

Analysis of Inventory Management Performance – A Case Study

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Abstract— The success of a product in today's global market place depends on capabilities of firms in the product's supply chain. Among these capabilities, effective inventory management is a capability necessary to lead in the global market place. The purpose of inventory management is to ensure availability of materials insufficient quantity as and when required and also to minimize investment in inventories. This paper will therefore help to understand the nature of inventory management of the supply store by applying suitable inventory management technique to the sample of the products of an enterprise which were more frequent in demand)

Keywords— Supply chain; inventory; demand; inventory technique; global market

INTRODUCTION

As, proportion of inventories to total asset generally varies between 20 to 30 percent ,its importance cannot be overemphasized. A proper balance must be maintained with the minimum financial impact on the customer. Inventory management is the integrated functioning of an organisation dealing with supply of materials and allied activities in order to achieve the maximum co-ordination and optimum expenditure on materials. It comprises of a series of processes, which provide an assessment of the organisation's inventory. Inventory management plays an important role in every company as any ineffective inventory system will result in loss of customers and sales. An effective inventory management is able to generate more sales for the company which directly affects the performance of the company. Therefore it requires a systematic inventory management which is managed by a group of employees who are experts in this area. To an inventory management to be more effective it must :

- Minimize the carrying cost and time.
- Control investment in inventories and keep it at an optimum level.
- Maintain sufficient stocks of raw materials in periods of short supply
- Permit a better utilization of available stock

The present study intends to examine a supply store of electrical products by evaluating its more demanded products. For this, a sample of the products chosen was categorized on the basis of XYZ Analysis . Further the XYZ classified products were categorized through FSN analysis also based on their consumption or more frequent demand.

I. ANALYTICAL APPROACH

A. Goals to achieve

- To classify sample of products on the basis of XYZ analysis.
- To apply XYZ - FSN inventory management technique to more frequently demanded products.

B. Research Findings

Inventory is defined as a stock of goods that is maintained by a business in anticipation of some future demand[1].The quantity to which inventory must fall in order to signal that an order must be placed to replenish an item[2].To work towards perfect order metrics , there has to be aggressive inventory management, restructuring supply chain operations to the perfect standard[3].Inventory refers to the stock pile of the product a firm is offering sale and the components but make up the product. The assets which the firm store as inventory in anticipation of need are raw materials ,work in progress, finished goods [4].

Safety stock is a term used by logisticians to describe a level of extra stock that is maintained to mitigate risk of stock outs due to uncertainties in supply and demand[5].Inventory management is the continuous process of planning, organizing and controlling inventory that aims at minimizing the investment in inventory while balancing supply and demand.[6]

II. RESEARCH METHODOLOGY

A. Research Design

Quantitative approach was deployed to address the research objectives. The qualitative research was conducted to understand the problem in inventory management by conducting a structured interview with Company X and for the quantitative research design needed to quantify the data and researchers calculate ratio analysis which is the information obtained from annual report.

B. Sources of Data Collection

For the purpose of this study, the researchers used both primary and secondary data to complete this study as required for both qualitative and quantitative methods has been used which data was obtained from structured interview as primary sources and secondary sources such as annual report, journal, article and textbook.

C. Data Collection Methods

In this study, the researchers obtain the data from interviewing the respondent on the issues of interest and documented information from annual report had been used to calculate safety stock and total investment.

D. Significant of the Study

Theoretically, this study will add to the inventory management literature. Practically, it will also provide useful information to the supply store as well as the practitioner to practice the same recommendation in order to improve their inventory management.

III DATA ANALYSIS

A. XYZ analysis

A total of 20 electrical items were selected for the analyses which were more frequently demanded. Firstly, on the basis of current (total) stock value of item, XYZ analysis is done as shown in Table 6.6. XYZ analysis is one of the basic supply chain techniques, often used to determine the inventory valuation inside Stores.

It's also strategic as it intends to enable the Inventory manager in exercising maximum control over the highest stocked item, in terms of stock value. A system of categorization, with similarities to Pareto analysis, the method usually categorizes inventory into three bands with each band having a different management control associated.

