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# Inventory Management System in a Small Business Enterprise

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***Abstract*—Many small firms have an excessive amount of cash tied up to accumulation of inventory sitting for a long period because of the slack inventory management or inability to control the inventory efficiently. The author has worked three years in a small business unit and has investigated and identified the reasons behind the inefficient inventory management in small firm. At the same time tried to propose feasible managerial suggestions to improve the company's inventory management through his own analysis, after examining the relevant theories and understanding the business operational practice of company.**

**Keywords** — *Inventory Management, Small business Enterprises (SME)*

## I. INTRODUCTION

Logistics and inventory management are embedded in each other and tied up closely. The "Bill of 'Rights'" that logistics professionals often repeat is to deliver the *right* product to the *right* place, at the *right* time, in the *right* quantity and condition, and at the *right* cost (Goldsby et al., 2005). To make it happen, effective inventory management is a cornerstone.

Using various SCM techniques many large companies have saved millions of dollars in costs and decreased inventories while improving efficiency and customer satisfaction. But the many small businesses generate a special condition which referred to as resource poverty that distinguishes them from the big businesses and requires some very different management approaches. This statement deviates from the traditional assumption that small businesses should use similar management principles as big businesses, only on a smaller scale (Welsh et al., 1981). Since the company where we are performing this project is a small business unit. Many SCM techniques and systems are too complex and expensive to implement for small business. Then one question comes up. Can SCM work for small businesses, with attention focused on inventory management?

## II. PROBLEM STATEMENT

The challenge in managing inventory is to balance the supply of inventory with demand. A company would Ideally want to have enough inventories to satisfy the demands of its customers no lost sales due to inventory stock outs. On the other hand, the company does not want to have too much inventory staying on hand because of the cost of carrying inventory. Enough but not too much is the objective.

The studied company, Unimax Pollution Control (I) Pvt Ltd. Wada, Maharashtra, India (named briefly as UPCIPL in text below) works in supplying centrifugal fans to its customers. The company has difficulty in matching its supply with the customer demand efficiently, which means both stock out of inventory and excess inventory occur in the business. Apart from that the company is facing related problems like less space and handling of inventory. The management problem has affected negatively their profitability mainly due to the existence of excess stock. It is considered that the problem results from insufficient control over inventory and volatile demand for each product on a monthly base. To get a reliable forecast of the demand is not easy task in the wholesaling industry because of being unable to estimate the right quantity of demand during a specific period for each product. Another reason is that the lead time of most products is long, about three months at the longest.

## III. PURPOSE OF THE PROJECT

The purpose of this thesis project is to investigate and identify the reasons behind the inefficient inventory management in UPCIPL. At the same time try to propose feasible managerial suggestions to improve the company's inventory management through our own analysis, after examining the relevant theories and understanding the business operational practice of UPCIPL.

## IV. PROJECT APPROACH

First of all I have investigated the current situation of inventory management in UPCIPL by using multiple sources of evidence, for instance, the interviews with the top manager and other related staff at UPCIPL, and annual sales records for ten sample items. Different level groups, and then the different inventory groups can be treated differently. We believe this classification can save much time, effort and cost on the daily inventory operation

and it is a cost efficient solution for the company, with improved management under limited resources.

Since the all ten items chosen were having different importance in terms of quantity and cost, I prefer to do ABC analysis and then EOQ model to tackle the inventory problem in UPCIPL.

## V. ANALYSIS

"We have an ambition to reduce the average inventory value finally to 60 million." Top manager of UPCIPL

And as I mentioned in empirical data, the annual sales turnover is 170 million. We calculated the target inventory turns through the following formula:

Target inventory turns = Sales volume at cost/Value of average inventory

= 170,000,000 / 60,000,000

=2.8334

The current average inventory value is about 80 million, applied to the inventory turns formula in current inventory turns=160,000,000/80,000,000=2.125

### A. ABC ANALYSIS

For ABC analysis to perform we have to go through the following stepwise procedure

- Determine annual quantity usage of each item.
- Multiply the annual quantity usage of each item by the cost of the item to obtain the total annual dollar usage of each item.
- Add the total dollar usage of all items to get the aggregate annual dollar inventory expenditure.
- Divide the total annual dollar usage of each item by the aggregate annual inventory expenditure to obtain the percentage of total usage for each item.
- List the items in rank order by percentage of aggregate usage.
- Review annual usage distribution and classify items as A, B, or C.

