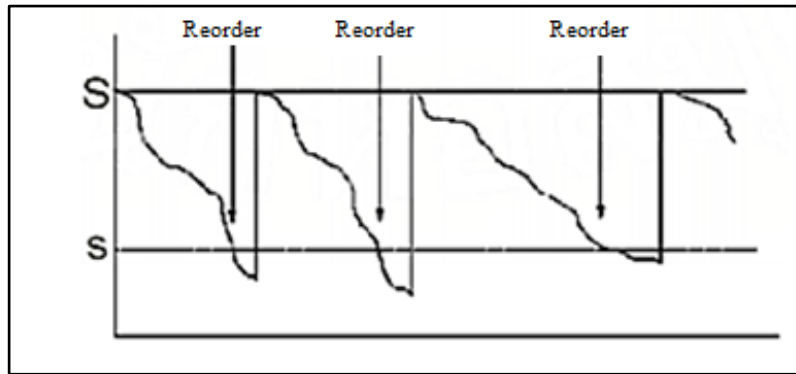


Figure 2.5 Order Point, Order Up-to-Level System, (s, S)

3. Periodic Review, Order Up-to-Level System (R, S)

This system could be called that Replenishment Cycle System. It is a system that determines a period of considering the inventory and equal duration. Order will increase from actual level of inventory to ordering level (S). Therefore, to consider level of inventory at the period of time (R) will be order at the different level between highest goods quantity (S), and inventory level meanwhile procurement process is shown in the Figure 2.6.

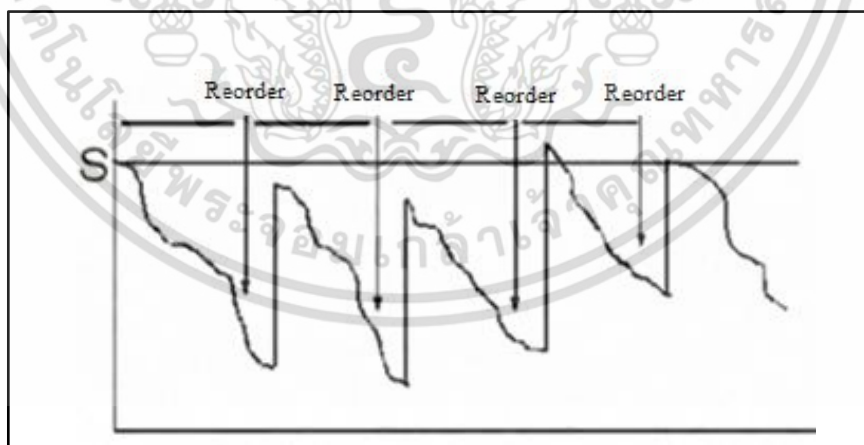


Figure 2.6 Periodic Review, Oder Up-to-Level System (R, S)

4. Combination System (R, s, S)

This system is to combine ordering amount, ordering point system, periodic review system, and level of order together where system will check inventory level in every period R. In case of level of inventory is equal or less than ordering point (s), inventory will not be ordered until next time.

2.14 FIFO and LIFO

1. First In First Out

First In First Out (FIFO) is the method to measure cost of inventory by using assumption that goods or materials which are purchased first, needed to bring out or sale first. First in First out is a normal concept of selling that company needs to sale or use the old one first. Therefore, cost of first in materials will be the same as cost of first product of production in the first in first out system.

2. Last In First Out

Last In First Out (LIFO) means goods or materials that come in lastly, and will be brought out first. Those materials are expired goods or chemical products. Last in first out is the system to measure cost of goods by setting assumption that goods or materials which come last it would be bring out or sale first as the LIFO system. Cost of last in inventory it will be cost of first out product of production. Cost of goods by using LIFO shown the cost of goods is the same price in current market.

2.15 Related Researches

The study of Nuttapol & Thananya (2006) attempted to improve the performance of controlling raw material in stock. According to their case, company did not have suitable policy for purchasing and inventory controlling. As the result, purchasing cost increased to 88.98% of overall inventory costs. So, ABC analysis was

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ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Meal heuristic were used to calculate the economic purchasing quantity. The researchers also considered about purchasing quantity, reorder point, and also safety stock. Single item and joint item were utilized by 95% of service level. From the research joint item ordering system with Silver-Meal heuristic was a better method, because it provided lowest total cost. According to the record of 2003, total cost of inventory was 202,006.16 Baht. If the company used the recommended method, the total inventory cost would be 78,863.47 Baht. Therefore, using the recommended method, it could reduce the total inventory cost by 60.96% or 123,142.69 Baht.

Abboud and Sfairy (1997) applied the classical economic order quantity – EOQ because of impact of back order and they did not charge for that. During the period of product shortage, customer had to wait for the product for a while. If a waiting time was so long, customer would be dissatisfied. The purposes of this study were to calculate appropriate level of goods when company purchased materials each time and also determine the lowest cost of back order per time.

Kim and Park (1985) purposed the heuristic method which was used to identify the reorder point for the material. This would impact to supply partially and back order.

Akinniyi, Silver and Nahmias (1981) had set level of service for the inventory. From the regulation, they set period that they expected product would be a shortage. It could be considered to be back order or lost demand for material without charge.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Company Overview

The company A was established in February, 2012. The company has an authorized capital of five million Baht. Currently, their production type is Make to Order (MTO). Most customers are regular customers who deal business with the company since the company has established. Although major customers are domestic customers, the company has other customers who are foreign companies. At the beginning, the company had not owned any machine. It needed to hire outsource to produce and label company logo. After the company had a better performance and had more tendencies to make more order the machines were purchased and the production was done by itself. Nowadays, the company has about 50-60 employees and has seven operational departments as follows; sales department, accounting department, designing department, procurement department, production department, inventory department, and delivery department. It produces the products of metal furniture and makes product as the customer's orders, including electric cabinet (Figure 3.1), server cabinet (Figure 3.2), Top Up cabinet (Figure 3.3), and shelf (Figure 3.4).



Figure 3.1 Electric cabinet

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Figure 3.2 Server Cabinet



Figure 3.3 Top-Up Cabinet



Figure 3.4 Shelf

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า ไม่ว่าจะกรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ตัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Raw materials of company are Steel (Figure 3.5), hardware (Figure 3.6) and consumables (Figure 3.7).



Figure 3.5 Steel



Figure 3.6 Hardware



Figure 3.7 Consumables

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For the inventory management, inventory of the company is divided into 3 types. First, raw materials are materials that the company uses to produce goods. Second, finished goods are the goods which are ready to serve to customers and sold in the market. Third, Work-In-Process may or may not be saleable. It is the partial process lying on the production floor. Inventory management of the company starts from customer send PO in advance for a month, and then the request will be delivered to procurement department. Procurement Department will calculate the amount of goods and goods available in the stock whether it is enough for request or not. After that it plans for raw materials, the company plans to order steel two to three days before. It transforms the unit of customer's order to be units of steel that the company needs to purchase and reserve for defective product about two percent. Then, it plans to order hardware 15-30 days before which is based on customer need. After that, it uses BOM (Bill of Material) to check raw material, whether it is enough to request and over than minimum stock or not. If it is lower than minimum stock, materials are needed to be purchased according to the amount of material and the amount of material used for production from BOM.

The main materials for production are steel and iron plates which are purchased from only one supplier, namely NHK steel Co., Ltd. Since this company is a main supplier, lead time of ordering is two to three days. The company does not have a problem of lack of material on hand and NHK also gives the credit to the company for 90 days. Because of these advantages, the company does not want to change the supplier.

For main material procurement, it will make an ordering around one to three times per month depending on how much material requirement for that month.

However, in the past, the company never evaluates the ordering cost or proper units of ordering.

Currently, the company does not have inventory management, especially for raw materials, so its operation is based on sales department's experience and procurement department's experience. This includes the amount of material procurement, frequency of procurement, and safety stock of inventory which is going to impact customer demand. Sometimes the lack of raw materials can affect to the production and so on. The current operational management is a manual method. There is no record in computer database and this can result in missing information about the movement of raw materials. Therefore, this impacts on the amount of materials in the stock.

Moreover, FIFO system has not been applied to the flow of raw materials because most of the materials are heavy steel. When employees request for raw materials, they concern only about their convenience. By doing this, the over stock problem may occur and eventually this problem leads to unnecessary expense

This research reveals the problem that found in inventory management was a high cost of inventory resulting from over purchasing of materials. This caused sunk cost and unnecessary cost of inventory management. The researcher had analyzed general information and found that high cost of inventory resulting from the improper inventory policy. The problems included overstocking of materials, insufficiency, and unsuitable duration for adding materials in stock.

3.2 Current Business Flow of the Company

The business flow of the company is depicted in Figure 3.8 .

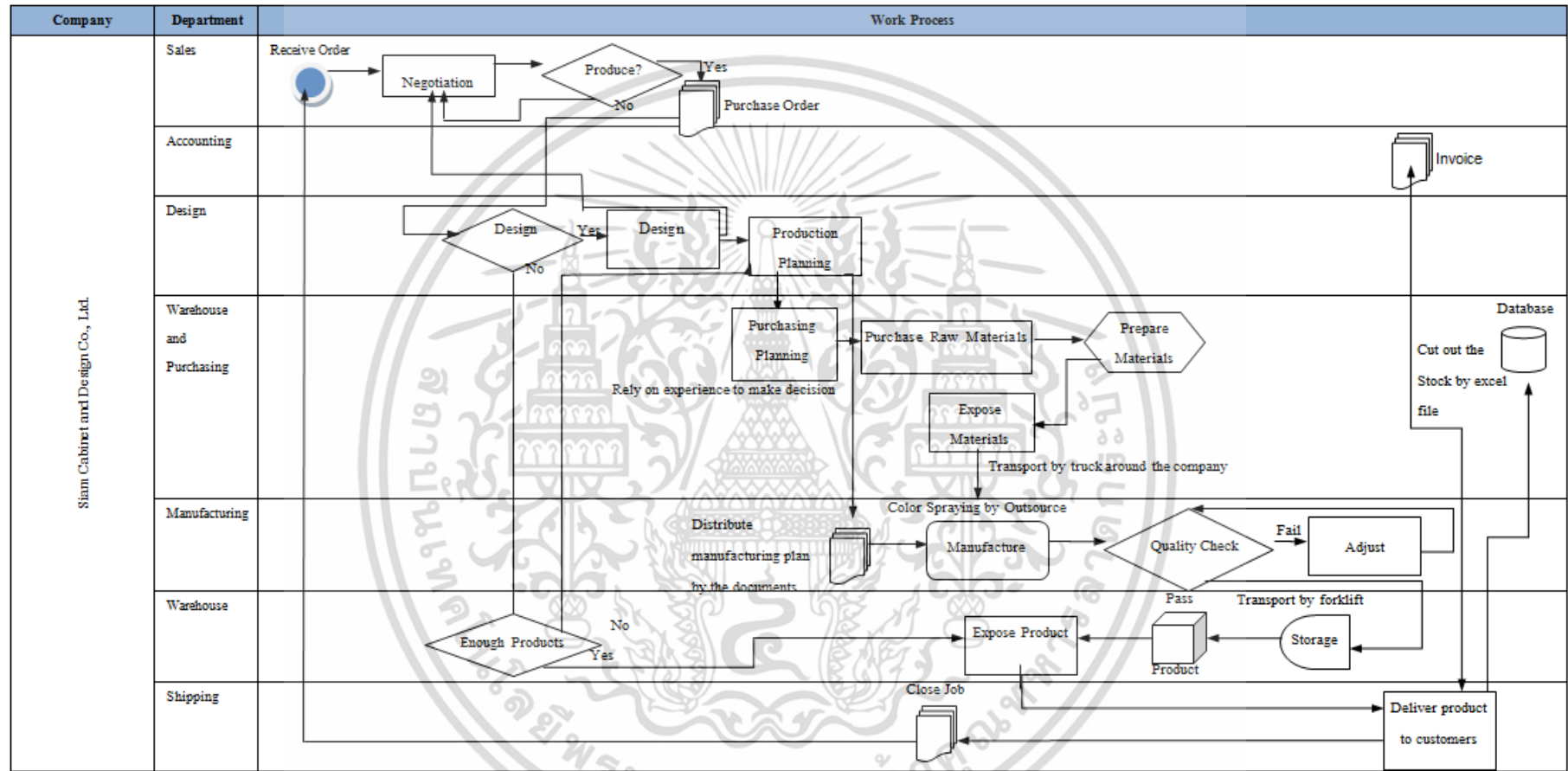


Figure 3.8 Business Process Flow

3.3 Problem Analysis Methods (Techniques or Tools)

According to the problems in this research, several tools will be used to analyze as follows:

1. Fishbone diagram will be used to analyze problems in the case study company.
2. ABC analysis will be used to categorize the importance of raw materials.
3. Total cost before proposed policy will be analyzed.
4. Proposed policy for each group

3.3.1 Problem Analysis by Using Fishbone Diagram

From the problems of the company, the researcher initially uses fishbone diagram for in-depth analysis.

1. Problem about holding cost

There is no suitable inventory management policy. The case study of the company has not calculated inventory as actual demand that is the cause of over stock. Some raw materials are used often and also have long lead time. Therefore, it is necessary to stock them. Moreover, the company lacks of dead stock policy that makes slow moving materials. For example, the boxes are still useless in the warehouse.

2. Problem about stock-out cost

Inappropriate inventory policy leads to lack of raw materials. In addition, the emergency orders make the company need to use the safety stock to produce emergency order.

3. Problem about warehouse space

The problem in the warehouse space is having many dead stock materials which are the boxes in the warehouse. The space of the warehouse is not

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used efficiently. Moreover, there is no suitable inventory management policy. Therefore, the over purchasing leads to full of space of the warehouse.

4. Problem about employees

Employees lack of responsibility and work too slow.

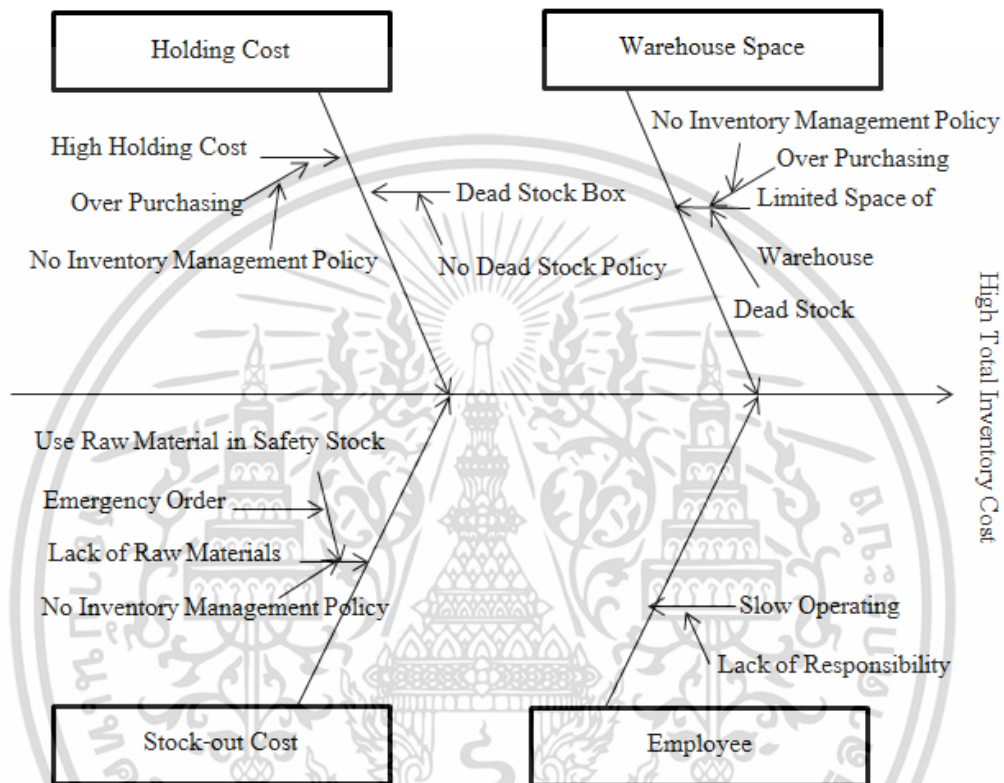


Figure 3.9 Fishbone diagram for analyze the problem and causes.

