A STUDY OF PROCUREMENT EVALUATION
A CASE STUDY OF PHARMACEUTICAL COMPANY

NIjarat Wichianprasit

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By	Nijarat Wichianprasit
Field of Study	Industrial Management
Advisor	Dr. Korakot Hemsathapat

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…….. Dean of the Graduate School

(Assoc. Prof. Dr. Pichit Sukchareonpong)

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Term Paper Committees

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(Dr. Jakkapong Limpanussorn)

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(Dr. Chark Tingsabhat)

……... Advisor

(Dr. Korakot Hemsathapat)

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The objective of this study is to find the materials ordering method, which provides low risk of materials shortage, optimum inventory level, less complication logic with minimize level of human intervention in the ERP system. The case study company has already started ERP implementation but the full function of production module has not been obtained. The actual production scheduling was performed outside the system. The evaluation was conducted on important export product groups. Six-month period was selected to simulate based on customer ordering plan of year 2014. The four material ordering patterns were selected for evaluation.

The first method: Advance arrival of materials before shipment date 90 days

The second method: Advance arrival of materials before shipment date 60 days and grouped safety stock of level 1 and level 2 components for each packing style

The third method: Advance arrival of materials before shipment date 60 days and safety stock of level 2 for each group and safety stock of level 1 for each packing style

The fourth method: Arrival of material at the 1st day of actual production month and safety stock of level 2 for each group and safety stock of level 1 for each packing style

The study found that no shortage of raw materials in the 2nd and the 4th method, but the 1st method and the 3rd method were found shortage. The averages of six-month inventory values of the 1st method to the 4th method were 13,090,000 Baht, 34663,333 Baht, 20,056,667 Baht, and 23,220,000 Baht, respectively. The most preferable method was the 4th method. The actual production scheduling was an important tool for material ordering. A safety stock has an important role to prevent the shortage of materials. However safety stock should be carefully monitored to control the level of inventory. For further study, the unstable of demand and supply should be considered.

Graduate School Student's Signature .....

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Nijarat Wichianprasit

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Chapter 1

Introduction

Background and Significance

In the dynamism environment of business competition, one of the most concerned issues by the customer is on time delivery of goods by the promised due date. According to the Just-in-Time (JIT) principle, delivery of products/materials must be adhered to the three criteria: what it needs, in the amount it needs, and by the time it needs. Evaluation of the accuracy of delivery is calculated by the combination of the three criteria. To achieve the accuracy of delivery, demand information from the downstream activities must be synchronized along the supply chain. Thus, the Enterprise Resources Planning (ERP) was developed to overcome the shortcomings of information unsynchronization to improve operations efficiency.

The production process is one of the activities in the supply chain. Input materials must arrive at the production facility on time as scheduled by production plan to achieve accuracy of delivery. The case study factory faced with inaccuracy arrival of input materials, for example, the incorrect amount of input material delivery, unable to order the input materials to be delivered on time to keep pace with the production date. These problems caused production incapability and delay of product delivery. Then, the factory decided to implement the ERP system to overcome all the difficulties. However, after the implementation, the production module of ERP system is not fully functioning due to the fact that the production capacity is unknown to the implementer. Thus, the Master Production Schedule (MPS) must be manually created. Consequently, the factory is now in need of a material ordering method of ERP system to match with the actual production schedule.

In this study, the possible material ordering methods will be evaluated under the conditions of no input material shortage and optimal inventory level control. The comparison of pro and con of material ordering solutions is also described.

Purposes of the Study

Feasible material ordering methods are evaluated in order to;

1. Reduce input material shortage of production to create stable supply chain of finished goods

2. Optimally control materials inventory level

Scope of the Study

The selected method of materials ordering will be applied in the ERP system to improve stable supply chain of export products of the PD 1 section of case study factory.

Operation Terms

Enterprise Resources Planning (ERP): system that can provide the needed information throughout the enterprise in real time and improves communications and collaborations in the enterprise.

Material Requirements Planning (MRP): system that is used to control inventory and manage order release

Dependent Demand: a demand directly related to or derived from the demand for other items or end products.

Master Production Schedule (MPS): This schedule is an indication of production item, production time and production quantity.

Bill of Materials (BOM): List of material items and quantity for one goods

Purchase Order Outstanding: Record of purchasing transaction.

Lead Time: the time required to get the components/materials of products.

Research Procedure

1. Review the research literatures concerned with ordering of dependent demand materials
2. Study of the background and current operations of the factory
3. Select a product group and collect data for evaluation
4. Evaluate the ordering pattern and calculate estimation of inventory value
5. Conclude the results of evaluation

Expected Results

1. No input materials shortage in production
2. Reach an acceptable inventory level
3. The guideline for logically creating alternatives and evaluation

Research Plan

Research plan and timeline are displayed in Table 1.

Table 1: Research Plan and Timeline

No.	Process	May 14		June 14		July 14		August 14	
1	Review the literatures								
2	Explore background and present conditions								
3	Select product group and collect data								
4	Evaluate the ordering methods								
5	Conclude the research								
6	Prepare term paper								

Chapter 2

Literature Review

The Enterprise Resources Planning (ERP) is one of management tools. This system can provide the needed information throughout the enterprise in real time and improves communications and collaborations in the enterprise. ERP was developed from Material Requirements Planning (MRP) and Material Requirement Planning II (MRP II). MRP was initially created to control inventory and manage order release. As manufacturing planning system, MRP II has a function to manage the manufacturing process including loading and scheduling materials. The next generation of the system is the evolution to ERP. This software can link all departments' information such as Marketing/Sale, Purchasing, Production, Finance/Accounting and Vendors see Figure 1 (Heizer; and Render. 2011).

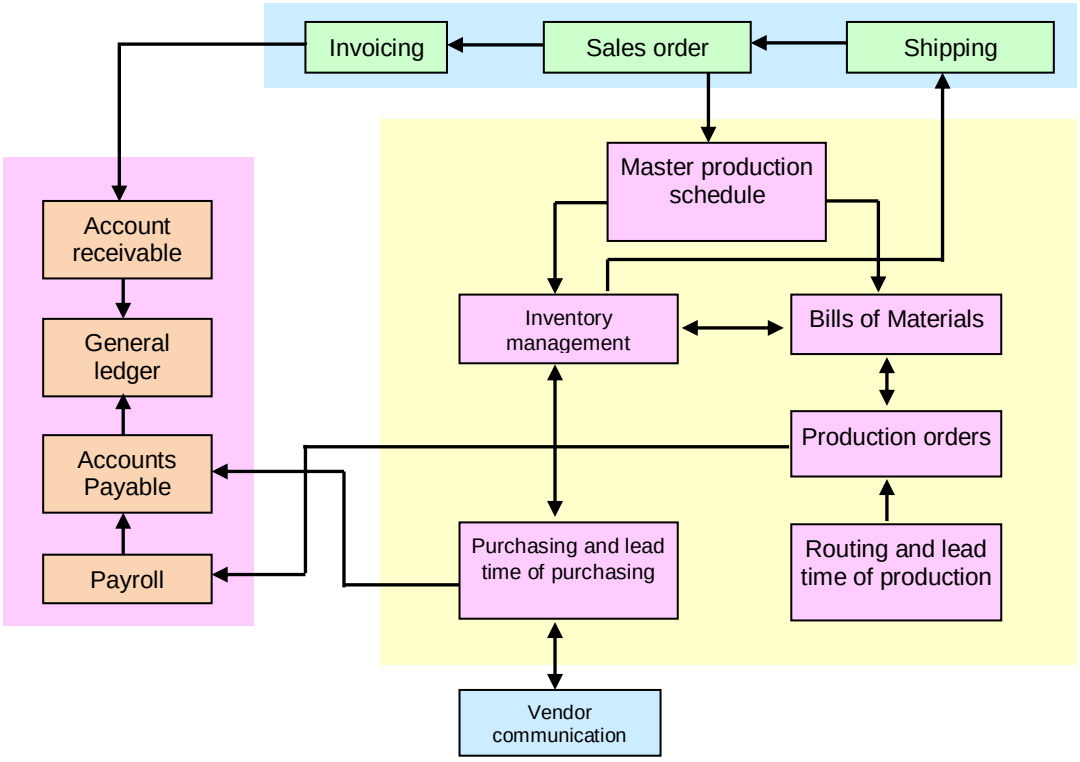

Figure 1: ERP Information and Data Flow

Source: Adapted from Heizer; and Render. (2011). **Operations Management**. p. 598.

Starting from the sales order generation, Master Production Schedule (MPS) is set. Then the system will create a material and production plan. Materials purchasing and production lead time are calculated in production module. For materials purchasing, the information of ordering is communicated between purchasing section and vendor/or supplier. After a product is manufactured and ship to customer according to the plan, accounting module will control account payable and account receivable (Goyal. 2011). When efficiently operated, ERP can be a powerful tool for operations management.

Dependent Demand

Dependent demand is a demand directly related to or derived from the demand of other items or end products. Input materials, which can be related them to make the goods or services, the demand of these items is dependent (Heizer; and Render. 2011). For example, the demand for compounds of pharmaceutical tablets, it consists of two active pharmaceutical ingredients: non-active ingredient no. 1 and non-active ingredient no. 2.

Material Requirements Planning (MRP) was developed from dependent demand technique. MRP is known as a basis of Enterprise Resources Planning (ERP).

Dependent Inventory Model Requirements (Heizer; and Render. 2011)

When this model is used in organization, the items that will be required are listed as follows;

1. Master Production Schedule (MPS)

This schedule is an indication of production item, production time and production quantity. The production schedules should be created from the bottleneck process of product group to prevent over capacity production. Each manufacturing process of products is analyzed and the bottleneck process is identified for MPS generation.

However, scheduling of manufacturing company is hard to be perfect. Pujawan and Smart (2012) studied on factors, which were effect to scheduling instability. More than half of company accepts that schedule instability was an important issue for company. The external factors, supplier relationship and buyer relationship, had an effect on schedule instability more than internal factors. Uncertainty of buyer order, information sharing and planning between manufacturer and buyer are the issues

of the buyer relationship. Flexibility and reliability of supplier are also the important issues concerning with schedule instability.

2. Bill of Materials (BOM) of products

Manufacturing of goods is required many items of materials. Material items and quantity for one goods are shown in BOM. Table 2 shows an example of BOM of product A. When compositions such as type or quantity of materials are changed to produce finished goods; the alteration of BOM has to be considered as well.

BOM explosion can reveal product structure and relation of each item in BOM to manufacturing products. The product structure is exhibited in Figure 2. The top level of product structure is the “0” level, that has the longest path of production since starting of procuring materials until the end of production. This “0” level is called parents and the below items of product structure are called components or children.