We have the annual sales report of UPCIPL' for ten items in year 2014. Following the procedures of ABC analysis, Table I presents each item's annual quantity usage and annual dollar usage.

TABLE I. Finding Annual Quantity & Usage

| Sr. No | Item No | Annual Demand | Unit Cost | Demand X cost (in thousands) |
|---|---|---|---|---|
| | | | | |
| 1 | 101 | 1376 | 18000 | 24768 |
| 2 | 102 | 829 | 2000 | 1658 |
| 3 | 103 | 773 | 20000 | 15460 |
| 4 | 104 | 1164 | 1230 | 1431 |
| 5 | 105 | 1698 | 7074 | 12011 |
| 6 | 106 | 658 | 256 | 168 |
| 7 | 107 | 2817 | 300 | 845 |
| 8 | 108 | 4508 | 50 | 225 |
| 9 | 109 | 1303 | 1640 | 2136 |
| 10 | 110 | 272 | 1200 | 326 |
| | | | | Total-59028 |

In accordance with the real situation of the sampled ten items in UPCIPL, we established 204040 as the appropriate percentage of the items for the classification as shown in table I. Now let's label the items in A, B, C categories with 204040 as appropriate percentage of item.

TABLE II. Classification of the Items in A, B & C Category

| Item No | Cumulative % of item | Demand X cost (in thousand) | % of total cost | Classification |
|---|---|---|---|---|
| 101 | 10% | 24768 | 41.95% | **A** |
| 103 | 20% | 15460 | 26.20% | **A** |
| 105 | 30% | 12011 | 20.35% | **B** |
| 109 | 40% | 2136 | 3.61% | **B** |
| 102 | 50% | 1658 | 2.80% | **B** |
| 104 | 60% | 1431 | 2.43% | **B** |
| 107 | 70% | 845 | 1.43% | **C** |
| 110 | 80% | 326 | 0.56% | **C** |
| 108 | 90% | 225 | 0.39% | **C** |
| 106 | 100% | 168 | 0.28% | **C** |
| | | Total-59028 | 100% | |

The actual percentage of the items obtained is as follows.

TABLE III. Result Obtained in ABC Analysis.

| Classification | Percentage of items | Percentage of value | |
|---|---|---|---|
| Class A items | 13.95% | 68.15% | Close day to day control |
| Class B items | 32.43% | 29.20% | Regular review |
| Class C items | 53.61% | 2.65% | Infrequent review |

In the table II, we observe that item number 105 has 20.35 percentage of the value in the overall production process and that amount is having much more importance as far as ABC analysis is concerned and looking at the current situation of UPCIPL. Should we keep the item number 105 in class B items category or divert it to A item category? This question has a traffic variation in the readings which we have obtained now. If we add the 105 item in the A item category it may produce a drastic result to control the inventory management analysis. We get the table as follows.

TABLE IV. Results Obtained After Shifting Item Number 105 into Class A Items Category.

| Classification | Percentage of items | Percentage of value | |
|---|---|---|---|
| Class A Items | 24.99% | 88.49% | Close day to day control |
| Class B Items | 21.4% | 8.85% | Regular review |
| Class C Items | 53.61% | 2.65% | Infrequent review |

Now let's compare both cases. In the first case before shifting item number 105 into class A item if we control only class A item then we will be working on 68% of the

percentage of the total value by working on almost 14% of the total percentage of the items. Whereas if we choose second case then we find that if we control the inventory level of class A items, we will be controlling the 88% of the percentage of the total value by working on almost 25% of the total percentage of the item.

ABC analysis is a kind of technique, which provides the means for identifying those items that make the largest impact on a company's overall inventory cost performance. Since our focus in the further part of the project would be class A items. Let's suppose we would be able to reduce the inventory level of class A items to almost 60% we will be reducing the overall inventory percentage of value to approximately 50% of the initial. Because of this we are choosing second case in our future part of the project.

