



S-Curve Calculations Overview

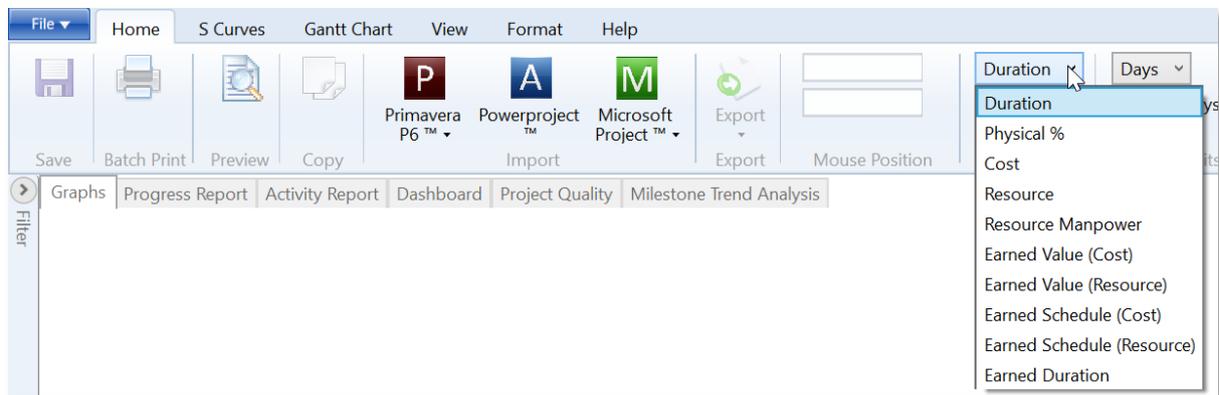
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Introduction

This document explains the 10 different S Curve types available in Project Tracker. The examples use Microsoft Project; however, the calculations are identical for Primavera P6 and Powerproject.

The curve types are selected from the Home Tab, S Curves.

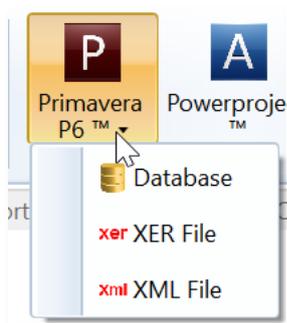


Project Tracker imports data with one click from each of the below mentioned project management software packages. Project Tracker does not use Excel, instead creates its own graphs in the software.

Supported Project Management Software

Primavera P6

Project Information is imported from P6 in 3 ways;



Database uses a direct connection to your P6 database whether it be Oracle, SQL or SQL Lite.

XER File allows the import of P6 generated XER files for live data and baselines. P6 does not need to be installed on your machine.

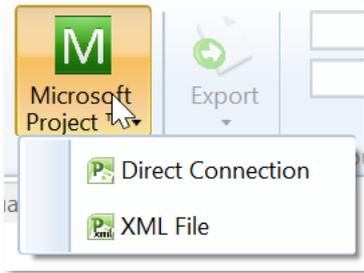
XML File allows the import of P6 generated XML files for live data and baselines. P6 does not need to be installed on your machine.

Powerproject

Project Information is imported using a direct connection to Powerproject which must be installed on your machine.

Microsoft Project

Project Information is imported from Project in 2 ways;



Direct Connection uses a connection to your installed version of Microsoft Project. It must be installed on your machine.

XML File allows the import of Microsoft Project generated XML files for live data and baselines. P6 does not need to be installed on your machine.

Recommended Project Set Up

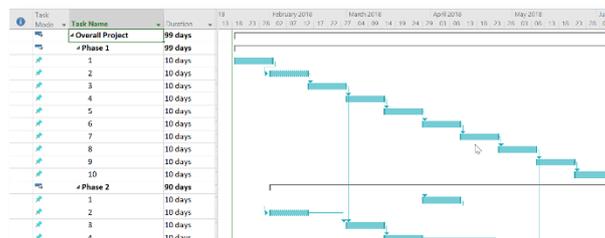
The simplest way of creating an S Curve is by using the Duration option. This negates the need for costs and resources to be added to the project. The calculation for a duration graph is detailed later.

Project Tracker will import all the relevant information from your project, so if you have costs and resources assigned, these are imported to allow cost and resource graphs to be created.