Table 2: Bill of Material of Product A 1,000 Boxes

BOM of Product A (1,000 Boxes)		
Items	**Quantity**	**Unit**
Core tablets	1,000,000	Tablets
Bottle set	1,000	Pcs
Inner boxes	1,000	Pcs
Carton boxes	100	Pcs
Adhesive tape	50	m
BOM of Core Tablets (1,000,000 Tablets)		
Items	**Quantity**	**Unit**
API	10	Kg
Excipient 1	100	Kg
Excipient 2	100	Kg

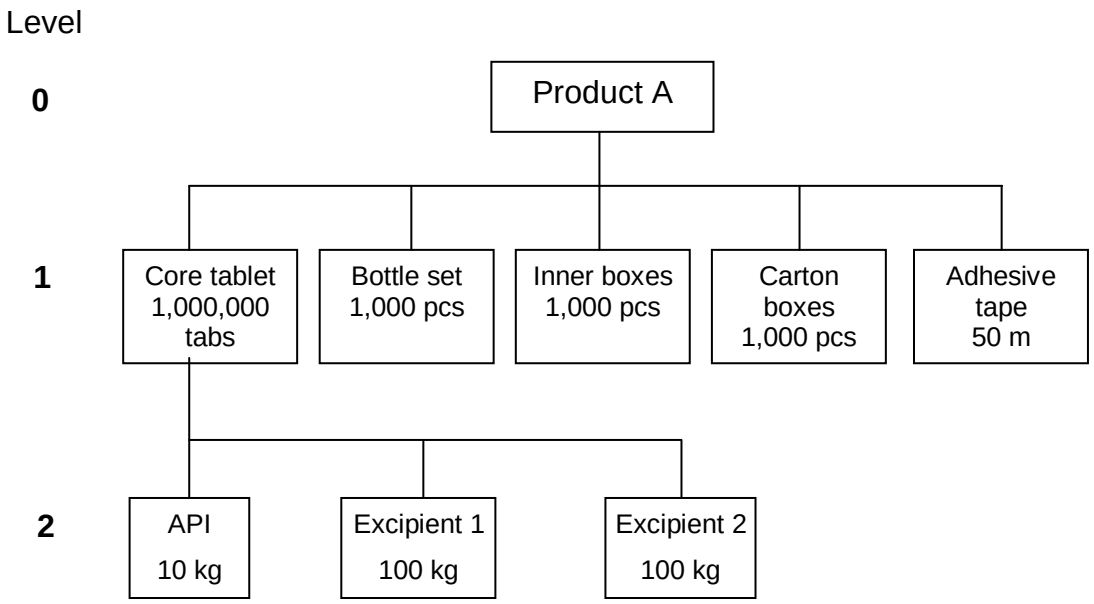

Figure 2: Product Structure of Product A

3. Inventory Availability

The quantity of inventory must be accurately recorded according to the actual inventory. If the recorded quantity does not match the actual value, it might lead to material shortage for production or waste of holding cost for over ordering of materials.

4. Purchase Order Outstanding

When purchase order is issued, this transaction should be recorded. The information of materials quantity and plan of arrival date must be shared to production department. Then, production section can easily follow-up the status of materials for production.

5. Lead Time

Lead time is the time required to get the components/materials of products. These are many kinds of lead time. However, the two important kinds of lead time for production are purchasing lead time, and production lead time. Purchasing lead time is started from issuing of purchase order until the material arrival at the factory. Production lead time is the first day of production process started until the end of production. For example, production lead time of core tablets is two weeks and purchasing lead time of API is four weeks as shown in Figure 3.

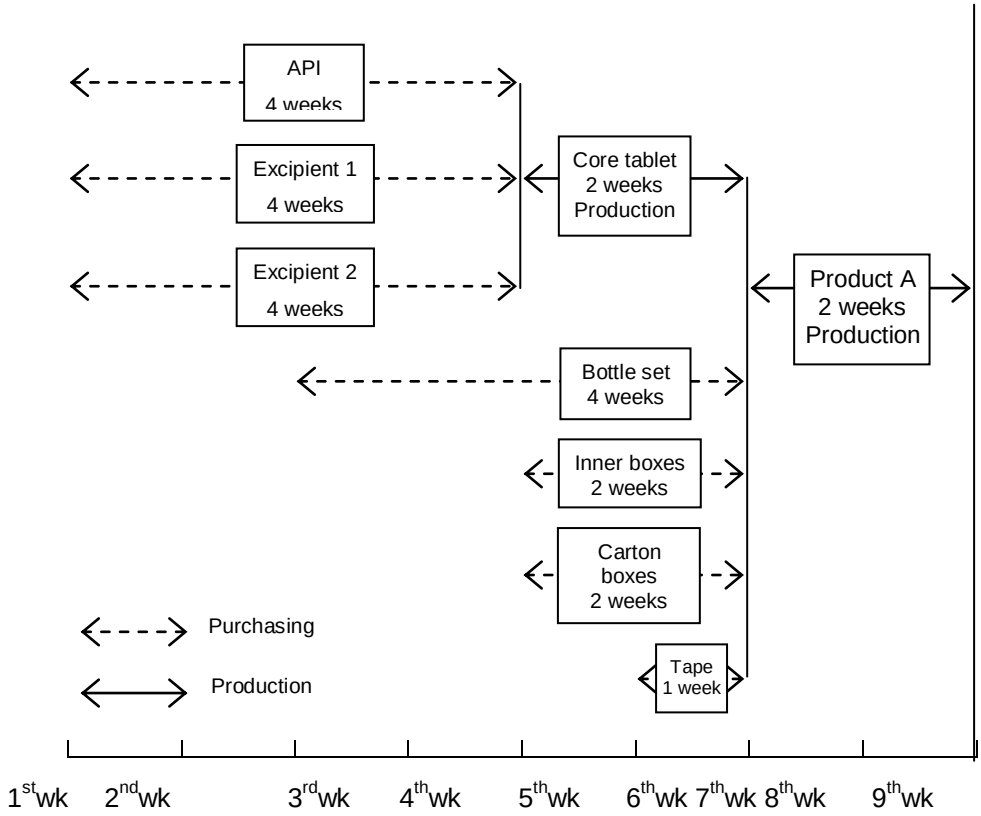

Figure 3: Time Phases of Product Structure of Product A

MRP Structure (Heizer; and Render. 2011)

The MRP system has the components as follows;

1. Master production schedule
2. Bill of materials
3. Inventory and purchasing records
4. Lead time of getting materials

The gross material requirements plan is created after the aforementioned components complete with the accurate data. It is the relation between a master production schedule (demand of materials) and material purchasing order (supply of materials). Gross materials plan is displayed in Table 3. In case of inventory on hand, the consumption and release order will be re-calculated and net requirement plan will be generated.

Table 3: Gross Materials Plan of Product A and Components

	Lead time (week)	Date of	Week								
			1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Product A (boxes)	2	Required									1,000
		Order release							1,000		
Core tablets (tabs)	2	Required							1 M		
		Order release					1M				
Bottle set (pcs)	4	Required							1,000		
		Order release			1,000						
Inner boxes (pcs)	2	Required							1,000		
		Order release					1,000				
Carton boxes (pcs)	2	Required							100		
		Order release					100				
Adhesive tape (m)	1	Required							50		
		Order release						50			
API (kg)	4	Required					10				
		Order release	10								
Excipient 1 (kg)	4	Required					100				
		Order release	100								
Excipient 2 (kg)	4	Required					100				
		Order release	100								

Safety Stock (Heizer; and Render. 2011)

In actual operation, the material purchasing and production might vary from standard, even if the supplier has high reliability or production process is very stable. Then optimum safety stock, which will be the buffer for the variation, is calculated for both materials and finished goods. Bodt; Wassenhowe; and Gelders (1982) simulated difference ordering pattern with demand uncertainty and safety stock. In addition, the researcher found that optimum quantity of safety stock was the important thing to maintain service level and also inventory cost must be also considered.

Lot Size Indication Techniques

Lot sizing valuation is decision, which indicates size of the lot or how much quantity is needed to order. There are many methods to indicate lot size in MRP system. The part of many techniques is listed as follows (Heizer; and Render. 2011 and Toomey. 1996).

1) Economic Order Quantity (Heizer; and Render. 2011)

This technique is statistical calculation using average requirement per period. But this technique will be used, when demand is unknown. However, MRP receives the demand from master production schedule. This method is concerning about demand in the period, set up or ordering cost and holding or carrying cost. The equation of economic order quantity is shown below.

$$Q^* = \sqrt{\frac{2DS}{H}}$$

Q^* = Optimum number of unit per order

D = Annual demand in units for the inventory item

S = Set up or ordering cost for each order

H = Holding or carrying cost per unit per year

2) Lot-for-Lot (Toomey. 1996)

The product will be manufactured according to the requirement only. There is no remaining portion to keep as the stock. But this technique might be not suitable for production with high set up cost or ordering per time. The example of requirement and receipt plan is shown in Table 4.

Table 4: Requirement and Receipt Plan of Lot-for-Lot

Date of	**Week**								
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**
Net requirement	10	40	50	65	30	100	50	10	30
On hand	0	0	0	0	0	0	0	0	0
Order receipt	10	40	50	65	30	100	50	10	30

3) Fixed Order Period (Toomey. 1996)

The period of ordering is fixed. But the quantity is equal to consumption during the fixed period. Then there are the inventory remains during the ordering period. The example of this technique is displayed in Table 5. The net requirement is same as example of lot-for-lot technique but order receipt is difference.

Table 5: Requirement and Receipt Plan of Fixed Order Period

Date of	Week								
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Net requirement	10	40	50	65	30	100	50	10	30
On hand	90	50	0	130	100	0	40	30	0
Order receipt	100			195			90		

4) Fixed order quantity (Toomey. 1996)

For this technique, the quantity is fixed but the ordering period will be varying according to the consumption. The same of net requirement of lot-for-lot and fixed period is used for this example, which is exhibited in Table 6. Order receipt is difference from 2 methods above and there is inventory remaining to the 10th week, because this method does not calculate the exact consumption to order materials.

Table 6: Requirement and Receipt Plan of Fixed Order Quantity

Date of	Week								
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Net requirement	10	40	50	65	30	100	50	10	30
On hand	90	50	0	35	105	5	55	45	15
Order receipt	100			100	100		100		

5) Least unit cost (Toomey. 1996)

The lot size is calculated by using set up cost and holding cost divided by each trial lot size. The lot size, which gave the lowest unit cost, will be selected.

6) Least total cost (Toomey. 1996)

For each trial lot size, the set up cost and holding cost are compared. The particular lot size is selected, if the set up cost and holding cost are most equal.

7) Part Period Balancing (Heizer; and Render. 2011)

This technique has same logic as least total cost. But lot size is changed by reflection of the next lot size in the future.

8) Wagner-Within Algorithm (Heizer; and Render. 2011)

This technique is the model that uses all possible combinations to select the optimum result.

More than one technique will be utilized for logic of MRP of one company to get desired result. Ghobbar; and Friend (2004) revealed that most of aviation companies use more than one lot-sizing technique to be the formula in MRP.

Related Research

Melnyk; and Piper (1981) simulated the operation of multi-stage and multi product factory to find the effect of safety production lead time into various dimension. In the study, safety lead time was only focused. The lot size was not concerned.

- Appropriate safety lead time can lead to better performance of MRP Implementation comparing with no safety lead time.

- But too high of safety lead time will cause the lower performance of production service.

- Safety lead time has better effect on the part level or initial children level than end level, because initial level was the upstream of production process.

- Large safety lead time relate to large inventory.

Enns (2001) studied in the topic of the relation between lot size setting and lead time setting that will affect on the delivery delay and total investment. The study was on assembly line. The finding of the study was listed below.

- The lot sizes affect to planned lead times. Too large or too small lot size needed to use long lead time compare with optimum lot size due to reasonable of processing time and set up time for production lot size.

- In the same lot size with long lead time, the customer delivery delay was low but inventory investment was high.

- The optimum lot size should be selected first, after that the planned lead time will be adjusted according to the situation.

Molinder (1997) studied on the impact of safety stock and safety lead time usage for lead time variability and demand variability. Total cost, which used for evaluation of each safety performance, was combination among inventory holding cost, stock out cost and set-up cost. The findings of the experiment were shown below.

- For high demand variability, safety stock provided lower total cost than safety lead-time.

- For high supply variability, safety lead time was more preferable, because it gave less total cost.

- In case of high demand and supply variability, total cost was extremely high for this case. However, the safety lead time option still gave lower total cost than safety stock option.

