STOCK OUT ANALYSIS: AN EMPIRICAL STUDY ON FORECASTING, RE-ORDER POINT AND SAFETY STOCK LEVEL AT PT. COMBIPHAR, INDONESIA

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Presented at the SIBR 2014 Conference (Kuala Lumpur) on Interdiciplinary Business and Economic Research, February 7-8, 2014, Kuala Lumpur, Malaysia

ABSTRACT

Inventory is one of the most important assets in the companies, especially in manufacturing company. In the event of problems related to inventory, the company's business processes will be disrupted. One example of the inventory problems is stock out case. Stock out is a condition in which the company is unable to meet customer demand due to inventory shortage in the warehouse. This problem is common in manufacturing companies which adapted make to stock system, for example pharmaceutical companies. PT. Combiphar is one of the pharmaceutical company in Indonesia that adapting the system. With this system, the company is required to perform demand forecasting to avoid shortages or excess inventory in the future. Another thing that must be determined by the company is the re-ordering time and safety stock levels in anticipation of stock out in the warehouse due to the long lead time.

Inventory management is an important aspect in supply chain management which can adjust level of inventory in the warehouse taking into costs such as: ordering cost, carrying cost and item cost. Inventory is needed to anticipate the stock out, avoid the price and lead time uncertainty. Economic Order Quantity (EOQ) is one of the inventory models that calculate the maximum inventory level to be ordered at the lowest cost.

This study uses quantitative method, includes: forecasting calculation with double exponential smoothing models to determine the level of demand in 2013 and 2014, determining the re-order point and safety stock level to know when company have to order and how much inventory is anticipated, also EOQ calculations to know how many orders of raw materials at the lowest cost.

Keywords: Inventory, Supply Chain Management, Stock Out, Make to Stock, Forecasting, Lead Time, Re-Order Point, Safety Stock, Economic Order Quantity

I. INTRODUCTION

Supply Chain Management (SCM) is an activity that involves the coordination management of materials, business information and financial flows in business relations between organizations. SCM is no longer regarded as a new concept for the company at this time. Many companies are implementing SCM in their business to improve the effectiveness and efficiency of logistics. Arnold, Chapman & Clive (2008) declare that effectiveness and efficiency is the key aspects in inventory management.

The 1990's have witnessed substantial progress in SCM with many organizations realizing that supply chain initiatives have increased their competitiveness, reduced inventory, and also improved their ability to meet customer demand. The challenges in managing supply chains are to ensure product availability and the ability to respond to market signals through accurate demand forecasts (Rawat & Altiok, 2008). PT Combiphar is one of the pharmaceutical manufacturing company that has adapted SCM as a business process, especially in the factory environment.

Supply chain consists of a variety processes ranging from raw material procurement and processing to distribution processing. Some researchers lay emphasis on optimizing the counting and information systems, the required buffer size to minimize shortage risk and costs, but never take into consideration the risk induced by inventory inaccuracy as the occurrence of stock out (Thiel & Hovelaque, 2009). Companies argue that stock-outs caused by suppliers, weather or difficulty in obtaining raw materials, result in many costumers have complaints to the company. The real issue however is the "safety stock". Companies were not aware that the effect of stock out itself can disturb the internal processes and lose the market share.

Production planning has two primary goals, meeting customer demands and lowering cost. These two goals may not always be consistent and in line. For example, an increase in the inventory level can certainly maximize the meeting of customer demands, but the holding cost may be too high and leading that the total cost is not the lowest one. Safety stock is carried to protect against the possibility of a stock out. A higher safety stock than required can increase operational costs, whereas low or no safety stock can lead to lost sales and customer dissatisfaction. Inventory management requires planning and control of inventory at optimum levels. It also determines the quality of a reasonable inventory to meet the needs of the processing or production on a scheduled basis and satisfy customer orders (Bayraktar & Ludkovski, 2012).

Rubin (2013) show an example of the failure in inventory system. Xeno Port Inc. had the chaotic condition when they can't solve the stock-out case. Hence many patients are not able to obtain the medicines from prescription given by the doctors. The company's management is very disappointed at this situation, thus they promised that this problem will not happen again. One of the improvements made by the company is working with Glaxo Inc. as a supplier of its manufacturing for problem solving (Rubin, 2013).

