

TO STUDY APPLICATION OF MATERIAL MANAGEMENT TECHNIQUES FOR COST BUDGETING AND ANALYSIS

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Abstract: Cost is one of the main challenges for the construction manager, where the success of a project is judged by meeting the criteria of cost with budget, schedule on time, and quality as specified by the owner. Cost budget is prepared by the various factors and the main factors is the materials that are used in the construction. In which, poor strategy or incorrect budget or improper material management can easily turn an expected profit into loss. To overcome this problem the inventory material management techniques are very useful.

Key words: Material management, material management techniques, ABC Analysis, EOQ Analysis, S-Curve Analysis

1. INTRODUCTION

Construction industry plays a important role in development of the countries like India. Construction industry is one of the largest industries and contributes to about 10% of the gross national product in industrialized countries. Construction industry has problematic in its nature because it contains large number of agencies as clients, contractors, consultants, stakeholders, shareholders and regulators. The use of various material management strategies has made it possible to undertake projects of mega scale.

Use of material management techniques can reduced the project cost. It is used for the preparing the cost budget for the analysis of the project cost. This will help for the higher authority to analyze the budget of the project.

It is a function for purchasing, planning, storing material in a optimum way which can help to minimize the costs like inventory, purchasing and material handling costs.

Material management is connected with the management functions that are supporting the complete cycle of material flow, from the purchase and internal control of production materials to planning and control work in process.

A Material Management

Material management is a systematic approach for controlling, planning and organizing all those activities that are concerned with the flow of materials into a project.

The main goal of material management is to ensure that the materials are available at their point of use when needed hence, fluent procurement of material can reduce the cost of the project as well as successful completion of the project.

Material management is the planning, directing, controlling and coordinating those activities which are concerned with materials and inventory requirements. Poor material management tends to loss in the profit of the project. Materials represent a major expense in construction, so proper handling of the materials can reduce the overall project cost. Material management is the process to deliver right material at right time at right place and in right quantity so as to minimize the cost of project.

B Importance and functions of Materials for a Project

Efficient materials management in construction project can helpful in various ways like materials planning, purchasing, inventory control, store-keeping and warehousing, handling and transportation, codification and standardization and the disposal of surpluses. When these functions are not properly managed, materials shortages, surpluses, and cash flow problems are likely to occur and this will tend project to loss. Effective materials management has the positive impacts on project overall cost, schedule, safety, and quality.[2]

functions of material management are identified as The Material Planning and controlling.

- Material control.
- Purchasing
- Stores and inventory control:
- Transportation.
- Material handling.

C Components of material management are:

- Strategic Sourcing and Purchasing.
- Inventory management

- Material requirement planning
 - Material handling and transport
 - Waste management
 - Coding and Classification of Materials
- D Objectives of materials management

To reach all these objectives, it is necessary to establish easy and good co-ordination between all the departments of the material management and also should have good co-ordination with the other departments of the organization for the better control on work.

- Low prices
- Lower inventories
- Efficient handling of materials
- Procuring and receiving of quality materials
- Supply and distribution of materials

2. LITRATURE REVIEW

[1] A review on material management through inventory management

Study: Construction materials is a major portion of any construction project. Around 30%-80% of the total cost of the project is concerned to the materials. Material management is made difficult when there is shortage in materials, delay in supply, price fluctuations, wastage and low space of storing the materials. Poor material management can result in loss of profit in construction. Efficient management of materials can result in saving in project cost. By studying this paper, it concludes that effective construction material management process is a key to success of construction project.

[2] Study of Material Management Techniques on Construction Project

Study: Material management is an important part of any type of project for improve productivity. In this research paper, there are three inventory management techniques are used for the material management. 1. ABC analysis 2. EOQ analysis 3. S-curve analysis. There is various reasons for the loss in profit but the properly use of material management techniques can achieve the timely flow of materials and equipment to the jobsite, therefor it is easy to facilitate improved work face planning and also can prepare better schedules as well as it helps in the lowering the project cost.

[3] Use of Various Techniques of Material management for Construction of Industrial Building

Study: The cost, quality and time are the major factors of the material management. Materials are the major consumer of the total project cost. The most of the effort are concerned with the reducing the labor cost. But the proper material management can also be very helpful in reducing the cost of the project.

The objectives of project are as follows:

- To determine effective material cost from total project.
- Find out the benefits of material management techniques.
- To study inventory control techniques.

[4] An Empirical Case Study of Material Management in Residential Project

Study: In this study it is all about the problems that are occurring by improper material management. Therefor the analysis of different management techniques is conducted for the analysis of the cost variance of project cost with the management techniques and with the improper material management. By conducting the ABC analysis and using this technique on the field can reduce the cost of project. The result for ABC analysis is below. By proper management of class A and class b materials can very helpful for the reducing the cost of the project.