Another study that focused on the impact of safety stock and safety lead time, but the evaluation of the impact was delivery performance and inventory level. Kampen; Donk; and Zee (2010) studied the utilization of safety stock and safety lead time on the situation of unreliability of demand or/and supply. Demand unreliability was the mean change of order quantity, order sequence and type of goods. And uncertainty of production process was unreliability of supply. Both unreliability of demand and supply reduce delivery performance. Then, safety stock or safety lead time will use as the buffer for each situation.

Supply variability

For this case, study showed that utilizing the safety lead time get the better result than safety stock. Safety lead time can increase process flexibility, when the unstable situation occurs in production line. The safety lead time also provides lower inventory level compare with usage of safety stock.

Demand variability

Safety stock was preferable than safety lead time in a multi product setting when demand uncertainty happens. Buffer goods can be delivered, even if the order was changed. The safety stock level should be sufficient for coverage of one-additional set-up at least for each product. For safety stock option, the increase of inventory was small, when the uncertainty of demand increases. On the other hand, the inventory level rapidly increases for safety lead time.

Mix of supply and demand variability

Safety lead time was more effective for handle this case than for multiple product situation. But the result of inventory level was same as case of demand variability. Safety lead time was very sensitive to change of uncertainty level.

From the related research above, the optimum lot size should be identified first for MRP system. Use of safety stock and safety lead time was selected according to the variability. Safety stock tends to provide the better performance, when demand variable was occurred. But supply variability and combination of variability of supply and demand, the safety lead time might be suitable more than safety stock for these scenarios. For this study, safety stock and safety lead time were also considered to evaluate in environment of case study company. Prevention of material shortage for production line and inventory control were major objective in the study.

Background of Case Study Company

The case study company was found since 1979. The company is co-investment between Thai and Japanese investment. The manufacturing plant produces entire pharmaceutical product since active pharmaceutical ingredients to pharmaceutical products. The case study company has approximately 350 employees, 100 employees is located at section of PD1 section.

Scope of Business

The case study company manufactures both sterile product (injections) and non-sterile product (tablets, capsules, powders, granules, solutions, and suspensions). And product also classified by market as follows;

1) Domestic products
   1.1 Human pharmaceutical products
      - Antibiotic
      - Gastrointestinal tract
      - Bone and Joint
      - Other
   1.2 Veterinary pharmaceutical products
      - Antibiotic
      - Feed mill
      - Other
2) Export products
   2.1 Human pharmaceutical products
      - Antibiotic
      - Gastrointestinal tract
      - Anti-depressant
      - Palliative product for Alzheimer's disease
      - Other
   2.2 Veterinary pharmaceutical products
      - Antibiotic
      - Feed mill
      - Other

Products of PD1 section are grouped as shown below;

1) Human domestic products
   1.1 Tablets 1 products
   1.2 Solutions 2 products
   1.3 Capsules 6 products
   1.4 Powders and granules 5 products
2) Human export products
   2.1 Tablets 21 products
   2.2 Capsules 3 products
   2.3 Solutions 1 product
   2.4 Powder and granules 2 product
3) Veterinary domestic products
   3.1 Suspension 2 products
   3.2 Solution 1 product

The human export tablets products, which were produced by the same machine, were selected for material ordering evaluation. These products were categorized into 5 groups according to core tablets. In each group has sub-category by packing style. The groups and packing styles of products were shown in Table 7.

Table 7: Product Groups Category

	Group name				
	Group A2	**Group A5**	**Group A9**	**Group B3**	**Group B5**
Packing style	1) A21	1) A51	1) A91	1) B31	1) B51
	2) A22	2) A52		2) B32	2) B52
	3) A23	3) A53			3) B53
	4) A24	4) A54			4) B54
	5) A25	5) A55			
	6) A26	6) A56			

For each group, it has same structure of Bill of Material (BOM), Table 8 exhibits example of Group A2 BOM. The core tablets were same but difference in packaging materials. The BOM explosion of product A21 was shown in Figure 4. Product A21 was classified as parent equal to level “0”. Core tablets A2 and packaging

materials was in level 1, and raw materials, which were compositions of core tablets, were level 2. Level 1 and level 2 were children of parent A21. The production batch size was fixed, cannot be partial manufacturing. Quantity per lot of raw materials was same for each packing style.

Table 8: Example of BOM of Product Groups A2

Level	**Items**	**Packing style**					
0		A21	A22	A23	A24	A25	A26
1	Packaging materials	PA21-1	PA22-1	PA23-1	PA24-1	PA25-1	PA26-1
		PA21-2	PA22-2	PA23-2	PA24-2	PA25-2	PA26-2
		PA21-3	PA22-3	PA23-3	PA24-3	PA25-3	PA26-3
		PA21-4	PA22-4	PA23-4	PA24-4	PA25-4	PA26-4
		PA21-5	PA22-5	PA23-5	PA24-5	PA25-5	PA26-5
		PA21-6	PA22-6	PA23-6	PA24-6	PA25-6	PA26-6
	Core tablets	A2	A2	A2	A2	A2	A2
2	Raw materials	RA2-1					
		RA2-2					
		RA2-3					
		RA2-4					
		RA2-5					

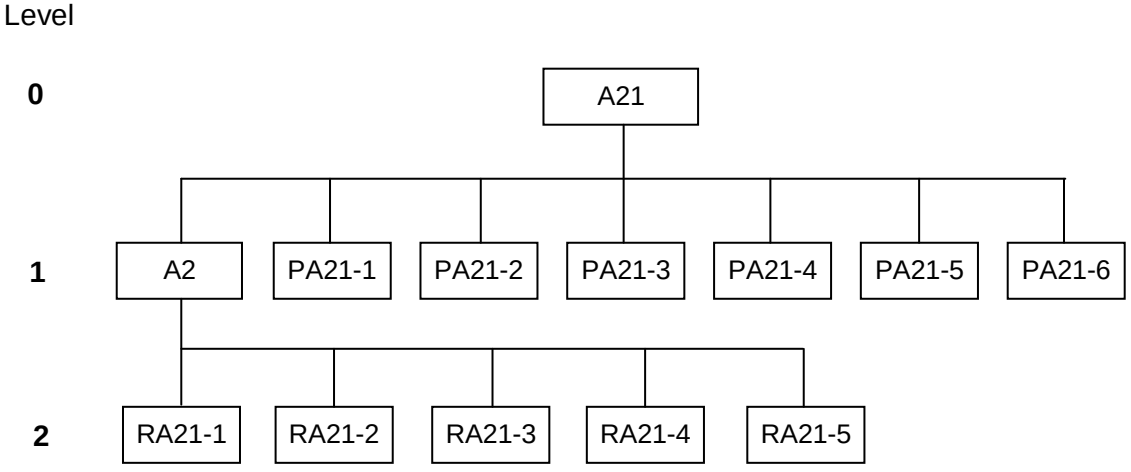

Figure 4: BOM Explosion of Product A21

Prices of material per lot of each packing style were listed in Table 9. Raw materials price for each packing style in same groups was same but packaging prices was different.

Production processes of all groups were described in Figure 5. Product groups A2, A5 and A9 use mixing machine number 1. Product groups A2, A5 and A9 use mixing machine number 2. But all groups were manufactured by same tableting machine, primary packing machine and secondary packing machine. The bottleneck of manufacturing process was primary packing process. Then PD1 section set production plan by capacity of primary packing machine.

Table 9: Prices of Material per Lot of All Packing Styles

Group	Packing styles	Price per 1 lot (Baht)		
		Raw materials (Level 2)	Packaging (Level 1 except core tablets)	Total
A2	A21	360,000	330,000	690,000
	A22		380,000	740,000
	A23		250,000	610,000
	A24		350,000	710,000
	A25		230,000	590,000
	A26		200,000	560,000
A5	A51	290,000	130,000	420,000
	A52		150,000	440,000
	A53		100,000	390,000
	A54		130,000	420,000
	A55		100,000	390,000
	A56		90,000	380,000
A9	A91	300,000	310,000	610,000
B3	B31	300,000	600,000	900,000
	B32		300,000	600,000
B5	B51	2,500,000	1,000,000	3,500,000
	B52		570,000	3,070,000
	B53		440,000	2,940,000
	B54		320,000	2,820,000

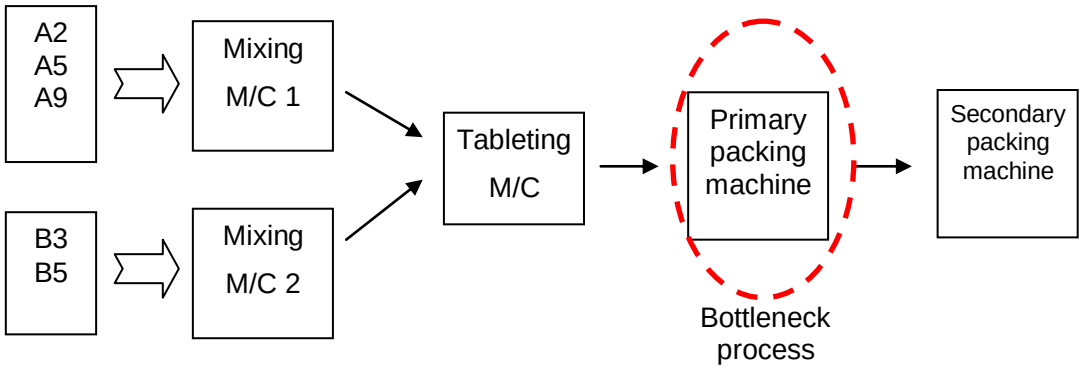

Figure 5: Manufacturing Flow Chart of All Product Groups

Current Concept for Order Raw Material and Production Planning

1) Receive order quantity from customer (annual order quantity)

Customer will send annual plan of ordering to factory. The order sheet consists of order quantity and lot number, which will be sent in each month.

2) Create master plan of export shipment plan

After factory get order sheet, export plan will be set in each month. The shipment plan was not smooth. First half of year, the order quantity was low but the second half of year has a huge quantity of shipment approximately account for 90% of order quantity per year.

3) Master production plan by PD1.

After PD1 get export shipment plan, PD1 will set master production schedule. Because of the fluctuation of shipment, PD1 section will be set and adjust according to production capacity. As described above, the primary packing process is bottleneck; therefore production capacity depends on this process.

4) Raw material ordering plan of procurement section

Procurement will order raw materials according to master plan of export shipment. The material should be ready to use for production 3 months before export of shipment.

Problems of Current System

Shortage of raw materials was found sometimes. The main reasons were listed as follows;

1) Information sharing between PD1 and Procurement section

Both purchasing and production set the plan according to their rule. Then if formulation section produces goods in advance more than 3 months and does not pass this information to purchasing in time.

2) Incorrect of raw material ordering

Purchasing section uses legacy system and manual operation to order huge amount of materials. Then incorrect raw materials ordering sometimes occurred.

From the reasons above, raw material shortage was found and PD1 needed to be postponed and revised production schedule. And this might be the cause that finished goods cannot be exported according to shipment plan. This problem is severe because one of the company policies is stable supply of products to customer.

Chapter 3

Research Methodology

Background

To prevent inaccuracy of procurement to reoccur, the company implemented an ERP system to synchronize information of all sections not only production and procurement. However, we need to consider “How to set logical process in ERP system to prevent shortage of raw materials and low level of raw materials inventory?” In the initial phase of ERP implementation, production capacity was not known. When export order was input in system, system suggested date of manufacturing. Suggestion manufacturing date was set by production lead time only and purchasing order was backward period of production lead time plus purchasing lead time as shown in Figure 6.

Fixed Conditions

1) Purchasing lead time was set as 90 days.

2) Evaluation period was 6 months between May and October 2014.

3) Shipment was the last day of every month.

4) Materials receiving date was the first day of every month.

5) Batch size was fixed and cannot be partial production.

6) Minimum order requirement was no considered.