Stock out are common in the manufacturing companies well as PT. Combiphar. This company has run stock out several times lately. Most of the products manufactured by the company is experiencing stock out from month to month, especially in 2012. Due to stock-outs, the company received a lot of complaints and criticism by the customers, so this causes a lower sales and decrease in revenue.

The losses that occur due to stock out case make the manufacturing companies trying hard to get out of this problem by raising the level of safety stock. It seems like very easy if the solution is just to raise the level of inventories. The problem is how to reach the maximum inventory levels with the minimum cost (Bottani, Ferretti, Montanari, Vignali, Longo, & Bruzzone, 2013). Maximum inventory with the minimum cost can determined through the Economic Order Quantity method (EOQ). Safety stock also has a relationship with forecasting (Smart, 2008) and lead time (Senapati, Mishra, Routra, & Biswas, 2012), which the company must determine the forecast demand to find out how many products, will be prepared in the future, whereas lead time can determine the level of safety stock due to lead long to raise the level of safety stock.

Cannot be separated from the human need of medicine or prevention of disease through antibodies and vitamin, how customers receive these products is also important. Many customers were complained and upset with the company's performance, particularly in terms of product distribution. Many mistakes happened when the product reached the hands of the distributor causing delays and defects. Mistakes happen during the distribution processes there are risks that can affect the flow of the supply chain, whereby it does not run smoothly. Lead time can also be one of the causes of stock out (Ong & Twentiarani, 2012), where long lead time and lead time uncertainty causes the longer process. It causes smaller line efficiency because the process that formed more focused on administrative activities nature as compared to the core activities.

II. LITERATURE REVIEW

There are many definitions of Supply Chain Management (SCM) (Wisner, Tan, & Leong, 2012), but generally, SCM can be defined as the planning and managing of all activities involved in sourcing and procurement, conversion and all logistic management activities. SCM is not a new concept for manufacturing companies since SCM has been implemented in the system a long time. SCM was first coined by a U.S. industry consultant in the early 1980's. In fact, the concept of SCM itself has been around since the early 20th century, especially on the assembly line. The characteristics of this era of supply chain management include the need for a large-scale production and re-engineering by cost reduction and attention to the Japanese management practices. SCM is an important thing to be owned by the manufacturing company, where SCM is the control of all the main activities of the company.

SCM organizes the logistic activities including inventory as an important asset in an organization based manufacturing. Inventories are materials and supplies that a business or institution carries either for sale or to provide inputs or supplies to the production process, divided into three types: raw material, work in process and finished goods. There are some costs used for inventory management decisions, but in general, there are five common costs in manufacturing companies, such as: item cost, carrying cost, ordering cost, stock out cost and also capacity associated cost (Arnold, Chapman, & Clive, 2008). One inventory model that is often used is the Economic Order Quantity. This model determine how much the quantity should be order, when the items to be ordered to achieve an economical value (Re-Order Point) and will counting the total cost of annual inventory to make the product (Wisner, Tan, & Leong, 2012). The EOQ formula is as follows:

$$\boldsymbol{EOQ = \sqrt{2RS/kC}} \quad \text{(2.1)}$$

Where the total annual inventory cost expressed as follows:

$$\textbf{TAIC = APC + AHC + AOC = (R x C) + (Q/2) x (K x C) + (R/Q) x S} \quad \text{(2.2)}$$

Where; TAIC = Total annual inventory cost; APC = Annual purchase cost; AHC = Annual holding cost; AOC = Annual order cost; R = Annual requirement or demand; C = Purchase cost per unit; S = Cost of placing one order (ordering in monetary costs per units); K = Holding rate; where annual holding cost per unit = k × C; and Q = Order quantity in units.

Based on the case, then be required safety stock or "spare tire" and re-order point to avoid the case of stock out. Wisner, Tan, & Leong (2012) stated that safety stock formula can also be written as follows:

$$\boldsymbol{SS = x - \mu} \quad \text{(2.3)}$$

Where; x = ROP (Reorder Point) = dLT + dσdLT, μ = Average demand during lead time; dLT = standard deviation of lead time; dLT = Standard deviation of demand during the lead time; and Z = Table value.