Figure 3.9 shows the causes that lead to high total inventory cost which are four main factors including holding cost, stock-out cost, warehouse space, and employee.

From Fishbone diagram, it reveals reducing inventory cost can be solved by calculating order quantity, re-order point, appropriate amount of stock and safety stock and propose dead stock policy.

3.3.2 Classification for Inventory Management by Using ABC Analysis

The next step, after analyzing the problem and causes, it is the process of classifying the importance of raw materials. To this end, each group will be emphasized precisely. After classifying the importance of materials, total cost of group A and B are needed to be analyzed. This has to be done before proposing policy.

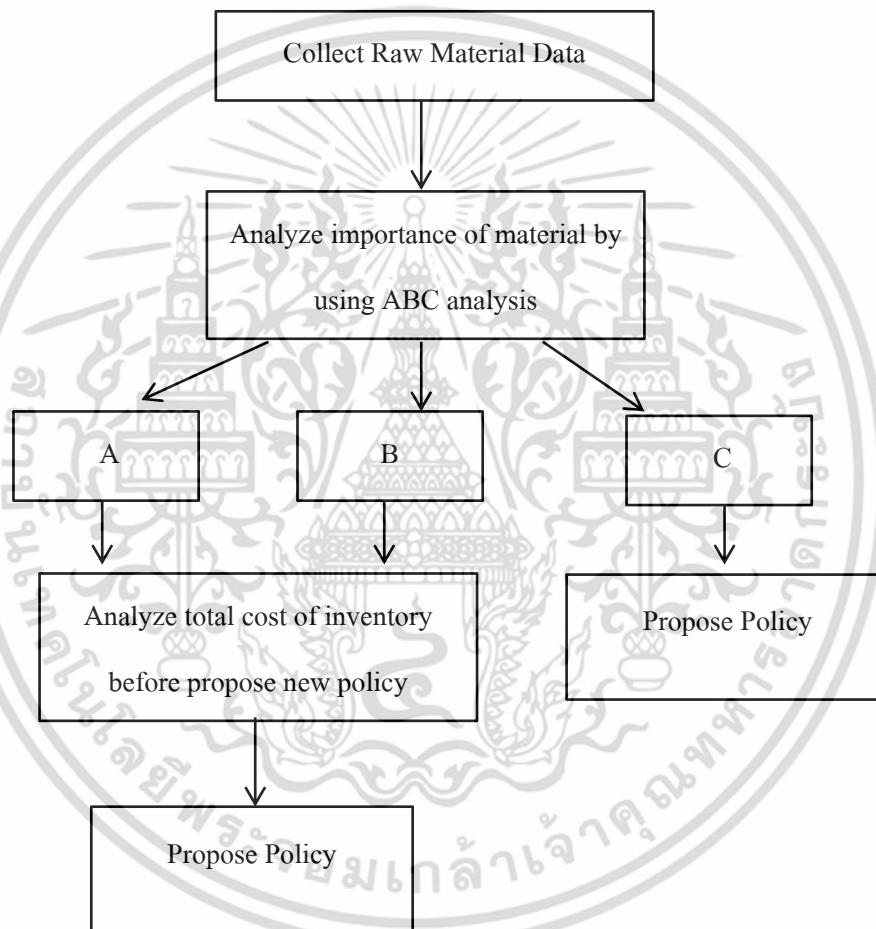


Figure 3.10 ABC Analysis

The importance of material can be classified into three groups as follows:

1. Group A is the most important material in inventory with high value and less list numbers. It accounts for almost 15-20 % of overall inventory and values approximately 75-80 % of overall inventory.

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2. Group B is a group of goods that has neutrally value. It accounts for 20-30 % of overall inventory and values about 15 % of overall inventory.

3. Group C is a low value of the product which is less valuable inventory; it is about 5-10 % of all value of stock.

3.3.3 Cost Analysis Before Proposing a Policy

To calculate total cost of inventory, all latest year costs that are related to total cost of inventory will be considered. The total cost of inventory can be calculated by (2.1) which is the previously shown in Chapter 2. For convenience, the equation is rewritten here again as (3.1).

$$TIC = \left(\frac{Q}{2} C_H\right) + \left(\frac{D}{Q} C_O\right) + S.C_H \quad (3.1)$$

Where

Q = Economic order quantity

D = Annual demand

S = Safety stock

C_H = Per-unit annual holding cost

C_O = Annual ordering cost

1. Ordering cost

Ordering cost includes procurement employee salary, telephone, paper, and internet is estimated as shown in Table 3.1.

Table 3.1 The Analysis of Ordering Cost

NO.	Activities	Detail	Cost (Baht /time)
1	Ordering	1.1 Procurement employee salary (12,000 Baht per month/ 22 Working days/ 8 hours per day/ plan to purchase and purchase materials for 30 minutes)	34.09
		1.2 Telephone	10.00
		1.3 Internet	6.00
		1.4 Paper	1.00
		Total	51.09

2. Holding Cost

Holding cost includes warehouse employee salary, interest, warehouse rental fee, electricity fee, and holding accessories. It is divided into steel holding cost, hardware, and sub-material holding cost shown as follows:

Table 3.2 The Analysis of Holding Cost

NO.	Type of Cost	Detail	Cost (Baht / piece / year)
1	Cost of steel and boxes storage		
1.1	Employee	Warehouse employee salary (12,000 baht/22 working days/8 hours per day/4 hours for checking materials/ responsible for 1,350 steel and 2,000 boxes	0.98
1.2	Storage area		
	- Warehouse	Rental fee 130,000 per month - 24.5 % of warehouse can storage 2,750 pieces of steel and 4,100 boxes	55.79
1.3	sunk cost	Interest rate 5 %	
2	Other Cost		
		Accessory (Rack, Shelf) 97,500 baht can place 2,750 (57.89%) pieces of steel and 2,000 (42.11%) boxes	20.52
		Forklift	29.10
Total			106.14

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Table 3.2 The Analysis of Holding Cost (Cont.)

NO.	Type of Cost	Detail	Cost (Baht / piece / year)
3	Cost of hardware and sub materials storage		
3.1	employee	Warehouse employee salary (12,000 baht/22 working days/8 hours per day/about 4 hours for checking materials/ responsible for 49,300 sub materials	0.06
3.2	Storage area		
	- Warehouse	Rental Fee 130,000 baht - 1.5 % of warehouse for 57,320 hardware and sub materials	0.41
		Total	0.47

For holding cost of the boxes, the boxes are materials which have high stock and also high inventory cost. Furthermore, purchasing boxes have to make an order by MOQ, and labeling of a customer's company to the boxes is needed. When the customer would like to change the company logo, it makes impact to ordered the boxes which cannot be used. Because those boxes do not protect goods, they can be easily damaged. But the company has already purchased. Therefore, dead stock occurs from the boxes and cost by 33 % of total inventory cost. Therefore, the policy as well as cost should set separately for this group. As shown in Table 3.3, it

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Table 3.3 The Analysis of Holding Cost without Box

NO.	Type of Cost	Detail	Cost (Baht / piece / year)
1	Cost of steel storage		
1.1	Employee	Warehouse employee salary (12,000 baht / 22 working days / 8 hours per day / 2 hours for checking materials / responsible for 1,350 iron plate	1.21
1.2	Storage area		
-	Warehouse	Rental fee 110,500 per month - 9.5% of warehouse can storage 2,750 steel	45.80
1.3	sunk cost	Interest rate 5 %	
2	Other Cost	Accessory (Rack, Shelf) 56,443 baht can place 2,750 pieces of steel	20.52
		Forklift	29.10
Total			96.63

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Table 3.3 The Analysis of Holding Cost without Box (Cont.)

NO.	Type of Cost	Detail	Cost (Baht / piece / year)
3	Cost of hardware and sub materials storage		
3.1	employee	Warehouse employee salary (12,000 baht/22 working days/8 hours per day/about 4 hours for checking materials/ responsible for 49,300 sub materials	0.06
3.2	Storage area		
	- Warehouse	Rental Fee 110,500 baht - 1.5 % of warehouse for 57,320 hardware and sub materials	0.35
Total			0.41

3. Stock-out Cost

Table 3.4 The Analysis of Stock-Out Cost without Box

Type of Cost	Detail	Cost (Baht / piece)
Fine	10% of product price	

*10% charge that the company makes agreement with customers

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3.3.4 Policy Proposal for Group A B C

After classifying the importance of materials, suitable policy for each group will be as follows:

1. Policy for Inventory Group A and B

The policy for raw materials in group A and B depend on the stability of demand. The stability of the demand can be calculated by variability coefficient of each raw materials' demand. Then, select suitable method for solving problems.

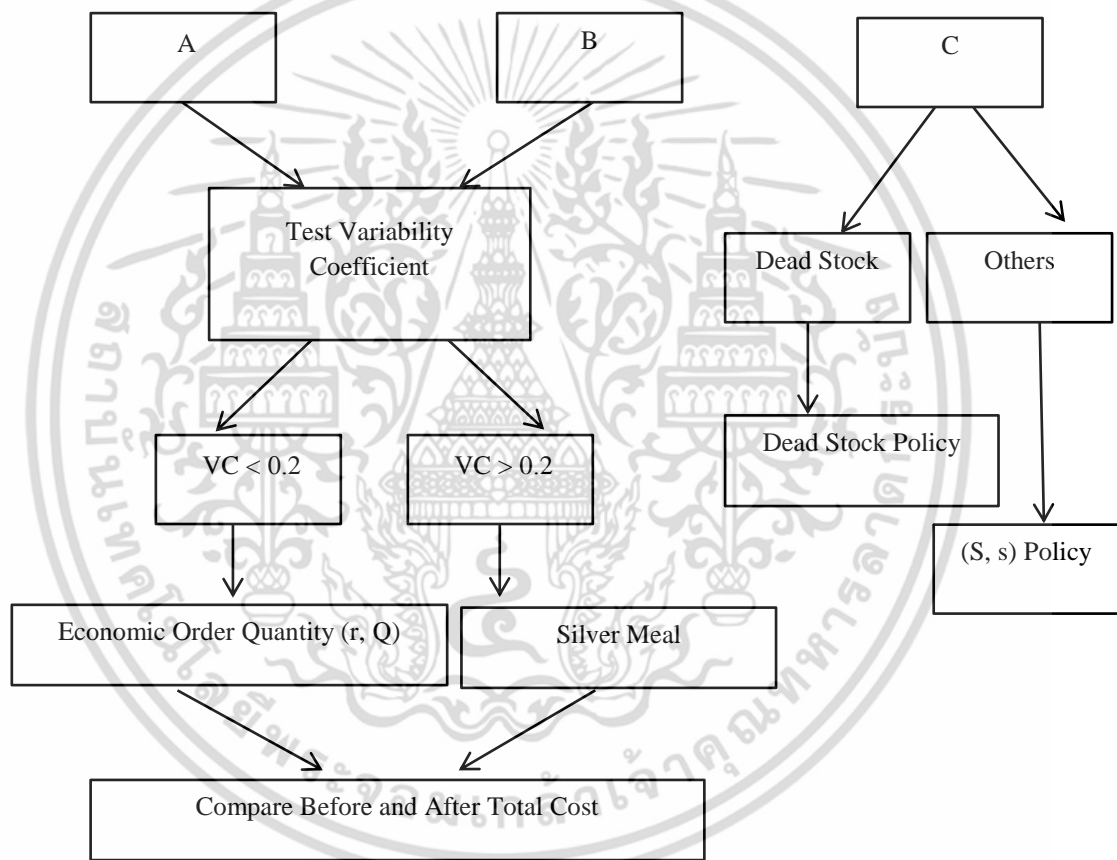


Figure 3.11 Policy for Group A and B

From Figure 3.3, EOQ method can be used when the demand is stable. It is necessary to consider about the stability of demand before using EOQ method which uses variability Coefficient testing. If the demand fluctuates, Silver-Meal method will

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be used to analyze in raw material. Variability coefficient can be calculated by using (2.15) which is formulated by Peterson and Silver (1985). For convenience the equation is rewritten here again as (3.2).

$$VC = \frac{\text{Est.var } D}{\bar{d}^2} \quad (3.2)$$

EOQ method will be an appropriate approach to use when;

1. Variability coefficient is less than 0.2. It means that the demand is stable and can use EOQ method to calculate the order quantity
2. Variability coefficient is more than 0.2. It means that the demand is unstable. Therefore, the silver-Meal method will be used to solve the problem.

After analyzing the variability coefficient in raw materials group A and B, raw materials which have variability coefficient less than 0.2 and can use EOQ method to calculate order quantity, (r, Q) policy will be used to solve the problem in this group as follows;

Q is Economic order quantity which can be determined (2.5). It is rewritten here again as (3.3).

$$Q = \sqrt{\frac{2DP}{H}} \quad (3.3)$$

Where

EOQ = Order quantity

D = Demand

P = Ordering cost / time

H = Holding cost per unit per year

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r is Re-Order point which Lead Time and Demand of each material are unstable. Therefore, it can be calculated from (2.9). It is rewritten here again as (3.4).

$$ROP = \bar{d} \times \bar{L} + z \sqrt{\bar{L} \sigma_d^2 + \bar{d}^2 \sigma_L^2} \quad (3.4)$$

Where

\bar{d} = Average demand

\bar{L} = Average Lead Time

Z = Service Level (95%)

σ_L = Standard deviation of Lead Time

σ_d = Standard deviation of demand

For raw materials that have Variability coefficient more than 0.2, the silver-meal method will be used to solve the problem. The silver-meal method is the method that formulates ordering by estimating demand in each period in advance which aims to find an appropriate order quantity that have lowest ordering and holding costs as previously mentioned in Chapter 2.

2. Policy for Inventory Group C

Because raw materials in group C are least important such as sub material, boxes and glove. If this group is strictly controlled, it will make unnecessary expense. But, the total inventory cost in group C is higher than group A and B because of slow moving boxes. Although the boxes have low price per unit, they have very high holding cost. They are also dead stock. It is the result of over purchasing and it is useless. Because customers have changed the brand logo, which are unlike

what they have purchased before. There are some leakages in the roof top of the warehouse. Therefore, the dead stock policy will be used in this kind of raw materials.

For other raw materials in group C, (S, s) policy will be used to solve the problem by setting the maximum holding quantity (S) from available space in warehouse that the company sets by themselves and calculates the minimum holding quantity or safety stock (s). After that Two Bin system and visual control will be used to monitor first in first out method.

The safety stock can be calculated from (2.10) and for convenience it is rewritten here again as (3.5).

$$S = z\sqrt{\bar{L}\sigma_d^2 + \bar{d}^2\sigma_L^2} \quad (3.5)$$

Where

\bar{d} = Average demand

\bar{L} = Average lead time

Z = Service level (95%)

σ_L = Standard deviation of lead time

σ_d = Standard deviation of demand

CHAPTER 4

RESULTS

4.1 ABC Classification Results

From the finding of raw materials of the company, ABC classification could be used to categorize the importance of 167 raw materials based on the value of each raw material and percentage of inventory value. The example of calculating the value of raw materials and percentage of inventory value is shown as Table 4.1 and Table 4.2, respectively.