**B. EOQ MODEL**

At present UPCIPL has realized that there are Problems in inventory management, which is not formalized and standardized, and the problems are growing faster and bigger. As response, they are starting to build the ROP (Reorder Point) systems for approximately 100 items, aiming at achieving efficient inventory management. But when asked, "How did the company determine the most suitable ROP level for each item", the top manager's personal experience coupled with help from historical sales data is the reply.

Table IV shows us the ROP level of ten items. UPCIPL uses the term "safety stock quantity" in the Table V. But they explained that if the inventory level reaches at or below this quantity, new orders would be released. This means "safety stock quantity" is the substitute of ROP and they are actually the same.

TABLE V. ROP Level & Order Quantity
SOURCE: UPCIPL

| Item No | Purchase Cost | In stock | Safety Stock | Purchase quantity |
|---|---|---|---|---|
| 101 | 18000 | 55 | 145 | 50 |
| 103 | 20000 | 23 | 35 | 40 |
| 105 | 7074 | 47 | 60 | 52 |
| 109 | 1640 | 14 | 10 | 30 |
| 102 | 2000 | 32 | 25 | 25 |
| 104 | 1230 | 0 | 15 | 45 |
| 107 | 300 | 156 | 70 | 50 |
| 110 | 1200 | 3 | 10 | 15 |
| 108 | 50 | 71 | 26 | 100 |
| 106 | 256 | 12 | 20 | 30 |

From the data in Table V, we have found out some problems with UPCIPL's current ROP level. For some items, ROP is set much lower than the largest possible demand during the three month lead time. On the other hand, for some items ROP is set even higher than the largest possible demand during the same lead time. Below we will analyze the situation and propose a method.

TABLE VI. Data Obtained From UPCIPL.

| Item Type | Item No. | Holding cost | Ordering cost | Lead time |
|---|---|---|---|---|
| **A** | 101 | 933 | 3240 | 30 |
| **A** | 103 | 750 | 3600 | 15 |
| **A** | 105 | 173 | 1273 | 8 |
| **B** | 109 | 4 | 295 | 2 |
| **B** | 102 | 200 | 36 | 7 |
| **B** | 104 | 14 | 221 | 2 |
| **C** | 107 | 5 | 54 | 5 |
| **C** | 110 | 40 | 216 | 4 |
| **C** | 108 | 3.5 | 9 | 2 |
| **C** | 106 | 20 | 56 | 1 |

Inventory costs

1. Holding or carrying costs: storage, insurance, investment, pilferage, etc.

Annual holding cost = average inventory level x holding cost per unit per year
= order quantity/2 x holding cost per unit per year

2. Setup or ordering costs: cost involved in placing an order or setting up the equipment to make the product Annual ordering cost = no. of orders placed in a year x cost per order

= annual demand/order quantity x cost per order
Calculating the above terms for our case study

Given: let's find for item number **101**
Annual Demand = 1376
Ordering cost = 933 per order per item
Holding cost = 3240 per item per year
No. of working days per year = 305
Then, it can be computed:

$$Q^* = \sqrt{\frac{2 \times 1376 \times 933}{3240}}$$

$Q^* = 28.15 \cong 28$
Total cost = 3240+933=4173
Number of orders = 1376/28.15 = 48.88 $\cong$ 49
Time between orders = 305/48.88 = 6.23 days $\cong$ 6 days
Daily demand = 1376/305 = 4.51
$\cong$ 5
If lead time = 30 days (lead time > time between orders)
Reorder point = 4.51x30 = 135.34
Reorder when inventory on hand = 135.3-Q*=135.34-28.15=107.19 $\cong$ 107

Reorder when inventory on hand with safety Stock =

135.3-Q*+safety Stock =135.34-28.15+2.81=110

By performing the similar calculation we obtained the optimal order quantity, total cost, number of orders, time between the orders, daily demand, reorder point as in tabulated in table VII

TABLE VII Results Obtained from EOQ Model.

| Item No | Optimal Order Quantity | No of Orders | Time Between Order (days) | Daily Demand | Reorder Point | Reorder Point with safety stock |
|---|---|---|---|---|---|---|
| 101 | 28 | 49 | 6 | 5 | 107 | 110 |
| 103 | 18 | 43 | 7 | 3 | 20 | 24 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 105 | 21 | 79 | 4 | 6 | 23 | 27 |
| 109 | 6 | 219 | 1 | 6 | 2 | 3 |
| 102 | 96 | 9 | 35 | 3 | 19 | 29 |
| 104 | 12 | 96 | 3 | 4 | 8 | 9 |
| 107 | 23 | 123 | 2 | 9 | 23 | 26 |
| 110 | 10 | 27 | 11 | 1 | 4 | 5 |
| 108 | 60 | 76 | 4 | 15 | 30 | 35 |
| 106 | 22 | 30 | 10 | 2 | 22 | 24 |

By performing the EOQ model we got the clear idea of the reorder point, optimal order quantity, and time between the orders.

