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"Prime Capabilities In Resource Optimization For Multiple Projects Using Primavera"

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Abstract: Resources play vital role in construction projects. The performance of Construction industry depends chiefly on how best the resources are managed. Optimization play pivotal role in resource management, but task is highly Haphazard and chaotic under the influence of complexities and vastness. Management always looks for optimum utility of resources available with them. Hence, the project management has got important place especially in resource allocation and smooth functioning with allocated budget. To achieve these goals and to exercise enhance optimization certain tools are used for resource allocation optimally. Current Work illustrates resource optimization techniques using Primavera for 2 ongoing projects with common resource pool shared. Comparative analysis is done for individual as well as combined usage so that effective utilization of resources is achieved and the demand/supply of resources is maintained. Advanced applications in Primavera helps to understand the resource usage allocated in individual project across different project platforms which helps the management to decide. Effective usage of Roles feature of Primavera is used to assist and meet the objective of the project.

Keywords: Primavera Project Planner, Optimization of Resources, Resource Leveling, Resource Management, Comparative Analysis.

I. INTRODUCTION

Project management in the business field is defined as managing and directing time, material, personnel, and costs to complete a particular project. One important phase in the project planning is Project Resource Scheduling. This process identifies resources amount and type according to the activity that scheduled. Planning the efficient use of resources is a complex task. The purpose is to create a smoother distribution of resource usage i.e. to minimize the fluctuation of the resource usage. The resource leveling is used to produce a solution to the problem.Construction project management (CM) is a professional service that uses specialized, project management techniques to oversee the planning, design, and construction of a project, from its beginning to its end. The purpose of construction management is to control a project's time, cost and quality.

II. OBJECTIVES

The present study focused on two major areas, namely:

1. Project Management of Construction Activities and
2. Resource Optimization.

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Resource demands of project A & B are individually leveled.

In other option demands of projects A & B are aggregated and then together leveled, Comparison of individually leveled and then combined option with aggregated and then leveled clearly indicates reduction in demand of resources, which could be best considered for economy.

III. METHODOLOGY

Current Work illustrates resource optimization techniques using Primavera for 2 ongoing projects with common resource pool shared. Comparative analysis is done for individual as well as combined usage so that effective utilization of resources is achieved and the demand/supply of resources is maintained.

In this present study the critical areas are, to overcome the over allocated units in the multiple as well as single projects. In multiple projects, one project gets overlapped to other project, for that particular area the present study is going to do. Afterwards optimization needs to be done.

It includes the analysis part, changes to be done after increasing the percentage rate of the individual resources and compare that cost into the cost of multiple project with single resource pool. Effective dates are given wherever over allocation is there. These are discussed in detail in next part.

IV. RESOURCE OPTIMIZATION AND LEVELING

Resources are non-other than the inputs while performing a work. They are an integral part of a project. To create any product or an element in case of construction industry the resources need to be integrated. In most of the site scenario the resources are limited. So, optimization needs to be done to get the maximum output. We can term them as Man, Material, Money and Machine.

There are two types of resource levelling

1. Automatic leveling
2. Manual levelling

Resource leveling can be done in three ways

1. Leveling all resources
2. Leveling the resources only within the total float
3. Leveling the resources by changing the maximum units.

4.1 RESOURCE ALLOCATION

Few conditions considered for optimum resource allocation are as follows:

1. Both Projects Tower A and Tower B should start simultaneously with a lag of 3 months.
2. Critical Resources are identified for the main activities.
3. Availability of resources is defined based on the data.
4. Combined both projects Tower A and Tower B as single Masterfile.
5. Resource defined for both the projects.
6. Created a common resource pool for both projects.
7. Final resource pool tabulated with cost.
8. Effective dates are given.

These are the most common resources used in most of the activities in the project.

1. Project Manager.
2. Site Engineer.
3. Structural Engineer.
4. Chief Engineer.
5. MEP Engineer.
6. Reinforcement Engineer.
7. Project Engineer.

In the above resources the over allocated units is leveled by giving effective dates for resources in which, where they get over allocated, on that particular date the number of resources gets increased by their requirement.

4.2 IMPORTANT DATES OF THE PROJECT:

1. Start date of TOWERA Project : 23rd January 2016.

End date of TOWERA project : 21st September 2017.
2. Start date of TOWER B Project : 23rd April 2016.
End date of TOWER B project : 22nd December 2017.
3. Start date of MULTIPLE Projects : 23rd January 2016.
End date of MULTIPLE Projects : 04th January 2018.