Table 4.1 Example of Calculation of Value of Inventory

Raw Material	Demand (Unit)	Price per Unit (Baht)	Value of Raw Material (Baht)
EG/SECC 1.0x1219x2438	5,720	559	= Demand x Price per Unit = 5,720 x 559 = 3,196,593 Baht

Table 4.2 Example of Calculation of Percentage of Inventory Value

Raw Material	Demand (Unit)	Price per Unit (Baht)	Percentage of Inventory Value
EG/SECC 1.0x1219x2438	3,196,593	18,162,388	$= \frac{\text{Value of Raw Material}}{\text{Total value of Inventory}} \times 100$ $= \frac{3,196,583}{18,162,388} \times 100$ $= 17.60\%$

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับใช้ภายในเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้เผยแพร่ไปใช้ประโยชน์ด้านการศึกษา
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Following the same method shown above, the researcher could classify the importance of 167 raw materials into group A, B and C as follows:

1. Raw Materials in Group A

Group A items have high value and a few amount of inventory. There are only 13 items out of 167 items from total raw materials. These 13 items have high values which account about 79.04 %. Therefore, it is necessary to have a tight control and closer watch due to high value. The raw materials in group A are shown in Table 4.3.



Table 4.3 Raw Materials in Group A

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
1	EG / SECC 1.0x1219x2438	5,720.00	558.85	3,196,593.40	17.60%	17.60%	A
2	EG / SECC 1.2x1219x2438	4,472.00	675.96	3,022,870.76	16.64%	34.24%	
3	SPCC 3.2 x 1219 x 1630	1,024.00	1,219.20	1,248,460.80	6.87%	41.12%	
4	EG / SECC 2.0x1219x2438	1,036.00	1,127.00	1,167,572.00	6.43%	47.55%	
5	EG / SECC 1.5x1219x2111	1,240.00	731.33	906,843.00	4.99%	52.54%	
6	EG / SECC 1.5x1219x2235	1,084.00	773.47	838,436.06	4.62%	57.16%	
7	EG / SECC 0.8x1219x2438	1,572.00	469.04	737,337.17	4.06%	61.22%	
8	Key PL-A301-1	3,640.00	180.00	655,200.00	3.61%	64.82%	
9	AL 1.0x1219x2438	724.00	890.00	644,360.00	3.55%	68.37%	
10	EG / SECC 1.5x1219x2438	740.00	845.25	625,485.00	3.44%	71.81%	
11	Cagenut M6 White Zinc	130,892.00	2.50	327,230.00	1.80%	73.62%	
12	SPCC 0.7 x 1219 x 2438	1,180.00	429.35	506,633.00	2.79%	76.41%	
13	EG / SECC 1.5x1219x2077	660.00	723.73	477,661.80	2.63%	79.04%	

Table 4.4 Raw Materials in Group B

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
1	EG / SECC 1.5x1219x2200	576.00	761.46	438,600.96	2.41%	2.41%	B
2	GI / SEGG 0.6x1219x2438	528.00	434.00	229,152.00	1.26%	3.68%	
3	GI / SEGG 1.2x1219x2438	252.00	863.10	217,501.20	1.20%	4.87%	
4	Key/ 212	4,800.00	31.00	148,800.00	0.82%	5.69%	
5	Clip	36,180.00	4.10	148,338.00	0.82%	6.51%	
6	EG / SECC 1.5x1219x1677	252.00	582.37	146,755.98	0.81%	7.32%	
7	Screw/JT U M6*12 Zinc	310,600.00	0.42	130,452.00	0.72%	8.04%	
8	Key/ 399	3,976.00	31.00	123,256.00	0.68%	8.72%	
9	Ball Bearing Slide 18" (S48) SV-3118	400.00	305.00	122,000.00	0.67%	9.39%	
10	Hinge Rack Plastic Grey+White SV-8201	7,912.00	15.00	118,680.00	0.65%	10.04%	
11	White Glove	2,120.00	53.00	112,360.00	0.62%	10.66%	

Table 4.4 Raw Materials in Group B (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
12	Stud weld M6*10	162,240.00	0.68	110,323.20	0.61%	11.27%	B
13	Spong Cushion	11,860.00	8.75	103,775.00	0.57%	11.84%	
14	Wheel 19" GERMANY EXPORT RACK 2"(Interlink)	1,088.00	88.00	95,744.00	0.53%	12.36%	
15	Black Hinge M6 (CCTV)	7,280.00	13.00	94,640.00	0.52%	12.89%	
16	Cable Management /G7-06002,G7-06003	8,000.00	11.40	91,200.00	0.50%	13.39%	
17	Carton/Fix Shelf 48 CM./G7-02045 446x480x32 mm.	4,224.00	19.80	83,635.20	0.46%	13.85%	
18	SPCC 3.2 x 1219 x 2438	40.00	2,034.18	81,367.20	0.45%	14.30%	
19	Stud weld M4*15	188,640.00	0.43	81,115.20	0.45%	14.74%	
20	Mask	2,400.00	30.00	72,000.00	0.40%	15.14%	

2. Raw Materials in Group B

Group B items are shown in Table 4.4. They are materials which have moderate value of all inventories. There are 20 items of all inventories. This group values 15.14% of total inventory value. The value does not depend on the amount of demand, but relies on the price per units.

3. Raw Materials in Group C

This is a group of materials which have a low value in inventory. There are 134 items. The calculation shows that materials in group C have the lowest value comparing to group A and group B which accounts for 5.77 % of total inventory value. Although this group has the largest amount of units, it has the lowest value as shown in Appendix A.

From the result of ABC Classification, group A have 13 items with a value of 14,354,682.99 Baht or 79.04%. Group B have 20 items with a value of 2,749,695.94 Baht or 15.14 %, and group C have 134 items with a value of 1,058,009.36 Baht or 5.77 %, respectively.

Table 4.5: Result of Model ABC Classification

Group	Quantity (Unit)	Total Value of Inventory (Baht)	%Accumulate of Inventory Value
A	13	14,354,682.99	79.04%
B	20	2,749,695.94	15.14%
C	134	10,660.61	5.77%

4.2 Variability Coefficient Testing in Raw Materials Group A and B

After identifying the importance of raw materials, it is necessary to test the variability coefficient of group A and B to determine the fluctuation of demand. It aims to find the suitable policy for each material which can be calculated as follows:

Table 4.6 Example of Calculation of Variability Coefficient

Raw Material	\bar{d} (Unit)	Est.Var D	Variability Coefficient	Method
EG/SECC 1.0x1219x2438	$\bar{d} = \frac{1}{n} \sum_{i=1}^n d_i$ $= 476.67$	$\left(\frac{1}{n} \sum_{i=1}^n d_i^2 \right) - \bar{d}^2$ $= 17,184.22$	$VC = \frac{\text{Est.var D}}{\bar{d}^2}$ $= \frac{17,184.22}{227,211.11}$ $= 0.08$	EOQ

Following the same method shown above, the variability coefficient for a selecting suitable method for each raw materials can be found as shown in Table 4.7.

It is seen that raw materials in class A and B have variability coefficient less than 0.2. There are 18 items from 33 items. Therefore, EOQ policy will be used for this group. Silver-Meal method will be used for items that have variability coefficient more than 0.2.

Table 4.7 Result of Variability Coefficient Testing

No.	List	Demand (Unit)	Average of Demand	Average of demand square	Est. Var D	VC	Method for solving
1	EG / SECC 1.0x1219x2438	5,720.00	476.67	227,211.11	17,184.22	0.08	EOQ
2	EG / SECC 1.2x1219x2438	4,472.00	372.67	138,880.44	23,307.56	0.17	EOQ
3	SPCC 3.2 x 1219 x 1630	1,024.00	85.33	7,281.78	2,358.22	0.32	Silver-Meal
4	EG / SECC 2.0x1219x2438	1,036.00	86.33	7,453.44	267.56	0.04	EOQ
5	EG / SECC 1.5x1219x2111	1,240.00	103.33	10,677.78	1,317.56	0.12	EOQ
6	EG / SECC 1.5x1219x2235	1,084.00	90.33	8,160.11	1,336.22	0.16	EOQ
7	EG / SECC 0.8x1219x2438	1,572.00	131.00	17,161.00	16,274.00	0.95	Silver-Meal
8	Key PL-A301-1	3,640.00	303.33	92,011.11	6,688.89	0.07	EOQ
9	AL 1.0x1219x2438	724.00	60.33	3,640.11	296.22	0.08	EOQ
10	EG / SECC 1.5x1219x2438	740.00	61.67	3,802.78	2,768.22	0.73	Silver-Meal
11	Cagenut M6 White Zinc	130,892.00	10,907.67	118,977,192.11	3,175,259.56	0.03	EOQ
12	SPCC 0.7 x 1219 x 2438	1,180.00	98.33	9,669.44	4,457.56	0.46	Silver-Meal
13	EG / SECC 1.5x1219x2077	660.00	55.00	3,025.00	2,466.67	0.82	Silver-Meal

Table 4.7 Result of Variability Coefficient Testing (Cont.)

No.	List	Demand (Unit)	Average of Demand	Average of demand square	Est. Var D	VC	EOQ Policy Status
14	EG / SECC 1.5x1219x2200	576.00	48.00	2,304.00	434.00	0.19	EOQ
15	GI / SEGG 0.6x1219x2438	528.00	44.00	1,936.00	1,360.67	0.70	Silver-Meal
16	GI / SEGG 1.2x1219x2438	252.00	21.00	441.00	298.67	0.68	Silver-Meal
17	Key/ 212	4,800.00	400.00	160,000.00	320,000.00	2.00	Silver-Meal
18	Clip	36,180.00	3,015.00	9,090,225.00	216.67	0.00	EOQ
19	EG / SECC 1.5x1219x1677	252.00	21.00	441.00	122.00	0.28	Silver-Meal
20	Screw/JT U M6*12 Zinc	310,600.00	25,883.33	669,946,944.44	32,720,022.22	0.05	EOQ
21	Key/ 399	3,976.00	331.33	109,781.78	58,043.56	0.53	Silver-Meal
22	Ball Bearing Slide 18" (S48) SV-3118	400.00	33.33	1,111.11	2,222.22	2.00	Silver-Meal
23	Hinge Rack Plastic Grey+White SV-8201	7,912.00	659.33	434,720.44	236,080.89	0.54	Silver-Meal
24	White Glove	2,120.00	176.67	31,211.11	422.22	0.01	EOQ
25	Stud weld M6*10	162,240.00	13,520.00	182,790,400.00	10,547,466.67	0.06	EOQ
26	Spong Cushion	11,860.00	988.33	976,802.78	88,869.56	0.09	EOQ

Table 4.7 Result of Variability Coefficient Testing (Cont.)

No.	List	Demand (Unit)	Average of Demand	Average of demand square	Est. var D	VC	EOQ Policy Status
27	Wheel 19" GERMANY EXPORT RACK 2"(Interlink)	1,088.00	90.67	8,220.44	366.22	0.04	EOQ
28	Black Hinge M6 (CCTV)	7,280.00	606.67	368,044.44	26,755.56	0.07	EOQ
29	Carton/Cable Management /G7-06002,G7-06003	8,000.00	666.67	444,444.44	648,888.89	1.46	Silver-Meal
30	Carton/Fix Shelf 48 CM./G7-02045 446x480x32 mm.	4,224.00	352.00	123,904.00	21,600.00	0.17	EOQ
31	SPCC 3.2 x 1219 x 2438	40.00	3.33	11.11	22.22	2.00	Silver-Meal
32	Stud weld M4*15	188,640.00	15,720.00	247,118,400.00	8,332,800.00	0.03	EOQ
33	Mask	2,400.00	200.00	40,000.00	3,266.67	0.08	EOQ

4.3 Result of Total Cost Before Purposing a Policy

To calculate total cost of inventory, the inventory quantity, ordering cost, holding cost and shortage cost are needed to be examined.

4.3.1 Calculation of holding cost

Holding cost can be computed by multiplying the annual per unit holding cost and interest with the inventory quantity as (2.3) and also includes the holding cost of safe stock as Table 4.8.

Table 4.8 Example of Calculation of Holding Cost

Raw Material	Holding Cost per Unit (Baht)	Interest (Baht)	Average Annual Demand (Unit)	Holding Cost (Baht)
AL 1.0x1219x2438	96.63	44.50	84	$= (\text{Holding Cost per Unit} + \text{Interest}) \times \text{Inventory Quantity}$ $= (96.63 + 44.50) \times 84$ $= 11,901.96$

4.3.2 Calculation of Ordering Cost

Table 4.9 shows the annual ordering cost calculation which can be computed by multiplying the ordering cost per time with the ordering frequency per year as (2.2).

Table 4.9 Example of Calculation of Ordering Cost

Raw Material	Ordering Cost per Time (Baht)	Ordering Frequency per Year (Time)	Ordering Cost (Baht)
AL 1.0x1219x2438	51.09	24	= Ordering Cost per Time x Ordering Frequency = 51.09 x 24 = 1,226.16

4.3.3 Calculation of Stock-out cost

Stock-out cost can be calculated by 10 percent of each raw material multiply by the number of stock-out as shown in Table 4.10.

Table 4.10 Example of Calculation of Stock-out Cost

Raw Material	Shortage quantity	10% of Price per Unit	Shortage Cost (Baht)
EG / SECC 1.5x1219x2438	48	89.00	= Shortage quantity x 10% of price per unit = 48 x 89.00 = 4,272.00

4.3.4 Calculation of Total Inventory Cost

Total Inventory Cost is the sum of ordering cost, holding cost and stock-out cost as shown in Table 4.11.

Table 4.11 Example of Calculation of Total Inventory Cost

Raw Material	Holding Cost	Ordering Cost	Shortage Cost	Total Inventory Cost (Baht)
AL 1.0x1219x2438	11,901.96	1,226.16	0.00	TIC = Holding Cost + Ordering Cost + Shortage Cost = 11,901.96 + 1,226.16 + 0.00 = 13,128.12

Following the same method shown above, the total cost of inventory can be found before purposing policy as Appendix B.

From table shown in Appendix B, total cost of inventory can be summarized as follows:

Table 4.12 Summary of Total Inventory Cost

Group	Holding Cost (Baht)	Ordering Cost (Baht)	Stock-out Cost (Baht)	Total Cost (Baht)	% Value
A	108,269.39	27,588.60	9,636.48	145,494.47	17.87%
B	50,728.22	41,689.44	0.00	92,417.66	11.35%
C	419,901.30	156,335.40	0.00	576,236.70	70.78%
Total	578,898.91	225,613.44	9,636.48	814,148.83	100.00%

From Table 4.13, the total cost of inventory is 814,148.83 Baht which are 145,494.47 from group A, 92,417 from group B and 576,236.70 from group C respectively. It shows that the highest cost is in group C because of high inventory of the boxes. So, it needs to monitor or propose policy different from group A and B.

4.4 Inventory Policies of Group A, B and C

After categorization of raw materials into each group, inventory policy for each group will be examined as follows:

4.4.1 Inventory Policies for Group A and B

From data collection, it found that demand and usage of raw materials was mostly stable. So, the proper policy for 19 raw materials in group A and B which have Variability Coefficient less than 0.2 are (Q, r) in order to find the appropriate Economic Order Quantity and when the raw materials decrease. It is necessary to calculate appropriate re-order point.

Q = Economic order quantity

R = Re-order point

Using (2.5) or equivalently (3.3), the EOQ (Q) can be computed as shown in Table 4.13.

Table 4.13 Calculation of EOQ of EG / SECC 1.0x1219x2438

Raw Material	Demand per year (Unit)	Ordering Cost per Time (Baht)	Holding Cost per Unit (Baht)	EOQ (Unit per Time)
EG / SECC 1.0x1219x2438	5,720.00	51.09	124.57	$Q = \sqrt{\frac{2DP}{H}}$ $= \sqrt{\frac{2(51.09)(5,720)}{124.57}}$ $= 69$

Following the same method shown above, the EOQ of 33 raw materials can be determined as shown in Table 4.4.

