Inventory management in a multinational company

Inventory may be desirable, even necessary, for smooth operation and good customer service in many situations. For instance, inventory can be used to reduce the lead time to respond to customer demand, to smooth out the production rate when there are variations in demand, and to protect the company from underestimates of demand (forecast errors) or shortage of supply. Reasons such as these, plus the fact that inventory is considered an asset on a company's balance sheet, have led many company's to carry excessive amounts of inventory. Some companies for example, the Japanese manufacturer Toyota, have become known for their ability to operate with low inventories and to achieve a high inventory turnover. (Inventory turnover is basically the ratio of sales to the average inventory level, both measured at cost or retail price.) The Japanese approach is to keep in process inventory low and to achieve quick flow of the product through the production cycle. Being able to respond quickly to demand, companies can work from a shorter range forecast, which is more accurate, so they need less safety stock to protect from uncertainty. [1]

2. Aims and objectives

Inventory management is an important concern for managers in all types of businesses. For companies that operate on relatively low profit margins, poor inventory management can seriously undermine the business. The challenge is not to pare inventories to the bone to reduce costs or to have plenty around to satisfy all demands, but to have the right amount to achieve the competitive priorities for the business most efficiently. [2]

Aims and objectives of this thesis are as follows:

- Deciding where to position inventory

- Determining when to replenish inventory

- Calculating how much to order

- Determining the placement of safety stock

- Refacilitating the use of business resources for profitable business results

- Ensuring the target level of inventory is available to support demand.

3. INVENTORY

Inventory is defined as the stock of any item or resource used in organization [3]. An inventory system is a collection of people, equipment and procedures that function to keep account of the quantity of each item in inventory and to determine which items to buy or produce in what quantities and at what times. Even very simple method that accomplishes these functions cost money to operate. Some inventory system requires transaction reporting to keep track of every instance in which units are added to or taken from the existing inventory. This perpetual inventory records can be expensive, but the additional expense can be justified for products that are relatively expensive to hold in inventory

3. 1. CYCLE INVENTORY

The portion of total inventory that varies directly with lot size, is called cycle inventory. Determining how frequently to order, and in what quantity, is called lot sizing, two principles apply.

The lot size, Q, varies directly with the elapsed time (or cycle) between orders. If a lot is ordered every five weeks, the average lot size must equal five weeks' demand.

The longer the time between orders for a given item, the greater the cycle inventory.

At the beginning of the interval, the cycle inventory is at its maximum or Q. at the end of the interval, just before a new lot arrives, cycle inventory drops to its minimum, or 0. the average cycle inventory is the average of these two extremes:

Average cycle inventory =

This formula is exact only when the demand rate is constant and uniform. However, it does provide a reasonably good estimate even when demand rates are not constant. Factors other than the demand rate also may cause estimating errors when this simple formula is used.

3. 2. SAFETY STOCK INVENTORY

To avoid customer service problems and the hidden costs of unavailable components, company holds safety stocks. Safety stocks inventory protects against uncertainties in demand, lead-time, and supply. Safety stocks are desirable when suppliers fail to deliver the desired quantity on the specified date with acceptable quality or when manufactured items have significant amounts of scrap or rework. Safety stock inventory ensures that operations are not disrupted when such problem occur, allowing subsequent operations to continue.

Figure 1: Various types of Inventory

To create safety stock, a farm places an order for delivery earlier than when the item is typically needed. The replenishment order therefore arrives ahead of time, giving a cushion against uncertainty.

Inventory used to absorb uneven rates of demand or supply, which businesses often face, is referred to as anticipation inventory. Predictable, seasonal demand patterns lead themselves to the use of anticipation inventory. Anticipation inventory also can help when supply, rather than demand, is uneven. A company may stock up on a certain purchased item if its suppliers are threatened with a strike or have severe capacity limitations.

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3. 4. PIPELINE INVENTORY

Inventory moving from point to point in the materials flow systems called pipeline inventory. Materials move from suppliers to a plant, from one operation to the next in the plant, from the plant to a distribution center for customer, and from the distribution center to a retailer. Pipeline inventory consists of orders that have been placed but not yet received. Pipeline inventory between two points, for either transportation or production, ca be

measured as the average demand during lead time, , which is the average demand for the item period (d) times the number of periods in the items lead time (L) to move between the two points, or

Pipeline Inventory = = dL. [2]

4. BATB Inventory Management

There are some standard management theories as we described earlier in chapter two. The operational environment varies firms to firms, companies to companies. Based on the different varying conditions most companies do manage the inventory at their own. They do not follow exactly what the theory implies but analyzing the theories they go for the decisions that suit them most effectively and efficiently.