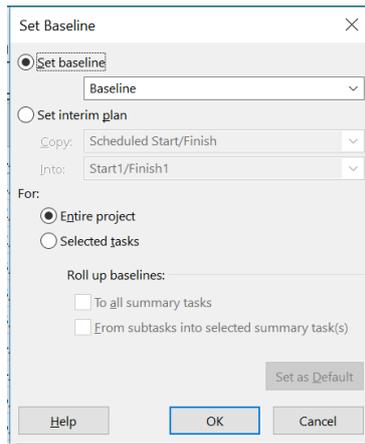
Irrespective of the Project Management software, ideally, you should have a baseline to allow planned data to be shown. Additionally, the status or data date should be set each reporting period and the project recalculated to move uncompleted activities to the right of that date. This allows the forecast to complete to be accurately plotted.

A typical set up for Microsoft Project is as below;

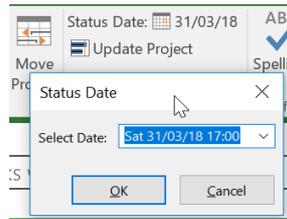
Firstly, we need to set up the project.



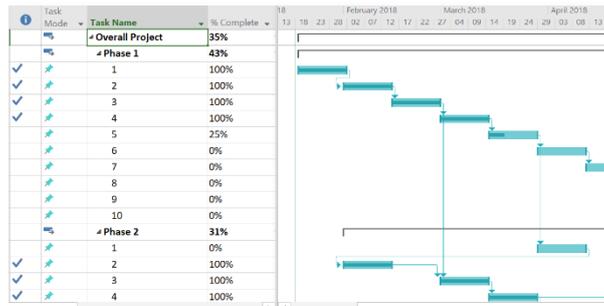
The next step is to baseline the project so that we have something to compare against.



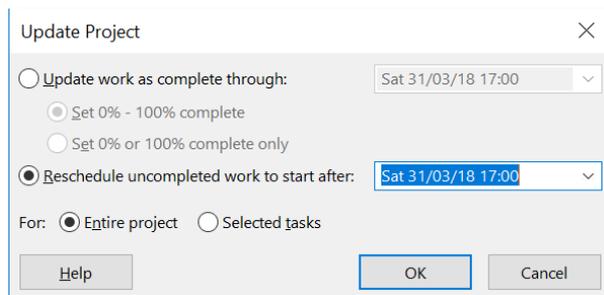
Now as the project gets underway add progress at each status date. Change the status date in Microsoft Project as required.



Now we can add progress against each activity. It's useful to insert a column for % complete.



Update the project to move uncompleted work to after the Status date.



This is useful to see the effects of any delays on the finish date of the project.

If, however, you do not recalculate the project, Project Tracker will adjust data internally to move uncompleted work to after the date. Please see Page 10 for detailed explanation of this calculation.

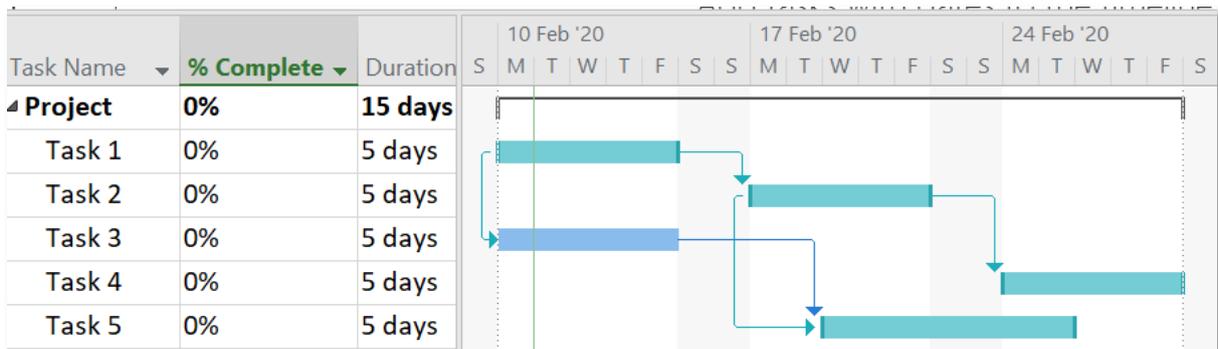
Curve Types Explained

There are 10 curve types in Project Tracker. These are explained in detail below (please note whilst Excel is used to explain calculations it is not used by Project Tracker)

Duration

The simplest curve to produce that does not require costs or resources to be added to your project.

Let's assume we have a simple project like the one below (these calculations are the same for Primavera P6 and Powerproject)



Project Tracker will analyse each task for each day of the project and calculate the number of hours per day to give a cumulative total of hours across the project.

It can be easier to understand how the data is calculated by using a spreadsheet. The task durations and dates have been added. So, where there is duration for a task this has been added to Excel in hours (assuming the calendar hours per day are 8).