Table 4.14 Result of EOQ Calculation

No.	List	VC	Demand per Year (Unit)	Ordering Cost per Time (Baht)	Holding Cost per Unit (Baht)	EOQ (Unit)
1	EG / SECC 1.0x1219x2438	0.08	5,720.00	51.09	124.57	69.00
2	EG / SECC 1.2x1219x2438	0.95	4,472.00	51.09	130.43	60.00
3	EG / SECC 2.0x1219x2438	0.08	1,036.00	51.09	152.98	27.00
4	EG / SECC 1.5x1219x2111	0.17	1,240.00	51.09	133.20	31.00
5	EG / SECC 1.5x1219x2235	0.73	1,084.00	51.09	135.30	29.00
6	Key PL-A301-1	0.12	3,640.00	51.09	9.14	202.00
7	AL 1.0x1219x2438	0.16	724.00	51.09	141.13	23.00
8	Cagenut M6 White Zinc	0.19	130,892.00	51.09	0.27	7,105.00
9	EG / SECC 1.5x1219x2200	0.28	576.00	51.09	134.70	21.00
10	Clip	0.82	36,180.00	51.09	0.35	3,274.00
11	Screw/JT U M6*12 Zinc	0.04	310,600.00	51.09	0.16	14,041.00
12	White Glove	0.70	2,120.00	51.09	2.79	279.00
13	Stud weld M6*10	0.04	162,240.00	51.09	0.17	9,761.00
14	Spong Cushion	0.03	11,860.00	51.09	0.58	1,449.00

Table 4.14 Result of EOQ Calculation (Cont.)

No.	List	VC	Demand per Year (Unit)	Ordering Cost per Time (Baht)	Holding Cost per Unit (Baht)	EOQ (Unit)
15	Wheel 19" GERMANY EXPORT RACK 2"(Interlink)	0.68	1,088.00	51.09	4.54	157.00
16	Black Hinge M6 (CCTV)	0.00	7,280.00	51.09	0.79	971.00
17	Carton/Fix Shelf 48 CM./G7-02045 446x480x32 mm.	0.00	4,224.00	51.09	97.62	67.00
18	Stud weld M4*15	0.46	188,640.00	51.09	0.16	10,925.00
19	Mask	0.00	2,400.00	51.09	1.64	386.69

R is calculated from re-order point. Because of the unstable of lead time, r is computed by using (2.9) or equivalently (3.4). Table 4.15 shows the example of ROP calculation for EG / SECC 1.0x1219x2438.

Table 4.15 Calculation of ROP of EG / SECC 1.0x1219x2438

Raw Material	\bar{d}	\bar{L}	σ_L	σ_d	Z	ROP (Unit)
EG / SECC 1.0x1219x2 438	15.8 9	3.00	0.00	11.0 3	1.65	$= \bar{d} \times \bar{L} + z \sqrt{\bar{L}\sigma_d^2 + \bar{d}^2\sigma_L^2}$ $= 15.89 \times 3.00 +$ 1.65 $\sqrt{(3 \times 11.03^2) + (15.89^2 \times 0.00^2)}$ $= 80 + 32$ $= 112.00$

Following the same method shown above, the ROP of 33 raw materials can be found as shown in Table 4.16.

Table 4.16: Result of ROP Calculation

No.	List	D Bar	L Bar	Z	σd	σLT	SS (Unit)	ROP (Unit)
1	AL 1.0x1219x2438	15.89	3.00	1.65	11.03	0.00	32.00	80.00
2	EG / SECC 0.8x1219x2438	12.42	3.00	1.65	8.98	0.58	29.00	67.00
3	EG / SECC 1.0x1219x2438	2.88	3.00	1.65	1.73	0.58	6.00	15.00
4	EG / SECC 1.5x1219x2111	3.44	3.00	1.65	1.93	0.58	7.00	18.00
5	EG / SECC 1.5x1219x2235	3.01	2.00	1.65	2.34	0.58	7.00	14.00
6	Key PL-A301-1	10.11	25.00	1.65	3.34	5.03	89.00	342.00
7	AL 1.0x1219x2438	2.01	2.00	1.65	0.70	0.58	3.00	8.00
8	Cagenut M6 White Zinc	363.59	15.00	1.65	172.67	0.00	1,101.00	6,555.00
9	EG / SECC 1.5x1219x2200	1.60	2.00	1.65	0.78	0.58	3.00	7.00
10	Clip	100.50	30.00	1.65	0.60	0.00	6.00	3,021.00
11	Screw/JT U M6*12 Zinc	862.78	15.00	1.65	233.52	0.00	1,488.00	14,430.00
12	White Glove	5.89	2.00	1.65	1.34	0.00	4.00	16.00

Table 4.16: Result of ROP Calculation (Cont.)

No.	List	D Bar	L Bar	Z	σd	σLT	SS (Unit)	ROP (Unit)
13	Stud weld M6*10	450.67	14.00	1.65	132.59	1.00	1,103.00	7,413.00
14	Sponge Cushion	32.94	29.00	1.65	12.17	1.00	121.00	1,077.00
15	Wheel 19" GERMANY EXPORT RACK 2"(Interlink)	3.02	4.00	1.65	0.50	1.53	8.00	21.00
16	Black Hinge M6 (CCTV)	20.22	15.00	1.65	6.68	0.00	43.00	347.00
17	Carton/Fix Shelf 48 CM./G7-02045 446x480x32 mm.	11.73	14.00	1.65	13.47	0.00	83.00	248.00
18	Stud weld M4*15	524.00	14.00	1.65	117.85	1.73	1,659.00	8,995.00
19	Mask	6.67	2.00	1.65	70.00	0.00	163.00	177.00

In case of some raw materials have VC more than 0.2, the EOQ cannot be used. Because the demand is inconsistent in each time. Thus, silver-meal method will be used for this group.

Silver Meal approach is the method to order materials within a covering period (T) in order to control cost per period to be lowest by finding overall expense per point of time. Normally, overall expense at the point of time will be over than overall expense per period of the next period. But the calculation will be stopped whenever the overall expense per time of the next period is over than the overall expense per time in the last period. It means that the ordering quantity at that time is all of demand from beginning until a certain period. By applying this approach, it is suitable in case of uncertain demand in each period. Total cost of Silver Meal method in each period can be calculated by (2.20). The ordering quantity which is the sum of demand in each period, which the variable cost in each period still have not increased from previous period can be computed by (2.21).

Table 4.17 shows example of calculation of order in January for Key/ 399

Table 4.17 Demand of Key/ 399 in year 2015

Month	Demand (Unit)
January	40
February	630
March	324
April	301
May	556
June	245
July	402
August	267
September	250
October	296
November	245
December	420
Total	3,976

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น เมื่ออนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Firstly, considering January as T1, the order for 1 month, which orders only 40 units can be calculated as following table:

Table 4.18 The Order For 1 Month Policy (January = T1)

Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost per period (Baht)	Holding Duration (Month)	Total Cost per T period (Baht)
40	51.09	0	1	$\frac{51.09+0}{1} = 51.09$

The order for 2 months, which are the order the quantity of January and February. It is necessary to hold the order of February for 1 month. So, it can be calculated as following table:

Table 4.19 The Order For 2 Months Policy (January = T1)

Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost per period (Baht)	Holding Duration (Month)	Total Cost per T period (Baht)
40 + 630	51.09	630 x 0.14	2	$\frac{51.09+88.2}{2} = 69.65$

From Table 4.19, it shows that the total cost of order for 2 months is higher than 1 month. So, the first ordering period is the order for use in 1 month which are 40 units.

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Then, consider February as T1, the order for 1 month, which orders only 40 units can be calculated as following table:

Table 4.20 The Order For 1 Month Policy (February = T1)

Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost per period (Baht)	Holding Duration (Month)	Total Cost per T period (Baht)
630	51.09	0	1	$\frac{51.09+0}{1} = 51.09$

The order for 2 months which are the order the quantity of February and March. It is necessary to hold the order of March for 1 month. So, it can be calculated as following table:

Table 4.21 The Order For 2 Months Policy (February = T1)

Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost per period (Baht)	Holding Duration (Month)	Total Cost per T period (Baht)
630 + 324	51.09	324 x 0.14	2	$\frac{51.09+45.36}{2} = 48.23$

The order for 2 months policy (February = T1) has lower total cost per this period. So, the 3 months ordering policy is needed to be calculated as following table:

Table 4.22 The Order For 2 Months Policy (February = T1)

Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost per period (Baht)	Holding Duration (Month)	Total Cost per T period (Baht)
630 + 324 + 301	51.09	$(324 \times 0.14) + (301 \times 0.14 \times 2)$	3	$= \frac{51.09+45.36+84.28}{3} = 60.24$

From Table 4.22, the researcher found that the total cost of order for 2 months is lower than 3 months. So, the second ordering period is the ordering for use in 2 months which orders 954 units.

For the next ordering, the method above can be used to calculate the ordering period in order to meet the lowest cost in T period. If we calculate till the last month, the ordering policy of these raw materials will be as shown in following table and also in Appendix C.

Table 4.23 Silver-Meal Method of Key/ 399

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	40	40	51.09	0.00	51.09
February	630	630+324 = 954	51.09	45.36	96.45
March	324	0	0.00	0.00	0.00
April	301	301	51.09	0.00	51.09
May	556	556+245 = 801	51.09	34.30	85.39
June	245	0	0.00	0.00	0.00
July	402	402+267 = 669	51.09	37.38	88.47
August	267	0	0.00	0.00	0.00
September	250	250+296 = 546	51.09	41.44	92.53
October	296	0	0.00	0.00	0.00
November	245	245+420 = 665	51.09	58.8	109.89
December	420	0	0.00	0.00	0.00
Total	3,976		357.63	231.14	588.77

4.4.1.1 Comparison of Total Cost After Proposing New Policies

The total cost after use new policy is divided into two parts. Firstly, the total cost of raw materials that uses EOQ method. It shows that the total cost of inventory decreases from 148,828.68 to 76,822.78 Baht or 47.44%. For silver meal method, the total cost of inventory decreases from 89,083.45 to 8,153.40 Baht or 90.85%.

Table 4.24: Comparison of Total Cost Before and After Using EOQ Method

No.	List	Before				After			
		Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
1	EG / SECC 1.0x1219x2438	21,800.14	1,226.16	0.00	23,026.30	8,284.05	4,235.29	0.00	12,519.34
2	EG / SECC 1.2x1219x2438	24,129.13	1,839.24	0.00	25,968.37	7,695.24	3,807.91	0.00	11,503.15
3	EG / SECC 2.0x1219x2438	7,317.54	1,839.24	5,364.48	14,521.26	2,983.11	1,960.34	0.00	4,943.45
4	EG / SECC 1.5x1219x2111	6,637.61	2,452.32	0.00	9,089.93	2,996.92	2,043.60	0.00	5,040.52
5	EG / SECC 1.5x1219x2235	5,491.06	2,452.32	0.00	7,943.38	2,909.02	1,909.71	0.00	4,818.73
6	Key PL-A301-1	1,439.55	3,065.40	0.00	4,504.95	1,736.60	920.63	0.00	2,657.23
7	AL 1.0x1219x2438	11,901.96	1,226.16	0.00	13,128.12	2,046.39	1,608.22	0.00	3,654.61
8	Cagenut M6 White Zinc	1,179.25	4,291.56	0.00	5,470.81	1,233.18	941.21	0.00	2,174.38
9	EG / SECC 1.5x1219x2200	4,512.55	1,839.24	0.00	6,351.79	1,818.49	1,401.33	0.00	3,219.82
10	Clip	345.00	1,839.24	0.00	2,184.24	566.84	564.58	0.00	1,131.42
11	Screw/JT U M6*12 Zinc	1,577.80	2,452.32	0.00	4,030.12	1,369.87	1,130.16	0.00	2,500.03
12	White Glove	139.50	613.08	0.00	752.58	400.37	388.21	0.00	788.58
13	Stud weld M6*10	765.25	3,065.40	0.00	3,830.65	1,041.13	849.18	0.00	1,890.31

Table 4.24: Comparison of Total Cost Before and After Using EOQ Method (Cont.)

No.	List	Before				After			
		Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
14	Spong Cushion	511.67	1,839.24	0.00	2,350.91	488.28	418.17	0.00	906.45
15	Wheel 19" GERMANY EXPORT RACK 2"(Interlink)	227.00	613.08	0.00	840.08	392.71	354.05	0.00	746.76
16	Black Hinge M6 (CCTV)	1,264.00	1,839.24	0.00	3,103.24	417.52	383.04	0.00	800.56
17	Carton/Fix Shelf 48 CM./G7-02045 446x480x32 mm.	12,202.50	2,452.32	0.00	14,654.82	11,372.73	3,220.96	0.00	14,593.69
18	Stud weld M4*15	969.00	3,065.40	0.00	4,034.40	1,150.12	882.16	0.00	2,032.28
19	Mask	590.40	2,452.32	0.00	3,042.72	584.41	317.09	0.00	901.50
	Total	103,000.92	40,463.28	5,364.48	148,828.68	49,486.95	27,335.83	0.00	76,822.78

Table 4.25: Comparison of Total Cost Before and After Using Silver Meal Method

No.	List	Before				After			
		Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
1	SPCC 3.2 x 1219 x 1630	3,952.88	2,452.32	0.00	6,405.20	0.00	613.08	0.00	613.08
2	EG / SECC 0.8x1219x2438	8,755.99	1,226.16	0.00	9,982.15	0.00	613.08	0.00	613.08
3	EG / SECC 1.5x1219x2438	9,051.16	1,226.16	4,272.00	14,549.32	0.00	613.08	0.00	613.08
4	SPCC 0.7 x 1219 x 2438	1,732.10	2,452.32	0.00	4,184.42	0.00	613.08	0.00	613.08
5	EG / SECC 1.5x1219x2077	4,881.01	1,839.24	0.00	6,720.25	0.00	613.08	0.00	613.08
6	GI / SEGG 0.6x1219x2438	15,087.08	613.08	0.00	15,700.16	39.44	567.82	0.00	607.26
7	GI / SEGG 1.2x1219x2438	1,782.26	1,839.24	0.00	3,621.50	0.00	613.08	0.00	613.08
8	Key/ 212	1,346.93	1,226.16	0.00	2,573.09	147.88	323.57	0.00	453.54
9	EG / SECC 1.5x1219x1677	3,803.88	1,226.16	0.00	5,030.04	0.00	613.08	0.00	613.08
10	Key/ 399	316.03	6,130.80	0.00	6,446.83	159.42	431.19	0.00	590.61

Table 4.25: Comparison of Total Cost Before and After Using Silver Meal Method (Cont.)