7) Ordering cost does not linearly related with the numbers of ordering

Evaluation Items and Desired Results

1) Material arrival: materials must arrive before production.

2) Inventory value: optimum materials inventory.

3) Complexity of materials ordering method: setting logical process should not be complicated.

4) Human intervention in system: manual operation in system should be minimized.

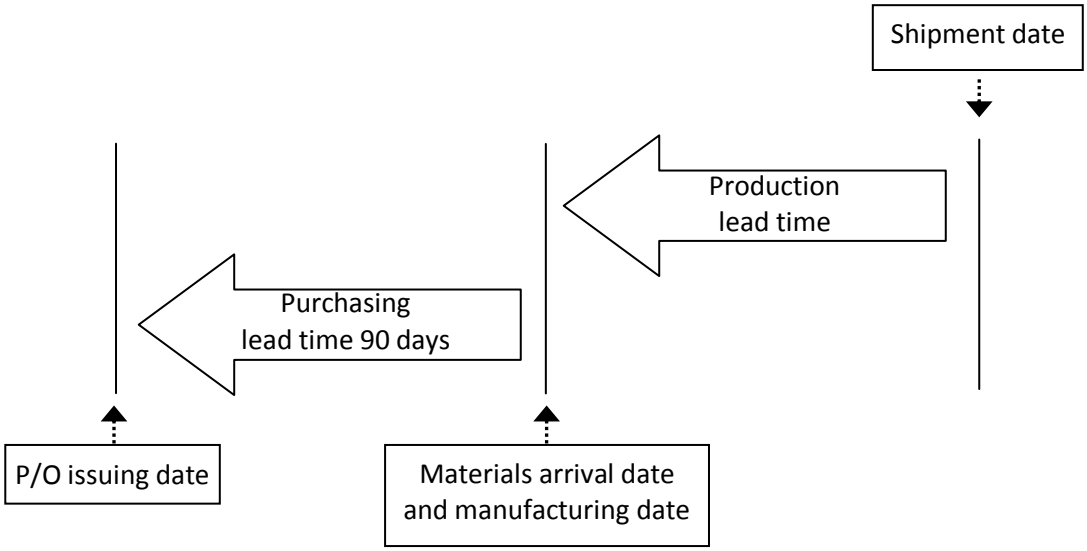

Figure 6: Concept of Date Calculation from Export Shipment until Materials P/O Issuing Date

Evaluation Methods

1) Collect data of the case study company as follows;

1.1) Export shipment plan of 2014

1.2) Materials receiving plan for production of shipment in 2014

1.3) Master production schedule for shipment of 2014

1.4) Price list of materials of each packing style

2) Evaluate the inventory by 2 methods, which were proposed by 2 sections

2.1) First method: Arrival of materials advance before shipment date 90 days (System production lead time 90 days, no consideration of actual MPS)

2.2) Second method: Arrival of materials advance before shipment date 60 days and grouped safety stock of level 1 and level 2 components for each packing style (System production lead time 60 days, no consideration of actual MPS)

3) Comparison between 2 methods, and set alternative method.

4) Simulation of alternative methods

4.1) Third method: Arrival of materials advance before shipment date 60 days and safety stock of level 2 for each group and safety stock of level 1 for each packing style (System production lead time 60 days, no consideration of actual MPS)

4.2 Fourth method: Arrival of material in 1st day of actual production month and safety stock of level 2 for each group and safety stock of level 1 for each packing style (No consideration of system production lead time)

Chapter 4

Results, Conclusion and Recommendation

Results

1) Evaluate the inventory by 2 methods, which were proposed by 2 sections.

1.1) Advance arrival of materials before shipment date 90 days (System production lead time 90 days, no consideration of actual MPS)

The production lead time was set as 90 days of all packing styles without consideration of production capacity. This was the conventional method of material ordering. Table 10 shows example of relation between export shipment plan and materials arrival plan of packing style A21.

The lead time from issuing P/O of materials to finished good shipment was 180 days as exhibited in Figure 7. This lead time consists of purchasing lead time 90 days and production lead time 90 days.

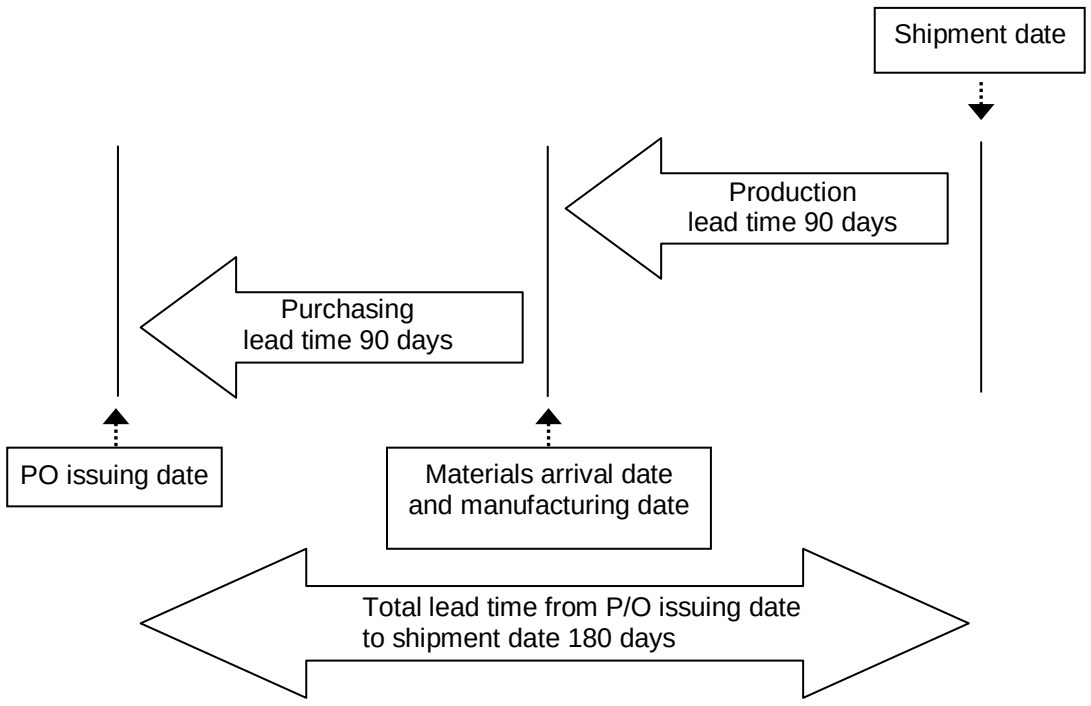

Figure 7: Total Lead Time of the 1st Method

Table 10: Example of 1st Method Export Shipment and Materials Arrival Plan of Packing Style A21

Packing style	Item	2014												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (lot)
Export shipment														
A21	Qty'(lot)			1			1		1	1	1	1	1	7
	Lot no.			001			002		003	004	005	006	007	
Materials arrival plans														
A21	Qty'(lot)	1			1		1	1	1	1	1			7
	Lot no.	001			002		003	004	005	006	007			

Result of average materials inventory value was 13,090,000 Baht (Table 11). The materials inventory cost was quite low. Materials were not ordered, if customer did not order products. But materials shortage problem was found in B53 products for 2 lots in June and August, because these 2 lots were manufactured before export shipment more than 3 months. In this case, production needed to reflect manufacturing date of abnormal lot for procurement section to adjust material purchasing and arrival date. The shortage of materials and materials adjustment for product B53 was shown in Table 12.

Table 11: Materials Inventory of 1st Method and Average Value of 6 Months

Group	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14	Average* (Baht)
A2	2,470,000	690,000	2,630,000	690,000	2,450,000	1,250,000	1,696,667
A5	3,990,000	5,050,000	4,020,000	4,400,000	8,820,000	9,930,000	6,035,000
A9	0	1,220,000	0	0	610,000	0	305,000
B3	0	0	0	0	0	600,000	100,000
B5	5,880,000	6,320,000	2,940,000	2,820,000	8,820,000	2,940,000	4,953,333
Total	12,340,000	13,280,000	9,590,000	7,910,000	20,700,000	14,720,000	13,090,000

Remark: *Average inventory value of 6 months in Thai Baht.

Table 12: Result from Evaluation of B53 for the 1st Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B53	B/F* stock	0	1	-1	0	-1	2
2,940,000	Use	1	2	1	1	1	2
Baht/lot	Receive	2	0	2	0	4	0
	C/F** stock	1	-1	0	-1	2	0
	Amount	2,940,000	-2,940,000	0	-2,940,000	5,880,000	0
B53	B/F* stock	0	1	0	0	0	2
2940000	Use	1	2	1	1	1	2
Baht/lot	Receive	2	1	1	1	3	0
(adjust)	C/F** stock	1	0	0	0	2	0
	Amount	2,940,000	0	0	0	5,880,000	0

Remark: *B/F is brought forward

**C/F is carry forward

1.2) Advance arrival of materials before shipment date 60 days and grouped safety stock of level 1 and level 2 components for each packing style (System production lead time 60 days, no consideration of actual MPS)

For this method, the production lead time will be set shorter as 60 days of all packing styles without consideration of production capacity. But the risk of shorter production lead time was compensated by usage of materials safety stock. Table 13 shows example of relation between export shipment plan and materials arrival plan of packing style A21.

Table 13: Example of 2nd Method Export Shipment and Materials Arrival Plan of Packing Style A21

Packing style	Item	2014												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (lot)
Export shipment														
A21	Qty'(lot)			1			1		1	1	1	1	1	7
	Lot no.			001			002		003	004	005	006	007	
Materials arrival plans														
A21	Qty'(lot)		1			1		1	1	1	1	1		7
	Lot no.		001			002		003	004	005	006	007		

The lead time from issuing P/O of materials to finished good shipment was 150 days as exhibited in Figure 8. This lead time consists of purchasing lead time 90 days and production lead time 60 days.

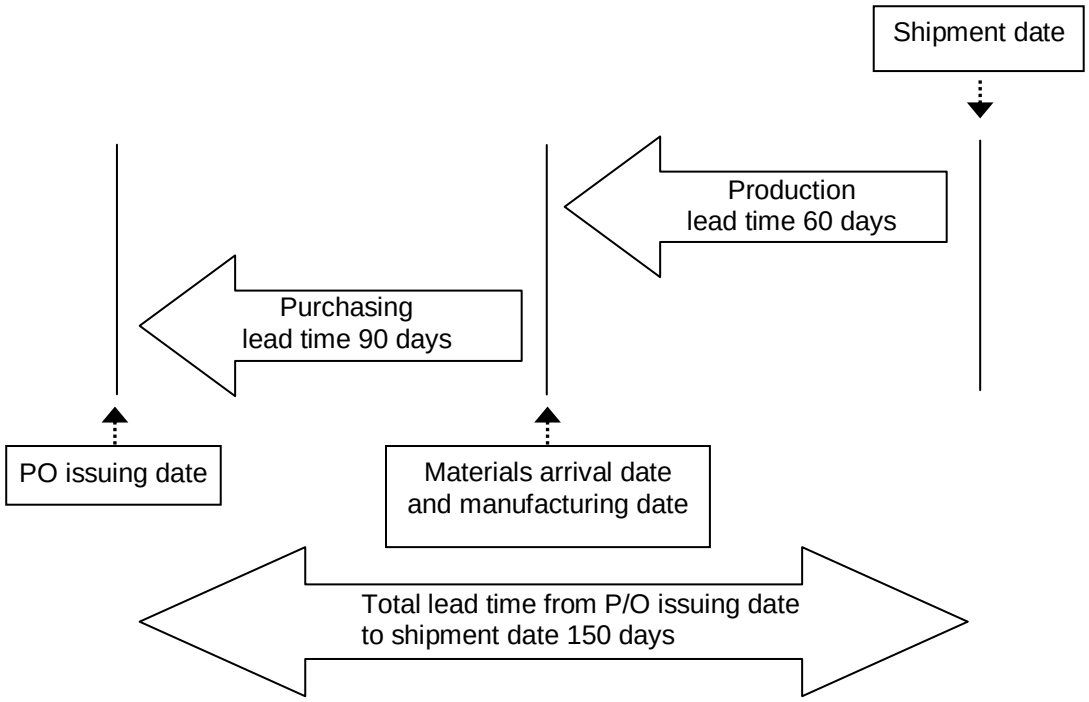

Figure 8: Total Lead Time of the 2nd Method

Safety stock calculation was derived from average lot quantity per shipment of every packing style for 12 months. Safety stock was not calculated from production per month because all packing styles were not manufactured every month. If the change of shipment occurs, PD1 will have high risk of material shortage. The equation was shown below. Quantity of safety stock of all packing styles was shown in Table 14.

$$\text{Average quantity per shipment (quantity of safety stock)} = \frac{Total\ \ quantity\ \ per\ year\ (lot)}{Shipment\ \ per\ year\ (time)}$$

For the Second method, the shortage problem was not found in the evaluation. The shortage risk reduces from safety stock, which was the buffer. But the average inventory value per month was very high (34,663,333 Baht). The average inventory value was displayed in Table 15.

