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Application of Selective Control Techniques in Maintenance Shop

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Abstract:
The study shows the need of inventory control and inventory reduction in the maintenance shop. It will show the importance and need of Zero inventory in the maintenance shop. In this work selective inventory control techniques apply for spare parts inventory modeling in maintenance shop. It was suggested that the conventional inventory model formulated as per their convenience is not very effective. The analysis is constructed for inventory modeling to achieve high efficiency. For Inventory reduction, selective inventory control techniques analysis carried out on the spare parts. The results show that there are a number of items present as scrap and a lot of items are just being accumulated and are not in use. It is suggested that extra unused items in order to reduce the inventory holding costs and empty the space which have been unnecessarily being occupied. ABC & XYZ analysis were carried out for the spare parts and it was found that it can be applied in Maintenance shop. The reasons for the same were stated. The research helps the maintenance shop to understand their current inventory model and the failures of the model. The study helps them to examine their inventory more effectively and hence later it help them to reduce the inventory which added increased productivity, business growth and reduce the losses.
KEYWORDS: *Selective Control Techniques, Inventory Control, Zero Inventory, ABC Analysis, XYZ Analysis.*

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I. Introduction :

The purpose of the project is to create a definite structure of spare parts inventory modeling and quantity for the spare parts in the maintenance shop. An ideal model for the spare parts will be determined by using the selective inventory control techniques along with it, the quantity of the spare parts that must be available at a time are also determined. The purpose isalso to reduce the inventory of the spare parts both non-moving and moving. This will directly lead to reduction of inventory cost and shelf space in the organization. In the process,the actual and promised lead time of the vendors will compare, which is used for checkingthe feasibility of the current system.

Without proper control, inventory has a tendency to grow beyond economic limits, tie up funds and increase the cost of maintenance or the carrying cost. At the same time, the non- availability involves the cost of stock-outs, re-ordering costs and additional transit costs. Inventory control as an integrated approach is thus essential for determining the time, items and quantity to indent, and amount of stock, so that purchasing and storing costs become minimum without affecting production, distribution, functional effectiveness, etc [1].

An equally critical analysis of all items required in maintenance shop be very expensive inthe sense that there may not be any saving by control process on low value because the cost of time used by the personnel of the shop in the process wall be more than that of the cost saving by inventory control. Materials management involves hundreds or thousands of individual transaction each year [2][3]. To do their job effectively , material manager must avoid the distraction of unimportant details and concentrate on significant matters. When deciding on which specific stock control system to use, items must generally be grouped together rather than considered individually to ensure that the administrative effort required to effect control does not become prohibitive. The inventory control procedures should isolate those items that require precise control from those that do not. 'Selective inventory control techniques' can indicate where the manager should concentrate his effort [4].

Objective:

1) The main objectives of study is to study the inventory management process in Maintenance Shop.
2) To learn how the Maintenance Shop keeps all the data of inventory perfectly.
3) To find out the composition of inventory with Selective Control Technique.
4) To analyze the inventory management techniques with ABC & XYZ analyses used in Maintenance Shop.

5) To study the Inventory Control Techniques with Selective Control Techniques of Maintenance Shop.
6) To reduce losses, damages and misappropriation of materials in Maintenance shop.
7) To analysis existing items in store of Maintenance shop in proper way.
8) To classify relevant items in a Maintenance shop based on relative significance.
9) ABC & XYZ analyses have been done to recommend suitable Inventory Management measures.

II. Methodology

Selective Inventory Control:

Expansion of industries has been the major goal of the industries. Companies are trying to expand their production, sales etc. in order to stand in the global market. The expansion has resulted into the expansion of various activities of the industry [5][6]. This in-turn increases the number of items to be purchased and hence, their upkeep has also increased significantly. Purchase and control of the items before their use, irrespective of their usage value, price or procurement problems, is therefore uneconomical. Industries store a number of different types of items. Various types of selective control techniques are :
1) ABC Analysis 2) HML Analysis 3) VED Analysis 4) SDE Analysis 5) GOLF Analysis 6) FSN Analysis 7) MUSIC 3D Analysis

ABC Analysis:

In materials management, the ABC analysis (or Selective Inventory Control) is an inventory categorization technique. ABC analysis divides an inventory into three categories—"A items" with very tight control and accurate records, "B items" with less tightly controlled and good records, and "C items" with the simplest controls possible andminimal records.

ABC Analysis is similar to the Pareto principle in that the 'A' items willtypically account for a large proportion of the overall value but a small percentage of the number of items.
Examples of ABC class are

- '**A**' items – 20% of the items accounts for 70% of the annual consumption value of theitems
- '**B**' items – 30% of the items accounts for 25% of the annual consumption value of theitems
- '**C**' items – 50% of the items accounts for 5% of the annual consumption value of theitems

Another recommended breakdown of ABC classes:

1. "A" approximately 10% of items or 66.6% of value
2. "B" approximately 20% of items or 23.3% of value
3. "C" approximately 70% of items or 10.1% of value

The ABC concept is based on Pareto's law. If too much inventory is kept, the ABC analysis can be performed on a sample. After obtaining the random sample, the following steps are carried out for the ABC analysis [7][8].

