



Monitoring Control Delay and Cost Implication Using Threshold Feature of Primavera

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ABSTRACT

Tracking & monitoring is a regular process for any construction project to evaluate planned v/s actual progress deviation. Where the baselines are used as a reference to check the above. In this project the delay is primarily taken as the main focus of study and the corresponding cost implication is evaluated. Threshold features in Primavera is used for around 5 parameters in the project (Start Date Variance (Days), Finish Date Variance (Days), Schedule Variance (SV), Cost Variance (CV) and Accounting Variance (AV)) which will govern the progress, as well as cost. The threshold feature in Primavera helps the project manager to monitor the tracking parameters precisely by giving range of input values. This feature most widely used in large projects with different tracking units. The benefit of threshold feature in this project helps in controlling the delay with respect to a review date so as to prevent the stretching of project duration.

Keyword: - Monitoring, Tracking, Threshold Paramètres, and Input Values.

1. INTRODUCTION

Project monitoring is the process of collecting, recording, and reporting information concerning project performance that project manager and others wish to know. Monitoring involves watching the progress of the project against time, resources and performance schedule during execution of the project and identifying lagging areas requiring timely attention and action whereas project controlling uses data from monitor activity to bring actual performance to planned performance.

This study is mainly done using Primavera P6, project management software. All activities and their sequence of occurrence, duration, and resources required and costs involved are studied. The organizational breakdown structure of company and work breakdown structure of the project are noted. Tracking of the completed activities. This gives an idea about the resources involved and financial aspect of the completed work. Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project Requirements

1.1 Objectives of the Project

- To suggest the importance and purpose of monitoring in the construction work.
- To suggest guidelines to contractors for updating the project.
- To analyze the reasons and factors of project delays
- To know the purpose of threshold feature of primavera in the project.
- To know the planned v/s actual progress in the project.
- To find out the issues/problems in the project
- To reduce the duration of the project
- To know how to reduce the duration by using effective resources units in the project.
- To know the exact status of the project.

1.2 Threshold Parameter Definitions

A threshold consists of a parameter, or type, and a lower and/or upper threshold value. Thresholds are used as a project management technique and also threshold means limit, The module generates an issue automatically when a threshold parameter is below or equal to the lower threshold or equal to or above the upper threshold value.

The following 5 threshold parameters are used in the project:

1.2.1 Start date variance (days)

A Start Date Variance threshold value is a specified number of days. An issue is generated if the difference between the activity's planned and current start dates (calculated as Planned Start Date – Start Date) falls beyond the threshold values.

If an activity's status is Not Started, then the Start date will be the Planned Start date, and the start date variance is always zero. If an activity's status is Started or Completed, then Start date is the actual start date.

- Start Variance= Start –Baseline Start

1.2.2 Finish date variance (days)

A Finish Date Variance threshold value is a specified number of days. An issue is generated if the difference between the activity's planned and current finish date (calculated as Planned Finish Date – Finish Date) falls beyond the threshold values.

If an activity's status is Not Started or Active, then the Finish date will be the Planned Finish date, and the finish date variance is always zero. If an activity's status is completed, then Finish date is the actual finish date.

A negative value for Finish Date Variance indicates that the current finish date is later than the planned finish date.

- Finish Variance=Finish-Baseline Finish

1.2.3 Schedule variance (SV) (Rs)

A Schedule Variance (SV) threshold value is expressed as a monetary value. An issue is generated if the Schedule Variance (the difference between the activity's earned value and the planned value) falls beyond the threshold values Schedule Variance is computed as $SV = \text{Earned Value Cost} - \text{Planned Value Cost}$.

It determines whether a project is behind or ahead of the schedule .A negative value indicates that less work was actually performed than was scheduled. The activity may be considered behind schedule.

If the threshold value is zero, an issue is generated as soon as the earned value of the work performed falls below the amount of work that was supposed to be performed, according to the schedule. A larger negative value for a Schedule Variance threshold indicates that an activity may be behind schedule by that amount before an issue is generated.