Although different criteria may be applied to each category. The typical method of "scoring" an inventory item is that of annual stock value of said item (qty in stock X cost of item) with the result then ranked and then scored (X, Y or Z).

Bandings may be specific to the industry but typically follow a 70%, 90%, 100% banding in that X class items represent 70% of the stock value (although they may account for 20% number wise), Y class items fall between 70% and 90% of the annual stock value with C class the remaining. In practical terms the complex high cost materials typically fall into the X class items, with the consumable, low cost (and typically fast moving) classed as X class.

Not all stock is equally valuable and therefore doesn't require the same management focus. The results of the XYZ analysis

provide information that helps evaluate how each inventory part should be monitored and controlled. These controls are typically:

X class items which are critically important and require close monitoring and tight control – while this may account for large value these will typically comprise a small percentage of the overall inventory count.

Y classes are of lower criticality requiring standard controls and periodic reviews of usage.

Z class require the least controls, are sometimes issues as "free stock" or forward holding.

Classification of inventory in terms of XYZ is also quite strategic as It can form the basis of various activity including leading plans on alternative stocking arrangements (consignment stock), reorder calculations and can help determine at what intervals inventory checks are carried out (for example X class items may be required to be checked more frequently than Z class stores).

B. Calculation of Safety stock

Based on the Maximum daily consumption, average daily consumption and lead time , safety stock is calculated. By the use of following formula safety stock for all the items has been calculated:

$$\text{Safety stock} = (\text{Maximum daily usage} - \text{Average daily usage}) * \text{Lead Time}$$

Where;

- Average Daily Usage = Annual Demand of individual item / 365
- Reorder Level = Safety stock + Average Daily usage * Lead time

After calculation of safety stock for each item, total cost for individual item has been calculated and has been ranked according to the total investment in decreasing order as shown in table 2.

Table 1 Calculation of safety stock for each item

S.No	Item	Max. daily consumption	Avg. Consumption	Lead time	Safety Stock
1	Panel meters	150	136.9863014	3	39.041095
2	Rotary Switches	100	54.79452055	5	226.02739
3	Load Break Switches	20	8.219178082	4	47.123287
4	Time Switches	50	19.17808219	3	92.465753
5	Contactors	50	27.39726027	4	90.410958
6	Onload Changeover Switch	100	68.49315068	5	157.53424
7	Air Circuit Breakers	120	95.89041096	4	96.438356
8	Digital Protective Relays	40	27.39726027	4	50.41095
9	Power Cables	100	82.19178082	4	71.232876
10	Metering Devices	70	56.71232877	3	39.863013

S.No	Item	Max. daily consumption	Avg. Consumption	Lead time	Safety Stock
11	AC Drives	100	83.43013699	3	49.709589
12	Miniature Circuit Breakers	80	57.53424658	3	67.397260
13	Modular Indicator	120	115.0684932	3	14.794520
14	Supply Monitors	50	19.7260274	3	90.821917
15	Push Buttons	20	9.863013699	5	50.684931
16	LED Indicators	15	4.931506849	5	50.342465
17	Timers	150	131.5068493	5	92.465753
18	Cable Ducts	10	4.931506849	5	25.342465
19	Thermal Overload Relays	30	24.65753425	3	16.027397
20	Motor Starters	50	10.95890411	3	117.12328