With highly fluctuating demand for products, inventory management has become an important element, especially for safety stock itself. There are four components for calculating safety stock: forecast demand, service level, lead time and also actual demand (Luthra, 2011). Safety stock is carried to protect against this possibility, but the problem is higher safety stock than required can increase operational costs, whereas low or no safety stock can lead to lost sales and customer dissatisfaction.

Based on these problems, it is necessary accurate forecasting so that the company can determine the quantities that should be purchased, produced, and shipped (Arnold, Chapman, & Clive, 2008). For forecasting calculation, then use double exponential smoothing (Holt's) model. In order to improve the accuracy of the forecast, the exponential smoothing with trend is more complex model that adjusts for. With trend-adjusted exponential smoothing, estimates for both the average and the trend are smoothed. This procedure requires two smoothing constant, α for the average and β for the trend. The formula is:

$$\mathbf{F_{t+1} = A_t + T_t} \quad \text{(2.4)}$$
$$\mathbf{A_t = \alpha D_t + (1-\alpha)(A_{t-1} + T_{t-1})} \quad \text{(2.5)}$$
$$\mathbf{T_t = \beta(A_t - A_{t-1}) + (1-\beta)T_{t-1}} \quad \text{(2.6)}$$

Where; F_{t+1} = forecast of demand for period t+1; A_t= Actual demand for period t; T_t = Estimate of trend at the end of period t; α = smoothing constant for level; and β = smoothing constant for trend.

Not only forecast, lead time is also become an element to determine safety stock and factor that can reduce stock out case. Nijkamp (2011) stated that: **"***Lead time is the time elapsed in between the receipt of customer order until the delivery of finished goods to the customer*"**.** There are many factors of lead time, such as: demand, order quantity, quality of product, reorder point, safety stock, and other price factors like discount, allow shortage or not, inflation, and the time value of money, are also important in the study and so on should be taken into consideration in the reduction of lead time in inventory study (Senapati, et al., 2011).

III. RESEARCH METHODOLOGY

III.1. DATA AND METHOD

The research methodology is the steps and procedures to be performed in the data collection or information to solve problems and the research hypothesis test. One of the most important elements in the research methodology is the use of scientific method as a tool to identify the object or phenomenon. Not only that, but also finding solutions to the problem being studied, so the results obtained can be justified scientifically. Methodology in this research is descriptive with quantitative approach, where the researcher conducted survey or direct observation and processed quantitative data.

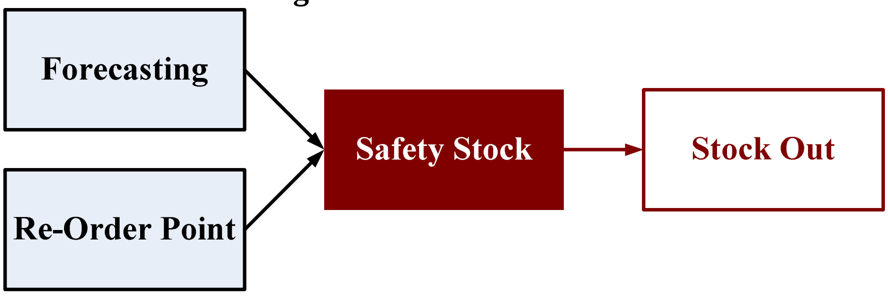
The data is either qualitative or quantitative and when processed will produce desired information. Based on the types, the data is divided into two kinds: primary and secondary data. Primary data is data that is acquired directly by the researchers or the author, while the secondary data are obtained from previous researches. The types of data used in this research are primary and secondary data. Primary data include surveys or direct observation, while secondary data is company historical data such as: stock out, demand and lead time.

This research focuses on the stock out case in the finished goods warehouse. There are more than 100 products are experiencing stock outs, but there are several products with the highest quantity and frequency. The data used is company internal data including: pending order or stock out, demand, actual production and shipment, lead time, holding cost, set up cost and also ordering cost.