No.	List	Before				After			
		Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
11	Ball Bearing Slide 18" (S48) SV-3118	130.82	2,452.32	0.00	2,583.14	138.51	335.62	0.00	474.13
12	Hinge Rack Plastic Grey+White SV-8201	131.28	3,065.40	0.00	3,196.68	0.00	613.08	0.00	613.08
13	Carton/Cable Management /G7-06002,G7-06003	4,860.00	613.08	0.00	5,473.08	0.00	587.54	0.00	587.54
14	SPCC 3.2 x 1219 x 2438	165.28	2,452.32	0.00	2,617.60	49.58	486.11	0.00	535.69
	Total	55,996.69	28,814.76	4,272.00	89,083.45	534.83	7,636.48	0.00	8,153.40

4.4.2 Inventory Policy for group C

For the policy of the boxes, as the mentioned cause of dead stock in Chapter 3, it is necessary to take a closer look on this type of material by using dead stock policy as follows:

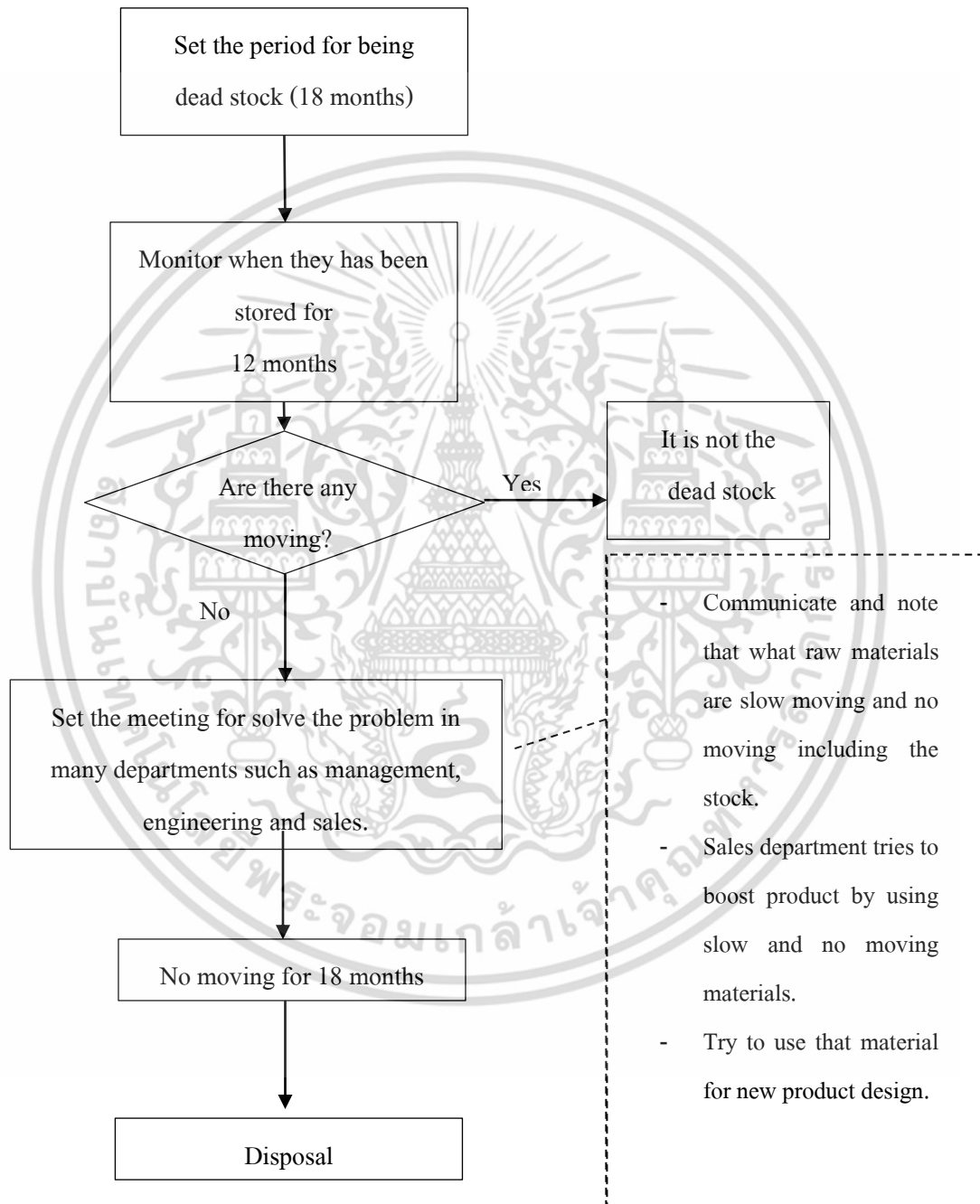


Figure 4.1: Dead Stock Policy

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From Figure 4.1, Raw materials are set not to move for 12 months as dead stock. Before these raw materials are disposed, there will be monitored and stored for another 6 months. The company needs to set the meeting to find out how to sell them during 6 months. If the materials do not move after 18 months, they will be disposed.

For other raw materials in group C, (S,s) policy will be used to solve the problem by setting the maximum holding quantity (S) and calculating the minimum holding quantity or safety stock (s)

S is set by the company and s is calculated from (2.10) or equivalent (3.5) that shown in Chapter 2 and 3. It can be calculated as shown in Table 4.26.

Table 4.26 The Calculation of Safety Stock

Raw Material	\bar{d} (Unit)	\bar{L} (Day)	Z	σ_d	σ_{LT}	Safety Stock (Unit)
Stud weld M4*10	481	11	1.645	131.8 5	1.15	$SS = 1.645 \sqrt{11(131.85)^2 + (481)^2 (1.15)^2} = 1,170$

The result of safety stock is shown in Appendix D.

CHAPTER 5

CONCLUSION

According to the case study, the appropriate inventory management approach which can reduce cost of inventory will be elaborated and suggest to the company for future improvement.

5.1 Conclusion

Chapter 1 explained the main problem of the company which was a problem about cost of inventory. There was a high cost of inventory resulting from the unsuitable inventory management policy. The suitable inventory management policy would assist the company to respond to the customer's requirement appropriately. The company could be aware of inventory purchasing, and how much company could hold inventory on hand and avoid stock-out. These would be result in the effective inventory management and having a lower cost of inventory. Therefore, inventory management policy should be improved in order to be more efficient and be able to solve such problems. Chapter 2 described the theories and methods which were concerned with the approach to solve inefficient inventory management and to set a new appropriate inventory management policy.

Chapter 3 explained the problems that occurred in the case study company which was a high cost of inventory. Firstly, holding cost was not calculated with actual order quantity. Eventually, over stock and dead stock had occurred. For example, the useless boxes were stocked in the warehouse. Secondly, stock-out cost which the company would be fined if they did not have enough raw materials to serve customers on time. Lastly, warehouse space which had a limited space due to the over

purchasing. Especially for the boxes which had big size and also had a lot of เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

quantities. Therefore, overall costs resulted from the unsuitable inventory policy. In order to enhance inventory management, the company should emphasize on inventory management policy by using ABC classification to categorize the importance of raw materials. After classification, testing for variability coefficient in group A and B which was an important portion of overall raw materials should be conducted. If the result is less than 0.2 means, demand is constant. It can use (Q, r) policy where Q stands for the order quantity and r stands for re-order point to calculate the order quantity. If the result is greater than 0.2, silver-meal method will be used to manage raw materials. For raw materials in group C, (S, s) policy would be used to solve the problem which S stands for the maximum holding quantity of available space of the warehouse ,and s stands for minimum holding quantity or safety stock. Then, Two Bin system and visual control would be used to monitor FIFO method.

After proposing new policy in Chapter 4, the finding revealed that from 167 raw materials were categorized into different groups respectively. Group A had 13 items with 79.04 percent of total value. Group B had 20 items with 15.14% percent of total value. Group C had 134 items with 5.77% of total value. After classifying raw materials, the researcher found that variable coefficient in group A and B which were lower than 0.2 and used (Q, r) policy had 18 items. On the other hand, the group with variable coefficient was greater than 0.2 and had 15 items. Silver Meal method would be applied to this group. The total cost after using new policy was divided into two parts. Firstly, the total cost of raw materials that used EOQ method, it showed that the total cost of inventory decreased from 148,828.68 to 76,822.78 Baht or 47.44%. For silver meal method, the total cost of inventory decreased from 89,083.45 to 8,153.40 Baht or 90.85%.

In group C, the researcher found that high cost of inventory caused from dead stock boxes which had the highest holding cost of inventory due to the over purchasing and warehouse problem such as leakage at the roof top of the warehouse. Therefore, this problem could be solved by using dead stock policy. This would dispose the boxes which had no movement more than 18 months. The company should monitor when the boxes have been stored in the warehouse over than 12 months. Then, it should set the meeting for solving the problem and store the boxes for another six months. If they were not being moved for 18 months, they would be disposed. For other items in group C, the (S, s) policy would be set for this group by setting the maximum holding quantity (S) and calculating the minimum holding quantity or safety stock (s). (S,s) policy could reduce the safety stock from 52,448 to 16,664 or 68.23%. Two Bin system and visual control would be used to monitor first in first out method.

5.2 Problem and Barrier

The data in this study were the company confidential data, therefore accessing and using data had to get approval as well as permission from the executive first.

The company had high holding cost per unit comparing with the ordering cost. Therefore, the results guide to order more frequently to avoid holding cost.

5.3 Recommendation

1. The company should manage group A and B inventory closely and define how much to order, when to order and safety stock to avoid the lack of raw materials.
2. Group C inventory has the highest holding cost. The company should forecast demand and set the appropriate stock to avoid dead stock
3. The company should forecast demand before using policy in order to find the accurate inventory.

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APPENDIX A

RAW MATERIALS IN GROUP C



เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table A-1 Raw material in group C

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
1	Carton Fix Shelf 25CM. /G7-01025	6,000.00	11.80	70,800.00	0.39%	0.39%	C
2	Black Straps	160.00	350.00	56,000.00	0.31%	0.70%	
3	Studs Pins (Tap mounted) M6*12 SUS	6,104.00	8.60	52,494.40	0.29%	0.99%	
4	Pem Nut M4	32,604.00	1.60	52,166.40	0.29%	1.27%	
5	GI / SEGG 1.0x1219x2438	68.00	746.54	50,764.72	0.28%	1.55%	
6	Stud weld M4*10	173,032.00	0.28	48,448.96	0.27%	1.82%	
7	Carton/Fix Shelf 95 CM./G7-02095	1,792.00	26.00	46,592.00	0.26%	2.08%	
8	Film 50 cm. x 300 m. x 15micron	332.00	140.00	46,480.00	0.26%	2.33%	
9	Stud weld M3x15 TOM	32,124.00	1.40	44,973.60	0.25%	2.58%	
10	Strand CO2 No. 0.8	48.00	870.00	41,760.00	0.23%	2.81%	
11	Stand off M4x14.2 Tom	19,504.00	1.99	38,812.96	0.21%	3.02%	
12	Cable Lugs + Blue M6 #2.5-6	17,816.00	2.00	35,632.00	0.20%	3.22%	

Table A-2 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
13	Cagenut M6 2T NI	9,936.00	2.91	28,913.76	0.16%	3.38%	C
14	White Cable management 4"	1,736.00	16.00	27,776.00	0.15%	3.53%	
15	Nut M6 Zinc	133,992.00	0.20	26,798.40	0.15%	3.68%	
16	Carton/Fix Shelf 65 CM./G7-02065 446x650x30 mm.	1,280.00	19.00	24,320.00	0.13%	3.81%	
17	SPCC 2.3 x 1220 x 2438	16.00	1,485.00	23,760.00	0.13%	3.94%	
18	PaperSheet 200x440 mm. for Shelf 25 cm.	6,000.00	3.40	20,400.00	0.11%	4.06%	
19	Carton/Type 2	840.00	21.69	18,219.60	0.10%	4.16%	
20	Tatter	704.00	25.00	17,600.00	0.10%	4.25%	
21	GI / SEGG 0.8x1219x2438	28.00	578.46	16,196.88	0.09%	4.34%	
22	Stud weld M6*10	9,352.00	1.45	13,560.40	0.07%	4.42%	
23	Carton/Fix Shelf 75 CM./G7-02075	600.00	21.00	12,600.00	0.07%	4.49%	

Table A-3 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
24	Flat Washer M6*13	111,864.00	0.11	12,305.04	0.07%	4.56%	C
25	Stand off M3x10	8,008.00	1.48	11,851.84	0.07%	4.62%	
26	White Stud M3x15 TOM	6,024.00	1.95	11,746.80	0.06%	4.69%	
27	Spring Washer M6	116,056.00	0.10	11,605.60	0.06%	4.75%	
28	SPCC 1.5 x 1219 x 2438	12.00	918.36	11,020.32	0.06%	4.81%	
29	Ball Bearing Slide 22" (S65,S75,S95) SV-3122	28.00	335.00	9,380.00	0.05%	4.86%	
30	SPCC 1.2 x 1220 x 2438	12.00	726.82	8,721.84	0.05%	4.91%	
31	Plastic Washer (Interlink)	13,200.00	0.66	8,712.00	0.05%	4.96%	
32	Carton/Type 4	200.00	43.40	8,680.00	0.05%	5.01%	
33	Box/Cross-Connect UL-6812 Size96 (125x750x750)1 Color printed	108.00	78.00	8,424.00	0.05%	5.05%	
34	Glove	96.00	85.00	8,160.00	0.04%	5.10%	

Table A-4 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
35	Nut M4 Zinc	58,264.00	0.14	8,156.96	0.04%	5.14%	C
36	Box/Cross-Connect UL-6103,6203,6206 Size3 (333x365x130)1 Color printed	240.00	32.00	7,680.00	0.04%	5.18%	
37	Flat Washer M4	44,496.00	0.16	7,119.36	0.04%	5.22%	
38	SPCC 1.0 x 1219 x 2438	12.00	585.00	7,020.00	0.04%	5.26%	
39	Box/Open Rack 42U (150x540x1990)/Brown	80.00	84.00	6,720.00	0.04%	5.30%	
40	Spring Washer M4	44,496.00	0.15	6,674.40	0.04%	5.34%	
41	Screw/O JP M5x6 Zinc	23,936.00	0.26	6,223.36	0.03%	5.37%	
42	Lock Washer M5 Zinc	43,616.00	0.14	6,106.24	0.03%	5.40%	
43	Key 1-172-03	48.00	110.00	5,280.00	0.03%	5.43%	
44	Screw/JP O M4x0.7x10 ZINC	29,604.00	0.17	5,032.68	0.03%	5.46%	
45	Screw/JP M6x1.0Px15 NI	13,200.00	0.33	4,356.00	0.02%	5.48%	

Table A-5 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
46	White Stud M3x10 (PS)	3,608.00	1.20	4,329.60	0.02%	5.51%	C
47	Screw/P+AB #7*1 NI	14,240.00	0.29	4,129.60	0.02%	5.53%	
48	SPCC 0.6 x 1219 x 2438	12.00	335.80	4,029.60	0.02%	5.55%	
49	Zip lock bag 8*12 cm.	20,040.00	0.19	3,807.60	0.02%	5.57%	
50	Screw/JT U M4x50 Zinc	7,280.00	0.50	3,640.00	0.02%	5.59%	
51	Labour pook (Plastic) #7	34,240.00	0.10	3,424.00	0.02%	5.61%	
52	SPCC 0.5 x 1219 x 2438	12.00	284.35	3,412.20	0.02%	5.63%	
53	Screw/ TMS-2 M6*12 +- Zinc	8,704.00	0.36	3,133.44	0.02%	5.65%	
54	Screw/Taper M4x15 Zinc (Cross)	15,912.00	0.18	2,864.16	0.02%	5.66%	
55	Screw/angle M10x30 Black	1,488.00	1.80	2,678.40	0.01%	5.68%	
56	Flat Washer M6*11*1 Zinc	13,200.00	0.20	13,200.00	0.01%	5.69%	
57	Box/ (440x560x125)/1 Color printed	40.00	58.00	40.00	0.01%	5.71%	
58	Screw/white M6x1.0x10 Angle Zinc	6,880.00	0.33	6,880.00	0.01%	5.72%	

Table A-6 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
59	Stud weld M6*20	952.00	2.20	952.00	0.01%	5.73%	C
60	Cable Lugs PV2.5-7A/Blue	800.00	2.10	800.00	0.01%	5.74%	
61	Rubber Cushion/1:60	12.00	130.00	12.00	0.01%	5.75%	
62	Cable Lugs V2.5-7B/Blue	800.00	1.70	800.00	0.01%	5.76%	
63	Nut M5 Zinc	2,288.00	0.40	2,288.00	0.01%	5.76%	
64	Labour pook 3/16"-24 40 mm.	592.00	1.50	592.00	0.00%	5.77%	
65	Nut M10/Black	1,088.00	0.80	1,088.00	0.00%	5.77%	
66	Screw/O JP M5x15 Zinc	1,888.00	0.45	1,888.00	0.00%	5.77%	
67	Sandpaper 7" No. 80	40.00	19.00	40.00	0.00%	5.77%	
68	Flat Washer M5	2,296.00	0.30	2,296.00	0.00%	5.77%	
69	Labour pook 1/4"x2	392.00	1.70	392.00	0.00%	5.77%	
70	Silver Marker/ UNIPANT	12.00	47.00	564.00	0.00%	5.77%	
71	Jeans Bib	4.00	140.00	560.00	0.00%	5.77%	