- Schedule Variance=Earned Value-Planned Value

From the above formula, we can conclude that:

- If Schedule Variance is positive, this means you are ahead of schedule.
- If Schedule Variance is negative, this means you are behind schedule.
- If Schedule Variance is zero, this means you are on schedule.
- When the project is completed Schedule Variance becomes zero, because at the end of the project all planned value has been earned

1.2.4 Cost variance (Cv) (Rs)

A Cost Variance (CV) threshold value is expressed as a monetary value. An issue is generated if the CV (the difference between the activity's earned value and the actual cost of performing the activity) falls beyond the threshold values, it shows whether a project is under or over budget.

Cost Variance is computed as $CV = \text{Earned Value Cost} - \text{Actual Cost}$. A negative value indicates that actual costs have exceeded the value of work performed, which may be considered a cost overrun.

If the lower threshold value is zero, an issue is generated as soon as actual cost of the work is greater than the value of the work. A larger negative value for the threshold indicates that a certain amount of cost overrun may be tolerated before an issue is generated.

- Cost Variance = Earned Value Cost - Actual Cost

From the above formula, we can conclude that:

- If Cost Variance is positive, this means you are under budget.
- If Cost Variance is negative, this means you are over budget.
- If Cost variance is zero, this means you are on budget.

1.2.5 Accounting variance (Av) (Rs)

An Accounting Variance (AV) threshold value is expressed as a monetary value. An issue is generated if the Accounting Variance (the difference between the activities' budgeted or planned cost according to the schedule and the actual cost of performing the activity) falls beyond the threshold values.

Accounting Variance is computed as $AV = \text{Planned Value Cost} - \text{Actual Cost}$.

A negative value indicates that actual costs have exceeded the scheduled costs. A positive value indicates that actual costs have not reached the scheduled costs.

If the lower threshold value is zero, an issue is generated as soon as actual costs are greater than scheduled costs.

2. METHODOLOGY

1. Identify The Critical Areas In The Project:

- Collected The Data On 15-Dec-2016
- Project Has Been Delayed For 8 Months from the Date 15-Dec-2015 to 15-Aug -2016.

2. Reasons For Delay:

- Project Was Stopped For A Period Of 8 Months Due To Financial Condition And Less Sales Of Apartments
- Approval Was Given Only For 5 Floors Against 11 Floors
- Design Changes From The Client Sent To Approval
- Customized Design Changes From The Client To Approve.

3. Apply The Parameters In Software:

In This Project 5 Parameters Are Used In It .Those Parameters Are As Follows:

- Start Date Variance
- Finish Date Variance
- Schedule Variance
- Cost Variance
- Accounting Variance

Baseline:

| 2 Project Columbs square | | Classic Schedule Layout | | | | | 06 | | | | |
|-----------------------------------|-------------------|-------------------------|-------------------|-------------------|--------------------|---------------------|------------------------------------|------|------|------|------|
| Activity ID | Activity Name | BL Project Start | BL Project Finish | Original Duration | Remaining Duration | Budgeted Total Cost | 2015 | 2016 | 2017 | 2018 | 2019 |
| 2 Project Columbs square | | 06-Oct-2014 08:00 | 20-Oct-2016 17:00 | 633d | 633d | Rs96,965,075.00 | 20-Oct-2016 17:00, 2 Project Colum | | | | |
| A1000 | Mobilization Manp | 06-Oct-2014 08:00 | 10-Nov-2014 17:00 | 30d | 30d | Rs0.00 | Mobilization Manpower and Material | | | | |
| Master Schedule for F,E & D Tower | | 28-Nov-2014 08:00 | 07-Sep-2016 17:00 | 551d | 551d | Rs41,968,655.00 | 07-Sep-2016 17:00, Master Schedule | | | | |
| Tower F | | 28-Nov-2014 08:00 | 18-Aug-2016 17:00 | 534d | 534d | Rs14,293,825.00 | 18-Aug-2016 17:00, Tower F | | | | |
| Tower E | | 10-Dec-2014 08:00 | 30-Aug-2016 17:00 | 534d | 534d | Rs13,621,230.00 | 30-Aug-2016 17:00, Tower E | | | | |
| Tower D | | 22-Dec-2014 08:00 | 07-Sep-2016 17:00 | 531d | 531d | Rs14,053,600.00 | 07-Sep-2016 17:00, Tower D | | | | |
| Master Schedule For A,B & C Tow | | 28-Nov-2014 08:00 | 20-Oct-2016 17:00 | 588d | 588d | Rs54,996,420.00 | 20-Oct-2016 17:00, Master Schedule | | | | |
| Tower A | | 28-Nov-2014 08:00 | 27-Sep-2016 17:00 | 568d | 568d | Rs19,187,155.00 | 27-Sep-2016 17:00, Tower A | | | | |
| Tower B | | 10-Dec-2014 08:00 | 27-Sep-2016 17:00 | 558d | 558d | Rs19,219,755.00 | 27-Sep-2016 17:00, Tower B | | | | |
| Tower C | | 22-Dec-2014 08:00 | 20-Oct-2016 17:00 | 568d | 568d | Rs16,589,510.00 | 20-Oct-2016 17:00, Tower C | | | | |