The most important dates in this project are where both the projects get overlapped. On that specific area only the working of this project is done. In that area, the resources used for the single project is also used for the multiple projects. In that part only the effective dates are given and also increased the cost of some resources by 20% and some resources by 40% to optimize the resources for both the projects.
The dates are:

JANUARY 23RD 2016 – MAY 7TH 2016.
MAY 7TH 2016 – DECEMBER 12TH 2017.
DECEMBER 12TH 2017 – 04TH JANUARY 2018.

In these dates up to 7th May 2016 the rate of the resources are same. From 7th May 2016 to 12th December 2017 the rate gets increased by 20% for some selected resources and 40% for some other resources, because they need to work for both the projects. So after12th December 2017 to finish of the project i.e., 4th January 2018 the rate again decreased to normal rate.

PERCENTAGE INCREASE OF THE RESOURCES:

1. Project Manager. - 20%
2. Site Engineer. - 20%
3. Structural Engineer. - 40%
4. Chief Engineer. - 20%
5. MEP Engineer. - 40%
6. Reinforcement Engineer. - 20%
7. Project Engineer. - 20%

4.3 COST DETAILS

We are going to discuss about the cost difference between the single Tower A project and Multiple projects and will give result about that which is the better project to select.
Rate of each selected resources in this project.

1. Project manager - Rs 2000/Day.
2. Site engineer - Rs 900/Day.
3. Structural engineer - Rs 750/Day.
4. Chief engineer - Rs 1500/Day.
5. MEP engineer - Rs 1500/Day.
6. Reinforcement engineer - Rs 600/Day.
7. Project engineer - Rs 1400/Day.

This rate gets varied in the overlapped area of multiple projects time. The dates are mentioned in the section 4.2.Now we will discuss about the cost of the single project and Multiple projects. Actual cost and saved cost will get to know.
Comparison is done for the 100% increment i.e., (By taking another resource pool) costs with the 20% or 40% incremented cost for the same resources used for the single project.