III.2. RESEARCH MODEL

Based on the stock out cases that occur, there is a factor that directly affects the case. That is, the level of the company's safety stock. Safety stock is also affected by forecasting and Re-order point. When the safety stock is at an appropriate level, it can reduce the stock out level.

Figure 1: Research Model



However, the safety stock calculations are influenced by the forecasting, because the safety stock level is determined based on a forecasting calculation. Not only that, but also re-order point can determine the safety stock level. Based on the figure above, the author can make the proposition as follows:

P_1 : Forecasting can determine the Safety Stock level;
P_2 : Re-Order Point can determine the Safety Stock level;
P_3 : Safety Stock can decrease the Stock Out level.

IV. RESULTS AND DISCUSSIONS

IV.1. STOCK OUT LEVEL AND THE PRODUCTS

A stock out or pending order is a condition experienced by the company that cannot meet the customers demand within a certain time frame. PT. Combiphar incurred stock outs in very high levels and value each month. The following Table 1: Stock-Out Products 2012 shows the amount of stock out levels identified by product. The table shows 20 products experienced the most stock out (quantity), the most frequent (frequency) and the highest value from 120 products experiencing stock out. The restrictions are as follows: (1) quantity ≥ 30,000 (average order quantity per period), (2) frequency ≥ 3 times (average order per year), and (3) value ≥ Rp. 500 million.

Research object selected based on the highest quantity, frequency and also value. CTS3 or "Comtusi" was selected as an object to be researched because it is has the highest quantity, frequency and value. Comtusi Syrup is a cough medicine product directly manufactured by PT. Combiphar, Padalarang, Indonesia. This product is made for hospitals and pharmacies and is available in pack of 60ml.

The total of stock out quantity in 2012 amounted to 1,390,698 units and the total value amounted to Rp 35,139,229,335. CTS3 has proportion 9% of the total stock out quantity; the quantities are equal to 128,036 units. This product has proportion 9.75% from the total value, i.e.

Rp 3,424,963,000. Due to the stock out case above, the revenue and gross profit decreased. The following shows the results of the calculation, if the demand is fulfilled and unfulfilled (stock out position).

Table 1: Stock-Out Products 2012

Product	Jan	Feb	Mar	Apr	May	June	July	Augs	Sep	Oct	Nov	Dec	TOTAL QT	FREQ	Value (Rp)
CTS3	37,000	13,150		2,921		23,887		28,700	8,928	13,450			128,036	7	3,424,963,000
LCC1		68,318	69,888	17,918									156,124	3	2,732,170,000
LCC4		57,090		53,363									110,453	2	1,988,154,000
TYA3				2,254	7,080	10,980	45,219						65,533	4	1,753,007,750
DBM1		81						320	160	1,040	960		2,561	5	1,526,868,200
LCM2									13	127	768	5,376	6,284	4	1,474,648,800
PTN3	1,687	3,685		1,999	345								7,716	4	1,097,556,900
LCC8		9,796	9,120	1,932		1							20,849	3	898,507,000
LVR2		4,372	10,600		4,120								19,092	3	840,048,000
RHI4	5,054	1,697	3,080	4,487		4,400		4,700					23,418	6	796,212,000
OBA8				111,698									111,698	1	755,078,480
PHX5				7,005		24	18,912			49	4,872		30,862	4	740,688,000
DNM2							21,058	51,400					72,458	2	724,580,000
PSY1							1,960	1,830					3,790	2	696,412,500
LAC1			52	10,680									10,732	2	665,384,000
FSC1						2,472	15,847						18,319	2	632,005,500
OBJ6						84,635							84,635	1	550,127,500
FTJ4	129				7,503	1,959							9,591	3	527,505,000
DBX1				1,145	3,612							539	5,296	3	522,762,200
NPN1				193	924	1,134		145					2,396	4	503,160,000

Source: PT. Combiphar, 2012

Table 2: Profit Analysis

Revenue if Demand is met in 2012		
Product Price	26,750	pcs
Revenue		12,866,750,000
Unit Cost	5,772,000,000	
Set Up & Ordering Cost	114,640,800	
Holding Cost	114,640,800	
Total Product Costs		6,001,281,600
Profit		**6,865,468,400**