The goal should not be to minimize inventory or to maximize customer service but rather to have the right amount to support the competitive priorities of the company.

4. 1. BATB Inventory System

BATB inventory system can be compared with a two-bin system in which an item's inventory is stored at two different locations. Inventory is first withdrawn from one-bin. The two-bin system implies that if the first bin is empty, the second bin provides backup to cover demand until a reenlistment arrives [2]. BATB has the flexibility to locate their inventory at different points from supplier to warehouse at supplier premises which is very good advantage for a company. The demand manager and the MPS manager reviews the inventory positions on the daily basis and then go for receiving

the lot from the pipeline inventory. This indicates that they are maintaining the pipeline inventory. It helps them reduce the lot size to be stocked at warehouse.

BATB Inventory includes:

- Finished goods

- Bled sets

- Filter rods

- Wrapping materials

- Leaf

- Tax stamps

- Bandle rolls

The study is mainly focused on the leaf. Because this is the major concern in any cigarette manufacturing company as it holds the maximum cycle time.

We will work with the raw materials inventory. Mainly BATB has two types of materials. These are wrapping material and Tobacco. They receive raw materials from both local and foreign suppliers. Foreign suppliers are mainly from Brazil, Argentina, Canada, South Africa and Zimbabwe. For local suppliers average lead-time is 10 to 15 days and for the foreign suppliers lead-time is 90 to 120 days. Leaf is supplied by both the local and foreign supplier. But ignoring the local leaf as it takes less time, we will take the imported leaf in account to analyze.

Leaf Strategy

Leaf is an agricultural plant, which must be cultivated, and it needs certain period to get matured. Therefore the ordering policy of leaf is very time

consuming. They have to place the order very early of the time it is needed to arrive. Suppose they need 1000-ton leaf in the month of April 2008, they inform their supplier right now that is in the month of April 2007, so that they can cultivate the leaf and then deliver. In addition, it is to be mentioned that just after the arrival in the warehouse the leaf is not as ready as to be used for production. It goes under another certain period of time for maturation and then is under for production. But if we talk about the lead-time it will include only the days between order placements to arrival at warehouse.

5. SAFETY STOCK

Usually one does not know precisely the number of units that will be demanded each day during the lead-time. The duration of lead-time may have unexplained or unexpected variation. Demand can be thought of a probabilistic variable with some expected amount of demand during a period of time and unexplained variations about the expected value. If inventory could be replenished one a moment's notice there would be no reason to be concerned about demand uncertainty. Whenever inventory reached zero, stock would be held again. With some lead time between the placement of an order an its arrival, however there is a chance that demand will be greater than expected and loss will be incurred due to stockout. When stockout costs are high and demand is very unpredictable, the financial risk is sizable. Safety stock is a means of protection against this risk. Safety stock (SS) is established simply by raising the reorder level above the expected lead-time demand. For probabilistic demand during lead-time, the reorder level is given by the following equation where represents the mean demand per unit of time. [1]

RL= (Ã- LT) + SS

Safety stock is the average amount one hand when replenishment orders arrive. Sometime demand during the lead-time is less than expected extra stock is on hand. Sometimes demand is greater than expected and some of the safety stock is used.

6. Methodology

Step 1: Conducting a primary survey.

Step 2: Preparing primary questionnaire

Step 3: Modification of the questionnaire

Open-ended questions: This type of questions found out the view of the decisions makers out for gathering information regarding the subject topic.

Close-ended questions: These types of questions were designed to extract information which are related to the preparation of a realistic forecast:

Step 4: Performing the case study and conducting the interview

Step 5: Data processing and analysis

6. 1 Demand Forecasting Strategy

Demand manager receives the sales history of the previous 4/5 years. He observes the trend that every month undergoes. There are some seasonal impacts in the cigarette market. But overall the market is a stable one. Following the trend of previous 4/5 years and considering the marketing activities, the demand manager goes for a rolling forecast over the next 18

months. The term ' rolling' here implies that the forecast is updated every month for the next 18 months.

Stable Trend-up Trend-down

Figure 2: Trends of Demand

By this, the demand manager feels flexible enough to consider any new promotional activity or any assumption from the marketing department and any seasonal impact, which has not been included earlier. The main focus of forecasting is based on the trend. If the trend is decreasing the forecasted sales goes down and vice versa.