ABC Analysis

From the ABC analysis following conclusions can be made,

- Class A materials – 4 items (70% of AUV)
- Class B materials – 9 items (25% of AUV)
- Class C materials – 20 items (5% of AUV)

[5] Construction materials management on project sites

Study: The material management techniques is used for ensure that the quantity of materials and right quality is appropriately selected, purchased and delivered on site at right time in nominal cost. Proper control, tracking and monitoring is a key function of the successful material management. The goal of material management is to ensure that the materials of construction are available when needed. Proper use of management techniques can increase in work efficiency by 35%.

[6] Construction cost analysis and its importance to the economy

Study: The construction industry plays an important role in the economy since it provides demand for the production of goods and services from other related industries. This industry has some characteristics which are the unique character of the construction outcome, large number of the small agencies, quality of work. Cost analysis in the construction industry in countries like India is very essential. By doing proper cost analysis of the project cost can help in the reducing the overall project cost.

[7] Cost benefit analysis for construction projects

Study: We are living in a civilized society which can demands that much more thought should be given to all possible alternative schemes before arriving at the best solution obtainable. The construction industry is a important industry in India. So that construction management at this stage is dominated by three main approaches. 1. Quantitative methods 2. Qualitative methods 3. A combine approach of the both. A proper construction management will help in the proper analysis of the project cost as well as it will help to prepare a proper cost budget of the project.

3. RESEARCH METHODOLOGY

Aim of the study

- To study material management at construction site by applying material management technique to prepare cost budget and analyses the cost of construction project and control the cost of the project.

Objectives of the study

- To study construction management techniques at the construction site.
- Apply inventory control technique to prepare cost budget and analysis of cost of the project.

4. STUDY AREA PROFILE

The case study which is selected for this project is Residential Project under Shree Rang Construction Company. Shree Rang Construction company was incorporated in June 2004. Company have successfully executed end-number of construction projects and achieved recognition in the construction field. Residential Project which has been selected as case study for this research work is Shree Rang Nagar.

5. RESEARCH CONTRIBUTION

• ABC Analysis

The ABC analysis works in a manner as to get attention to the important items that are used to be in the construction projects. The ABC Analysis divides the materials based on the Annual procurement of that material. This analysis is used to identify the materials that has a high cost in overall project cost. In the ABC model, items categorized under class A has the highest annual consumption. Items under class B has moderate annual consumption and items under class C is lowest annual consumption.

Class A – 70% of AUV

Class B – 20% of AUV

Class c – 10% of AUV

• EOQ Analysis

Economic Order Quantity is used to determines the most efficient amount of goods that should be purchased based on ordering and inventory carrying costs. The EOQ provides a model for calculating the perfect reorder point and the nominal reorder quantity to ensure the minimum storage of inventory with no shortage.

1. Equation of Economic Order Quantity

$$Q = \sqrt{(2 \times Co \times D) / Cc}$$

Co- Ordering Cost

D- Total consumption

Cc- Inventory Carrying Cost

• S Curve Analysis

The S-Curve is a form of mathematical theory, which aims to represent the utilization of resources over the propose time of the project. S Curve analysis is an important project management tool. This analysis is carried for comparison of planned and actual cost for material items. S Curve evaluated by using Microsoft Excel. Using s Curve analysis Cost variance is calculated as difference between budgeted cost and actual cost.

6. ANALYSIS AND RESULTS

[1] ABC Analysis

Table 1 ABC Analysis

SR NO. (1)	ITEM NAME (2)	UNIT OF MEASUREMENT (3)	ANNUAL USAGE (4)	COST PER UNIT ITEM (5)	PERCENTAGE OF ITEM USED (6) = (4)/Σ(4)	CUM PER ITEM USED = (7)	ANNUAL USAGE VALUE (8) = (4)X(5)	PERCENTAGE OF ANNUAL USAGE (9)	CUM ANNUAL USAGE % (10)	RANK (11)
1	Steel	Kg	1,90,000	35	45	45	66,50,000	46	46	A
2	Cement	Bag	8500	280	2	47	23,80,000	16	62	A
3	Aluminium sliding window	Sq.ft	4625	180	1	48	8,32,500	6	68	A
4	Vitrified tiles	Sq.ft	16,600	50	4	52	8,25,000	6	74	A
5	Brick	Nos	1,80,000	3.5	43	95	6,30,000	4	78	A
6	Aggregate	Ton	700	710	0	95	4,97,000	3	81	B
7	Sand	Ton	800	600	0	95	4,80,000	3	84	B
8	Wooden doors	Nos	160	2500	0	95	4,00,000	3	87	B
9	Plastic paint colour	Litre	620	550	0	95	3,41,000	2	89	B
10	Mosaic tiles	Sq.ft	6120	50	2	97	3,06,000	2	91	C
11	Ceramic tiles	Sq.ft	8600	35	3	100	3,01,000	2	93	C
12	5-Amp point	Nos	440	240	0	100	1,05,600	0.7	94	C
13	Circuit point 2.5 mm	Nos	60	1620	0	100	97,200	0.5	95	C
14	Light point	Nos	340	240	0	100	81,600	0.5	96	C
15	Bathroom basin	Nos	40	2000	0	100	80,000	0.5	97	C
16	Exterior primer	Litre	620	125	0	98	77,500	0.5	98	C