Revenue if Demand is not met in 2012 (Stock Out Position)		
Product Price	26,750	pcs
Revenue		9,442,054,500
Unit Cost	4,235,688,000	
Set Up & Ordering Cost	114,640,8000	
Holding Cost	114,640,800	
Total Product Cost		4,464,969,600
Profit		**4,977,084,900**

Source: PT. Combiphar, 2012

The calculations above show a substantial difference in profits due to stock out case. The company did not incur a loss, but decreased in profits. Due to stock out in 2012, the company lost sales is Rp1,888,383,500. Based on the profit analysis above, it is apparent that the company experienced declining profits due to stock out situation. The following Table 3: Forecasting Results 2013-2014is the results of forecasting, ROP and also Safety Stock:

Table 3: Forecasting Results 2013-2014

Month	**Demand 2011**	**Demand 2012**	**Forecasting 2013**	**Forecasting 2014**
January	70,000	58,000	**70,000**	**20,491**
February	52,000	44,000	**70,000**	**47,933**

Month	Demand 2011	Demand 2012	Forecasting 2013	Forecasting 2014
March	54,000	42,000	**54,880**	**49,566**
April	41,000	50,000	**49,821**	**47,204**
May	42,000	36,000	**37,880**	**51,730**
June	55,080	51,000	**34,693**	**41,365**
July	31,000	30,000	**46,159**	**48,532**
August	49,000	54,000	**32,659**	**34,351**
September	28,000	30,000	**41,981**	**47,794**
October	32,000	36,000	**29,754**	**34,501**
November	36,000	32,000	**27,803**	**33,143**
December	20,000	18,000	**31,389**	**29,926**
Total	**510,080**	**481,000**	**527,018**	**486,535**

Source: PT. Combiphar, 2012

From the above data on demand in 2011 and 2012, and forecasting measures for 2013 and 2014, the following statistics can be calculated.

Table 4: Statistical Calculations

Error	Mean Absolute Deviation (MAD)	Mean Squared Error (MSE)	Mean Absolute Percent Error (MAPE)
-936.39	**1,1134.78**	**197,880,100**	**0.3**

Source: PT. Combiphar, 2012

IV.2. FORECASTING WITH DOUBLE EXPONENTIAL SMOOTHING MODEL

By using double exponential smoothing method, there are two smoothing constants; alpha (α) and beta (β). Smoothing constant alpha: 0.6 on the basis that the data is volatile but not too extreme, while the beta value: 0.4 on the basis that demand has decreased trend during the last 24 months (2 years). Determination of beta value is also based by trial and error. Based on the Forecasting calculation using QM, the result come out as follows:

In the table above, are shown various degrees of error ranging from error quantity, MAD, MSE and also MAPE. Quantity error is negative value, it means that the average forecasting demand quantity is higher than the past (history data). Then, if the company follows the forecasting figures accurately, then the company produces more than 936 products compared with past demand. Maybe it can avoid the stock out case but the company must be careful because the number of 936.39 will be able to settle in the warehouse if in fact the future is higher than the past demand.

IV.3. SAFETY STOCK AND RE-ORDER POINT

Safety stock is calculated to determine how many products should be used by the company as "spare tire" within certain time to reduce the stock out case. Based on the Safety Stock and ROP calculation using POM-QM, the results are shown in Figure 2: Safety Stock and Re-Order Point Results.

Safety stock = 300 are maximum stocks that should be owned by the company in anticipation of stock out due to delays, raw materials ordering errors and also any emergency demand during the lead time period. By adding safety stock, the company should re-order materials when inventory levels reach maximum 58.858 units.