Fig-1 Baseline of the Project 06-Oct-2014

Updating:

Fig-2 Updated the Project to 15-Dec-2015

Scheduling:

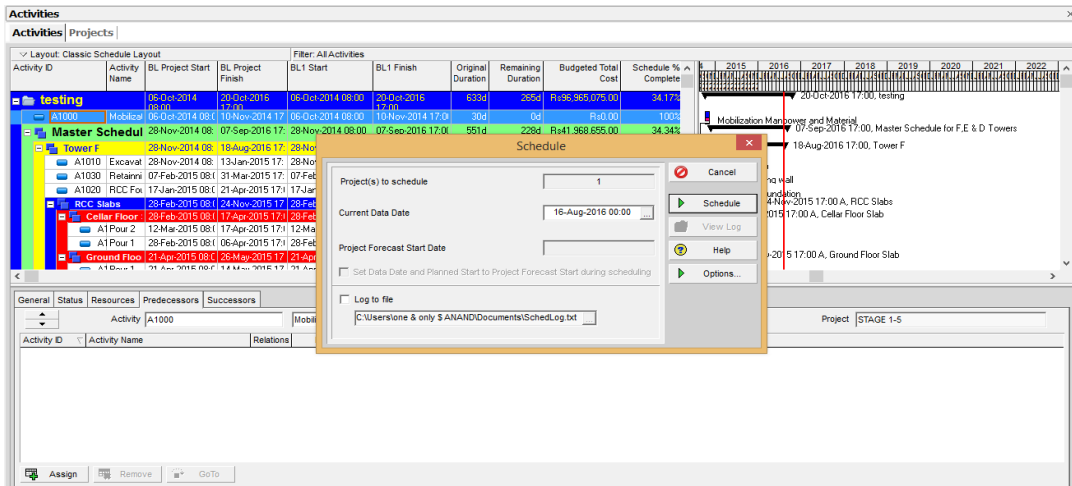


Fig-3 Scheduling Process Has Done For the Date 16-Aug-2016

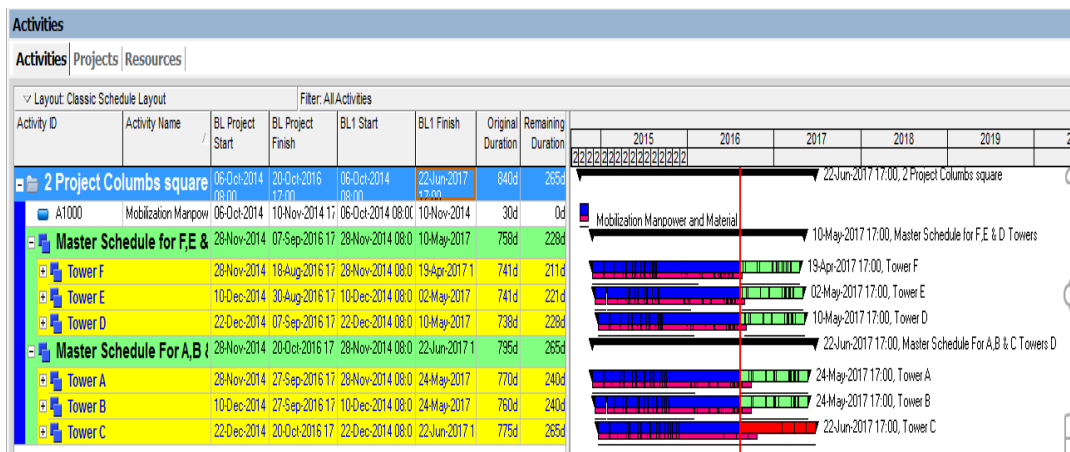


Fig- 4 Duration of the Project Got Extended To 22-Jun -2017

Review Date:

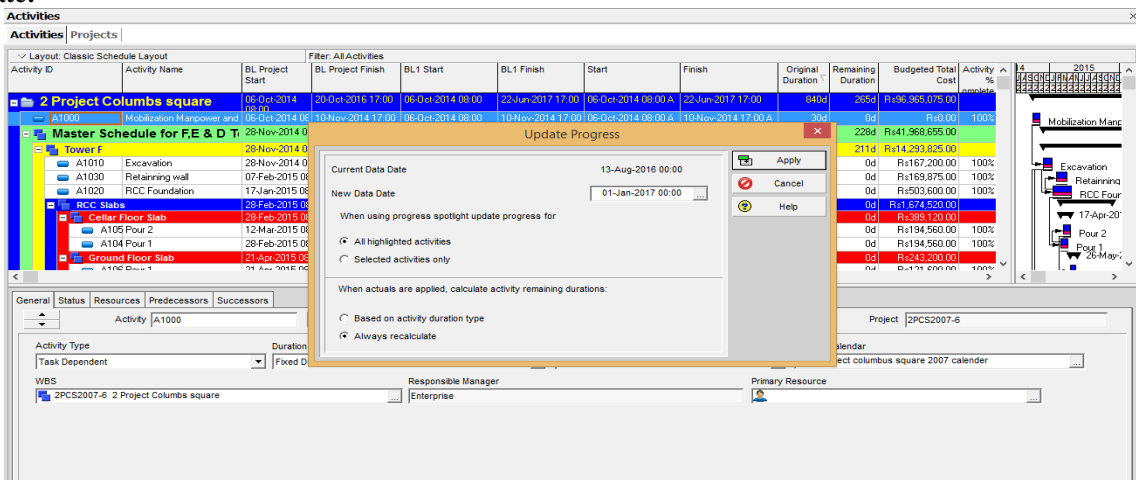


Fig- 5 Updating Process of the Project to 1-Jan-2017

2.1 Date of monitoring:

Parameter has been monitored by giving lower threshold value and upper threshold value as inputs and also respective date for monitoring the project.

Table -1: Date of monitoring

| | |
|----------------------|--------------------|
| From The Date | To The Date |
| 06-Oct-2014(Ps) | 1-Jan-2017 (DD) |
| 16-Aug-2016 | 1-Jan-2017 |

2.2 Fixed Units Concept:

Fixed Units Concept of Primavera Helps To Reduce The Duration Of An Activity That Is If We Increase The Resources, We Can Reduce The Duration of The Activity.

