

Comparative Analysis of HML, VED and FSN in Material Management in Residential Project

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Abstract: *The cost of construction materials has increased significantly in recent years and accounts for about 50 % to 60 % of total project cost. Material management has been important aspect since long back and will be crucial as long as construction sector runs. Research finding shows that strict control over material management technique can increase overall efficiency of the project, this adds to substantial savings and increase profit margin of the firms. This paper aims to study inventory control techniques which includes High Medium Low (HML), Vital Essential Desirable (VED) and Fast-moving materials Slow-moving materials Nonmoving materials (FSN). Study was accomplished through literature reviews, discussion with contractors, site engineers, supervisors and by observations on a residential construction project. Implementing combination of HML, VED and FSN technique simultaneously on a residential project is advantageous so as to manage material according to classification based on unit price, criticality and consumption rate.*

Keywords: Material management, Inventory, HML, VED, FSN analysis.

1. Introduction

There are various areas which are to be focused in construction domain, material management is one of them. Material management is the process to plan and control all the efforts required to ensure the correct quality and quantity of materials are properly obtained at a reasonable cost and are available when required. Materials management is an important element in managing of project, materials on a project can contribute from 50 % to 60 % of the cost of the work [1]. Inventory control is also called as stock control, if material is procured in early stage, capital gets tied up and requires continuous check on the inventory.

On the other hand if material procurement at site is delayed it will affect scheduling of activities and the project may be delayed. Material expense represents a major part in construction industry, so minimizing procurement cost improves opportunity for minimizing the overall cost of the project. Classifying inventory plays an important role in identifying and optimizing the stock level of materials of industry, overstocking increases the holding cost and locks ups the capital of the organization. Under stocking also referred as the shortage or out of stock cost, would lead to the losses in profits. Classification enables to categories material according to their unit cost, criticality and the

consumption rate. There are various types of inventory control techniques such as FSN, XYZ, ABC, HML, VED, SDE etc. Here we shall focus on the HML, VED and FSN. Combination of these techniques is useful in deploying strict control on inventory by eliminating stock out situation, cost and time reduction technique and check consumption rate of materials.

2. Literature review

Arpit Bhadiyadra, Deep Upadhyaya and Sumit Phugat, (2018) explains HML analysis, procedure to categories materials according to their unit cost, first find the annual demand and annual usage with the help of unit cost of each material. Then calculate percentage of unit cost, cumulative of unit cost and then classify the inventory item. Parameter set by the firm for categorizing the item for example: “H-Item”: Items whose unit price is ≥ 10000 , “M-item”: Items whose price is ≥ 1000 and < 10000 and “L-item”: Items whose price is < 1000 [1].

Yogesh Kumar, Rupesh Kumar Khaparde, Komal Dewangan, Gautam Kumar Dewangan, Jalam Singh Dhiwar and Devprakash Sahu, (2017) focused on F, S, and N analysis. In construction industry all the items are not required with the same frequency, some materials are continuously required whereas some are required very occasionally and some materials may not be required or may become obsolete and might not have been used for years. Fast moving (F) materials are used in large amount and are generally 10-15% of total materials. Slow moving (S) materials are used in minimum amount as compared to F- class materials and are generally 30-35% of total materials. Nonmoving (N) materials are generally 60-65% of total materials. Basic steps for FSN analysis are: Prepare the list of materials with their unit cost, annual demand, annual usage and arrange the materials in the decreasing order of their annual demand. Calculate the percentage and cumulative percentage of annual demand. Classify materials into F, S and N class accordingly, draw the graph on the basis of cumulative percentage of annual demand and category of F, S, and N [2].

Sayali shet and Raju Narwade, (2017) studied that ABC analysis is most economical and suitable throughout construction project. Using SDE and VED analysis the initial investment is more so interest charge is more. ABC analysis is based on overall cost of the materials, VED analysis gives priority to use material during different activities. ABC analysis gives least interest charges as compare to other techniques used in inventory management. It shows that ABC analysis is most economical and suitable than other method to control inventory on-site [3].