Figure 2: Safety Stock and Re-Order Point Results

Inventory Results

Safety Stock.Result Solution

Parameter	Value	Parameter	Value
(Daily)demand (d-bar)	1,463.94	Z value	1.64
Demand Std dev (sigma-d)	.6	Expected demand during lead	58,557.6
Service Level %	95	Safety Stock	300.172
Lead time (in days) (L)	40	Reorder point	58,857.77
Lead time std dev (sigma L)	.125		

Source: PT. Combiphar, 2012; QM Software

IV.4. ECONOMIC ORDER QUANTITY

EQO is the total inventories booked at a time to minimize the annual inventory costs. Based on the EOQ calculation using POM-QM, the results come out as follows:

Figure 3: Economic Order Quantities Results

Inventory Results

EOQ Result Solution

Parameter	Value	Parameter	Value
Demand rate(D)	527,018	Optimal order quantity (Q*)	65,509.02
Setup/Ordering cost(S)	14,250,000	Maximum Inventory Level	65,509.02
Holding cost(H)	3,500,000	Average inventory	32,754.51
Unit cost	12,000	Orders per period(year)	8.04
Days per year (D/d)	360	Annual Setup cost	114,640,800
Daily demand rate	1,463.94	Annual Holding cost	114,640,800
Lead time (in days)	40		
Safety stock	0	Unit costs (PD)	6,324,216,000
		Total Cost	6,553,498,000
		Reorder point	58,557.55

Source: PT. Combiphar, 2012; QM software

Based on EOQ calculation, the maximum order at the level of 65.509 units for one-time order, where in year, the company can order as many as 8 times. This amount is the order with the lowest annual cost for the company. It is shows a large difference between the results of calculations with actual ordering quantity. In fact, the company just ordered 30,000 per one-time order, while the suggested order quantity is 65,509. Without safety stock calculation, thus the company should reorder materials when inventory levels reach 58.558 units.

IV.5. THE RELATIONSHIP BETWEEN EOQ, ROP AND SAFETY STOCK

Based on the forecasting demand for 1 year (average daily demand = 1,464), it is apparent how much quantity should be ordered, held, and when is the re-order point (ROP). The company must make an order maximum of 65.509 units. At the level where inventory that has been produced reaches 58.858, then the company must reorder. In order to avoid the stock out during any lead time period the company must have a safety stock of 300 units.

Safety stock and ROP results above are using the forecasting demand. In fact, as good as any method used, there is of course a level of error. It is seen in the comparison of actual and forecasting demand in the period January to July 2013. Therefore, it is necessary to adjust the safety stock level and ROP each period. It is also caused by differences in the demand level for each period, so the safety stock and ROP levels are different as well as any of its periods. The following is a table of Production Requirement Plan 2013 that is a combination of all results calculation ranging from forecasting, safety stock and also ROP using the Economic Order Quantity models.