Table A-7 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
72	Hinge M5 PH18 Black 4-145 (Outdoor)	72.00	7.50	540.00	0.00%	5.77%	C
73	Glove (Long)	12.00	40.00	480.00	0.00%	5.77%	
74	SPCC 2.0 x 70.5 x 1500	12.00	37.85	454.20	0.00%	5.77%	
75	Key/ G399	16.00	28.00	448.00	0.00%	5.77%	
76	Sandpaper No. 80	12.00	35.00	420.00	0.00%	5.77%	
77	Jeans Armband	4.00	100.00	400.00	0.00%	5.77%	
78	Broom	12.00	30.00	360.00	0.00%	5.77%	
79	Clear adhesive tape/ UniTape	12.00	27.00	324.00	0.00%	5.77%	
80	Zip lock bag 6x8 cm.	2,480.00	0.13	322.40	0.00%	5.77%	
81	Bush OD19mm. 1/2"(Telecom Rack)	16.00	15.00	240.00	0.00%	5.77%	
82	Duct tape/ YAZAKI	16.00	13.00	208.00	0.00%	5.77%	
83	Spring (Close Rack) SV-8200	12.00	15.00	180.00	0.00%	5.77%	
84	Clear adhesive tape	12.00	14.00	168.00	0.00%	5.77%	

Table A-8 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
85	4" SUMO	12.00	13.00	156.00	0.00%	5.77%	C
86	Flange Nut Zinc M6	152.00	1.00	152.00	0.00%	5.77%	
87	Distilled water	12.00	10.00	120.00	0.00%	5.77%	
88	SPCC 2.0 x 70.5 x 390	12.00	9.80	117.60	0.00%	5.77%	
89	SPCC 2.0 x 70.5 x 650	12.00	9.80	117.60	0.00%	5.77%	
90	Screw/Taper M4x10 Zinc	1,000.00	0.11	110.00	0.00%	5.77%	
91	Screw/Hexagon 1/2"x3"	12.00	6.67	80.04	0.00%	5.77%	
92	Cable Lugs + Yellow M6 #5.5-6	24.00	3.30	79.20	0.00%	5.77%	
93	welding goggles	12.00	6.50	78.00	0.00%	5.77%	
94	Key Case 399 SV-8203	12.00	6.00	72.00	0.00%	5.77%	
95	Knot 1/2"	12.00	5.09	61.08	0.00%	5.77%	
96	Zip lock bag 10x15 cm.	160.00	0.29	46.40	0.00%	5.77%	
97	Screw/Taper M5x12 Zinc	80.00	0.55	44.00	0.00%	5.77%	

Table A-9 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
98	Flat Washer 5/8"	12.00	1.53	18.36	0.00%	5.77%	C
99	Ground (Green+Yellow)	4.00	3.31	13.24	0.00%	5.77%	
100	White Stud M6x15 Rack	12.00	1.00	12.00	0.00%	5.77%	
101	Screw/JT U M4x10 Zinc	12.00	0.33	3.96	0.00%	5.77%	
102	Spring Washer M8	12.00	0.08	0.96	0.00%	5.77%	
103	Support paper 6 Outlet+ size 175x440	0.00	1.87	0.00	0.00%	5.77%	
104	Support Paper 12 Outlet size 175x730	0.00	2.00	0.00	0.00%	5.77%	
105	Carton/Outdoor 250x330(210x253x412) 1x6	0.00	17.00	0.00	0.00%	5.77%	
106	Carton/Outdoor 250x450(210x253x532)1x11	0.00	15.00	0.00	0.00%	5.77%	
107	Carton/Outdoor 450x450(210x453x532)2x11	0.00	23.00	0.00	0.00%	5.77%	

Table A-10 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
108	Carton/Outdoor 650x450(210x653x533)3x11	0.00	28.50	0.00	0.00%	5.77%	C
109	Carton/Outdoor 650x750(210x653x833)3x22	0.00	38.00	0.00	0.00%	5.77%	
110	Carton/Outdoor 450x730(210x453x813)2x22	0.00	29.00	0.00	0.00%	5.77%	
111	Carton/Outdoor 500x880(210x503x963)	0.00	33.00	0.00	0.00%	5.77%	
112	Carton/Slide Shelf 48 CM./G7-03045	0.00	23.00	0.00	0.00%	5.77%	
113	Carton/Slide Shelf 65 CM./G7-03065	0.00	24.00	0.00	0.00%	5.77%	
114	Carton/Slide Shelf 75 CM./G7-03075	0.00	25.00	0.00	0.00%	5.77%	
115	Carton/Slide Shelf 95 CM./G7-03095	0.00	32.00	0.00	0.00%	5.77%	
116	Box/Open Rack 27U (150x540x1240)	0.00	76.00	0.00	0.00%	5.77%	

Table A-11 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
117	Box/Open Rack 36U (150x540x1640)/Brown	0.00	76.00	0.00	0.00%	5.77%	C
118	Box/Close Rack 45U/White/1 Color printed	0.00	193.00	0.00	0.00%	5.77%	
119	Box/Rack 15U*60 (24.75"x26"x31.375")/White/2 Color printed	0.00	95.00	0.00	0.00%	5.77%	
120	Box/Rack 15U*80 (24.75"x26"x31.375")/White/2 Color printed	0.00	100.00	0.00	0.00%	5.77%	
121	Box/Rack 27U (24.75"x26"x51.875")/White/2 Color printed	0.00	157.00	0.00	0.00%	5.77%	
122	Box/Rack 36U (24.75"x34"x69")/White/2 Color printed	0.00	228.00	0.00	0.00%	5.77%	

Table A-12 Raw material in group C (Cont.)

No.	Description	Demand (Unit)	Price per Unit (Baht)	Value (Baht)	% Value	Accumulate	Class
123	Box/Rack 42U (24.75"x26"x79.75")/White	0.00	230.00	0.00	0.00%	5.77%	C
124	Box/19"Network Rack 45U/White	0.00	193.00	0.00	0.00%	5.77%	
125	Box/P4 220x260x110 mm.	0.00	12.43	0.00	0.00%	5.77%	
126	Box/DC 280x316x85 mm.	0.00	14.30	0.00	0.00%	5.77%	
127	Box/PS 230x300x95 mm.	0.00	9.02	0.00	0.00%	5.77%	
128	Box/PG 295x295x105 mm.	0.00	10.45	0.00	0.00%	5.77%	
129	Box/TOP CF/Adjoin lid 100x482x504 mm.	0.00	16.70	0.00	0.00%	5.77%	
130	Box/Door CF/Lap Over lid 44x504x713 mm.	0.00	19.00	0.00	0.00%	5.77%	
131	Box/Body CF/Adjoin lid 480x504x719 mm.	0.00	69.00	0.00	0.00%	5.77%	
132	Box/RE USE 400x600x400 mm.	0.00	38.50	0.00	0.00%	5.77%	
133	Box/Stock Shelf/Mark/70x225x900 mm.	0.00	18.50	0.00	0.00%	5.77%	
134	Pad in Stock Shelf 215x897 mm. Box	0.00	4.50	0.00	0.00%	5.77%	

APPENDIX B

TOTAL INVENTORY COST BEFORE PROPOSING POLICY



เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table B-1 Total inventory cost before proposing policy

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
1	AL 1.0x1219x2438	84.33	24.00	0.00	11,901.96	1,226.16	0.00	13,128.12
2	EG / SECC 0.8x1219x2438	72.92	24.00	0.00	8,755.99	1,226.16	0.00	9,982.15
3	EG / SECC 1.0x1219x2438	175.00	24.00	0.00	21,800.14	1,226.16	0.00	23,026.30
4	EG / SECC 1.2x1219x2438	185.00	36.00	0.00	24,129.13	1,839.24	0.00	25,968.37
5	EG / SECC 1.5x1219x2438	65.17	24.00	48.00	9,051.16	1,226.16	4,272.00	14,549.32
6	EG / SECC 1.5x1219x2111	49.83	48.00	0.00	6,637.61	2,452.32	0.00	9,089.93
7	EG / SECC 1.5x1219x2235	40.58	48.00	0.00	5,491.06	2,452.32	0.00	7,943.38
8	EG / SECC 1.5x1219x2200	33.50	36.00	0.00	4,512.55	1,839.24	0.00	6,351.79
9	EG / SECC 1.5x1219x1677	30.25	24.00	0.00	3,803.88	1,226.16	0.00	5,030.04
10	EG / SECC 1.5x1219x2077	36.75	36.00	0.00	4,881.01	1,839.24	0.00	6,720.25
11	EG / SECC 2.0x1219x2438	47.83	36.00	44.00	7,317.54	1,839.24	5,364.48	14,521.26
12	GI / SEGG 0.6x1219x2438	127.50	12.00	0.00	15,087.08	613.08	0.00	15,700.16

Table B-2 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
13	GI / SEGG 0.8x1219x2438	46.00	12.00	0.00	5,775.44	613.08	0.00	6,388.52
14	GI / SEGG 1.0x1219x2438	6.00	0.00	0.00	803.74	0.00	0.00	803.74
15	GI / SEGG 1.2x1219x2438	12.75	36.00	0.00	1,782.26	1,839.24	0.00	3,621.50
16	SPCC 0.5 x 1219 x 2438	84.42	24.00	0.00	9,357.38	1,226.16	0.00	10,583.54
17	SPCC 0.6 x 1219 x 2438	26.83	24.00	0.00	3,043.44	1,226.16	0.00	4,269.60
18	SPCC 0.7 x 1219 x 2438	14.67	48.00	0.00	1,732.10	2,452.32	0.00	4,184.42
19	SPCC 1.0 x 1219 x 2438	5.00	0.00	0.00	629.40	0.00	0.00	629.40
20	SPCC 1.5 x 1219 x 2438	5.00	0.00	0.00	712.74	0.00	0.00	712.74
21	SPCC 1.2 x 1220 x 2438	5.00	0.00	0.00	664.86	0.00	0.00	664.86
22	SPCC 2.3 x 1220 x 2438	5.00	48.00	0.00	854.40	2,452.32	0.00	3,306.72
23	SPCC 3.2 x 1219 x 2438	0.83	48.00	0.00	165.28	2,452.32	0.00	2,617.60
24	SPCC 3.2 x 1219 x 1630	25.08	48.00	0.00	3,952.88	2,452.32	0.00	6,405.20
25	SPCC 2.0 x 70.5 x 1500	341.25	0.00	0.00	33,620.80	0.00	0.00	33,620.80

Table B-3 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
26	SPCC 2.0 x 70.5 x 390	341.25	0.00	0.00	33,142.20	0.00	0.00	33,142.20
27	SPCC 2.0 x 70.5 x 650	341.25	0.00	0.00	33,142.20	0.00	0.00	33,142.20
28	Stud weld M3x15 TOM	1,622.50	132.00	0.00	340.73	6,743.88	0.00	7,084.61
29	Stud weld M4*10	6,000.00	72.00	0.00	924.00	3,678.48	0.00	4,602.48
30	Stud weld M6*10	4,398.00	60.00	0.00	765.25	3,065.40	0.00	3,830.65
31	Stud weld M4*15	6,000.00	60.00	0.00	969.00	3,065.40	0.00	4,034.40
32	Stud weld M6*10	759.50	84.00	0.00	161.39	4,291.56	0.00	4,452.95
33	Stud weld M6*20	421.00	36.00	0.00	105.25	1,839.24	0.00	1,944.49
34	White Stud M3x10 (PS)	559.00	24.00	0.00	111.80	1,226.16	0.00	1,337.96
35	White Stud M3x15 TOM	1,053.00	156.00	0.00	250.09	7,970.04	0.00	8,220.13
36	White Stud M6x15 Rack	5.00	0.00	0.00	0.95	0.00	0.00	0.95
37	Standoff M3x10	2,323.00	48.00	0.00	497.12	2,452.32	0.00	2,949.44
38	Standoff M4x14.2 Tom	2,745.00	48.00	0.00	657.43	2,452.32	0.00	3,109.75

Table B-4 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
39	Studs Pins (Tap mounted) M6*12 SUS	1,754.00	24.00	0.00	999.78	1,226.16	0.00	2,225.94
40	Pem Nut M4	1,027.00	60.00	0.00	225.94	3,065.40	0.00	3,291.34
41	Cagenut M6 White Zinc	4,450.00	84.00	0.00	1,179.25	4,291.56	0.00	5,470.81
42	Cagenut M6 2T NI	6,960.00	12.00	0.00	1,987.08	613.08	0.00	2,600.16
43	Screw/JP M6x1.0Px15 NI	4,399.50	24.00	0.00	688.52	1,226.16	0.00	1,914.68
44	Flat Washer M6*11*1 Zinc	6,045.00	24.00	0.00	906.75	1,226.16	0.00	2,132.91
45	Plastic Washer (Interlink)	1,280.00	24.00	0.00	221.44	1,226.16	0.00	1,447.60
46	Wheel 19" GERMANY EXPORT RACK 2"(Interlink)	50.00	12.00	0.00	227.00	613.08	0.00	840.08
47	Screw/angle M10x30 Black	107.00	48.00	0.00	24.61	2,452.32	0.00	2,476.93
48	Nut M10/Black	95.00	36.00	0.00	17.10	1,839.24	0.00	1,856.34
49	Screw/ TMS-2 M6*12 +- Zinc	1,550.00	36.00	0.00	244.90	1,839.24	0.00	2,084.14
50	Screw/JT U M6*12 Zinc	9,800.00	48.00	0.00	1,577.80	2,452.32	0.00	4,030.12

Table B-5 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
51	Screw/JP O M4x0.7x10 ZINC	750.00	36.00	0.00	111.38	1,839.24	0.00	1,950.62
52	Screw/JT U M4x50 Zinc	586.50	96.00	0.00	96.77	4,904.64	0.00	5,001.41
53	Screw/white M6x1.0x10 Angle Zinc	800.00	48.00	0.00	125.20	2,452.32	0.00	2,577.52
54	Screw/Taper M5x12 Zinc	361.50	12.00	0.00	60.55	613.08	0.00	673.63
55	Screw/Taper M4x10 Zinc	50.00	36.00	0.00	7.28	1,839.24	0.00	1,846.52
56	Screw/Taper M4x15 Zinc (Cross)	1,151.50	156.00	0.00	171.57	7,970.04	0.00	8,141.61
57	Screw/JT U M4x10 Zinc	50.00	0.00	0.00	7.83	0.00	0.00	7.83
58	Screw/O JP M5x15 Zinc	324.00	12.00	0.00	52.65	613.08	0.00	665.73
59	Screw/O JP M5x6 Zinc	1,771.50	24.00	0.00	271.04	1,226.16	0.00	1,497.20
60	Screw/P+AB #7*1 NI	1,835.00	36.00	0.00	283.51	1,839.24	0.00	2,122.75
61	Nut M4 Zinc	1,050.00	36.00	0.00	154.35	1,839.24	0.00	1,993.59
62	Nut M5 Zinc	390.00	12.00	0.00	62.40	613.08	0.00	675.48