Ujjavala Patel and Anand Patel, (2015) suggests to use material management techniques so as to reduce cost and increase profit margins during lifecycle of construction project, this includes proper documented procedures to decrease cost and increase profit. Factors affecting inventory control system includes design, poor planning and scheduling, inefficient workforce, lack of security, storage facility and waste on construction site. Firm with proper material management system increases overall efficiency by about 35% [4].

3. Research methodology

Research methodology used consists of analysis of HML, VED and FSN technique, initially literature review was studied to collect qualitative data. For quantitative data site with plot area of 5562 sq.m and built up area of 1831 sq.m was selected. Excavation, PCC, RCC, brickwork, plastering, A/C work, waterproofing and dry cladding activities were going on. During analysis, 45 materials were used for above mentioned activities and their rates and consumption rates were taken from contractors, site engineers and supervisors.

3.1. Material management techniques

3.1.1. HML Analysis: HML stands for High, Medium and Low. Materials are categorized based on unit price as High price, Medium price and Low price. H-class requires continues check and control over the materials, whereas L-class materials are required in bulk and their unit cost is the least among three. Criteria for classification varies from organization to organization, general percentage based classification –

H-class – These are high price materials and are 10 to 15 % of the total materials,

M-class – These are medium price materials and are 20 to 25 % of the total materials and

L-class – These are low price materials and are 60 to 70 % of the total materials.

HML analysis was carried out by listing all the materials required during the construction and arranged them in descending order of their unit price. Annual usage, percentage of total material cost and cumulative percentage of total material cost was calculated and then categorized the materials based on cut off lines. Graph was plotted on cumulative percentage total material cost.

3.1.2. VED Analysis: VED stands for Vital, Essential and Desirable. Materials are classified based on their criticality in terms of their effect on various construction activities. Vital are those materials whose absence leads to halt of an activity, in absence of essential materials activity can run but it increases cost and time, lack of desirable materials causes minor or no disruption in running of activity. VED analysis eliminates stock out problems and helps in smooth working of construction activity. VED analysis was accomplished by studying ongoing activity on-site and by categorizing each material for completion of activity as vital, essential and desirable. Material cost required for finishing of activity was calculated. VED classification varies from organization to organization depending on criticality of materials.

3.1.3. FSN Analysis: FSN stands for Fast moving, Slow moving and Nonmoving. FSN analysis looks after Materials that are used regularly FSN analysis was performed by finding average stay and consumption rate of materials, cumulative average stay and cumulative consumption rate was calculated, percentage average stay and percentage consumption rate, cumulative of average stay and cumulative of consumption rate was computed and then categorized materials under F, S and N class respectively. Generally F-class materials contribute to less than 10 % of total materials, S-class holds less than 20 % of total materials, and N-class contribute to remaining materials. At last took the combination of average stay and consumption rate to get the final classification. FSN classification may vary depending on consumption of material.

Formulae to calculate –

$$\text{Average stay} = [\text{Cumulative no. of inventory holding days} \div (\text{Total quantity received} + \text{Opening balance})] \quad (1)$$

$$\text{Consumption Rate} = [\text{Total issue quantity} \div \text{Total period duration}] \quad (2)$$

Table 1. FSN classification by combination of consumption rate and average stay

Sr.No.	C.R.	A.S	Final
1	F	F	F
2	F	S	F
3	F	N	S
4	S	F	S

5	S	S	S
6	S	N	N
7	N	F	S
8	N	S	N
9	N	N	N

Where C.R. = Consumption Rate and
A.S. = Average Stay

4. Analysis and Results

Data analysis of HML, VED and FSN analysis is completed from materials unit cost, criticality of each material, average stay and consumption rate of materials.