Table 14: Safety Stock of Each Packing Style

Packing style	Total quantity per year (lot)	Shipment (time)	Average quantity per shipment (safety stock, lot/time)
A21	7	7	1
A22	2	2	1
A23	6	6	1
A24	3	3	1
A25	6	6	1
A26	2	2	1
A51	18	6	3
A52	4	2	2
A53	35	7	5
A54	11	3	4
A55	19	3	7
A56	6	4	2
A91	6	3	2
B31	2	1	2
B32	3	2	2
B51	3	3	1
B52	5	4	2
B53	10	4	3
B54	3	3	1

Table 15: Materials Inventory of the 2nd Method and Average Value of 6 Months

Group	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14	Average* (Baht)
A2	3,900,000	3,900,000	3,900,000	3,900,000	3,900,000	4,460,000	3,993,333
A5	9,260,000	11,600,000	9,260,000	12,020,000	9,260,000	15,980,000	11,230,000
A9	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000
B3	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
B5	15,270,000	18,340,000	12,330,000	18,340,000	5,760,000	21,280,000	15,220,000
Total	32,650,000	38,060,000	29,710,000	38,480,000	23,140,000	45,940,000	34,663,333

Remark: *Average inventory value of 6 months in Thai Baht.

2) Comparison between 2 methods, conclusion of results and set alternative method

Shortage of materials

Shortage of materials was found for the 1st method of B53 for 2 lots, because these 2 lots produced before finished goods shipment 4 months. But shortage of materials was not found in 2 methods.

Amount of inventory

The average amount per month values of the first method and the second method were 13,090,000 and 34,663,333, respectively. The average amount of the second method was higher than the first method almost 3 times.

For the first method, production information must be reflected to procurement in time, if PD1 need to manufacture product before 3 months of shipment. It could reduce materials shortage. The second method could produce lower risk of material shortage because safety stock was buffer. But the average inventory amount was quite high. The high inventory amount comes from safety stock. Then calucation of optimum safety stock must be redone to reduce the level of inventory.

3) Evaluation of alternative methods

From the evaluation above, the second method was chosen for evaluation with a new level of safety stock. And this method was named as the third method. The safety stock of each group was recalculated.

3.1) Advance arrival of materials before shipment date 60 days and safety stock of level 2 for each group and safety stock of level 1 for each packing style (System production lead time 60 days, no consideration of actual MPS).

The safety stock was divided into 2 categories. The first category was raw materials, which were the ingredients to manufacture core tablets. The second category was packing materials for each packing style. As description of BOM, all packing styles in the same groups will be produced by same core tablets. The safety stock was calculated from same equation as the second method. But average quantities per shipment of each group core tablets were added. Except group A9 that has only 1 packing style (A91). Table 16 exhibits recalculation of safety stock of both categories. Materials arrival date was 60 days before shipment same as the second method.

Table 16: Recalculation of Safety Stock of 2 Categories (Raw Materials and Packaging Materials)

	Packing style	Total quantity per year (lot)	Shipment (time)	Average quantity per shipment (safety stock, lot/time)
Raw materials	**A2**	26	12	3
	A5	93	11	9
	B3	5	2	3
	B5	21	7	3
Packaging materials	**A21**	7	7	1
	A22	2	2	1
	A23	6	6	1
	A24	3	3	1
	A25	6	6	1
	A26	2	2	1
	A51	18	6	3
	A52	4	2	2
	A53	35	7	5
	A54	11	3	4
	A55	19	3	7
	A56	6	4	2
	A91	6	3	2
	B31	2	1	2
	B32	3	2	2
	B51	3	3	1
	B52	5	4	2
	B53	10	4	3
	B54	3	3	1

Table 17: Materials Inventory of the 3rd Method and Average Value of 6 Months

Group	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14	Average* (Baht)
A2	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000	3,380,000	2,913,333
A5	5,200,000	7,540,000	5,200,000	7,960,000	5,200,000	11,920,000	7,170,000
A9	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000
B3	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
B5	5,270,000	8,340,000	2,330,000	8,340,000	760,000	11,280,000	6,053,333
Total	17,210,000	22,620,000	14,270,000	23,040,000	12,700,000	30,500,000	20,056,667

Remark: *Average inventory value of 6 months in Thai Baht.

The materials average value per 6 months was reduced after re calculation of safety stock as shown in Table 17. But shortage of raw materials was found in B5 core tablets (Table 18). It shows that the reduction of buffer stock has an

effect on shortage of materials. And this problem also came from the material arrival setting does not relate to production schedule. Then, the next method of evaluation needs to consider production schedule.

Table 18: Result from Evaluation of Core Tablets B5 for the 3rd Method

Core tablets	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B5	B/F* stock	3	1	2	0	2	-2
2,500,000	Use	2	2	4	1	5	2
Baht/lot	Receive	0	3	2	3	1	7
	C/F** stock	1	2	0	2	-2	3
	Amount	2,500,000	5,000,000	0	5,000,000	-5,000,000	7,500,000
B5	B/F* stock	3	1	2	0	2	0
2,500,000	Use	2	2	4	1	5	2
Baht/lot	Receive	0	3	2	3	3	5
(adjust)	C/F** stock	1	2	0	2	0	3
	Amount	2,500,000	5,000,000	0	5,000,000	0	7,500,000

Remark: *B/F is brought forward

**C/F is carry forward

3.2) Recalculation of safety stock by categorized raw material and arrival of materials in the first day of production month

Safety stock would be calculated the same as the third method. But the materials arrival correlates to production schedule. The example of export shipment, production plan, and material arrival of product A51 was displayed in Table 19. PD1 would like to get materials for all lots, which were produced in this month, on the 1st day of manufacturing month. PD1 has to set supposition manufacturing date of all lots to be the 1st day of month as well, even if all lots was not manufacturing in the same day. For example, factory has to export product A51 lot no. 010-013 in September. A51 lot no. 010-012 was manufactured in August and the remaining 1 lot (lot no. 013) was manufactured in September. Then supposition manufacturing date of lot no 010-012 and 013 will be 1st August and 1st September, respectively. Materials of lot no. 010-013 will arrive in the same day of supposition manufacturing date. The lead time of P/O issuing until finished goods was variation depend on supposition manufacturing date as shown in Figure 9.

Table 19: Example of the 4th Method Export Shipment and Materials Arrival Plan of Packing Style A51

Packing style	Item	2014												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (lot)
Export shipment														
A51	Qty'(lot)				2	2	2	3		4		5		18
	Lot no.				001-002	003-004	005-006	007-009		010-013		014-018		
Production plan														
A51	Qty'(lot)		2	2	1	1	3		3	1	5			18
	Lot no.		001-002	003-004	005	006	007-009		010-012	013	014-018			
Materials arrival plan														
A51	Qty'(lot)		2	2	1	1	3		3	1	5			18
	Lot no.		001-002	003-004	005	006	007-009		010-012	013	014-018			

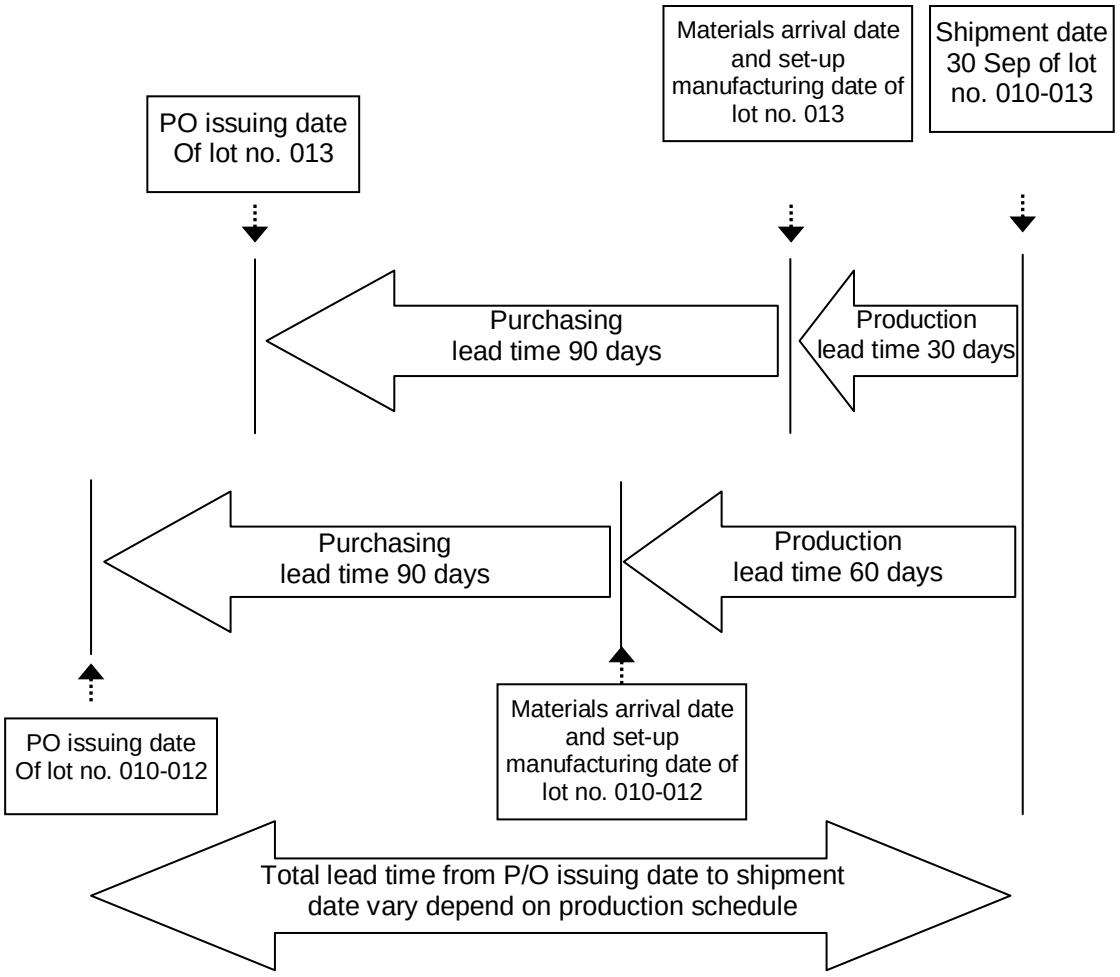

Figure 9: Total Lead Time of the 4th Method

The evaluation result was display in Table 20. Average inventory value (23,220,000 baht) was higher than the third method approximately 15%. But the shortage of materials and materials stock fluctuation were not found in 6 months. If the production and ordering was stable according to the plan, quantity of safety stock could be reduced in order to reduce materials inventory value as well.

