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The Analysis of Procurement and Inventory Policy: Steel Tank Firm

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Abstract. The purpose of this study is to provide recommendation; how the targeted firm should manage their procurement and inventory. Currently, the firm has not been used any theoretical approach for determine the right amount to stock and to procure. This problem, eventually, leads to overstocking of 200-liter Steel Tank and, therefore, increasing in total cost of inventory. Hence, this study use Continuous Review System policy (s, Q*) in order to compare the cost to that from the current situation. By integrating data from 2013-2015 of both types of tank quality, the variation coefficients are tested. Then, the demand of the product for 12 months period will be forecasted. At last, procurement economic order quantity, inventory level and new procurement equilibrium will be defined. Result indicates that total cost of the recommended policy, from January to December 2016, is 68,775.32 Baht lower than the previous or 39.44 in percentage.

Keywords--- Inventory Management, Continuous Review System Policy, Demand Forecast

INTRODUCTION

Nowadays, in the most industries business are critical competitive that made them create strategies to be advantage competitive to get larger market share. The important strategy is using in many firms are focus on maintain quality of products and services, price, reduce cost, meet customers need and satisfy customers. Thus reduce cost processing in organization is one procedure to support capacities in market competition. Many organization concentrate on build to reduce cost strategy in management which is best process to reduce cost in inventory and purchasing operations

This research studied a company is purchasing firm and distribution steel Tank 200 liters. This company is purchase used products from seller and re-cycles it for selling according customer's needs with highest profit margin. In addition the company has stock products in inventory for satisfying customer requirements. Now this company has main raw material is 200 steel tank produce for selling 2 types are good quality and fair quality of products. Their policy concerns inventory found this company lack of controlling stock inventory, order point and order quantities.

So they often faced over stock of raw material problem and reorder in many times that affect to cost of raw materials inventory and cost of order is higher. This research aims to find policy for controlling appropriate quantity of raw material by using theory inventory management to support reducing cost in purchasing including total cost.

Thus this study, researcher learnt more research of (Panwipa Puthipad and Pornthipa Ongkunaruk, 2011) for studying to adjust purchasing policy and find appropriately management by gathering data and group type of product accord ABC Analysis. After that, select 2 items of raw materials which are highest valve annually and highest valve in inventory. There are 2 items selected divided 2 types are raw material normal distribution and raw material other distribution.

Then calculate the data in each policy to compare costs. The results found normal distribution method should use in continuous policy such as determine highest and lowest inventory policy, reused raw material should calculate with simulation method. The purpose of this research is study materials control inventory policy in company in case of products requirement, purchasing quantity of raw material inventory, ordering cost and holding cost for developing inventory strategy.

METHODOLOGY

The research used information about demand products of company both good and fair quality in year 2013-2015 while gathered information from sales department to use in process and find policy reorder materials and determine level of store raw material inventory by forecasting demand and adjusting to use in January to June 2016, then compare expenditure each policy including order expenses and analysis expense in control inventory policy as below.

2.1 Examine Coefficient of Variation of products demanding

Examine coefficient of Variation of demand 200 liters steel tank in year 2013-2015 by measuring coefficient of Variation to calculate demanding

$$Coefficient\ of\ Variation = \frac{SD}{\bar{X}}$$

Ref. **SD** = *Standard Deviation*

$\bar{X}$ = *Mean*

Measurement as below

1. If CV is less than 0.25 means demand 200 liters steel bucket is stable, so it can be used EOQ to calculate ordering quantity.
2. If CV is more than or equal 0.25 means demand *200* liters steel tank is variance , so it can be used other methods to calculate such as Silver-Meal or forecasting demand to calculate ordering quantity

2.2 Study expense of ordering cost and holding cost in case of the company

Study expense of ordering cost and holding cost in case of the company 200 liters steel tank products both qualities are good and fair quality from supplier separated by expenses as below.

2.2.1 Fixed cost in ordering per time

Fixed cost will be included issuing purchase order documents until received material inventory.

2.2.2 Holding cost in inventory

Estimate material holding cost depends on kinds of materials and owner consideration.

2.3 Forecasting Demand of each material quality in year 2016

Used forecasting demand with materials need and selected forecasting method is flexible to adjust Simple Exponential Smoothing

2.4 Determine reorder policy used replenishment system.

Reorder policy used replenishment system which is determine material inventory reorder point and quantity of order stability in each time at 99%.