17	15-Amp plug (2.5mm wire)	Nos	100	613	0	100	61,300	0.4	98	C	
18	MS Rail	Kg	600	70	0	100	42,000	0.2	98	C	
19	Double door distribution 12-way	Nos	20	2000	0	100	40,000	0.2	98	C	
20	Fan point	Nos	140	240	0	100	33,600	0.2	99	C	
21	15-Amp 4mm wire	Nos	40	742	0	100	29,680	0.2	99	C	
22	Circuit point 4mm	Nos	40	632	0	100	25,280	0.2	99	C	
23	Circuit point 1 mm	Nos	80	300	0	100	24,000	0.2	99	C	
24	3-way point	Nos	60	400	0	100	24,000	0.2	99	C	
25	Kitchen basin	Nos	20	1000	0	100	20,000	0.1	99	C	
26	Tv point	Nos	80	250	0	100	20,000	0.1	100	C	
27	Telephone point	Nos	80	250	0	100	20,000	0.1	100	C	
28	Bell point	Nos	20	400	0	100	8,000	0.0	100	C	
							4,19,505				
								1,44,31,160			

[2] EOQ Analysis

Table 2: EOQ Analysis

Sr. No	Material	Total cost without EOQ (Rs.)	Total Cost Using EOQ (Rs.)
1	Cement	23,98,515	23,86,211
2	Sand	4,89,203	4,84,517
3	Aggregate	5,07,568	5,00,854
4	Brick	6,43,950	6,34,930
5	Steel	67,33,950	66,61,431