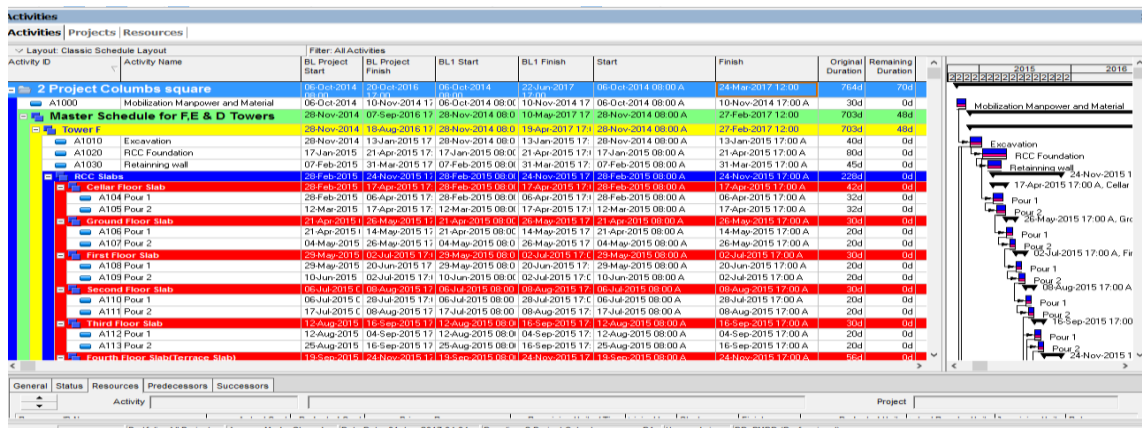


Fig- 6 by Doubling the Resources Units Duration of the Project Got Reduced

3. RESULTS AND DISCUSSIONS

As per the above discussion made in the project monitoring, threshold parameters are evaluated for the delay of 8 months as per the dates given, and the work started from 16-aug-2016 with the review date of 1-jan-17.

The following results can be tabulated as per variance threshold parameter:

1. Start date variance (days):

| From the date | To the date (Review date) | No. of issues | Lower threshold reading | Upper threshold reading | Maximum lower threshold reading | Maximum higher threshold reading |
|---------------|---------------------------|---------------|-------------------------|-------------------------|---------------------------------|----------------------------------|
| 06-Oct-14 | 1-jan-17 | 78 | -5 | 5 | -207 | - |
| | | 78 | -1 | 2 | -207 | - |
| 16-aug-16 | 1-jan-17 | 64 | -5 | 5 | -207 | - |
| | | 64 | -1 | 2 | -207 | - |

Discussion: Maximum issues obtained are 78 and maximum variance is 207 days, variance is in negative. So it's behind the schedule, which are shown below.

| | |
|---------------|-------------|
| 15-feb-2016 | 23-apr-2016 |
| 26-march-2016 | 03-jun-2016 |
| 07-april-2016 | 15-jun-2016 |
| 23-apr-2016 | 1-jul-16 |
| 05-may-2016 | 1-jul-2016 |
| 17-may-2016 | 25-jul-2017 |

Solution: The above results indicates that 78 WBS levels are effected and delay is in the range of -1 to 2 days and -5 to 5 days, so it's the indication to the management that based on 78 issues action has to be taken by setting on resolution date and working on the current measure.

2. Finish date variance (days):

| From the date | To the date (Review date) | No. of issues | Lower threshold reading | Upper threshold reading | Maximum lower threshold reading | Maximum higher threshold reading |
|---------------|---------------------------|---------------|-------------------------|-------------------------|---------------------------------|----------------------------------|
| 06-Oct-14 | 1-jan-17 | 133 | -5 | 5 | -207 | - |
| | | 133 | -1 | 2 | -207 | - |
| 16-aug-16 | 1-jan-17 | 119 | -5 | 5 | -207 | - |
| | | 119 | -1 | 2 | -207 | - |

Discussion: Max .number of issue is 133 and the maximum variance 207 days is in negative so it's behind the schedule in date range.

| | |
|-------------|-------------|
| 28-nov-2014 | 18-aug-2016 |
| 10-dec-2014 | 30-aug-2016 |
| 22-dec-2014 | 07-sep-2016 |
| 28-nov-2014 | 27-sep-2016 |
| 10-dec-2014 | 27-sep-2016 |
| 22-dec-2014 | 20-oct-2016 |

Solution: The above results indicates that 133 WBS levels are effected and delay is in the range of -1 to 2 days and -5 to 5 days, so it's the indication to the management that based on 133 issues action has to be taken by setting on resolution date and working on current measure.

3. Schedule variance (Rs) :

| From the date | To the date (Review date) | No. of issues | Lower threshold reading | Upper threshold reading | Maximum lower threshold reading | Maximum higher threshold reading |
|---------------|---------------------------|---------------|-------------------------|-------------------------|---------------------------------|----------------------------------|
| 06-Oct-14 | 1-jan-17 | 167 | -5000 | -10000 | (Rs37,421,578.67) | - |
| | | 94 | -5000 | +10000 | (Rs37,421,578.67) | - |
| | | 87 | -100000 | 2 | (Rs37,421,578.67) | - |
| | | 78 | -200000 | 2 | (Rs37,421,578.67) | - |
| | | 67 | -300000 | 2 | (Rs37,421,578.67) | - |
| | | 39 | -500000 | 2 | (Rs37,421,578.67) | - |
| 16-aug-16 | 1-jan-17 | 119 | -5000 | -10000 | (Rs37,421,578.67) | - |
| | | 88 | -5000 | 10000 | (Rs37,421,578.67) | - |
| | | 74 | -100000 | 2 | (Rs37,421,578.67) | - |
| | | 65 | -200000 | 2 | (Rs37,421,578.67) | - |
| | | 57 | -300000 | 2 | (Rs37,421,578.67) | - |
| | | 38 | -500000 | 2 | (Rs37,421,578.67) | - |

Discussion: Max .number of issue is 167 and the maximum variance is (Rs37, 421,578.67) in negative so it's behind the schedule.

