

SCHEDULING AND MATERIAL MANAGEMENT IN CONSTRUCTION OF CIVIL ENGINEER BLOCK (PHASE-1) AT NMAMIT NITTE CAMPUS USING MICROSOFT PROJECT TOOL

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Abstract - Construction, whenever we hear this name the only thing which pops to our mind is cement, sand, jelly, water, bricks. Actual construction can never be finished completely with hundred percent with only these things. Along with this we need to schedule our project with good planning and construction materials need to be managed properly. If materials are not handled with care then the project may undergo the time delay, over budgeting etc. Now a days in market wide varieties of construction software's are available for designing, scheduling, planning, budgeting purpose and soon. Here Microsoft project tool is used in order to schedule our project. Along with scheduling the material management is carried out using ABC analysis.

Key Words: Material Management, Quantity Estimation, S-Curve analysis, ABC analysis, Microsoft Project, Inventory Control Technique

1. INTRODUCTION

Second most populated country in the world is India next to China. As a result of huge population there is eclectic demand for construction sectors. And it's not that construction has gained its importance in twenty century but with the help of construction history we can say that the importance of constructions can be seen even during Stone Age period. One of the best example of construction practice during olden days are Mohenjo Daro built during Indus Valley Civilization.

Most of the construction firms in India are making use of Microsoft Project Software for scheduling of a project, tracking of a project, budgeting, comparing the progress of more than one project. This software is introduced and sold by Microsoft. In our project we are using MSP in order to determine the total duration required to complete the project.

In construction along with planning and scheduling even material plays an energetic role. Material needs to be planned and managed from planning stage to execution stage. If materials are not handled properly it may result in over budget or under budget. Under budgeting does not have any effect on the project but if there is over budgeting then extra precautionary measure need to be undertaken.

Inventory control technique helps and shows to handle the material. It is a intermingling of both qualitative analysis and

quantitative analysis. Qualitative analysis is carried out using S-Curve and quantitative analysis is carried out using various methods like ABC analysis, SDE analysis, XYZ analysis, VED analysis, First-In First-Out method and soon.

1.1 OBJECTIVE

Project is a temporary efforts carried out in order to create an inimitable service or result. Project has starting date and the finishing date hence it is temporary in nature. Every project has certain objectives or goals in it and when these objectives are fulfilled the project comes to an end. The objectives of the project are,

- To estimate total civil cost.
- Scheduling of project is carried out using MSP to determine the total duration of project.
- Qualitative analysis i.e. S-Curve
- Quantitative analysis i.e. ABC analysis

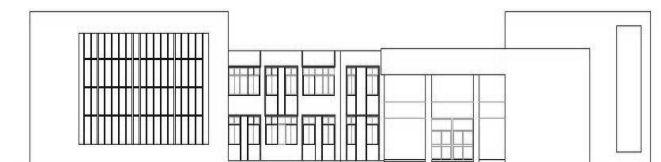


Fig-1: NMAMIT Civil Engineer Block (Phase-1)

2. LITERATURE REVIEW

Nikhil R Mahajan et al. (2017) paper mainly deals with objective of finding out the difference between the traditional planning technique and modern planning technique. The objective was achieved as he started data collection in parts i.e. primary data and secondary data. After this the collected data's were analyzed. As a result of analysis the modern planning technique showed the more positive review.

Monish Kumar K et al. (2017) the objectives of this paper is to develop the effective schedule and to determine the total cost and time required to complete the project with efficiency. Methodology is been carried out in two phase. Phase-1 consist of documentation or data collection i.e.

drawings, information's, soil test data etc. through questionnaires survey and with the help of site engineer. Phase-2 consist of implementing the collected data in Microsoft Project in order to schedule the project. As a result accurate planning is done using MSP-2013. Delays and over budgeting of the project is avoided.

Sayali Shet et al. (2017) main goal of this research is to determine the best inventory control technique. Research started with determining the need for material management and data collection and collected data is analyzed using ABC analysis, SDE analysis and VED analysis and then comparing all the analysis to identify the better analysis. As a result ABC analysis is identified as best technique.