2.4.1 Calculate to economic order quantity (EOQ)

$$Q^* = \sqrt{\frac{2kD}{h}}$$

as Q^* = Quantity order per time (Q^*)
D = Demand per year (unit)
k = orderinjg cost per year (Baht)
h = Holding cost per yesr (Baht)

2.4.2 Calculate to Safety stock

$$ss = \sigma_D \times k \times \sqrt{L}$$

as ss = Quantity of safety stock
σ_D = Standard deviation
L = Lead time
k = Standard variable under curve

2.4.3 Calculate to Reorder point

$$ROP = (\mu_D \times L) + ss$$

as ROP = Re order point (Unit)
μ_D = Used rates(Unit per month)
L = Lead time
ss = safety stock

2.5 Comparing between new and old policy inventory cost

Bring total cost of new and old policy to calculate for finding lowest cost

RESULTS OF RESEARCH

3.1 Examine coefficient of Variation of demand 200 liters steel tank

Examine coefficient of Variation of demand 200 liters steel tank in year 2013-2015 by measuring coefficient of Variation to calculate demanding as table 1

Table 1 coefficient of Variation of demand 200 liters steel tank both quality

item	Mean per month	S.D.	C.V.
Good quality of 200 liters steel tank	6,197.58	1,597.05	0.26
Fair quality of 200 liters steel tank	4,118.81	1,192.12	0.29

The results from Table 1 that coefficient of Variation of demand 200 liters steel tank in good quality equal 0.26 and fair quality 0.29

3.2 ordering cost and holding cost in case of the company

3.2.1 Fixed cost in ordering per time

Total fixed cost in ordering per time total is 153 baht per time

3.2.2 Holding cost in inventory

Holding cost in inventory be calculated from opportunity cost investment 8% per year when calculated formula h = ic price of demand 200 liters steel tank in good quality equal 300 Baht per piece and fair quality equal 200 Baht per piece and Holding cost in inventory for good quality is 24 baht /piece / year and fair quality is 16 baht /piece / year

3.3 Forecasting demand in next 6 months in year 2016

Forecasting demand in next 6 months January to June in year 2016 by using Simple Exponential Smoothing determined $\alpha = 0.1$ for good quality and $\alpha = 0.1$ for fair quality refers to demanding of good quality products equal 5,761 pieces per month and fair quality products equal 4,475 pieces per month.

The results of error of measurement in forecasting by using Simple Exponential Smoothing determined σ is standard variable as Table 2

Table 2 Show error of measurement

item	α	MAD	MAPE	TS	σ
Good quality of 200 liters steel tank	0.1	1,316.04	22.74	(-6.0, 4.1)	1,645.05
Fair quality of 200 liters steel tank	0.1	892.29	21.59	(-3.9, 5.6)	1,115.36

3.4 new policy in order and holding inventory

Ordering in new policy use Continuous Inventory System Perceptual (s, Q*) and quantity control inventory in level 99% can calculate as below

3.4.1 Economic order quantity (EOQ)

Economic order quantity able to bring all value calculated before instead of formula and the results are found economic order quantity both of quality 200 liters steel tank

- EOQ of Good quality 200 liters steel tank is 939 pieces per time
- EOQ of Fair quality 200 liters steel tank is 1,014 pieces per time

3.4.2 Calculate to Safety stock

Ordering quantity both of quality 200 liters steel tank have lead time 1 week and S.D. as table 4 and determined services 99%. Then use Z, z =99% refer to k = 2.33 the results of Safety stock both of quality 200 liters steel tank

- Safety stock of Good quality 200 liters steel tank is 1,848 pieces
- Safety stock of fair quality 200 liters steel tank is 1,253 pieces

3.4.3 Calculate to Reorder point

Calculating of Reorder point able to bring all value calculated before instead of formula and the results are found Reorder point as below

- Reorder point Good quality 200 liters steel tank is 3,178 pieces
- Reorder point of fair quality 200 liters steel tank is 2,286 pieces

3.5 Comparing between new and old policy inventory cost

Bring the results of EOQ, ROP above instead of formula Continuous Inventory System Perceptual (s, Q*) by modified to compare total costs is refer to forecasting demand of products since January 2016 to June 2016 as table 3 show comparing between old and new policy. The old and new policy summarize from ordering cost and holding cost included all cost occurred in first 6 months in year 2016.

Table 3 Total costs

Raw materials	Total Costs	
	Old policy	(s, Q*)
Good quality of 200 liters steel tank	78,128.22	66,238.02
Fair quality of 200 liters steel tank	96,228.51	39,343.39
total	174,356.73	105,581.41

Total costs both old and new policy of company as above can be compared new policy will higher cost is 68,775.32 Baht or 39.44 %

CONCLUSION AND SUGGESTION

This study was found both qualities are good and fair quality get coefficient of Variation of demand higher than 0.25 that made need to analysis Forecasting Demand of each material quality in year 2013-2015 for calculating new policy in inventory and comparing between costs of new and old policy. Then applied both of policies use in January to June 2016 that refer to new policy able to reduce cost in January to June 2016 is 68,775.32 Baht or 39.44% and no lack of raw materials. So the reason why both of costs are very difficult because old policy lack of planning in ordering and controlling high costs problem. Thus if company has plan in ordering and holding will encourage to reduce inventory costs that related to research of (Varathorn Punyangarm, 2008) studied demanding raw materials in production to forecast demand of products aims to find economic order quantity EOQ, reorder point , Safety stock quantity and total costs. The results that can be reduce costs in production and decrease quantity of safety stock. In this case of steel tank firm should to manage new policy which is Continuous Inventory System Perceptual (s, Q*) instead of old policy because new policy can reduce total costs and no lack of inventory.

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