	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb
Task 1	8	8	8	8	8														
Task 2								8	8	8	8	8							
Task 3	8	8	8	8	8														
Task 4													8	8	8	8	8	8	
Task 5										8	8	8		8	8				

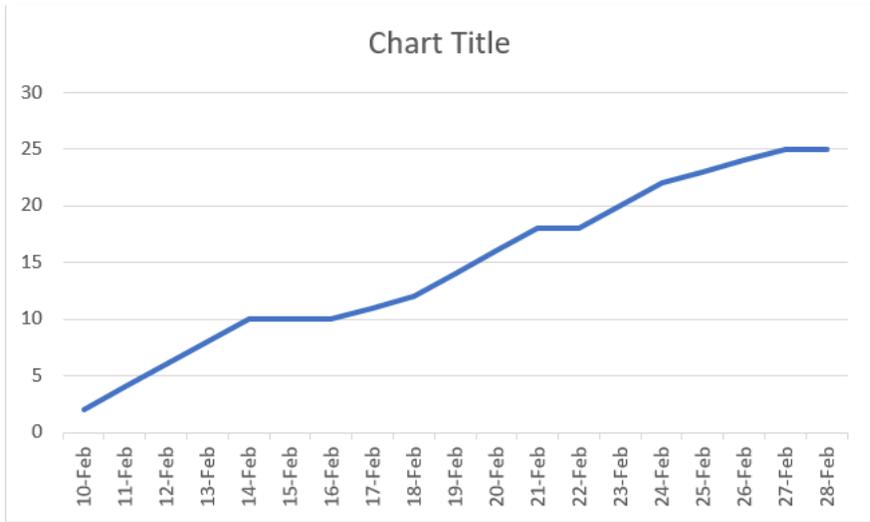
Note there is no work at weekends so no data is shown. Project Tracker imports all calendars so all non-working time is taken into account.

Project Tracker then cumulates the data to create a curve. In the screenshot below the hours have been cumulated and an additional line has been added to show this in days.

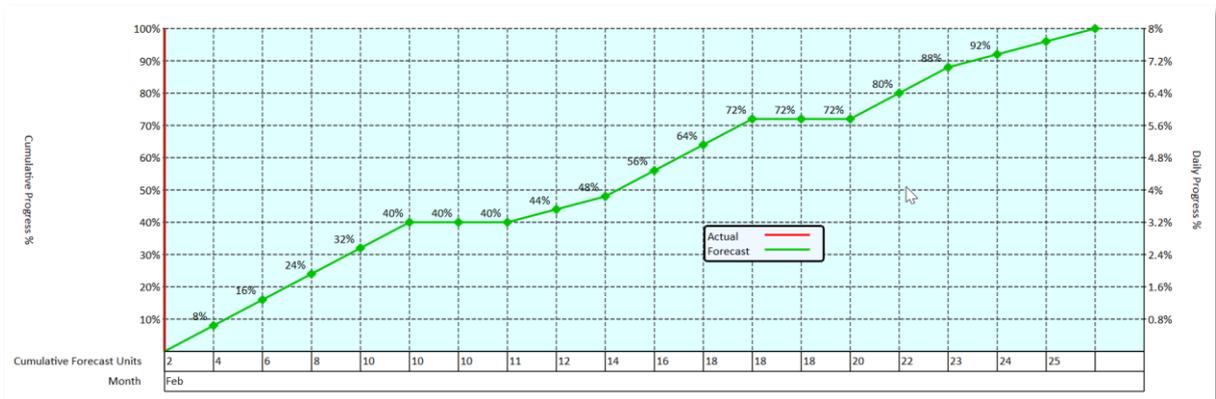
Note: The duration of the project in Microsoft Project is shown as 15 days which is the working duration between the start and finish of the project. However, for the curve the total working duration in the project is 25 days which is the cumulative duration of all tasks.

	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb
Task 1	8	8	8	8	8														
Task 2								8	8	8	8	8							
Task 3	8	8	8	8	8														
Task 4													8	8	8	8	8	8	
Task 5										8	8	8		8	8				
Total Hours	16	16	16	16	16	0	0	8	8	16	16	16	0	16	16	8	8	8	0
Total Days	2	2	2	2	2	0	0	1	1	2	2	2	0	2	2	1	1	1	0
Cumulative Hours	16	32	48	64	80	80	80	88	96	112	128	144	144	160	176	184	192	200	200
Cumulative Days	2	4	6	8	10	10	10	11	12	14	16	18	18	20	22	23	24	25	25