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V. FIGURES AND TABLES

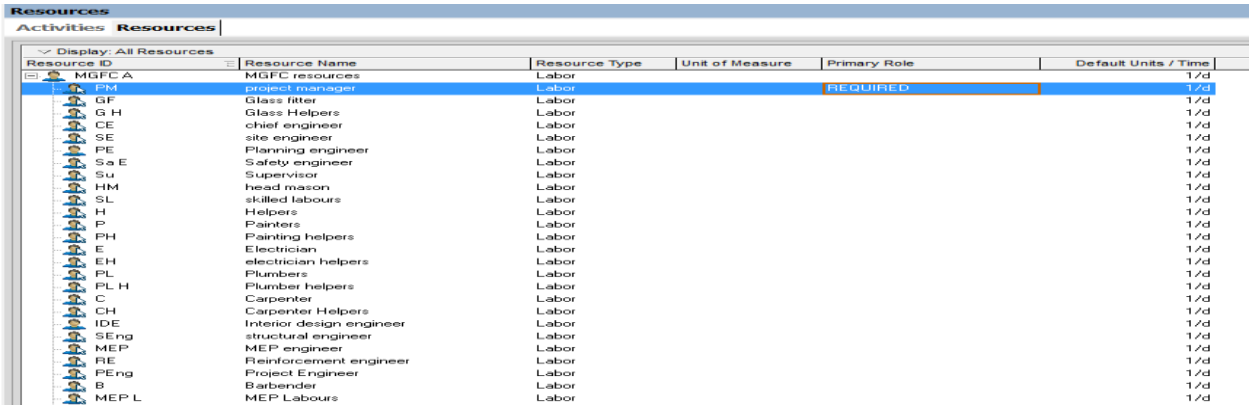


Figure 1 List of Resource Library Used

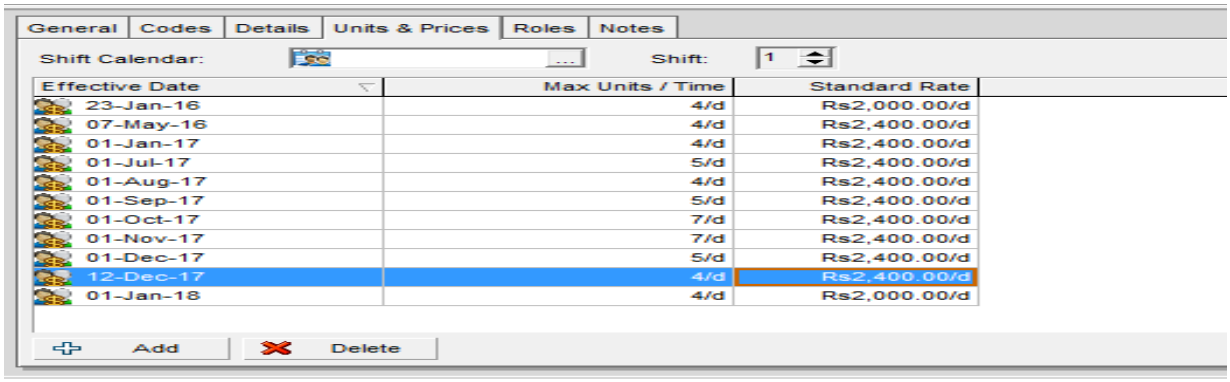
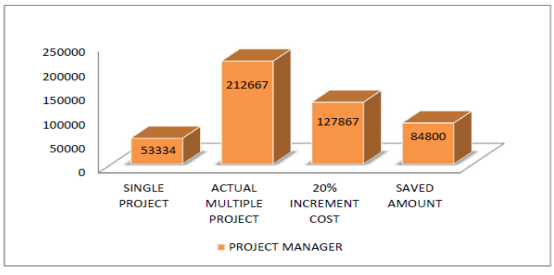


Figure 2 Effective Dates Given To Project Manager

Table 1Budgeted Units Of Single And Multiple Projects

Resource name	Single project	Multiple project
1. Project Manager	27	53
2. Site Engineer	123	247
3. Structural Engineer	35	70
4. Chief Engineer	10	20
5. MEP Engineer	157	314
6. Reinforcement Engineer	45	86
7. Project Engineer	111	222



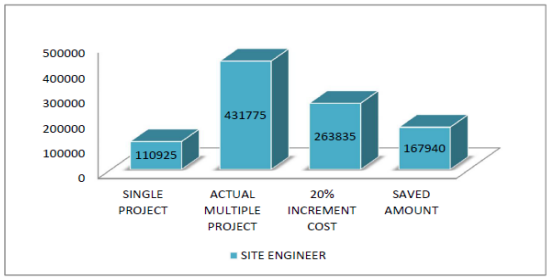


Figure 3 Cost comparison of PM

Figure 4 Cost comparison of SE

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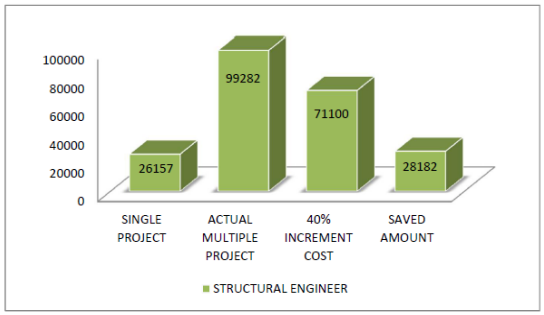


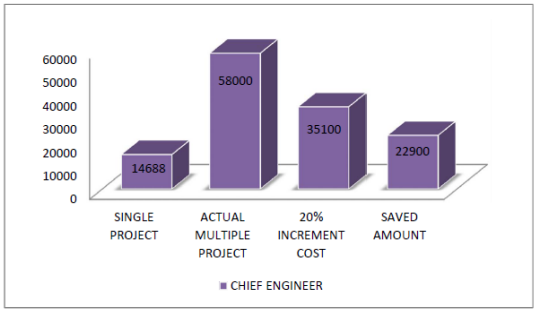
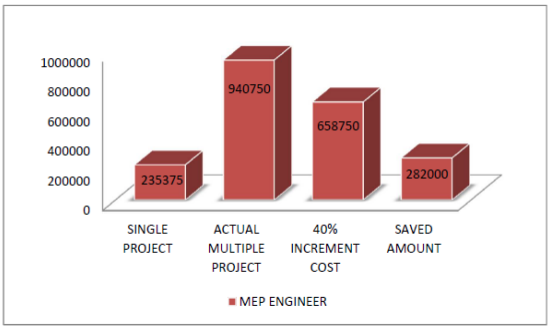