Figure 4: The Relationships Between EOQ, ROP, and Safety Stock

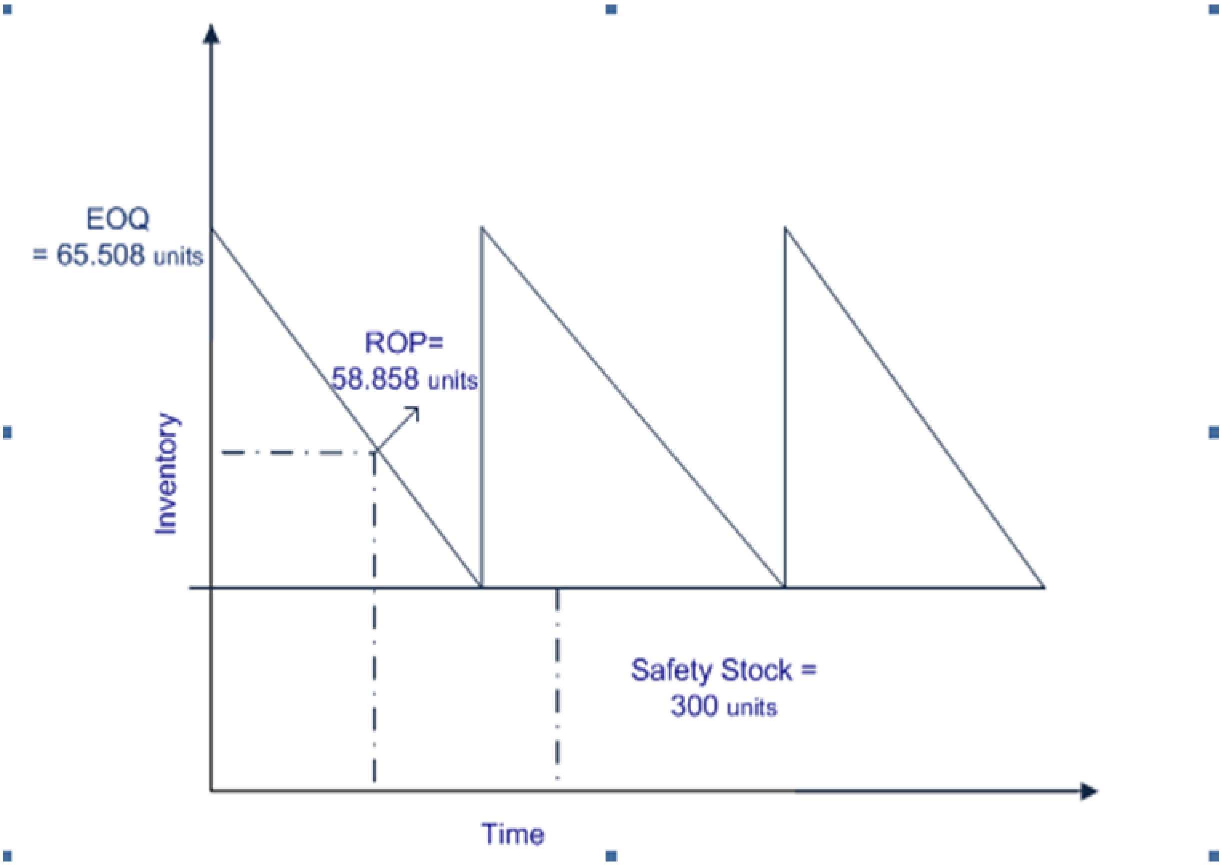


Table 5: Production Requirement Plan (Jan-Jul 2013)

Month 2013	Jan	Feb	Mar	Apr	May	Jun	Jul
Forecasting 2013	70,000	70,000	54,880	49,821	37,880	34,693	46,159
Demand	65,000	56,000	56,000	42,000	32,000	36,000	42,000
Quantity Error (Forecasting-Demand)	5,000	14,000	1,120	7,821	5,880	1,307	4,159
Safety Stock (SS)	-	-	-	-	-	247	288
Maximum SS						300	300
on Hand (Initial Inventory)	23,144	2,071	16,361	21,689	35,358	33,230	3,969
Production Plan	-	28,000	42,000	32,000	28,000	65,508	46,257
Shipment	21,072	46,432	47,328	45,696	25,872	65,508	45,969
on Hand (Ending Inventory)	2,072	16,361	21,689	35,385	33,230	3,969	288
Re-Order Point (ROP)	-	-	-	-	-	48,246	42,288
Maximum ROP						58,858	58,858
Economic Order Quantity (EOQ)	-	-	-	-	-	65,508	65,508

Source: PT. Combiphar, 2012

Table 6: Production Requirement Plan (Aug-Dec 2013)

	Demand Based on the Forecasting				
Month 2013	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Forecasting 2013	32,659	41,981	29,754	27,803	31,389
Demand	32,659	41,981	29,754	27,803	31,389
Quantity Error (Forecasting-Demand)	-	-	-	-	-
Safety Stock (SS)	223	287	203	190	215
Maximum SS	300	300	300	300	300
on Hand (Initial Inventory)	288	223	287	203	190
Production Plan	32,594	42,045	29,670	27,790	31,414
Shipment	32,659	41,981	29,754	27,803	31,389
on Hand (Ending Inventory)	223	287	203	190	215
Re-Order Point (ROP)	32,893	42,567	29,963	28,000	31,595
Maximum ROP	58,858	58,858	58,858	58,858	58,858
Economic Order Quantity (EOQ)	65,508	65,508	65,508	65,508	65,508

Source: PT. Combiphar, 2012

The above tables; Table 5: Production Requirement Plan (Jan-Jul 2013) and Table 6: Production Requirement Plan (Aug-Dec 2013) are the summaries of all the results that have been obtained. The safety stock and re-order point are determined each period with lead time (30 days) based on the average demand per month. Results shown in figure 4.5 are the maximum safety stock and ROP within a one year period because demand used is the average per year not per month. Demand from January to July 2013 is actual demand, while the month of August to December is based on the forecasting demand. Production planning adjusted to demand, safety stock and previous inventory. If the previous demand is not met, then the demand is transferred to the next month. It is shown by red numbers on the production requirement table.