3. METHODOLOGY

Material management and scheduling is carried out with the help of NMAM Institute of Technology, Nitte Civil Engineer Block (Phase-1) construction. It is actually a three phase construction which consist of basement and G+6 floors. Our methodology follows the given chart below.

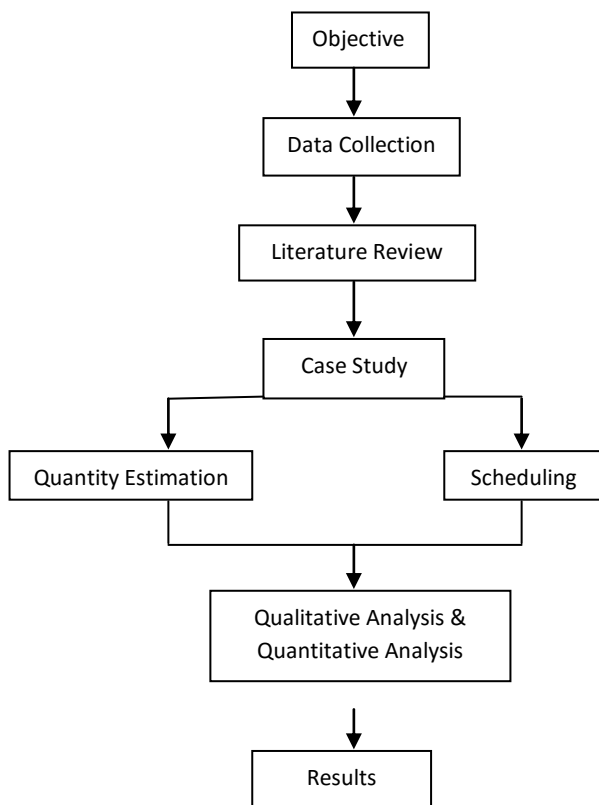


Fig-2: Methodology

3.1 QUANTITY ESTIMATION

Quantity estimation is the process of finding out the appropriate quantity of material's required for construction purpose. With the help of Microsoft Excel quantity estimation is carried out for quantity and total civil cost of structure is determined. Quantities are expressed in terms of square meter or cubic meter. Average method i.e. product of

area and depth/height is used for quantity estimation but in few cases like plastering, painting instead of area, the perimeter of structure is considered. After quantity estimation and assigning unit cost to each material the total civil cost of the project is Rs 6, 43, 08, 100.00.

3.2 PROJECT SCHEDULING

Project scheduling of phase-1 construction is carried out using Microsoft Project. Project start date is 26th June 2017. Initially to start with schedule calendar need to be created and assigned to both entry table and bar chart in Gantt chart.

Calendars in Microsoft Project are as shown below,

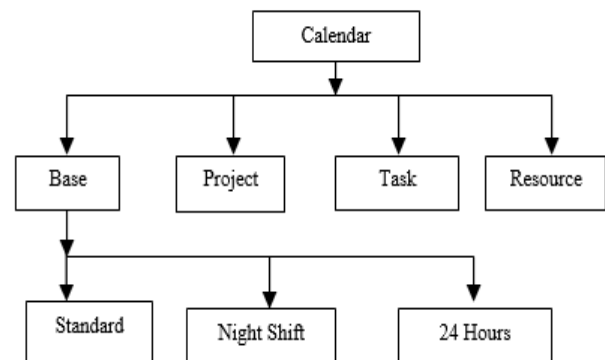


Fig-3: Calendar Types

In our project, standard calendar with working hours from morning 8:30 A M to evening 5:30 P M with hour break in between is assigned for Gantt Chart. After this the task are assigned to perform project and then resources required for task performance is assigned to particular task. As we are considering only material in construction the assigned resources are material type.

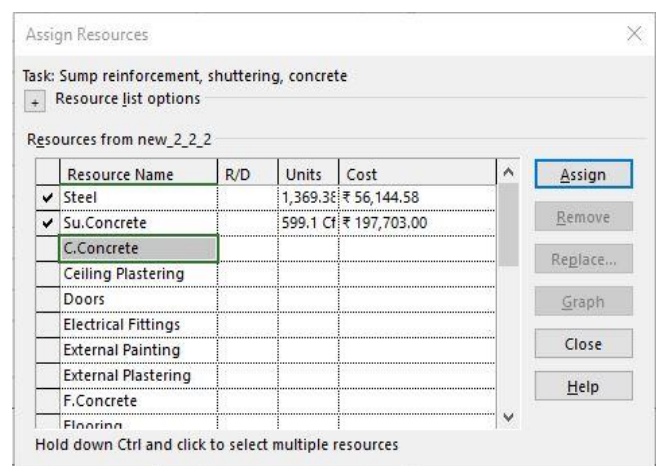


Fig-4: Assign Resources

As a result of scheduling the total duration required for project completion is determined and our project must finish on 31st July 2018.