Table 20: Materials Inventory of the 4th Method and Average Value of 6 Months

Group	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14	Average*
A2	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000
A5	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000
A9	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000
B3	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
B5	11,280,000	11,280,000	11,280,000	11,280,000	11,280,000	11,280,000	11,280,000
Total	23,220,000	23,220,000	23,220,000	23,220,000	23,220,000	23,220,000	23,220,000

Remark: *Average inventory value of 6 months in Thai Baht.

Discussion

From the results above, the fourth method was chosen as the 1st candidate for implementation of ERP system. However, this method has disadvantage, that PD1 need to set supposition manufacturing dates in system gradually, because current ERP system does not has production capacity information. Thus, actual operations must be reobserved. If the result of the fourth method does not give satisfactory result, the third method will be the 2nd alternative solution. However, some safety stock need to be adjusted to prevent material shortage. The longest lead time was the first method and the highest average inventory value was the second method. These 2 methods were less favorable solutions.

Conclusion

Materials shortage for production line was the big issue of manufacturing firm. But the high volume of materials inventory, which excess the required amount, was not required to solve the problem of materials shortage. Even if the ERP system was implemented in the case study company but the full function does not yet implement. The function of production capacity was not utilized, therefore the suggestion of production scheduling from the ERP cannot use for actual manufacturing. For our study, 4 methods of ordering pattern were evaluated in 6 months period.

The first method: Advance arrival of materials before shipment date 90 days (System production lead time 90 days, no consideration of actual MPS).

The second method: Advance arrival of materials before shipment date 60 days and grouped safety stock of level 1 and level 2 components for each packing style (System production lead time 60 days, no consideration of actual MPS).

The third method: Advance arrival of materials before shipment date 60 days and safety stock of level 2 for each group and safety stock of level 1 for each packing style (System production lead time 60 days, no consideration of actual MPS).

The fourth method: Arrival of material in the 1st day of actual production month and safety stock of level 2 for each group and safety stock of level 1 for each packing style (No consideration of system production lead time).

Shortage of materials

The first method found 2 times of shortage. And the third method found 1 time of shortage. But no shortage of material was found in the second and the fourth method. It can be assumed that consideration of actual production schedule was important for materials ordering. If the actual production schedule was not concerned, the safety stock must be added. Even if long system lead time was set; it has the chance of material shortage.

Inventory level

The average inventory value ranks from high to low as the second method, the fourth method, the third method and the first method. But the stable value was founded only the third method. The average inventory value from 6 months was shown in Table 21.

Table 21: Average Inventory Value from 6 Months of All Methods

Method	**Month**						**Average**
	May 14	**Jun 14**	**Jul 14**	**Aug 14**	**Sep 14**	**Oct 14**	**(baht)**
1st	12,340,000	13,280,000	9,590,000	7,910,000	20,700,000	14,720,000	13,090,000
2nd	32,650,000	38,060,000	29,710,000	38,480,000	23,140,000	45,940,000	34,663,333
3rd	17,210,000	22,620,000	14,270,000	23,040,000	12,700,000	30,500,000	20,056,667
4th	23,220,000	23,220,000	23,220,000	23,220,000	23,220,000	23,220,000	23,220,000

Remark: *Average inventory value of 6 months in Thai Baht.

Complication of the method

The first method was the least complication, but PD 1 need to reflect the actual production information to procurement section in time to prevent materials shortage. The second method and the 3rd Method were the middle level, because the optimum safety stock would be calculated. The most complication was the fourth method, because optimum safety stock was calculated and actual production schedule need to be concerned.

Manual operation in the system

The fourth method needs high level of manual operation in the system. The actual scheduling must be set periodically. For the first, second and third method, the parameters of system production lead time and safety stock were input at the initial only.

Table 22 exhibits the conclusion of detail above. The most preferable method was the fourth method. The second was the third method. Next was the first and the second method, because there need the adjustment to prevent materials shortage and control level of inventory.

Table 22: Conclusion of Each Item for All Materials Ordering Methods

Method	Risk of material shortage	Inventory level	Method complication	Level of manual operation	System production lead time (day)
1st	High	Low	Low	Low	90
2nd	Low	Very high	Medium	Low	60
3rd	Medium	Medium	Medium	Low	60
4th	Low	Medium	High	High	Not concerned

Recommendation

From the evaluation, the favorable method was observed as the fourth method. This method was needed to set schedule of production in the ERP system, but the result in actual operation need to be reviewed. Then, the third method can be set as back up method by setting of system production lead time 60 days. If the utilization of this method fails, the alternative method will be ready to operate. After the implementation was stable, the reduction of safety stock was the next consideration. And frequency increment of ordering should be observed the result as well. For the case study company, statistic of unstable demand and supply was not recorded. Then, the effect of the unstable parameter was not yet observed, the future study might be expansion to uncertainty of supply and demand.

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Appendices

Appendix A

Export Plan, Master Production Plan and Material Receiving Plan

Table 23: Export Plan of Each Packing Style of 2014

Packing style	Items	2014												Total (lot)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
A21	Qty'(lot)			1			1		1	1	1	1	1	**7**
	Lot no.			001			002		003	004	005	006	007	
A22	Qty'(lot)				1					1				**2**
	Lot no.				001					002				
A23	Qty'(lot)		1	1		1		1		1		1		**6**
	Lot no.		001	002		003		004		005		006		
A24	Qty'(lot)	1			1			1						**3**
	Lot no.	001			002			003						
A25	Qty'(lot)	1		1		1		1		1		1		**6**
	Lot no.	001		002		003		004		005		006		
A26	Qty'(lot)							1				1		**2**
	Lot no.							001				002		
A51	Qty'(lot)				2	2	2	3		4		5		**18**
	Lot no.				001-002	003-004	005-006	007-009		010-013		014-018		
A52	Qty'(lot)										2		2	**4**
	Lot no.										001-002		003-004	
A53	Qty'(lot)	1		4		6		7		6		6	5	**35**
	Lot no.	001		002-005		006-011		012-018		019-024		025-030	031-035	
A54	Qty'(lot)				4		4					3		**11**
	Lot no.				001-004		005-008					009-011		
A55	Qty'(lot)						6		5			8		**19**
	Lot no.						001-006		007-011			012-019		
A56	Qty'(lot)						1		2		2		1	**6**
	Lot no.						001		002-003		004-005		006	
A91	Qty'(lot)						3		2			1		**6**
	Lot no.						001-003		004-005			006		
B31	Qty'(lot)						2							**2**
	Lot no.						001-002							
B32	Qty'(lot)						2						1	**3**
	Lot no.						001-002						003	
B51	Qty'(lot)						1		1			1		**3**
	Lot no.						001		002			003		
B52	Qty'(lot)						1	1		1		2		**5**
	Lot no.						001	002		003		004-005		
B53	Qty'(lot)						2	2		2		4		**10**
	Lot no.						001-002	003-004		005-006		007-010		
B54	Qty'(lot)						1		1		1			**3**
	Lot no.						001		002		003			

Table 24: Master Production Plans of 2014

Packing style	Items	2014												Total (lot)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
A21	Qty'(lot)	1			1			1	1	1	1		1	**7**
	Lot no.	001			002			003	004	005	006		007	
A22	Qty'(lot)		1						1					**2**
	Lot no.		001						002					
A23	Qty'(lot)	2		1			1		1		1			**6**
	Lot no.	001-002		003			004		005		006			
A24	Qty'(lot)	1	1				1							**3**
	Lot no.	001	002				003							
A25	Qty'(lot)	2		1			1		1		1			**6**
	Lot no.	001-002		003			004		005		006			
A26	Qty'(lot)						1					1		**2**
	Lot no.						001					002		
A51	Qty'(lot)		2	2	1	1	3		3	1	5			**18**
	Lot no.		001-002	003-004	005	006	007-009		010-012	013	014-018			
A52	Qty'(lot)									2			2	**4**
	Lot no.									001-002			003-004	
A53	Qty'(lot)	4	1	6			1	6		6		6	5	**35**
	Lot no.	001-004	005	006-011			012	013-018		019-024		025-030	031-035	
A54	Qty'(lot)		2	2		4						3		**11**
	Lot no.		001-002	003-004		005-008						009-011		
A55	Qty'(lot)					6		5				8		**19**
	Lot no.					001-006		007-011				012-019		
A56	Qty'(lot)					1		2		2			1	**6**
	Lot no.					001		002-003		004-005			006	
A91	Qty'(lot)				3			2			1			**6**
	Lot no.				001-003			004-005			006			
B31	Qty'(lot)			2										**2**
	Lot no.			001-002										
B32	Qty'(lot)				2								1	**3**
	Lot no.				001-002								003	
B51	Qty'(lot)				1			1		1				**3**
	Lot no.				001			002		003				
B52	Qty'(lot)				1	1		1		2				**5**
	Lot no.				001	002		003		004-005				
B53	Qty'(lot)				2	1	2	1	1	1	2			**10**
	Lot no.				001-002	003	004-005	006	007	008	009-010			
B54	Qty'(lot)				1			1		1				**3**
	Lot no.				001			002		003				

Table 25: Material Receiving Plans for Production of 2014

Packing style	Items	2013		2014										Total (lot)
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
A21	Qty'(lot)			1			1		1	1	1	1	1	**7**
	Lot no.			001			002		003	004	005	006	007	
A22	Qty'(lot)				1					1				**2**
	Lot no.				001					002				
A23	Qty'(lot)		1	1		1		1		1		1		**6**
	Lot no.		001	002		003		004		005		006		
A24	Qty'(lot)	1			1			1						**3**
	Lot no.	001			002			003						
A25	Qty'(lot)	1		1		1		1		1		1		**6**
	Lot no.	001		002		003		004		005		006		
A26	Qty'(lot)							1				1		**2**
	Lot no.							001				002		
A51	Qty'(lot)				2	2	2	3		4		5		**18**
	Lot no.				001-002	003-004	005-006	007-009		010-013		014-018		
A52	Qty'(lot)										2		2	**4**
	Lot no.										001-002		003-004	
A53	Qty'(lot)	1		4		6		7		6		6	5	**35**
	Lot no.	001		002-005		006-011		012-018		019-024		025-030	031-035	
A54	Qty'(lot)				4		4					3		**11**
	Lot no.				001-004		005-008					009-011		
A55	Qty'(lot)						6		5			8		**19**
	Lot no.						001-006		007-011			012-019		
A56	Qty'(lot)						1		2		2		1	**6**
	Lot no.						001		002-003		004-005		006	
A91	Qty'(lot)						3		2			1		**6**
	Lot no.						001-003		004-005			006		
B31	Qty'(lot)						2							**2**
	Lot no.						001-002							
B32	Qty'(lot)						2						1	**3**
	Lot no.						001-002						003	
B51	Qty'(lot)						1		1			1		**3**
	Lot no.						001		002			003		
B52	Qty'(lot)						1	1		1		2		**5**
	Lot no.						001	002		003		004-005		
B53	Qty'(lot)						2	2		2		4		**10**
	Lot no.						001-002	003-004		005-006		007-010		
B54	Qty'(lot)						1		1		1			**3**
	Lot no.						001		002		003			