Now to find out the inventory level after formulating the Model we have to multiply reorder point with unit cost and multiply the reorder quantity with holding cost and then adding the two values we get the inventory level as follows

TABLE VIII. Total Cost of Inventory

| Item No | Unit Cost | Reorder Point | Inventory cost | Total Holding Cost | Total cost of inventory |
|---|---|---|---|---|---|
| 101 | 18000 | 110 | 1980,000 | 356,400 | 2336,400 |
| 103 | 20000 | 24 | 480,000 | 86,400 | 566,400 |
| 105 | 7074 | 27 | 190,998 | 34,371 | 225,369 |
| 109 | 1640 | 3 | 4920 | 885 | 5805 |
| 102 | 2000 | 29 | 58,000 | 1044 | 59044 |
| 104 | 1230 | 9 | 11,070 | 1989 | 13,059 |
| 107 | 300 | 26 | 7800 | 1404 | 9204 |
| 110 | 1200 | 5 | 6000 | 1080 | 7080 |
| 108 | 50 | 35 | 1750 | 315 | 2065 |
| 106 | 256 | 24 | 6144 | 1344 | 7488 |
| | | | Total= | Total= | Total= |
| | | | 2,746,682 | 485,232 | 3,231,914 |

After using the EOQ analysis we have found that still almost 32 lacks inventory we have to keep in our factory to run the business smoothly.

We observe in the table that total cost of inventory of class A items is almost 31 lacks (23,36,400 + 5,66,400 + 225,369 ).The cost of inventory of class A items is having more importance in the total cost of inventory of the total inventory. After using the ABC analysis followed by the EOQ technique we have average inventory value almost 32 lacks that means yearly 32 X 12 =384 lacks.

Value of average inventory for an year would be =3200000 X 12=38,400,000

Now let's go through the inventory turns formulae as we have mentioned earlier

Inventory turns = Sales volume at cost/Value of average inventory

$$\text{Inventory Turns} = \frac{170,000,000}{38,400,000} = 4.42$$

From top manager's statement, we are ambitious to achieve inventory turns to 3.0 but by doing the ABC analysis and EOQ model we have achieved more than target inventory turns.

From top managers statement we have to achieve our target inventory of 60 million where as we have lowered to 38.4 million.

## VI. CONCLUSION

Following ABC classification, different review periods could be set in accordance with each category's specific characteristic. A items have the first priority to be reviewed as they account for 25% of total number of items, but with more than 80% of total dollar value.

It is concluded that EOQ model is best suited technique which can be used in any small production firm to control the inventory management. This technique gives us the data limit to formulate the overall production process to a systematic production. It provides us very important answers like when to order? , how much to order? , how many times to order? Etc.

## VII. SCOPE OF FUTURE WORK

In this project ABC analysis has played a major rule for inventory reduction and for periodic review of each item. Class A items have more value if we observe the total percentage of value. If in case we would be able to reduce the inventory level of class A items to almost 60% we will be reducing the overall inventory percentage of value to approximately 50% of the initial. Lead time for item no 101, 103 and 105 are 30days, 15 days and 8 days. If in the future we can reduce this lead time to 50 % less than the present lead time the reorder point will also reduce to almost 50 % lesser than the present. Thus we will able to reduce the inventory level to greater extent than what we have done now.

In the theoretical part of the ABC analysis we have observed a term "day to day control". If we take as much quantity of the class A items from the supplier as much we required for next day we can reduce the inventory level to a much greater extent.

My suggestion had gone to the UPCIPL top manager but they are not convinced to work in this way because of the certain reasons and their production system is now working better than before with EOQ analysis. So I am not getting any contribution to implement this technique in the UPCIPL.

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