3.3 QUALITATIVE ANALYSIS

Qualitative analysis makes use of unquantifiable material. This qualitative analysis is carried out using S-Curve. S-Curve is a very important tool for comparing the progress of work along with time. In S-Curve analysis comparison is between planned cost and actual cost of material. As it is ongoing project it is bit difficult to obtain the actual cost of material at site because actual quantity of material can be obtained only when project comes to an end. Hence here in S-Curve analysis RMC is considered as we can obtain actual cost of RMC as it used in site. RMC M-25 grade concrete is used for concreting of beams, slabs. The structure consist of one construction joint in lower ground floor and two construction joint in upper ground floor and first floor. A there is one construction joint in lower ground the slab is divided into two parts and concreting of these two slabs are carried out differently. Similar way in upper ground floor and first floor there are two construction joint and slabs are divided into three and concreting is done separately for all three slabs.

Firstly planned cost i.e. BCWP is calculated by multiplying the total quantity of each material and unit cost. Then actual cost i.e. ACWP is obtained from site supervisor. Cost variation is obtained by subtracting planned cost and actual cost. Finally cost performance index is calculated by dividing planned cost and actual cost in order to determine the efficiency of the project. CPI has three conditions they are,

- $CPI < 1$, Unfavorable condition
- $CPI = 1$, Favorable condition
- $CPI > 1$, Favorable condition according to plan

3.4 QUANTITATIVE ANALYSIS

Quantitative analysis is carried out using various methods like XYZ analysis, VED analysis, SDE analysis, First-In First-Out method etc. Here we are using ABC analysis as it considered as one of the best material management technique at the site. ABC analysis is carried out by considering the value and volume of the material. This method is derived from Pareto Principle founded by Vilfredo Pareto. Here materials are classified into three classes based on value and volume of material like Class A, Class B and Class C.

Table-1: Summarizing ABC analysis

CLASS	VALUE	VOLUME	DESIRED DEGREE OF CONTROL
A	70	10	STRICT
B	20	20	MODERATE
C	10	70	LOW

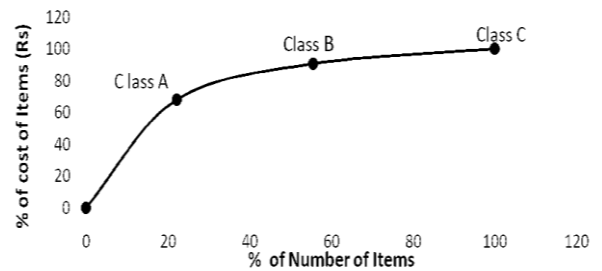


Chart-1: ABC graph

4. RESULTS AND DISCUSSION

After project scheduling the project start date is 26th June 2017 and project must finish on 31st July 2018. The total civil cost was estimated in Microsoft Excel and it is around Rs 6, 43, 08, 100.00.

S-Curve analysis of RMC-25 grade concrete is tabulated below,

Table-2: S-Curve analysis of RMC -25 grade

RMC M-25 GRADE					
SL. NO.	RMC M-25 GRADE	PLANNED COST	ACTUAL COST	COST VARIATION	COST PERFORMANCE INDEX
1	F.F slab 1	6,08,009.00	6,07,700.00	309.00	1.00
2	U.G slab 2	4,77,662.50	4,63,500.00	14,162.50	1.03
3	U.G slab 1	5,96,215.50	5,92,250.00	3,965.50	1.01
4	L.G slab 2	3,73,735.50	3,70,800.00	2,935.50	1.01
5	L.G slab 1	5,80,817.00	5,66,500.00	14,317.00	1.03

There is slight variation in planned cost and actual cost. CPI value is one and greater than one which symbolizes that we are in favorable condition.