Solution: The above results indicates that 167 WBS levels are effected and delay is in the range of -5000 to -10000Rs, so it's the indication to the management that based on the 167 issues action has to be taken by increase the resources in the project .

4. Cost variance (Rs):

| From the date | To the date (Review date) | No. of issues | Lower threshold reading | Upper threshold reading | Maximum lower threshold reading | Maximum higher threshold reading |
|---------------|---------------------------|---------------|-------------------------|-------------------------|---------------------------------|----------------------------------|
| 06-Oct-14 | 1-jan-17 | 35 | -5000 | 100000 | (Rs3,291,391.33) | - |
| | | 9 | -200000 | 200000 | (Rs3,291,391.33) | - |
| | | 3 | -700000 | 200000 | (Rs3,29,391.33) | - |
| 16-aug-16 | 1-jan-17 | 31 | -5000 | -10000 | (Rs3,291,391.33) | - |
| | | 9 | -200000 | 200000 | (Rs3,291,391.33) | - |
| | | 3 | -700000 | 200000 | (Rs3,291,391.33) | - |

Discussion: Max .number of issue is 35 and the maximum variance is (Rs3, 291,391.33) in negative so it's over budget.

Solution: The above results indicates that 35 WBS levels are effected and delay is in the range of -5000 to 100000Rs, so it's the indication to the management that based on the 35 issues action has to be taken by reducing the actual cost or the work progress for the existing activities as per plan should be greater without any increase in the actual cost.

5. Accounting variance (Rs):

| From the date | To the date (Review date) | No. of issues | Lower threshold reading | Upper threshold reading | Maximum lower threshold reading | Maximum higher threshold reading |
|---------------|---------------------------|---------------|-------------------------|-------------------------|---------------------------------|----------------------------------|
| 06-Oct-14 | 1-jan-17 | 159 | 0 | 100000 | (Rs81,570.00) | Rs34,130,187.33 |
| | | 174 | -5000 | -10000 | (Rs81,570.00) | Rs34,130,187.33 |
| | | 159 | -5000 | 100000 | (Rs81,570.00) | Rs34,130,187.33 |
| | | 82 | -250000 | 100000 | | Rs34,130,187.33 |
| | | 82 | -500000 | 100000 | | Rs34,130,187.33 |
| 16-aug-16 | 1-jan-17 | 105 | 0 | 100000 | (Rs72,000.00) | Rs34,130,187.33 |
| | | 119 | -5000 | -10000 | (Rs72,000.00) | Rs34,130,187.33 |
| | | 105 | -5000 | 100000 | (Rs72,000.00) | Rs34,130,187.33 |
| | | 69 | -250000 | 100000 | | Rs34,130,187.33 |
| | | 69 | -500000 | 100000 | | Rs34,130,187.33 |

Discussion: Max .number of issue is 174 and the maximum variance is (Rs81, 570.00) in negative so it's the indication of actual cost is exceeds the planned cost, and also in accounting variance some of the WBS are positive so it's the indication that cost is under control.

Solution: The above results indicates that 174 WBS levels are effected and delay is in the range of -5000 to -10000Rs, so it's the indication to the management that based on the 174 issues in the project, they can avoid accounting variance in the future

4. CONCLUSIONS

- Duration of the project is reduced to 3 months
- Got to know the exact status of the projects.
- Changes done based on the threshold parameter.
- As per the abstract the delay of 8 months was approximately reduced to 3 months that reducing the project schedule by 30%.
- Resources allocation was revised to crunch the project duration
- If the project progress is executed in the same way the project can be completed on schedule.

5. REFERENCES

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