EOQ is 65.508 units, because the EOQ calculation is not per month but per year. However, production capacity should not exceed the EOQ, because if production is greater than the EOQ, it means over-capacity and increase the cost. If production is higher than ROP, then re-order is made when production is complete. This is to avoid excess inventory in the warehouse.

As an improvement to the long lead time, then the line efficiency analysis is needed to determine the overall process that aims to cut the non value added processes, then not too much time wasted.

Table 7: Line Efficiency

HYA11 (Raw Material)																	
28.12.12		30.12.12		02.01.12		14.01.12		02.02.13		05.02.13		07.02.13	**Value Added =**	-	Hours	5.00	Days
Create Purchase req	**2**	**Create PO Date**	3	**Release PO**	11	**Delivery Requirement**	14	**Good Receipt (GR)**	3	**Sampling**	2	**Release**	**Cycle time =**	-	Hours	35.00	Days
													Non Value Added =	-	Hours	30.00	Days
													Line Efficiency =	**14%**			

BXXX0D2																	
02.01.13		03.01.13		09.01.13		01.02.13		09.02.13		11.02.13		11.02.13	**Value Added =**	16	Hours	2	Days
Create Purchase req	**1**	**Create PO Date**	6	**Release PO**	20	**Delivery Requirement**	7	**Good Receipt (GR)**	2	**Sampling**	0	**Release**	**Cycle time =**	288	Hours	36	Days
													Non Value Added =	272	Hours	34	Days
													Line Efficiency	**6%**			

ECTS3A3																	
13.12.12		13.12.12		24.12.12		18.01.13		28.01.13		30.01.13		30.01.13	**Value Added =**		Hours	2.00	Days
Create Purchase req	**0**	**Create PO Date**	10	**Release PO**	20	**Delivery Requirement**	9	**Good Receipt (GR)**	2	**Sampling**	0	**Release**	**Cycle time =**		Hours	41.00	Days
													Non Value Added =		Hours	39.00	Days
													Line Efficiency =	**5%**			

Line efficiency aims to determine the ratio between the Value Added processes (VA) and the cycle time. The ratio shows how many VA processes percentage compared with the Non-value added (NVA) processes .Based on the lead time data above, it is clear what the process takes a long time. Through the line efficiency analysis, then obtained very small presentation. It means that, the process which "Value Added" of a product such as: sampling, production and release are smaller than the "Non Value Added" covering administrative processes, such as: create purchase requisition and purchase order, order releases until delivery of raw materials.

V. CONCLUSION

Based on the stock out case, the company must conduct forecasting. Not only forecasting, but also the company needs to know when is the reorder point and what is the safety stock level. Demand forecasting technique using *Double Exponential Smoothing* (Holt's) were conducted to determine how much demand each month in the future, so there is no excess or shortage of inventory; while the re-order point was conducted to determine the optimum order with the lowest cost. Safety stock could not be separated from these two things and also holds an important role. Safety stock enables the company to reduce and even avoid the case of stock out. The re-order point and Safety Stock calculation was done by using Economic Order Quantity model (EOQ).

PT. Combiphar's inventory system shows that the order quantity is smaller than EOQ calculation i.e.: 30,000 units (average ordered by the company per period) and 65,508 units (based on the model of Economic Order Quantity). Thus, it will lead to stock out case continuously. From the other side, there is a non-efficiency of cost because the company did not order at the point of maximum quantity with minimum cost. Not only non-efficiency of cost, but also lead time. Low percentage of line efficiency describes many non-value added (NVA) processes in the company that makes a long lead time.

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