XYZ Analysis:

XYZ analysis has a correlation with ABC analysis, only the difference is that instead ofannual consumption and price per unit , the inventory value is considered. Usually XYZ analysis is used in conjunction with either ABC analysis or HML analysis [9][10].

XYZ analysis is based on value of stock on hand (i.e- inventory investment)[11]. Items whose inventory values are high are called X items , while those whose inventory values are low arecalled Z items and Y items are those which have moderate inventory stock. This can also be shown as below :-

- X- high inventory value
- Y-moderate inventory value
- Z- low inventory value

In this study “ABC and XYZ” techniques of selective inventory control are applied in the Spare parts inventory in maintenance shop. This paper analyses the data of one financial year. Acquiring the initial knowledge on functioning of maintenance shop, The objective of this study is to identify of relevant items for inventory management using selective control techniques.
It is found from shop data that in the context of total inventory, the raw materials take share.The raw materials

inventory may again be cover around 70% of the total raw material inventory namely Category1, Category2, Category3 and Category4.

Results of ABC Analysis:

An analysis of the annual consumption value for the year 2018 is in the Table 1 . Corresponding plots are presented in Fig.1. It shows that 75 percent of the total annual consumption values are due to 12.79 percent of the total number of items under category A. Four percent of the total annual consumption value is from more than 59.52 percent of the total number of items under category C and 21 percent of the total annual consumption valueis from 27.69 of the total number of items under category B. So, by controlling the 'A' groupitems only, a better inventory control is possible.

Class	% of items	% of total consumption value
A	12.79	75
B	27.69	21
C	59.52	4

TABLE 1: Summary of ABC analysis for the year 2018

Results of XYZ Analysis:

Total summary of XYZ analysis for the year 2018 is shown in Table 2. The table shows that 80 percent of the total inventory value is due to 8.35 percent of the total number of items under category X. Similarly, only 5 percent of the total inventory value is responsible for 80.43 percent of the total number of items under category Z and 15 percent of the total inventory value is from nearly 11.22 of the total number of items under category Y. This analysis, therefore, helps to identify those few items which account for the large amount of money locked up in stock and steps are to take for their reduction.

Class	Percentage of items	% of total inventory cost
X	8.35	80
Y	11.22	15
Z	80.43	5

TABLE 2: Summary of XYZ analysis for the year 2018

Two Dimensional Analysis covering ABC and XYZ:

	X	Y	Z
A	High consumptionvalue. Even demand. Reliable forecasts.	High consumptionvalue. Predictably variable demand. Less reliableforecasts.	High consumptionvalue. Sporadic, variabledemand. Forecasting unreliable orimpossible.
B	Medium consumptionvalue. Even demand. Reliable forecasts.	Medium consumptionvalue. Predictably variable demand. Less reliableforecasts.	Medium consumptionvalue. Sporadic, variabledemand. Forecasting unreliable orimpossible.
C	Low consumptionvalue. Even demand. Reliable forecasts.	Low consumption value. Predictably variable demand. Less reliable forecasts.	Low consumptionvalue. Sporadic, variable demand. Forecasting unreliable orimpossible.

Results of the two dimensional analysis for the year 2018 are given in Table 3. For 2018, a two dimensional analysis covering ABC and XYZ is shown in Table 3. It is obvious that 'AX' items are very important for the organization and it is the least for 'CX' item. The study reveals that the following items in 'AX' category are quite important for the Maintenance Shop. Hence, proper inventory control techniques should be applied for these items. Then these figures are supposed to be compared with the existing one to determine whetherunnecessary high inventory is maintained by the Maintenance Shop or not.

	X	Y	Z
A	8	8	36
B	14	13	80
C	11	20	194

Table 3: Item wise two dimensional matrix

	X	Y	Z
A	2.08%	2.08%	9.38%
B	3.64%	3.39%	20.83%
C	2.86%	5.21%	50.52%

Table 4: Summary of Two dimensional matrix (percentage wise) using ABC & XYZ analysis

III. CONCLUSIONS

Following conclusions may be drawn from the analysis done on the inventory management problem:

Total number of items in raw material store is quite large, and this necessitates the method of 'Selective control technique' to apply. Thus, in this work, four categories of raw materials, covering around 70% of the total raw material inventory, are considered.

A three dimensional analysis covering ABC and XYZ are done for the year 2018, and it reveals that the AX category items are quite important for the organization. There are 384 spare parts in following Unit 1 maintenance shop. After ABC analysis, 12.79% items are classified in A category which consume 75% of total consumption value, 27.69% items are classified in B category which consume 21% of total consumption value, 59.52% items are classified in C category which consume 5% of total consumption value. After XYZ analysis, 8.35% items are classified in X category which consume 80% of total inventory cost, 11.22% items are classified in Y category which consume 15% of total inventory cost, 80.43% items are classified in Z category which consume 5% of total inventory cost. After making two dimensional matrix with ABC & XYZ analysis, total number of item AX is 8, AY is 8, AZ is36, BX is 14, BY is 13, BZ is 80, CX is 11, CY is 20 & CZ is 194. Percentage wise total number of items Rigorous indent control and consumption control is very much required for these items. Analysis is carried out with inventories and consumption quantity of the above items to test for inadequacy. Erratic relationship between consumption and inventory suggests to establish a good forecast, if possible, to make the inventory control more effective.

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