6. 2. Findings

Imported leaf stock:

Year end 2008 imported leaf stock was 317 million Taka

Average 2008 leaf stock was 334 million Taka (~ 4 months duration)

Currently, they are following an inventory policy of maintaining a 90 day safety stock which varies in quantity and value terms over the year with fluctuation in

demand.

7. ANALYSIS

The assumptions presented in the chapter two have been considered applicable to develop the EOQ for the imported leaf.

Considerations:

Grade: AN30/104S

Demand in Kg/Month:

Annual Demand = 152000 Kg

Holding Cost = 32 TK/ Kg

Ordering Cost = 700 TK (Assumed)

EOQ = $\sqrt{(2DS/H)}$

= $\sqrt{((2*152000*700)/32)}$

=. 75Kgs

Kgs

7. 1 HOW MUCH TO ORDER

The analysis shows that the company should order 2579 kg for the particular grade each time, a quality that should be result in 58. 93 cycles per year.

Actually, the equation derived doesn't result in actual lot size that must be ordered. This will help to manage lot size and inventory control. The current moves towards the inventory cost and quantities, stress the importance in reducing lot size. That means to reducing lot sizes is to reduce setup time and cost. When smaller lots are run, holding cost is reduced. The point is to understand the logic and where to apply it. The effect on order size resulting from reducing setup cost is shows in the following figure. When the setup

cost is reduced, the total cost curve shifts from TC1 to TC2. Correspondingly, the EOQ is reduced from EOQ1 to EOQ2 and the maximum total cost is reduced from TC1min to TC2min.[3]

Figure 6: Effect of reduced set up cost on order size and total cost

7. 2. Reorder level

The order quantity and reorder level are interrelated. A large order quantity causes fewer replenishment cycles with fewer exposures to stockout, so the reorder level can be reduced, and vice versa. Theoretically, we would have to find simultaneous solutions to equations for Q and RL to find their normal values. The value of D, S and H are only estimates, and the value of the EOQ will be approximate whether or not an adjustment is made for the expected stockout cost. Consequently, as often as done, we disregard the interrelationship between Q and RL. We solve for the EOQ, ignoring its effect on stockout cost, and then we find the best reorder level for this value of Q.

Assumptions:

Highest Service Level Factor corresponding to 99. 99% satisfaction level used though recommended maximum level is usually 98%; this results in a more than 50% higher safety stock

ii) Safety Stock calculated using standard deviation of actual demand rather than variance between forecast and actual giving higher levels of safety buffer.

iii) Lead time taken to be 4 months for all grades whereas actual lead time is considerably less providing greater safety stock to cover variation in demand during lead time.

Calculation:

RL = L + z

Where, RL = Reorder Point in Units, = Average Demand Per Time Period, L = Lead Time, Z = No. of Standard Deviation for a Specified Service Level,= Standard Deviation of Usages during Lead Time

Annual Demand = 152000 kgs

Average Demand/Per Month = 12666. 66

L= 4 Months

Z = 99. 99%

=

Ïƒd = âˆš (âˆ‘ (di-dâˆ') 2/12), in a range from i-1 to 12

= âˆš (31066666. 66/12)

= 1609. 00

Therefore, =

= 1609*

= 3218

From the above calculation RL can be determined as follows:

RL = 12666. 66 * 4 + 4*3218

= 50666. 64 + 12872

= 63538. 64

This says that when the stock on hand gets down to 60610. 26 kgs order should be placed.

7. 3. Level of Safety Stock

Safety stock=

= 4*3218

= 12872

It results to a safety stock of 31 days, as the daily demand is 416. 43 kgs. But theoretically it is applicable for the particular grade. Though the other grades do not involve so much variation in their demand, considering some logistic capabilities for the overall improved leaf the proposed safety stock is 50 days. This will allow for flexibility during roll out of new safety stock polling while guarding against unanticipated changes in sales and supply scenarios.

The reason for proposing this amount of safety stock is to protect much against the uncertainty of demand. Because there may be a situation that for a sudden change in demands the system may not be flexible enough to meet the change from the calculated safety stock. This is due to demand

forecasting that takes place over a long period and the order is placed for a particular month very early of the situation it experiences the change in its demand. So immediately it is not possible for the system to respond the sudden change in demand. For this, proper level of safety stock should be placed in a company for its smooth operation. Another fact is that the lead time from order placement to arrival at warehouse involves some events over which the proper control is not possible. The following section represents the impact of reduction of safety stock and then the analysis of lead time is shown. It is to be mentioned that the more the lead times the more the level of safety stock. Therefore the lead time calculation is an important factor for the placement of safety stock.