Figure 5 Cost Comparison of ST ENG Figure 6 Cost Comparison Of CE



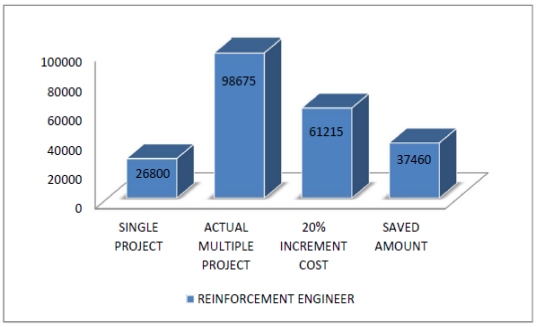
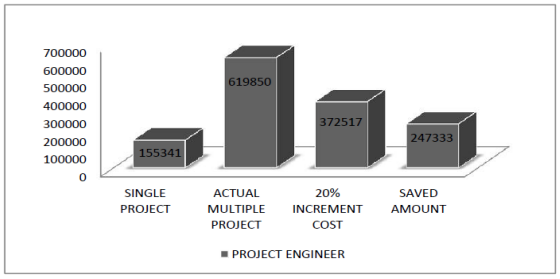


Figure 7 Cost Comparison Of MEP ENG Figure 8 Cost Comparison Of RE



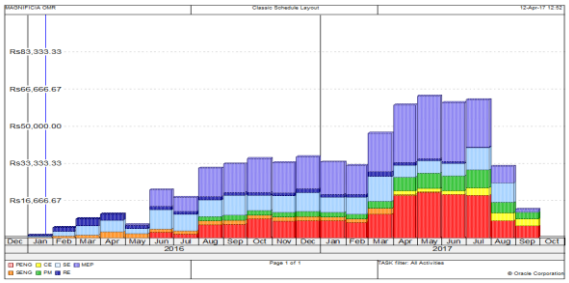


Figure 9 Cost Comparison Of PEFigure 10 Resource Usuage Profile of Single Project

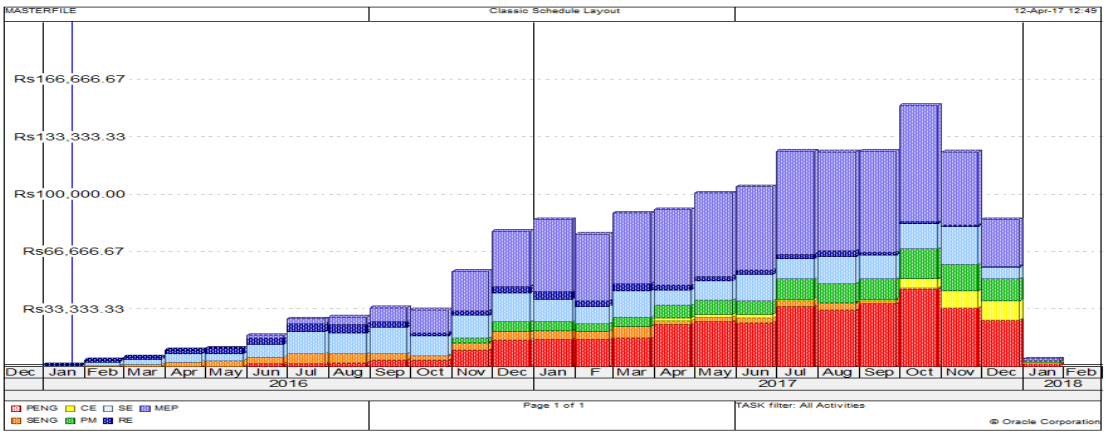


Figure 11 Resource UsageProfile Of Multiple Projects

VI. CONCLUSION

The above results shows that, it justifies that when operating on multiple projects, the resource allocation becomes a challenging without a proper tool.

Oracle Primavera P6 justifies and helps the project engineer or planning engineer to asses the over allocation and using the effective date features and altering the rate, the usage of resources can be optimized. Thus in this project a saving of 20 to 40% of resource cost is done by using the above features. Finally comparison has to be done for Individually Resource Allocated Cost and Combined Resource Allocated Cost for 2 Projects.

Resource name	Cost in single project	Cost in Multiple project	Cost we got for multiple project	**% Cost Saving**
1. Project Manager	Rs 53334/-	Rs 212667/-	Rs 127867/-	**40%**
2. Site Engineer	Rs 110925/-	Rs 431775/-	Rs 263835/-	**39%**
3. Structural Engineer	Rs 26157/-	Rs 99282/-	Rs 71100/-	**29%**
4. Chief Engineer	Rs 14688/-	Rs 58000/-	Rs 35100/-	**40%**
5. MEP Engineer	Rs 235375/-	Rs 940750/-	Rs 658750/-	**30%**
6. Reinforcement Engineer	Rs 26800/-	Rs 98675/-	Rs 61215/-	**38%**
7. Project Engineer	Rs 155341/-	Rs 619850/-	Rs 372517/-	**40%**

The above figures are only for the selected resources in the project. If we do it for all the resources, the cost of the total project will get reduce and amount can be saved.

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