Appendix B

Evaluation Results of Each Group for All Material Ordering Method

Table 26: Result from Evaluation of Group A2 for 1st Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A21	B/F* stock	0	0	1	1	1	1
690,000	Use	0	0	1	1	1	1
Baht/lot	Receive	0	1	1	1	1	1
	C/F** stock	0	1	1	1	1	1
	Amount	0	690,000	690,000	690,000	690,000	690,000
A22	B/F* stock	0	0	0	1	0	0
740,000	Use	0	0	0	1	0	0
Baht/lot	Receive	0	0	1	0	0	0
	C/F** stock	0	0	1	0	0	0
	Amount	0	0	740,000	0	0	0
A23	B/F* stock	0	1	0	1	0	1
610,000	Use	0	1	0	1	0	1
Baht/lot	Receive	1	0	1	0	1	0
	C/F** stock	1	0	1	0	1	0
	Amount	610,000	0	610,000	0	610,000	0
A24	B/F* stock	0	1	0	0	0	0
710,000	Use	0	1	0	0	0	0
Baht/lot	Receive	1	0	0	0	0	0
	C/F** stock	1	0	0	0	0	0
	Amount	710,000	0	0	0	0	0
A25	B/F* stock	0	1	0	1	0	1
590,000	Use	0	1	0	1	0	1
Baht/lot	Receive	1	0	1	0	1	0
	C/F** stock	1	0	1	0	1	0
	Amount	590,000	0	590,000	0	590,000	0
A26	B/F* stock	0	1	0	0	0	1
560,000	Use	0	1	0	0	0	0
Baht/lot	Receive	1	0	0	0	1	0
	C/F** stock	1	0	0	0	1	1
	Amount	560,000	0	0	0	560,000	560,000
Total A2	Amount	2,470,000	690,000	2,630,000	690,000	2,450,000	1,250,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 27: Result from Evaluation of Group A5 for 1st Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A51	B/F* stock	1	3	0	4	1	5
420000	Use	1	3	0	3	1	5
Baht/lot	Receive	3	0	4	0	5	0
	C/F** stock	3	0	4	1	5	0
	Amount	1,260,000	0	1,680,000	420,000	2,100,000	0
A52	B/F* stock	0	0	0	0	2	0
440,000	Use	0	0	0	0	2	0
Baht/lot	Receive	0	0	0	2	0	2
	C/F** stock	0	0	0	2	0	2
	Amount	0	0	0	880,000	0	880,000
A53	B/F* stock	0	7	6	6	6	6
390,000	Use	0	1	6	0	6	0
Baht/lot	Receive	7	0	6	0	6	5
	C/F** stock	7	6	6	6	6	11
	Amount	2,730,000	2,340,000	2,340,000	2,340,000	2,340,000	4,290,000
A54	B/F* stock	4	0	0	0	0	3
420,000	Use	4	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	3	0
	C/F** stock	0	0	0	0	3	3
	Amount	0	0	0	0	1,260,000	1,260,000
A55	B/F* stock	6	0	5	0	0	8
390,000	Use	6	0	5	0	0	0
Baht/lot	Receive	0	5	0	0	8	0
	C/F** stock	0	5	0	0	8	8
	Amount	0	1,950,000	0	0	3,120,000	3,120,000
A56	B/F* stock	1	0	2	0	2	0
380,000	Use	1	0	2	0	2	0
Baht/lot	Receive	0	2	0	2	0	1
	C/F** stock	0	2	0	2	0	1
	Amount	0	760,000	0	760,000	0	380,000
Total A5	Amount	3,990,000	5,050,000	4,020,000	4,400,000	8,820,000	9,930,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 28: Result from Evaluation of Group A9 for 1st Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A91	B/F* stock	0	0	2	0	0	1
610,000	Use	0	0	2	0	0	1
Baht/lot	Receive	0	2	0	0	1	0
	C/F** stock	0	2	0	0	1	0
Total A9	Amount	0	1,220,000	0	0	610,000	0