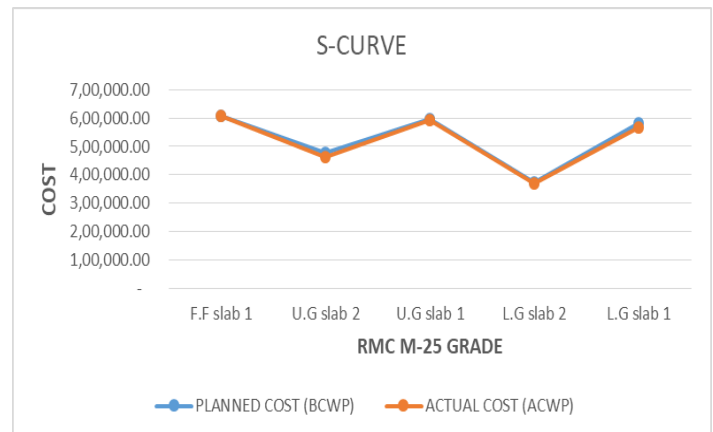


Chart-2: S-Curve analysis

ABC analysis is carried out for all material coming under civil cost. Themn after analysis materials are classified as Class-A,

Class-B and Class-C. Class-A materials are usually very costly and strict monitoring is required. Class-B materials are less costly compared to Class-A hence moderate analysis need to be done for Class-B materials and finally Class-C materials are of less cost and they doesn't require any strict monitoring.

Table-3: ABC analysis

MATERIALS	TOTAL COST	USAGE AS A % OF TOTAL USAGE	CUMULATIVE %
Steel	3,00,17,592.71	47%	47%
Concrete	1,97,53,913.87	31%	77%
Laterite & Solid Blocks	43,99,814.34	7%	84%
Plastering	33,79,473.42	5%	89%
Chemicals	23,43,408.25	4%	93%
Flooring	19,56,544.90	3%	96%
Windows	9,04,996.49	1%	98%
Doors	6,25,213.50	1%	99%
Excavation	5,17,137.04	1%	99%
Waterproofing agent	4,09,922.97	1%	100%
TOTAL=	6,43,08,017.50	100%	

The graph after ABC analysis is as shown below,

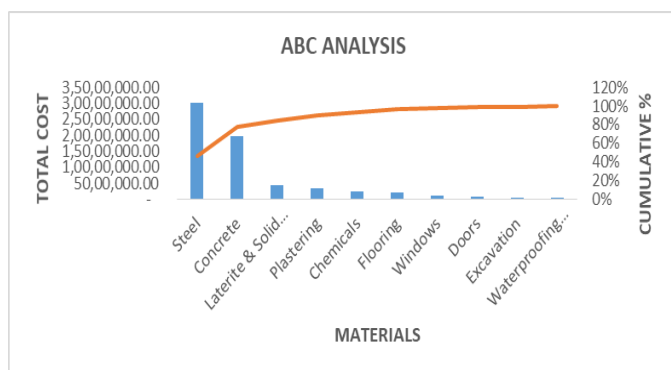


Chart-3: ABC analysis graph

5. CONCLUSIONS

Microsoft excel is a simple tool which helped in estimation of appropriate quantities used in construction and with the help of Microsoft Project tool scheduling was done.

In S-Curve analysis the CPI values were one and greater than one which signifies that the project is in favorable condition i.e. cost efficient project.

ABC analysis helped in classifying the material into three classes. Class A materials are steel and concrete. Class B materials are laterite and solid block, plastering, chemicals and flooring. Class C materials are windows, doors, excavation and waterproofing agents.

Class A materials need to be monitored strictly on daily basis, Class B materials need to be moderately monitored on weekly or fortnight basis, Class C materials need to be monitored on monthly or bi-monthly basis as it is low monitored.

ACKNOWLEDGEMENT

I would like to extend my gratefulness to Dr. Srinath Shetty K who helped me in guiding the project at the same time I would also like to thank Mr. Janakaraj and Mr. Kiran who assisted in project progress. Last but not the least I would like to thank our institution NMAM Institute of Technology, Nitte for providing this opportunity.

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