HML analysis

Table 2. HML Result

CLASSIFICATION					
SR. NO.	CATEGORY	NO. OF ITEMS	% OF ITEMS	COST (Rs.)	% COST
1	H	5	11.11	5944645.87	67.48
2	M	11	24.44	1569204.28	17.81
3	L	29	64.44	1295950.00	14.71
		45	100.00	8809800.15	100.00

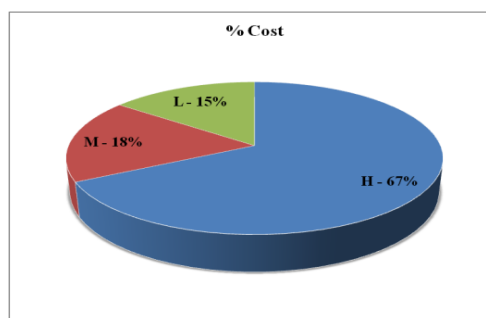


Figure 1. Percentage cost of H, M and L

VED analysis

Table 3. VED Result

CLASSIFICATION			
SR. NO.	CATEGORY	MATERIAL COST (Rs.)	% COST
1	V	6353706.53	88.58
2	E	796890.37	11.11
3	D	22000.00	0.31
		7172596.90	100.00

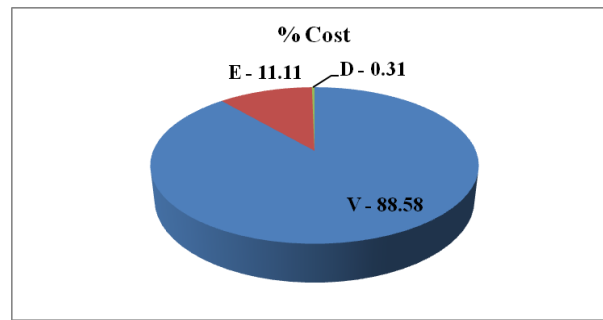


Figure 2. Percentage cost of V, E and D

FSN analysis

Table 4. FSN Result

CLASSIFICATION					
SR. NO.	CATEGORY	NO. OF ITEMS	% OF ITEMS	COST (Rs.)	% COST
1	F	3	8.11	263554.96	2.99
2	S	6	16.22	1289224.08	14.63
3	N	28	75.68	7257021.11	82.37
		37	100.00	8809800.15	100.00

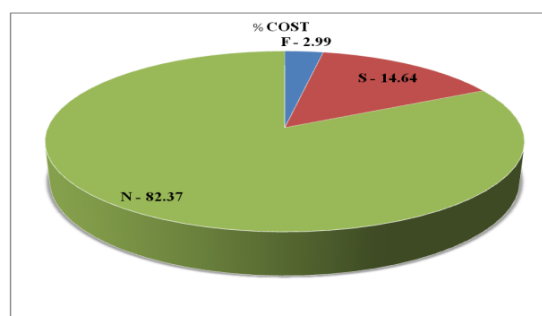


Figure 3. Percentage cost of F, S and N

5. Conclusion

The research results shows that implementing combination of material management techniques such as HML, VED and FSN on a residential project helps to control and use materials required for different activities.

From HML analysis, cost for 'H' category consists of 67.48 % of total cost, from VED analysis, 'V' category include 88.58 % of total cost, whereas from FSN analysis, 'N' category contains 82.37 % of total cost. HML analysis does not gives the criticality/importance of material, VED helps to order material in advance to avoid time overrun and stock out situations. FSN gives average stay and consumption rate of the material in a project, higher the stay of material, slower is the usage of material.

Therefore instead of comparison between the material management techniques, their combination would help to control, manage, store and plan. From the study it is clear that priorities of the materials varies based on analysis techniques and organizations, therefore management of firm must decide their process to control materials.

Table 5 Conclusion from study

Particulars	High	Medium	Low
	Vital	Essential	Desirable
	Fast moving	Slow moving	Non moving
Control	Highest	Intermediate	Least
Check	Tight	Intermediate	Less
Safety	High	Intermediate	Less

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