Table 2 Items Ranked according to total investment

S.No	Item	Unit Cost	Safety Stock	Total Cost	Rank
1	Panel meters	9070	39.04109589	354102.7397	10
2	Rotary Switches	3743	226.0273973	846020.5479	5
3	Load Break Switches	20000	47.12328767	942465.7534	4
4	Time Switches	24600	92.46575342	2274657.534	3
5	Contactors	7560	90.4109589	683506.8493	8
6	On load Changeover Switch	31050	157.5342466	4891438.356	2
7	Air Circuit Breakers	52215	96.43835616	5035528.767	1
8	Digital Protective Relays	5060	50.4109589	255079.4521	11
9	Power Cables	8419	71.23287671	599709.589	9
10	Metering Devices	18000	39.8630137	717534.2466	6
11	AC Drives	2570	49.70958904	127753.6438	14
12	Miniature Circuit Breakers	10500	67.39726027	707671.2329	7
13	Modular Indicator	3305	14.79452055	48895.89041	15
14	Supply Monitors	1750	90.82191781	158938.3562	13
15	Push Buttons	582	50.68493151	29498.63014	17
16	LED Indicators	870	50.34246575	43797.94521	16
17	Timers	2175	92.46575342	201113.0137	12
18	Cable Ducts	295	25.34246575	7476.027397	19
19	Thermal Overload Relays	295	16.02739726	4728.082192	20
20	Motor Starters	177	117.1232877	20730.82192	18

After ranking the products based on the total investment a selective inventory management technique i.e. XYZ Analysis has been applied to each of the individual product .This

analysis is based on the valuation of product as shown in the table 3 below.

Table 3: Items ranked according to investment -XYZ Analysis

S.No	Items	Total Investment	% Value	Cum %	Category
7	Air Circuit Breakers	5035528.767	0.28052	28%	X
6	On load Changeover Switch	4891438.356	0.27249	55%	X
4	Time Switches	2274657.534	0.12672	68%	X
3	Load Break Switches	942465.7534	0.0525	73%	Y
2	Rotary Switches	846020.5479	0.04713	78%	Y
10	Metering Devices	717534.2466	0.03997	82%	Y
12	Miniature Circuit Breakers	707671.2329	0.03942	86%	Y
5	Contactors	683506.8493	0.03808	90%	Z
9	Power Cables	599709.589	0.03341	93%	Z
1	Panel meters	354102.7397	0.01973	95%	Z
8	Digital Protective Relays	255079.4521	0.01421	96%	Z
17	Timers	201113.0137	0.0112	98%	Z
14	Supply Monitors	158938.3562	0.00885	98%	Z
11	Ac Drives	127753.6438	0.00712	99%	Z
13	Modular Indicator	48895.89041	0.00272	99%	Z
16	LED Indicators	43797.94521	0.00244	100%	Z
15	Push Buttons	29498.63014	0.00164	100%	Z
20	Motor Starters	20730.82192	0.00115	100%	Z
18	Cable Ducts	7476.027397	0.00042	100%	Z
19	Thermal Overload Relays	4728.082192	0.00026	100%	Z

In the above table shows the classification of various items as XYZ items using XYZ analysis based on valuation. From the classification X items are Air Circuit Breakers ,On load Changeover Switch and Time Switches items .These items are critically important and require close monitoring and tight control – while this may account for large value these will typically comprise a small percentage of the overall inventory count . Load Break Switches, Rotary Switches, Metering Devices and Miniature Circuit Breakers are the Y category items which are

of lower criticality requiring standard controls and periodic reviews of usage. Contactors, Power Cables, Panel meters, Digital Protective Relays, Timers, Supply Monitors, AC Drives, Modular Indicator, LED Indicators, Push Buttons ,Motor Starters, Cable Ducts, Thermal Overload Relays are the Z category items which require the least control. Pie chart above shows the percentage contribution of all the items classified as X,Y and Z items. The X category items hold the priority from management perspective and should be strictly monitored