Table B-6 Total inventory cost before proposing policy Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
63	Nut M6 Zinc	1,345.00	84.00	0.00	201.75	4,291.56	0.00	4,493.31
64	Screw/Hexagon 1/2"x3"	5.00	0.00	0.00	2.37	0.00	0.00	2.37
65	Knot 1/2"	5.00	0.00	0.00	1.97	0.00	0.00	1.97
66	Flat Washer 5/8"	5.00	0.00	0.00	1.08	0.00	0.00	1.08
67	Flange Nut Zinc M6	160.00	12.00	0.00	30.40	613.08	0.00	643.48
68	Labour pook 1/4"x2	179.00	48.00	0.00	40.28	2,452.32	0.00	2,492.60
69	Labour pook 3/16"-24 40 mm.	245.50	36.00	0.00	52.78	1,839.24	0.00	1,892.02
70	Labour pook (Plastic) #7	1,754.50	36.00	0.00	254.40	1,839.24	0.00	2,093.64
71	Lock Washer M5 Zinc	1,250.00	108.00	0.00	183.75	5,517.72	0.00	5,701.47
72	Flat Washer M4	1,633.50	36.00	0.00	241.76	1,839.24	0.00	2,081.00
73	Spring Washer M4	2,162.50	36.00	0.00	318.97	1,839.24	0.00	2,158.21
74	Flat Washer M5	387.00	12.00	0.00	59.99	613.08	0.00	673.07

Table B-7 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
75	Flat Washer M6*13	1,600.00	72.00	0.00	232.80	3,678.48	0.00	3,911.28
76	Spring Washer M6	1,250.00	72.00	0.00	181.25	3,678.48	0.00	3,859.73
77	Spring Washer M8	50.00	0.00	0.00	7.20	0.00	0.00	7.20
78	Bush OD19mm. 1/2"(Telecom Rack)	50.00	0.00	0.00	44.50	0.00	0.00	44.50
79	Spong Cushion	886.00	36.00	0.00	511.67	1,839.24	0.00	2,350.91
80	Rubber Cushion/1:60	25.00	0.00	0.00	166.00	0.00	0.00	166.00
81	Black Hinge M6 (CCTV)	1,600.00	36.00	0.00	1,264.00	1,839.24	0.00	3,103.24
82	Hinge M5 PH18 Black 4- 145 Hinge Pr05 (Outdoor)	132.00	12.00	0.00	67.98	613.08	0.00	681.06
83	Hinge Rack Plastic Grey+White SV-8201	147.50	60.00	0.00	131.28	3,065.40	0.00	3,196.68
84	Spring (Close Rack) SV- 8200	41.00	0.00	0.00	36.49	0.00	0.00	36.49
85	Key Case 399 SV-8203	16.00	0.00	0.00	7.04	0.00	0.00	7.04

Table B-8 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
86	Key 1-172-03	57.50	12.00	0.00	324.30	613.08	0.00	937.38
87	Key PL-A301-1	157.50	60.00	0.00	1,439.55	3,065.40	0.00	4,504.95
88	Key/ 212	797.00	24.00	0.00	1,346.93	1,226.16	0.00	2,573.09
89	Key/ 399	187.00	120.00	0.00	316.03	6,130.80	0.00	6,446.83
90	Key/ G399	5.00	0.00	0.00	7.70	0.00	0.00	7.70
91	Ball Bearing Slide 18" (S48) SV-3118	8.50	48.00	0.00	130.82	2,452.32	0.00	2,583.14
92	Ball Bearing Slide 22" (S65,S75,S95) SV-3122	10.00	0.00	0.00	168.90	0.00	0.00	168.90
93	Ground (Green+Yellow)	1.00	24.00	0.00	0.31	1,226.16	0.00	1,226.47
94	Cable Lugs + Yellow M6 #5.5-6	10.00	0.00	0.00	3.05	0.00	0.00	3.05
95	Cable Lugs + Blue M6 #2.5-6	271.00	60.00	0.00	65.04	3,065.40	0.00	3,130.44
96	Cable Lugs PV2.5-7A/Blue	16.50	48.00	0.00	4.04	2,452.32	0.00	2,456.36

Table B-9 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
97	Cable Lugs V2.5-7B/Blue	16.50	48.00	0.00	3.71	2,452.32	0.00	2,456.03
98	Clip	1,000.00	36.00	0.00	345.00	1,839.24	0.00	2,184.24
99	Zip lock bag 8*12 cm.	669.50	48.00	0.00	100.09	2,452.32	0.00	2,552.41
100	Zip lock bag 6x8 cm.	50.00	0.00	0.00	7.33	0.00	0.00	7.33
101	Zip lock bag 10x15 cm.	13.00	0.00	0.00	2.01	0.00	0.00	2.01
102	White Cable management 4"	212.50	12.00	0.00	199.75	613.08	0.00	812.83
103	Support paper 6 Outlet+ size 175x440	25.00	0.00	0.00	2,418.09	0.00	0.00	2,418.09
104	Support Paper 12 Outlet size 175x730	25.00	0.00	0.00	2,418.25	0.00	0.00	2,418.25
105	Carton/Outdoor 250x330(210x253x412) 1x6	250.00	48.00	0.00	24,370.00	2,452.32	0.00	26,822.32
106	Carton/Outdoor 250x450(210x253x532)1x11	25.00	0.00	0.00	2,434.50	0.00	0.00	2,434.50

Table B-10 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
107	Carton/Outdoor 450x450(210x453x532)2x11	25.00	0.00	0.00	2,444.50	0.00	0.00	2,444.50
108	Carton/Outdoor 650x450(210x653x533)3x11	25.00	0.00	0.00	2,451.38	0.00	0.00	2,451.38
109	Carton/Outdoor 650x750(210x653x833)3x22	25.00	0.00	0.00	2,463.25	0.00	0.00	2,463.25
110	Carton/Outdoor 450x730(210x453x813)2x22	10.00	0.00	0.00	980.80	0.00	0.00	980.80
111	Carton/Outdoor 500x880(210x503x963)	10.00	0.00	0.00	982.80	0.00	0.00	982.80
112	Carton Fix Shelf 25CM. /G7-01025	1,000.00	12.00	0.00	97,220.00	613.08	0.00	97,833.08
113	PaperSheet 200x440 mm. for Shelf 25 cm.	125.00	48.00	0.00	38.75	2,452.32	0.00	2,491.07

Table B-11 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
114	Carton/Fix Shelf 48 CM./G7-02045 446x480x32 mm.	125.00	48.00	0.00	12,202.50	2,452.32	0.00	14,654.82
115	Carton/Fix Shelf 65 CM./G7-02065 446x650x30 mm.	226.00	60.00	0.00	22,053.08	3,065.40	0.00	25,118.48
116	Carton/Fix Shelf 75 CM./G7-02075	50.00	0.00	0.00	4,884.00	0.00	0.00	4,884.00
117	Carton/Fix Shelf 95 CM./G7-02095	100.00	48.00	0.00	9,793.00	2,452.32	0.00	12,245.32
118	Carton/Slide Shelf 48 CM./G7-03045	25.00	0.00	0.00	2,444.50	0.00	0.00	2,444.50
119	Carton/Slide Shelf 65 CM./G7-03065	12.50	0.00	0.00	1,222.88	0.00	0.00	1,222.88
120	Carton/Slide Shelf 75 CM./G7-03075	12.50	0.00	0.00	1,223.50	0.00	0.00	1,223.50
121	Carton/Slide Shelf 95 CM./G7-03095	155.00	48.00	0.00	15,225.65	2,452.32	0.00	17,677.97
122	Carton/Cable Management /G7-06002,G7-06003	50.00	12.00	0.00	4,860.00	613.08	0.00	5,473.08

Table B-12 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
123	Box/Open Rack 27U (150x540x1240)/Brown	13.50	0.00	0.00	1,355.81	0.00	0.00	1,355.81
124	Box/Open Rack 36U (150x540x1640)/Brown	10.00	0.00	0.00	1,004.30	0.00	0.00	1,004.30
125	Box/Open Rack 42U (150x540x1990)/Brown	5.00	0.00	0.00	504.15	0.00	0.00	504.15
126	Box/Close Rack 45U/White/1 Color printed	25.00	48.00	0.00	2,657.00	2,452.32	0.00	5,109.32
127	Box/Rack 15U*60 (24.75"x26"x31.375")/White /2 Color printed	50.00	0.00	0.00	5,069.00	0.00	0.00	5,069.00

Table B-13 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
128	Box/Rack 15U*80 (24.75"x26"x31.375")/White /2 Color printed	50.00	0.00	0.00	5,081.50	0.00	0.00	5,081.50
129	Box/Rack 27U (24.75"x26"x51.875")/White /2 Color printed	50.00	0.00	0.00	5,224.00	0.00	0.00	5,224.00
130	Box/Rack 36U (24.75"x34"x69")/White/2 Color printed	50.00	0.00	0.00	5,401.50	0.00	0.00	5,401.50
131	Box/Rack 42U (24.75"x26"x79.75")/White/ 2 Color printed	50.00	0.00	0.00	5,406.50	0.00	0.00	5,406.50
132	Box/19"Network Rack 45U/White	50.00	0.00	0.00	5,314.00	0.00	0.00	5,314.00

Table B-14 Total inventory cost before proposing policy Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
133	Carton/Type 2	95.00	48.00	0.00	9,282.88	2,452.32	0.00	11,735.20
134	Carton/Type 4	25.00	48.00	0.00	2,470.00	2,452.32	0.00	4,922.32
135	Box/Cross-Connect UL-6103,6203,6206 Size3 (333x365x130)1 Color printed	60.00	48.00	0.00	5,893.80	2,452.32	0.00	8,346.12
136	Box/Cross-Connect UL-6210 Size20 (440x560x125)/1 Color printed	15.00	48.00	0.00	1,492.95	2,452.32	0.00	3,945.27
137	Box/Cross-Connect UL-6812 Size96 (125x750x750)1 Color printed	50.00	0.00	0.00	5,026.50	0.00	0.00	5,026.50
138	Box/P4 220x260x110 mm.	50.00	0.00	0.00	4,862.58	0.00	0.00	4,862.58
139	Box/DC 280x316x85 mm.	25.00	0.00	0.00	2,433.63	0.00	0.00	2,433.63
140	Box/PS 230x300x95 mm.	25.00	0.00	0.00	2,427.03	0.00	0.00	2,427.03

Table B-15 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
141	Box/PG 295x295x105 mm.	25.00	0.00	0.00	2,428.81	0.00	0.00	2,428.81
142	Box/TOP CF/Adjoin lid 100x482x504 mm.	25.00	0.00	0.00	2,436.63	0.00	0.00	2,436.63
143	Box/Door CF/Lap Over lid 44x504x713 mm.	25.00	0.00	0.00	2,439.50	0.00	0.00	2,439.50
144	Box/Body CF/Adjoin lid 480x504x719 mm.	25.00	0.00	0.00	2,502.00	0.00	0.00	2,502.00
145	Box/RE USE 400x600x400 mm.	25.00	0.00	0.00	2,463.88	0.00	0.00	2,463.88
146	Box/Stock Shelf/Mark/70x225x900 mm.	25.00	0.00	0.00	2,438.88	0.00	0.00	2,438.88
147	Pad in Stock Shelf 215x897 mm. Box	25.00	0.00	0.00	9.13	0.00	0.00	9.13
148	White Glove	50.00	12.00	0.00	139.50	613.08	0.00	752.58
149	Mask	360.00	48.00	0.00	590.40	2,452.32	0.00	3,042.72

Table B-16 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
150	Tatter	125.00	48.00	0.00	173.75	2,452.32	0.00	2,626.07
151	Film 50 cm. x 300 m. x 15micron	65.00	48.00	0.00	464.10	2,452.32	0.00	2,916.42
152	Black Straps	50.00	0.00	0.00	882.00	0.00	0.00	882.00
153	Sandpaper 7" No. 80	15.00	0.00	0.00	1,463.70	0.00	0.00	1,463.70
154	Strand CO2 No. 0.8	11.50	48.00	0.00	501.86	2,452.32	0.00	2,954.18
155	4" SUMO	5.00	0.00	0.00	3.95	0.00	0.00	3.95
156	Glove (Long)	10.00	0.00	0.00	21.40	0.00	0.00	21.40
157	Glove	17.50	48.00	0.00	76.83	2,452.32	0.00	2,529.15
158	Jeans Armband	10.00	0.00	0.00	51.40	0.00	0.00	51.40
159	Jeans Bib	2.50	48.00	0.00	17.85	2,452.32	0.00	2,470.17
160	Clear adhesive tape/ UniTape	10.00	0.00	0.00	14.90	0.00	0.00	14.90
161	Clear adhesive tape	10.00	0.00	0.00	8.40	0.00	0.00	8.40

Table B-17 Total inventory cost before proposing policy (Cont.)

No.	List	Average Inventory (Unit)	Ordering frequency per year	Shortage per year (Unit)	Holding Cost (Baht)	Ordering Cost (Baht)	Shortage Cost (Baht)	Total Cost (Baht)
162	Sandpaper No. 80	10.00	0.00	0.00	983.80	0.00	0.00	983.80
163	Distilled water	10.00	0.00	0.00	6.40	0.00	0.00	6.40
164	welding goggles	2.50	0.00	0.00	1.16	0.00	0.00	1.16
165	Silver Marker/ UNIPANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
166	Broom	0.00	0.00	0.00	0.00	0.00	0.00	0.00
167	Duct tape/ YAZAKI	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX C

SILVER MEAL RESULTS

Table C-1 Silver-Meal Method of SPCC 3.2 x 1219 x 1630

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	22	22	51.09	0.00	51.09
February	140	140	51.09	0.00	51.09
March	94	94	51.09	0.00	51.09
April	100	100	51.09	0.00	51.09
May	55	55	51.09	0.00	51.09
June	60	60	51.09	0.00	51.09
July	143	143	51.09	0.00	51.09
August	105	105	51.09	0.00	51.09
September	187	187	51.09	0.00	51.09
October	50	50	51.09	0.00	51.09
November	20	20	51.09	0.00	51.09
December	48	48	51.09	0.00	51.09
Total	1,024		613.08	0.00	613.08

Table C-2 Silver-Meal Method of EG / SECC 0.8x1219x2438

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	22	22	51.09	0.00	51.09
February	61	61	51.09	0.00	51.09
March	310	310	51.09	0.00	51.09
April	121	121	51.09	0.00	51.09
May	70	70	51.09	0.00	51.09
June	80	80	51.09	0.00	51.09
July	220	220	51.09	0.00	51.09
August	120	120	51.09	0.00	51.09
September	225	225	51.09	0.00	51.09
October	109	109	51.09	0.00	51.09
November	114	114	51.09	0.00	51.09
December	120	120	51.09	0.00	51.09
Total	1,572		613.08	0.00	613.08

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table C-3 Silver-Meal Method of EG / SECC 1.5x1219x2438

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	2	2	51.09	0.00	51.09
February	53	53	51.09	0.00	51.09
March	130	130	51.09	0.00	51.09
April	48	48	51.09	0.00	51.09
May	53	53	51.09	0.00	51.09
June	69	69	51.09	0.00	51.09
July	100	100	51.09	0.00	51.09
August	37	37	51.09	0.00	51.09
September	85	85	51.09	0.00	51.09
October	67	67	51.09	0.00	51.09
November	59	59	51.09	0.00	51.09
December	37	37	51.09	0.00	51.09
Total	740		613.08	0.00	613.08

Table C-4 Silver-Meal Method of SPCC 0.7x1219x2438

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	13	13	51.09	0.00	51.09
February	106	106	51.09	0.00	51.09
March	176	176	51.09	0.00	51.09
April	50	50	51.09	0.00	51.09
May	108	108	51.09	0.00	51.09
June	105	105	51.09	0.00	51.09
July	50	50	51.09	0.00	51.09
August	168	168	51.09	0.00	51.09
September	150	150	51.09	0.00	51.09
October	132	132	51.09	0.00	51.09
November	95	95	51.09	0.00	51.09
December	27	27	51.09	0.00	51.09
Total	1,180		613.08	0.00	613.08

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table C-5 Silver-Meal Method of EG / SECC 1.5x1219x2077