[3] S-Curve Analysis

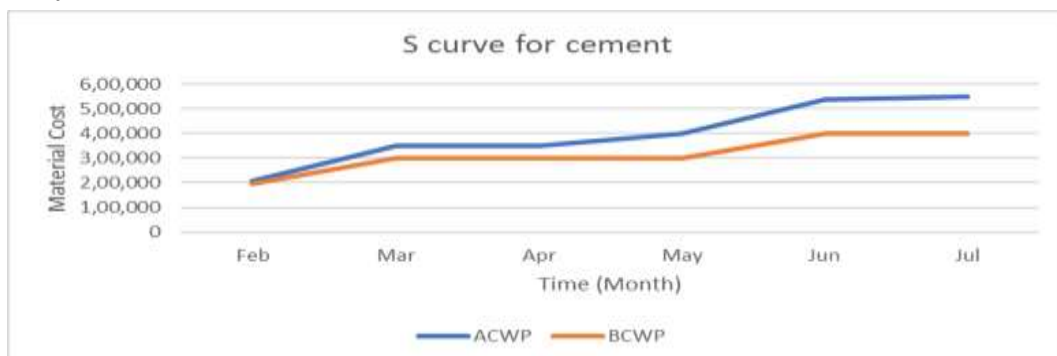


Figure 1: S Curve for Cement

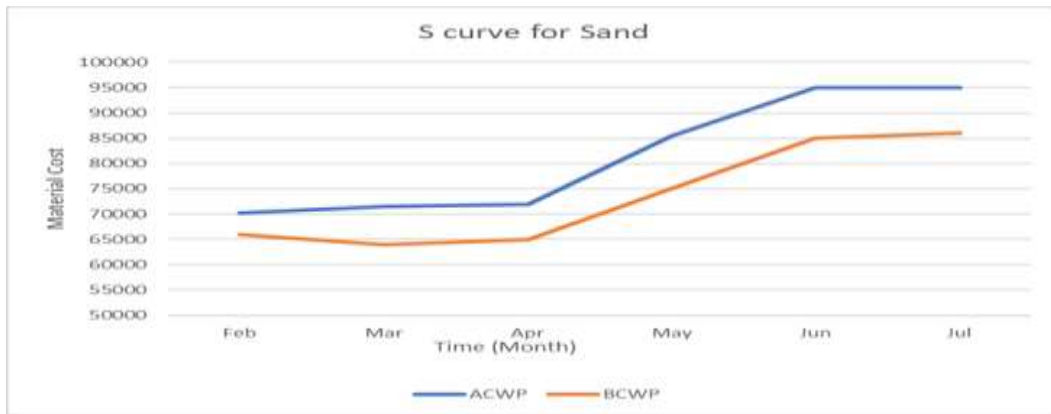


Figure 2: S Curve for Sand

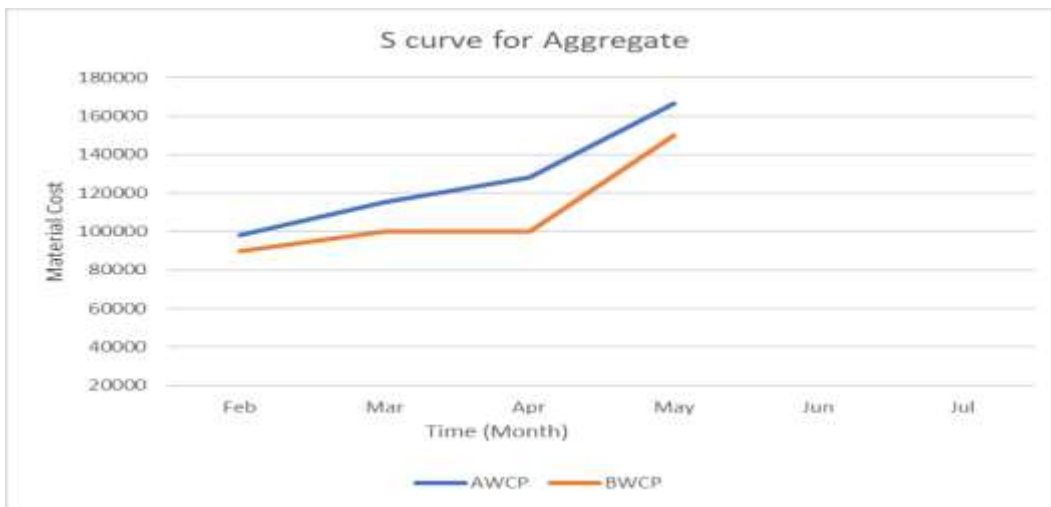


Figure 3: S Curve for Aggregate

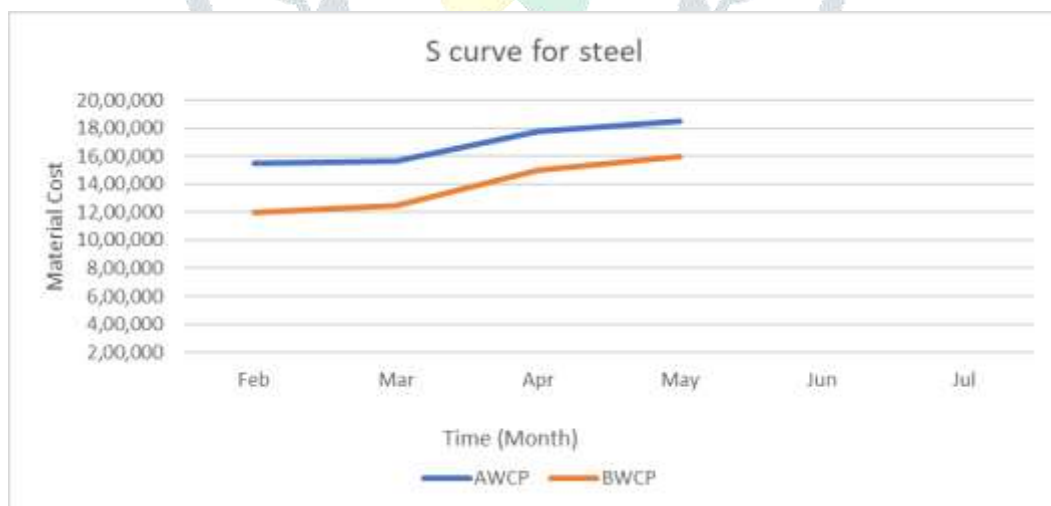


Figure 4: S Curve for Steel

Cost budget by help of S Curve Analysis

Table 3: Cost Budget

	Cement	Sand	Aggregate	Bricks	Steel
February	2,07,760	70,200	98,000	-	15,45,050
March	3,50,690	71,500	1,15,000	-	15,65,050
April	3,50,690	72,000	1,28,000	-	15,73,900
May	4,00,358	85,500	1,66,568	2,00,583	20,49,950
June	5,38,964	95,000	-	2,06,981	-
July	5,50,053	95,003	-	2,41,400	-

7. CONCLUSION

This study concludes that the materials are the highest consumers of total project cost. Around 50%-60% cost of total project cost is concerned with the materials. This study clearly indicates that the managing of all the materials from the design stage to the construction stage is very important. Using of material management techniques can help to reduce the cost and also it will help to prepare a cost budget for the future work. The above study helps to classify materials that are more valuable by using the inventory management techniques such as ABC analysis, EOQ analysis and s-curve analysis and also can help to prepare cost budget for the various analysis.

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