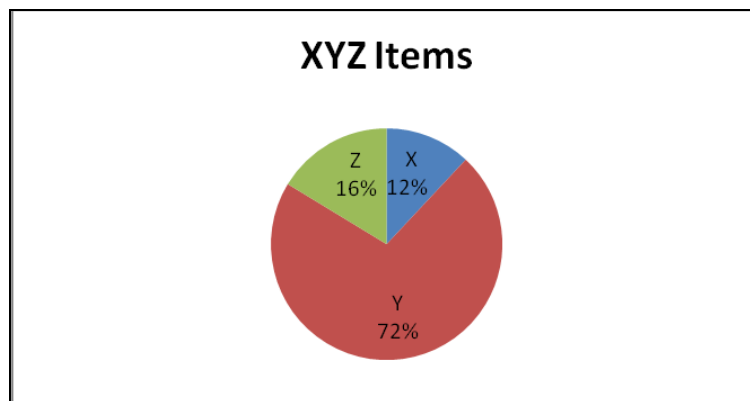


Fig.1 Pie -chart showing XYZ category items

IV JOINT CLASSIFICATION: XYZ-FSN

All the items in the inventory are not required at the same frequency. Some are required regularly, some occasionally, and some very rarely. FSN classifies items into fast moving, slow moving and non moving category. After applying XYZ analysis, the items are further classified on the basis of FSN analysis. For this analysis, suitable data and observations from the supplier were collected. Based on the information

provided, further classification of items into fast moving, slow moving and non -moving category is done. The XYZ categorized items will be categorized into FSN according to the table as shown below:

The XYZ classified items were further classified on the basis of demand as fast moving, slow moving and non moving as shown:

Table 4: XYZ-FSN Analysis

	F	S	N
X	Tight inventory control	Reduce stocks to very low level	Quick disposal of items at optimum price
Y	Normal inventory control	Reduce stocks to low level	Should be disposed as early as possible
Z	Can reduce clerical labour by increasing stocks	Reduce stocks to low level	Can afford to dispose at lower price

Table 5 Items - ranked acc. to demand (FSN analysis)

S.No	Category	F	S	N
1	X	Air Circuit Breakers		
2		On load Changeover Switch		
3			Time Switches	
4	Y		Load Break Switches	
5		Rotary Switches		
6				Metering Devices
7			Miniature Circuit Breakers	
9		Power Cables		
10			Panel meters	
11				Digital Protective Relays

S. No	Category	F	S	N
12	z	Timers		
13				Supply Monitors
14		Ac Drives		
15			Modular Indicator	
16		LED Indicators		
17				Push Buttons
18				Motor Starters
19		Cable Ducts		
20				Thermal Overload Relays

The above table shows clearly the XYZ - FSN classification of items. According to this management needs to focus on X category items among which Air Circuit Breakers and On load Changeover Switch are fast moving items. Both the items needs tight inventory control and regular monitoring. Time switches falls under slow moving category which although is very important item from management perspective as it is X - class item but has slow inventory movement. It is also good for management to analyse that none of the item in X class is non-moving.

Among Y class items only rotary switches are the fast moving items which needs normal inventory control for smooth inventory flow. Load Break Switches and Miniature Circuit Breakers are slow moving items in Y class. Metering devices in Y class items are the only non -moving items. In Z class items, Contactors, Power Cables, Timers, AC Drives, LED Indicators, Cable Ducts are fast moving items which can reduce clerical labour by increasing their stock level. Panel meters, Modular indicator and Thermal overload relays are slow moving items in Z category whose stock can be reduced to low level. Relays ,Supply monitors, Push buttons ,motor starters ,digital protecting relays are the non moving items which management can afford to dispose off at lower price so as to sort the distressed inventory problem which is also the major problem faced by the supplier.

V RESULTS AND DISCUSSIONS

Inventory problems of too great or too small quantities on hand can cause business failures. If an organization experiences stock-out of a critical inventory item, production halts could result. Inventory management indicates the broad frame work of managing inventory. The inventory management technique is more useful in determine the optimum level of inventory and finding answers to problem of safety stock and lead time. Inventory management has become highly developed to meet the rising challenges in most Corporate entities and this is in response to the fact that inventory is an asset of distinct feature.

It was found that inventory holds lots of imbalance in maintaining its level. Some products were frequently demanded, some were occasionally demanded and some were not moving at all from and to the inventory. From the classification of items it was found that X category items hold the priority from management perspective and should be strictly monitored as they are the only products on which high investment is incurred. The total number of such highly invested products contributes about 15 % of the total components. Y class items holds 20 % contribution to the total components in terms of investment , and as they are of lower criticality, they requires lower standard controls and periodic reviews of usage. Z class items contributes to about 65 % of the total components which require the least controls, sometimes can be neglected .

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