7. 4. BENEFITS CALCULATION

GRADE: AN30/104S

Annual consumption = 152000kgs

90 days safety stock = 38000kgs

50 days safety stock = 21111. 11

Therefore,

WC Reduction = (38000-21111. 11)*165

= 2. 78 million Taka

7. 5. OFFSHORE STOCK COST CALCULATION

Reduction in safety stock = 16888. 89 kgs

This amount of excess stock will be held at supplier premises for a maximum additional period of 12 months.

Holding cost at BATB @ 12%

= 16888. 89Ã-135. 11Ã-12%

= 273823 Taka

Holding cost at supplier @ 7. 2% + Excess Duty

= 16888. 89 Ã- 135. 11 Ã- 7. 2% Ã- 1. 22

= 200439 Taka

Therefore, Savings = 73384 Taka

8. IMPACT OF REDUCED LEVEL OF SAFETY STOCK ON WC

Proposed Safety Stock based on lead-time, variability in demand during 2006 and desired service level indicates a substantially lower requirement of safety stock even with very conservative assumptions

Using 2007 volumes this would translate to reducing imported leaf stock from an average of 322. 60 Million TK. to about 179. 18 Million TK.

Jan 08

Feb08

Mar 08

Apr 08

May 08

Jun 08

Aug08

9. LEAD TIME ANALYSIS

It has been already mentioned that the more the lead time the more the

safety stock. Lead time involves the total time from the order placement to

arrival at warehouse

Figure 7: Supply Lead Time

We can develop a pie chart highlighting the time taken on a percentage

basis by different events that take place from order placement to arrival at

warehouse.

Symbols

Events

Average

%

A

TIME TAKEN BW ORD PLACE &PRO INVOICE REC

14. 75

7

B

TIME TAKEN BW LC REQUI&EST

10. 93

5

C

NO. OF DAYS SPENT B/W LC &SHIPMENT DATE

38. 90

19

D

ARRIVAL IN CTG (ACTUAL SHIPMENT – ETA CTG)

35. 10

17

E

DAYS REQD – CTG TO ICD

6. 05

3

F

DAYS REQD – ICD TO WAREHOUSE

8. 58

4

Table 1: Lead Time Analysis

The pie chart shows that a major part of the time from order placement to arrival at warehouse involves the events C and D over which the control cannot be held so easily. They involve some complex as well as time taking procedures. But in case of the rest of the events different action can be issued very effectively.

Figure 8: Events placed on Warehouse (Percentage basis)

In addition there are some recommendations for reducing the lead-time in the next chapter.

10. RECOMMENDATION

As the analysis shows that the company can reduce the level of safety stock, the first phase of recommendation represents how it can be carried out and the later phase defines the steps, which should be proper monitored and controlled with a view to, maintain an optimized inventory management system. This will enable to obtain an effective safety stock level.

Allowing Inventory Policy Exceptions for certain grades to satisfy requirements for blend changes and brain launches.

Reviewing and improving the order tracking process as necessary.

Monitoring orders, delivery performance and safety stock policy adhere continually.

Gradually moving to safety stock of 2. 5 months and then to 50 days, with 6 months duration difference.

Holding the excess stock at the supplier premises.

Locating the inventory at different points in the pipeline rather to hold much in the warehouses.

The following steps should be performed in order to implement the recommend actions:

Developing operational excellence in demand forecasting so that there will be fewer surprises.

Cutting the lead-time to reduce the demand uncertainty during lead time.

Reducing the supplier uncertainty. Supplier reliability can be increased by sharing the production plans with them, permitting them to make more realistic forecast.

Improving the logistics capability by planning the infrastructure to meet demand, then implementing and controlling the physical flows of material and final goods from points of origin to points of use.

11. CONCLUSION

It has been revealed that the traditional inventory management system needs some modification depending on the situation or the operating environment, while inventory is management by a company. The different inventory models provide a different set of capabilities and opportunities to exploit different competitive priorities. Some members of different industries and consulting firms have already started to criticize classical inventory models seem fashionable. But prior to the operating conditions different classical inventory models can be considered as the decision making tools that will enable a company to take its step under conflicting pressure. All the system needs is proper integration of operation and business. This will smooth the flow of information and thereby implementation of such models would be openhanded.