Remark: *B/F is brought forward, **C/F is carry forward

Table 29: Result from Evaluation of Group B3 for 1st Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B31	B/F* stock	0	0	0	0	0	0
900,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	0	0	0	0	0	0
	Amount	0	0	0	0	0	0
B32	B/F* stock	0	0	0	0	0	0
600,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	1
	C/F** stock	0	0	0	0	0	1
	Amount	0	0	0	0	0	600,000
Total B3	Amount	0	0	0	0	0	600,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 30: Result from Evaluation of Group B5 for 1st Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B51	B/F* stock	0	0	1	0	0	0
3,500,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	1	0	0	1	0
	C/F** stock	0	1	0	0	0	0
	Amount	0	3,500,000	0	0	0	0
B52	B/F* stock	0	0	0	0	0	0
3,070,000	Use	1	0	1	0	2	0
Baht/lot	Receive	1	0	1	0	2	0
	C/F** stock	0	0	0	0	0	0
	Amount	0	0	0	0	0	0
B53	B/F* stock	0	1	-1	0	-1	2
2,940,000	Use	1	2	1	1	1	2
Baht/lot	Receive	2	0	2	0	4	0
	C/F** stock	1	-1	0	-1	2	0
	Amount	2,940,000	-2,940,000	0	-2,940,000	5,880,000	0
B53	B/F* stock	0	1	0	0	0	2
2,940,000	Use	1	2	1	1	1	2
Baht/lot	Receive	2	1	1	1	3	0
(adjust)	C/F** stock	1	0	0	0	2	0
	Amount	2,940,000	0	0	0	5,880,000	0
B54	B/F* stock	0	0	1	0	1	0
2,820,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	1	0	1	0	0
	C/F** stock	0	1	0	1	0	0
	Amount	0	2,820,000	0	2,820,000	0	0
Total B5	Amount	5,880,000	6,320,000	2,940,000	2,820,000	8,820,000	2,940,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 31: Result from Evaluation of Group A2 for 2nd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A21	B/F* stock	1	1	1	1	1	1
690,000	Use	0	0	1	1	1	1
Baht/lot	Receive	0	0	1	1	1	1
	C/F** stock	1	1	1	1	1	1
	Amount	690,000	690,000	690,000	690,000	690,000	690,000
A22	B/F* stock	1	1	1	1	1	1
740,000	Use	0	0	0	1	0	0
Baht/lot	Receive	0	0	0	1	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	740,000	740,000	740,000	740,000	740,000	740,000
A23	B/F* stock	1	1	1	1	1	1
610,000	Use	0	1	0	1	0	1
Baht/lot	Receive	0	1	0	1	0	1
	C/F** stock	1	1	1	1	1	1
	Amount	610,000	610,000	610,000	610,000	610,000	610,000
A24	B/F* stock	1	1	1	1	1	1
710,000	Use	0	1	0	0	0	0
Baht/lot	Receive	0	1	0	0	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	710,000	710,000	710,000	710,000	710,000	710,000
A25	B/F* stock	1	1	1	1	1	1
590,000	Use	0	1	0	1	0	1
Baht/lot	Receive	0	1	0	1	0	1
	C/F** stock	1	1	1	1	1	1
	Amount	590,000	590,000	590,000	590,000	590,000	590,000
A26	B/F* stock	1	1	1	1	1	1
560,000	Use	0	1	0	0	0	0
Baht/lot	Receive	0	1	0	0	0	1
	C/F** stock	1	1	1	1	1	2
	Amount	560,000	560,000	560,000	560,000	560,000	1,120,000
Total A2	Amount	3,900,000	3,900,000	3,900,000	3,900,000	3,900,000	4,460,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 32: Result from Evaluation of Group A5 for 2nd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A51	B/F* stock	3	3	3	3	4	3
420000	Use	1	3	0	3	1	5
Baht/lot	Receive	1	3	0	4	0	5
	C/F** stock	3	3	3	4	3	3
	Amount	1,260,000	1,260,000	1,260,000	1,680,000	1,260,000	1,260,000
A52	B/F* stock	2	2	2	2	2	2
440,000	Use	0	0	0	0	2	0
Baht/lot	Receive	0	0	0	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	880,000	880,000	880,000	880,000	880,000	880,000
A53	B/F* stock	5	5	11	5	11	5
390,000	Use	0	1	6	0	6	0
Baht/lot	Receive	0	7	0	6	0	6
	C/F** stock	5	11	5	11	5	11
	Amount	1,950,000	4,290,000	1,950,000	4,290,000	1,950,000	4,290,000
A54	B/F* stock	4	4	4	4	4	4
420,000	Use	4	0	0	0	0	0
Baht/lot	Receive	4	0	0	0	0	3
	C/F** stock	4	4	4	4	4	7
	Amount	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	2,940,000
A55	B/F* stock	7	7	7	7	7	7
390,000	Use	6	0	5	0	0	0
Baht/lot	Receive	6	0	5	0	0	8
	C/F** stock	7	7	7	7	7	15
	Amount	2,730,000	2,730,000	2,730,000	2,730,000	2,730,000	5,850,000
A56	B/F* stock	2	2	2	2	2	2
380,000	Use	1	0	2	0	2	0
Baht/lot	Receive	1	0	2	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	760,000	760,000	760,000	760,000	760,000	760,000
Total A5	Amount	9,260,000	11,600,000	9,260,000	12,020,000	9,260,000	15,980,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 33: Result from Evaluation of Group A9 for 2nd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A91	B/F* stock	2	2	2	2	2	2
610,000	Use	0	0	2	0	0	1
Baht/lot	Receive	0	0	2	0	0	1
	C/F** stock	2	2	2	2	2	2
Total A9	Amount	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 34: Result from Evaluation of Group B3 for 2nd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B31	B/F* stock	2	2	2	2	2	2
900,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	2	2	2	2	2	2
	Amount	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
B32	B/F* stock	2	2	2	2	2	2
600,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	2	2	2	2	2	2
	Amount	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Total B3	Amount	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 35: Result from Evaluation of Group B5 for 2nd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B51	B/F* stock	1	1	1	1	1	0
3,500,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	0	1	0	0	1
0	C/F** stock	1	1	1	1	0	1
0	Amount	3,500,000	3,500,000	3,500,000	3,500,000	0	3,500,000
B52	B/F* stock	2	1	2	1	2	0
3,070,000	Use	1	0	1	0	2	0
Baht/lot	Receive	0	1	0	1	0	2
0	C/F** stock	1	2	1	2	0	2
0	Amount	3,070,000	6,140,000	3,070,000	6,140,000	0	6,140,000
B53	B/F* stock	3	2	2	1	2	1
2,940,000	Use	1	2	1	1	1	2
Baht/lot	Receive	0	2	0	2	0	4
	C/F** stock	2	2	1	2	1	3
	Amount	5,880,000	5,880,000	2,940,000	5,880,000	2,940,000	8,820,000
B54	B/F* stock	1	1	1	1	1	1
2,820,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	0	1	0	1	0
	C/F** stock	1	1	1	1	1	1
	Amount	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000
Total B5	Amount	15,270,000	18,340,000	12,330,000	18,340,000	5,760,000	21,280,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 36: Result from Evaluation of Group A2 for 3rd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A2 tablets	B/F* stock	3	3	3	3	3	3
360,000	Use	0	4	1	4	1	3
Baht/lot	Receive	0	4	1	4	1	4
	C/F** stock	3	3	3	3	3	4
	Amount	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,440,000
A21	B/F* stock	1	1	1	1	1	1
330,000	Use	0	0	1	1	1	1
Baht/lot	Receive	0	0	1	1	1	1
	C/F** stock	1	1	1	1	1	1
	Amount	330,000	330,000	330,000	330,000	330,000	330,000
A22	B/F* stock	1	1	1	1	1	1
380,000	Use	0	0	0	1	0	0
Baht/lot	Receive	0	0	0	1	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	380,000	380,000	380,000	380,000	380,000	380,000
A23	B/F* stock	1	1	1	1	1	1
250,000	Use	0	1	0	1	0	1
Baht/lot	Receive	0	1	0	1	0	1
	C/F** stock	1	1	1	1	1	1
	Amount	250,000	250,000	250,000	250,000	250,000	250,000
A24	B/F* stock	1	1	1	1	1	1
350,000	Use	0	1	0	0	0	0
Baht/lot	Receive	0	1	0	0	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	350,000	350,000	350,000	350,000	350,000	350,000
A25	B/F* stock	1	1	1	1	1	1
230,000	Use	0	1	0	1	0	1
Baht/lot	Receive	0	1	0	1	0	1
	C/F** stock	1	1	1	1	1	1
	Amount	230,000	230,000	230,000	230,000	230,000	230,000
A26	B/F* stock	1	1	1	1	1	1
200,000	Use	0	1	0	0	0	0
Baht/lot	Receive	0	1	0	0	0	1
	C/F** stock	1	1	1	1	1	2
	Amount	200,000	200,000	200,000	200,000	200,000	400,000
Total A2	Amount	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000	3,380,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 37: Result from Evaluation of Group A5 for 3rd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A5 tablets	B/F* stock	9	9	15	9	16	9
290,000	Use	12	4	13	3	11	5
Baht/lot	Receive	12	10	7	10	4	22
	C/F** stock	9	15	9	16	9	26
	Amount	2,610,000	4,350,000	2,610,000	4,640,000	2,610,000	7,540,000
A51	B/F* stock	3	3	3	3	4	3
130,000	Use	1	3	0	3	1	5
Baht/lot	Receive	1	3	0	4	0	5
	C/F** stock	3	3	3	4	3	3
	Amount	390,000	390,000	390,000	520,000	390,000	390,000
A52	B/F* stock	2	2	2	2	2	2
150,000	Use	0	0	0	0	2	0
Baht/lot	Receive	0	0	0	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	300,000	300,000	300,000	300,000	300,000	300,000
A53	B/F* stock	5	5	11	5	11	5
100,000	Use	0	1	6	0	6	0
Baht/lot	Receive	0	7	0	6	0	6
	C/F** stock	5	11	5	11	5	11
	Amount	500,000	1,100,000	500,000	1,100,000	500,000	1,100,000
A54	B/F* stock	4	4	4	4	4	4
130,000	Use	4	0	0	0	0	0
Baht/lot	Receive	4	0	0	0	0	3
	C/F** stock	4	4	4	4	4	7
	Amount	520,000	520,000	520,000	520,000	520,000	910,000
A55	B/F* stock	7	7	7	7	7	7
100,000	Use	6	0	5	0	0	0
Baht/lot	Receive	6	0	5	0	0	8
	C/F** stock	7	7	7	7	7	15
	Amount	700,000	700,000	700,000	700,000	700,000	1,500,000
A56	B/F* stock	2	2	2	2	2	2
90,000	Use	1	0	2	0	2	0
Baht/lot	Receive	1	0	2	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	180,000	180,000	180,000	180,000	180,000	180,000
Total A5	Amount	5,200,000	7,540,000	5,200,000	7,960,000	5,200,000	11,920,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 38: Result from Evaluation of Group A9 for 3rd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A91	B/F* stock	2	2	2	2	2	2
610,000	Use	0	0	2	0	0	1
Baht/lot	Receive	0	0	2	0	0	1
	C/F** stock	2	2	2	2	2	2
Total A9	Amount	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 39: Result from Evaluation of Group B3 for 3rd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B3 tablets	B/F* stock	3	3	3	3	3	3
300,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	3	3	3	3	3	3
	Amount	900,000	900,000	900,000	900,000	900,000	900,000
B31	B/F* stock	2	2	2	2	2	2
600,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	2	2	2	2	2	2
	Amount	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
B32	B/F* stock	2	2	2	2	2	2
300,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	2	2	2	2	2	2
	Amount	600,000	600,000	600,000	600,000	600,000	600,000
Total B3	Amount	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 40: Result from Evaluation of Group B5 for 3rd Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B5 tablets	B/F* stock	3	1	2	0	2	-2
2,500,000	Use	2	2	4	1	5	2
Baht/lot	Receive	0	3	2	3	1	7
	C/F** stock	1	2	0	2	-2	3
	Amount	2,500,000	5,000,000	0	5,000,000	-5,000,000	7,500,000
B5	B/F* stock	3	1	2	0	2	0
2,500,000	Use	2	2	4	1	5	2
Baht/lot	Receive	0	3	2	3	3	5
(adjust)	C/F** stock	1	2	0	2	0	3
	Amount	2,500,000	5,000,000	0	5,000,000	0	7,500,000
B51	B/F* stock	1	1	1	1	1	0
1,000,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	0	1	0	0	1
	C/F** stock	1	1	1	1	0	1
	Amount	1,000,000	1,000,000	1,000,000	1,000,000	0	1,000,000
B52	B/F* stock	2	1	2	1	2	0
570,000	Use	1	0	1	0	2	0
Baht/lot	Receive	0	1	0	1	0	2
	C/F** stock	1	2	1	2	0	2
	Amount	570,000	1,140,000	570,000	1,140,000	0	1,140,000
B53	B/F* stock	3	2	2	1	2	1
440,000	Use	1	2	1	1	1	2
Baht/lot	Receive	0	2	0	2	0	4
	C/F** stock	2	2	1	2	1	3
	Amount	880,000	880,000	440,000	880,000	440,000	1,320,000
B54	B/F* stock	1	1	1	1	1	1
320,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	0	1	0	1	0
	C/F** stock	1	1	1	1	1	1
	Amount	320,000	320,000	320,000	320,000	320,000	320,000
Total B5	Amount	5,270,000	8,340,000	2,330,000	8,340,000	760,000	11,280,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 41: Result from Evaluation of Group A2 for 4th Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A2 tablets	B/F* stock	3	3	3	3	3	3
360,000	Use	0	4	1	4	1	3
Baht/lot	Receive	0	4	1	4	1	3
	C/F** stock	3	3	3	3	3	3
	Amount	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000
A21	B/F* stock	1	1	1	1	1	1
330,000	Use	0	0	1	1	1	1
Baht/lot	Receive	0	0	1	1	1	1
	C/F** stock	1	1	1	1	1	1
	Amount	330,000	330,000	330,000	330,000	330,000	330,000
A22	B/F* stock	1	1	1	1	1	1
380,000	Use	0	0	0	1	0	0
Baht/lot	Receive	0	0	0	1	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	380,000	380,000	380,000	380,000	380,000	380,000
A23	B/F* stock	1	1	1	1	1	1
250,000	Use	0	1	0	1	0	1
Baht/lot	Receive	0	1	0	1	0	1
	C/F** stock	1	1	1	1	1	1
	Amount	250,000	250,000	250,000	250,000	250,000	250,000
A24	B/F* stock	1	1	1	1	1	1
350,000	Use	0	1	0	0	0	0
Baht/lot	Receive	0	1	0	0	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	350,000	350,000	350,000	350,000	350,000	350,000
A25	B/F* stock	1	1	1	1	1	1
230,000	Use	0	1	0	1	0	1
Baht/lot	Receive	0	1	0	1	0	1
	C/F** stock	1	1	1	1	1	1
	Amount	230,000	230,000	230,000	230,000	230,000	230,000
A26	B/F* stock	1	1	1	1	1	1
200,000	Use	0	1	0	0	0	0
Baht/lot	Receive	0	1	0	0	0	0
	C/F** stock	1	1	1	1	1	1
	Amount	200,000	200,000	200,000	200,000	200,000	200,000
Total A2	Amount	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000	2,820,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 42: Result from Evaluation of Group A5 for 4th Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A5 tablets	B/F* stock	9	9	9	9	9	9
290,000	Use	12	4	13	3	11	5
Baht/lot	Receive	12	4	13	3	11	5
	C/F** stock	9	9	9	9	9	9
	Amount	2,610,000	2,610,000	2,610,000	2,610,000	2,610,000	2,610,000
A51	B/F* stock	3	3	3	3	3	3
130,000	Use	1	3	0	3	1	5
Baht/lot	Receive	1	3	0	3	1	5
	C/F** stock	3	3	3	3	3	3
	Amount	390,000	390,000	390,000	390,000	390,000	390,000
A52	B/F* stock	2	2	2	2	2	2
150,000	Use	0	0	0	0	2	0
Baht/lot	Receive	0	0	0	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	300,000	300,000	300,000	300,000	300,000	300,000
A53	B/F* stock	5	5	5	5	5	5
100,000	Use	0	1	6	0	6	0
Baht/lot	Receive	0	1	6	0	6	0
	C/F** stock	5	5	5	5	5	5
	Amount	500,000	500,000	500,000	500,000	500,000	500,000
A54	B/F* stock	4	4	4	4	4	4
130,000	Use	4	0	0	0	0	0
Baht/lot	Receive	4	0	0	0	0	0
	C/F** stock	4	4	4	4	4	4
	Amount	520,000	520,000	520,000	520,000	520,000	520,000
A55	B/F* stock	7	7	7	7	7	7
100,000	Use	6	0	5	0	0	0
Baht/lot	Receive	6	0	5	0	0	0
	C/F** stock	7	7	7	7	7	7
	Amount	700,000	700,000	700,000	700,000	700,000	700,000
A56	B/F* stock	2	2	2	2	2	2
90,000	Use	1	0	2	0	2	0
Baht/lot	Receive	1	0	2	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	180,000	180,000	180,000	180,000	180,000	180,000
Total A5	Amount	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 43: Result from Evaluation of Group A9 for 4th Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
A91	B/F* stock	2	2	2	2	2	2
610,000	Use	0	0	2	0	0	1
Baht/lot	Receive	0	0	2	0	0	1
	C/F** stock	2	2	2	2	2	2
Total A9	Amount	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000	1,220,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 44: Result from Evaluation of Group B3 for 4th Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B3 tablets	B/F* stock	3	3	3	3	3	3
300,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	3	3	3	3	3	3
	Amount	900,000	900,000	900,000	900,000	900,000	900,000
B31	B/F* stock	2	2	2	2	2	2
600,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	2	2	2	2	2	2
	Amount	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
B32	B/F* stock	2	2	2	2	2	2
300,000	Use	0	0	0	0	0	0
Baht/lot	Receive	0	0	0	0	0	0
	C/F** stock	2	2	2	2	2	2
	Amount	600,000	600,000	600,000	600,000	600,000	600,000
Total B3	Amount	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000

Remark: *B/F is brought forward, **C/F is carry forward

Table 45: Result from Evaluation of Group B5 for 4th Method

Packing style	Item	MAY'14	JUNE'14	JULY'14	AUG'14	SEP'14	OCT'14
B5 tablets	B/F* stock	3	3	3	3	3	3
2,500,000	Use	2	2	4	1	5	2
Baht/lot	Receive	2	2	4	1	5	2
	C/F** stock	3	3	3	3	3	3
	Amount	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000
B51	B/F* stock	1	1	1	1	1	1
1,000,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	0	1	0	1	0
	C/F** stock	1	1	1	1	1	1
	Amount	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
B52	B/F* stock	2	2	2	2	2	2
570,000	Use	1	0	1	0	2	0
Baht/lot	Receive	1	0	1	0	2	0
	C/F** stock	2	2	2	2	2	2
	Amount	1,140,000	1,140,000	1,140,000	1,140,000	1,140,000	1,140,000
B53	B/F* stock	3	3	3	3	3	3
440,000	Use	1	2	1	1	1	2
Baht/lot	Receive	1	2	1	1	1	2
	C/F** stock	3	3	3	3	3	3
	Amount	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000
B54	B/F* stock	1	1	1	1	1	1
320,000	Use	0	0	1	0	1	0
Baht/lot	Receive	0	0	1	0	1	0
	C/F** stock	1	1	1	1	1	1
	Amount	320,000	320,000	320,000	320,000	320,000	320,000
Total B5	Amount	11,280,000	11,280,000	11,280,000	11,280,000	11,280,000	11,280,000

Remark: *B/F is brought forward, **C/F is carry forward