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	25	25	51.09	0.00	51.09
February	15	15	51.09	0.00	51.09
March	125	125	51.09	0.00	51.09
April	80	80	51.09	0.00	51.09
May	50	50	51.09	0.00	51.09
June	30	30	51.09	0.00	51.09
July	111	111	51.09	0.00	51.09
August	69	69	51.09	0.00	51.09
September	36	36	51.09	0.00	51.09
October	27	27	51.09	0.00	51.09
November	38	38	51.09	0.00	51.09
December	54	54	51.09	0.00	51.09
Total	660		613.08	0.00	613.08

Table C-6 Silver-Meal Method of GI / SEGG 0.6x1219x2438

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	35	35+4 = 39	51.09	39.44	96.36
February	4	0	0.00	0.00	0.00
March	93	93	51.09	0.00	51.09
April	10	10	51.09	0.00	51.09
May	38	38	51.09	0.00	51.09
June	27	27	51.09	0.00	51.09
July	82	82	51.09	0.00	51.09
August	50	50	51.09	0.00	51.09
September	53	53	51.09	0.00	51.09
October	55	55	51.09	0.00	51.09
November	31	31	51.09	0.00	51.09
December	50	50	51.09	0.00	51.09
Total	528		561.99	39.44	607.26

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table C-7 Silver-Meal Method of GI / SEGG 1.2x1219x2438

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	5	5	51.09	0.00	51.09
February	13	13	51.09	0.00	51.09
March	45	45	51.09	0.00	51.09
April	15	15	51.09	0.00	51.09
May	19	19	51.09	0.00	51.09
June	28	28	51.09	0.00	51.09
July	12	12	51.09	0.00	51.09
August	20	20	51.09	0.00	51.09
September	30	30	51.09	0.00	51.09
October	30	30	51.09	0.00	51.09
November	20	20	51.09	0.00	51.09
December	15	15	51.09	0.00	51.09
Total	252		613.08	0.00	613.08

Table C-8 Silver-Meal Method of Key/212

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	1,200	$1,200+0+0 = 1,200$	51.09	0.00	51.09
February	0	0	0.00	0.00	0.00
March	0	0	0.00	0.00	0.00
April	400	400	51.09	0.00	51.09
May	602	$602+300 = 902$	51.09	42.00	93.09
June	300	0	0.00	0.00	0.00
July	800	$800+300 = 1,100$	51.09	42.00	93.09
August	300	0	0.00	0.00	0.00
September	348	$348+200 = 548$	51.09	28.00	79.09
October	200	0	0.00	0.00	0.00
November	400	$400+250 = 650$	51.09	35.00	86.09
December	250	0	0.00	0.00	0.00
Total	4,800		306.54	147.00	453.54

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table C-9 Silver-Meal Method of EG / SECC 1.5x1219x1677

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	8	8	51.09	0.00	51.09
February	20	20	51.09	0.00	51.09
March	35	35	51.09	0.00	51.09
April	10	10	51.09	0.00	51.09
May	13	13	51.09	0.00	51.09
June	17	17	51.09	0.00	51.09
July	46	46	51.09	0.00	51.09
August	9	9	51.09	0.00	51.09
September	13	13	51.09	0.00	51.09
October	25	25	51.09	0.00	51.09
November	43	43	51.09	0.00	51.09
December	13	13	51.09	0.00	51.09
Total	252		613.08	0.00	613.08

Table C-10 Silver-Meal Method of Key/ 399

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	40	40	51.09	0.00	51.09
February	630	630+423 = 1,053	51.09	59.22	110.31
March	423	0	0.00	0.00	0.00
April	301	301	51.09	0.00	51.09
May	556	556+245 = 801	51.09	34.30	85.39
June	245	0	0.00	0.00	0.00
July	402	402+267 = 669	51.09	37.38	88.47
August	267	0	0.00	0.00	0.00
September	250	250+296 = 546	51.09	41.44	92.53
October	296	0	0.00	0.00	0.00
November	245	245+420 = 665	51.09	58.8	109.89
December	420	0	0.00	0.00	0.00
Total	3,976		357.63	231.14	588.77

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table C-11 Silver-Meal Method of Ball Bearing Slide 18”

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	100	100+0+0 = 100	51.09	0.00	51.09
February	0	0	0.00	0.00	0.00
March	0	0	0.00	0.00	0.00
April	50	50+20+12 = 82	51.09	40.96	92.05
May	20	0	0.00	0.00	0.00
June	12	0	0.00	0.00	0.00
July	70	70+10+12 = 92	51.09	28.16	79.25
August	10	0	0.00	0.00	0.00
September	12	0	0.00	0.00	0.00
October	66	66	51.09	0.00	51.09
November	40	40+20 = 60	51.09	25.60	76.69
December	20	0	0.00	0.00	0.00
Total	400		255.45	94.72	350.17

Table C-12 Silver-Meal Method of Plastic Hinge Rack Grey+White SV-8201

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	70	70	51.09	0.00	51.09
February	1,260	1,260	51.09	0.00	51.09
March	648	648	51.09	0.00	51.09
April	1,057	1,057	51.09	0.00	51.09
May	490	490	51.09	0.00	51.09
June	730	730	51.09	0.00	51.09
July	1,500	1,500	51.09	0.00	51.09
August	498	498	51.09	0.00	51.09
September	258	258	51.09	0.00	51.09
October	100	100	51.09	0.00	51.09
November	1,001	1,001	51.09	0.00	51.09
December	300	300	51.09	0.00	51.09
Total	7,912		613.08	0.00	613.08

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table C-13 Silver-Meal Method of Carton/Cable Management/ G7-06002, G7-06003

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	1,800	1,800	51.09	0.00	51.09
February	200	200+0 = 200	51.09	0.00	51.09
March	0	0	0.00	0.00	0
April	1,567	1,567	51.09	0.00	51.09
May	200	200	51.09	0.00	51.09
June	400	400	51.09	0.00	51.09
July	1,478	1,478	51.09	0.00	51.09
August	700	700	51.09	0.00	51.09
September	200	200	51.09	0.00	51.09
October	655	655	51.09	0.00	51.09
November	600	600	51.09	0.00	51.09
December	200	200	51.09	0.00	51.09
Total	8,000		587.54	0.00	587.54

Table C-14 Silver-Meal Method of SPCC 3.2x1219x2438

Month	Demand (Unit)	Order Quantity (Unit)	Ordering Cost (Baht)	Holding Cost (Baht)	Total Cost (Baht)
January	0	0	0.00	0.00	51.09
February	10	10+0 = 10	51.09	0.00	51.09
March	0	0	0.00	0.00	0
April	5	5	51.09	0.00	51.09
May	7	7	51.09	0.00	51.09
June	5	5+1 = 6	51.09	16.53	67.62
July	1	0	0.00	0.00	51.09
August	3	3+1 = 4	51.09	16.53	67.62
September	1	0	0.00	0.00	51.09
October	4	4+1 = 5	51.09	16.53	67.62
November	1	0	0.00	0.00	51.09
December	3	3	51.09	0.00	51.09
Total	40		357.63	49.59	407.22

เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

APPENDIX D

RESULT OF SAFETY STOCK OF GROUP C



เอกสารนี้เป็นเอกสารที่สงวนไว้สำหรับการใช้งานเพื่อการศึกษาเท่านั้น ไม่อนุญาตให้นำไปใช้ประโยชน์ด้านการค้า
ไม่ว่ากรณีใดๆ ทั้งสิ้น อีกทั้งห้ามมิให้ดัดแปลงเนื้อหา และต้องอ้างอิงถึงเจ้าของเอกสารทุกครั้งที่มีการนำไปใช้

Table D-1 Result of safety stock results of group C

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
1	Studs Pins (Tap mounted) M6*12 SUS	17	30	1.645	17.17	0.00	155
2	Pem Nut M4	91	7	1.645	86.22	1.00	405
3	Stud weld M4*10	481	11	1.645	131.85	1.15	1170
4	Film 50 cm. x 300 m. x 15micron	1	2	1.645	0.32	0.58	2
5	Stud weld M3x15 TOM	90	11	1.645	83.19	1.15	492
6	Strand CO2 No. 0.8	1	5	1.645	0.03	0.58	1
7	Standoff M4x14.2 Tom	55	45	1.645	47.13	56.29	5120
8	Cable Lugs + Blue M6 #2.5-6	50	14	1.645	20.72	1.53	178
9	Cagenut M6 2T NI	28	29	1.645	9.10	1.15	97
10	White Cable management 4"	5	1	1.645	8.35	0.00	14
11	Nut M6 Zinc	373	15	1.645	64.31	0.00	410
12	PaperSheet 200x440 mm. for Shelf 25 cm.	17	15	1.645	10.72	0.00	69

Table D-2 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
13	Tatter	2	1	1.645	1.74	0.58	4
14	Stud weld M6*10	26	10	1.645	15.98	0.00	84
15	Flat Washer M6*13	311	15	1.645	157.75	0.00	1006
16	SPCC 2.3 x 1220 x 2438	1	2	1.645	0.04	0.58	1
17	Stand off M3x10	23	10	1.645	38.49	0.00	201
18	White Stud M3x15 TOM	17	10	1.645	16.50	0.00	86
19	Spring Washer M6	323	15	1.645	160.70	0.00	1024
20	Plastic Washer (Interlink)	37	6	1.645	11.44	1.15	84
21	Glove	1	1	1.645	0.26	0.58	2
22	Nut M4 Zinc	162	15	1.645	94.19	0.00	601
23	Flat Washer M4	124	15	1.645	120.93	0.00	771
24	GI / SEGG 0.8x1219x2438	1	3	1.645	1.26	0.58	4

Table D-3 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
25	Spring Washer M4	124	15	1.645	120.93	0.00	771
26	Screw/O JP M5x6 Zinc	67	14	1.645	59.45	0.58	368
27	Lock Washer M5 Zinc	122	14	1.645	55.92	0.58	368
28	Screw/JP O M4x0.7x10 ZINC	83	15	1.645	131.04	0.00	835
29	Screw/JP M6x1.0Px15 NI	37	30	1.645	11.44	0.00	104
30	White Stud M3x10 (PS)	11	10	1.645	17.32	2.00	98
31	Screw/P+AB #7*1 NI	40	15	1.645	40.12	0.00	256
32	Key 1-172-03	1	15	1.645	0.17	0.00	2
33	Zip lock bag 8*12 cm.	56	14	1.645	48.69	0.00	300
34	Screw/JT U M4x50 Zinc	21	13	1.645	6.68	1.00	53
35	Labour pook (Plastic) #7	96	15	1.645	67.07	0.00	428
36	Screw/ TMS-2 M6*12 +- Zinc	25	30	1.645	6.25	0.00	57

Table D-4 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
37	Screw/Taper M4x15 Zinc (Cross)	45	14	1.645	21.00	1.00	149
38	Screw/angle M10x30 Black	5	15	1.645	2.50	0.00	16
39	Flat Washer M6*11*1 Zinc	37	12	1.645	11.44	2.89	188
40	Screw/white M6x1.0x10 Angle Zinc	20	13	1.645	6.84	0.00	41
41	Stud weld M6*20	3	12	1.645	4.54	1.53	28
42	Cable Lugs PV2.5-7A/Blue	3	15	1.645	3.85	0.58	25
43	Cable Lugs V2.5-7B/Blue	3	14	1.645	3.85	0.00	24
44	Nut M5 Zinc	7	14	1.645	11.01	0.58	69
45	Labour pook 3/16"-24 40 mm.	2	15	1.645	1.82	0.00	12
46	Nut M10/Black	4	15	1.645	0.78	0.00	5
47	Screw/O JP M5x15 Zinc	6	15	1.645	9.08	0.58	58
48	Flat Washer M5	7	15	1.645	11.01	0.00	71

Table D-5 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
49	Labour pook 1/4"x2	2	11	1.645	1.85	0.58	11
50	Jeans Bib	1	1	1.645	0.02	0.00	1
51	Hinge M5 PH18 Black 4-145 Hinge Pr05 (Outdoor)	1	15	1.645	0.35	0.00	3
52	Zip lock bag 6x8 cm.	7	15	1.645	11.93	0.00	77
53	Flange Nut Zinc M6	1	14	1.645	0.69	0.58	5
54	Screw/Taper M4x10 Zinc	3	15	1.645	39.84	0.00	254
55	Screw/Taper M5x12 Zinc	1	15	1.645	0.35	0.00	3
56	Ground (Green+Yellow)	1	14	1.645	0.02	1.53	3
57	GI / SEGG 1.0x1219x2438	1	0	1.645	0.67	0.00	0
58	SPCC 0.5 x 1219 x 2438	1	0	1.645	0.00	0.00	0
59	SPCC 0.6 x 1219 x 2438	1	0	1.645	0.10	0.00	0
60	SPCC 1.0 x 1219 x 2438	1	0	1.645	0.00	0.00	0

Table D-6 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
61	SPCC 1.5 x 1219 x 2438	1	0	1.645	0.00	0.00	0
62	SPCC 1.2 x 1220 x 2438	1	0	1.645	0.00	0.00	0
63	SPCC 2.0 x 70.5 x 1500	1	0	1.645	0.00	0.00	0
64	SPCC 2.0 x 70.5 x 390	1	0	1.645	0.00	0.00	0
65	SPCC 2.0 x 70.5 x 650	1	0	1.645	0.00	0.00	0
66	White Stud M6x15 Rack	1	0	1.645	0.00	0.00	0
67	Screw/JT U M4x10 Zinc	1	0	1.645	0.00	0.00	0
68	Screw/Hexagon 1/2"x3"	1	0	1.645	0.00	0.00	0
69	Knot 1/2"	1	0	1.645	0.00	0.00	0
70	Flat Washer 5/8"	1	0	1.645	0.00	0.00	0
71	Spring Washer M8	1	0	1.645	0.00	0.00	0
72	Bush OD19mm. 1/2"(Telecom Rack)	1	0	1.645	0.00	0.00	0

Table D-7 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
73	Rubber Cushion/1:60	1	0	1.645	0.00	0.00	0
74	Spring (Close Rack) SV-8200	1	0	1.645	0.00	0.00	0
75	Key Case 399 SV-8203	1	0	1.645	0.00	0.00	0
76	Key/ G399	1	0	1.645	0.00	0.00	0
77	Ball Bearing Slide 22" (S65,S75,S95) SV-3122	1	0	1.645	0.00	0.00	0
78	Cable Lugs + Yellow M6 #5.5-6	1	0	1.645	0.00	0.00	0
79	Zip lock bag 10x15 cm.	1	0	1.645	0.00	0.00	0
80	Support paper 6 Outlet+ size 175x440	0	0	1.645	0.00	0.00	0
81	Support Paper 12 Outlet size 175x730	0	0	1.645	0.00	0.00	0
82	Pad in Stock Shelf 215x897 mm.	0	0	1.645	0.00	0.00	0
83	Black Straps	1	0	1.645	0.00	0.00	0
84	Sandpaper 7" No. 80	1	0	1.645	0.00	0.00	0

Table D-8 Result of safety stock results of group C (Cont.)

No.	List	Demand per day (Unit)	Lead time bar (Day)	Z (95%)	σd per day	σLT	Safety Stock (Unit)
85	4" SUMO	1	0	1.645	0.00	0.00	0
86	Glove (Long)	1	0	1.645	0.00	0.00	0
87	Jeans Armband	1	0	1.645	0.00	0.00	0
88	Clear adhesive tape/ UniTape	1	0	1.645	0.00	0.00	0
89	Clear adhesive tape	1	0	1.645	0.00	0.00	0
90	Sandpaper No. 80	1	0	1.645	0.00	0.00	0
91	Distilled water	1	0	1.645	0.00	0.00	0
92	welding goggles	1	0	1.645	0.00	0.00	0
93	Silver Marker/ UNIPANT	1	0	1.645	0.00	0.00	0
94	Broom	1	0	1.645	0.00	0.00	0
95	Duct tape/ YAZAKI	1	0	1.645	0.00	0.00	0

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