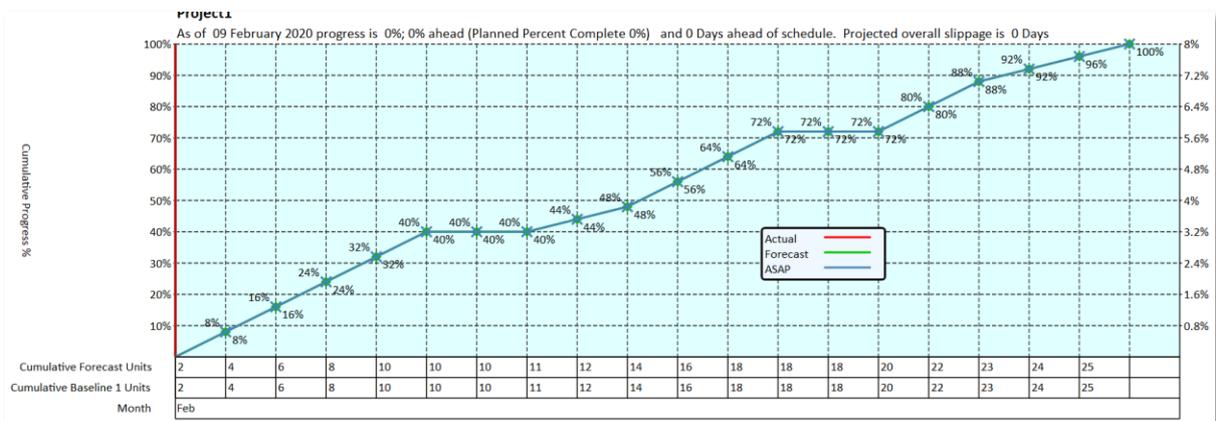
Graphed in Excel the data would look like this;



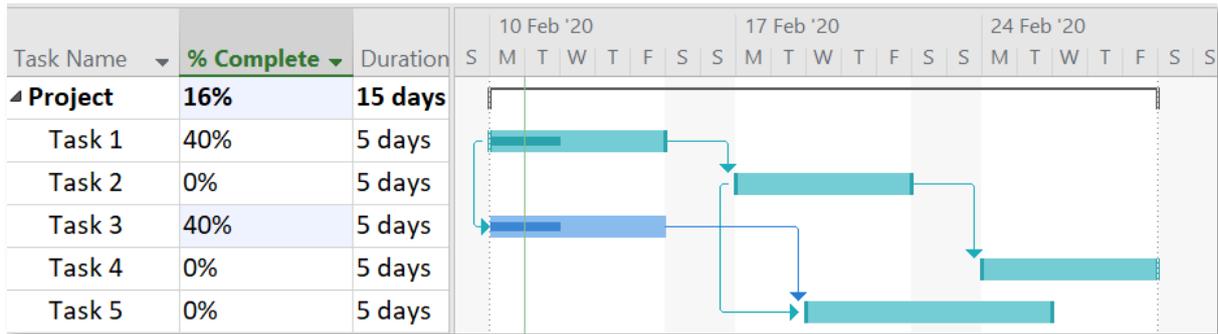
In Project Tracker it looks like this;



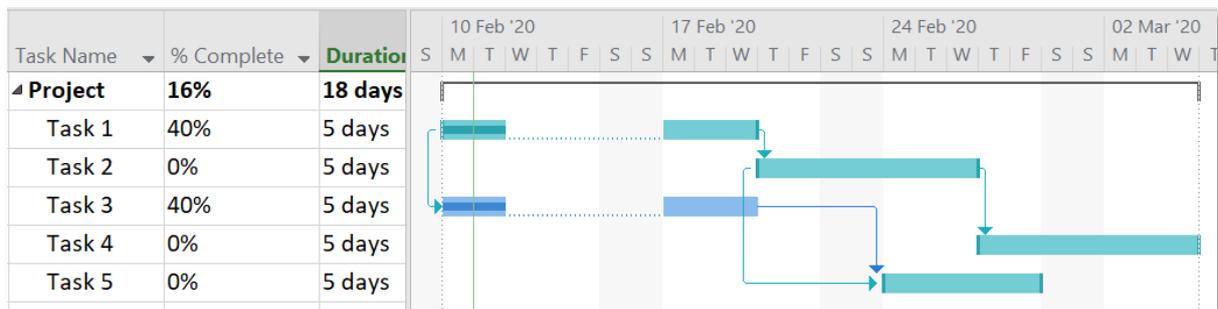
Let's assume the project has been baselined. As the tasks haven't moved or changed durations the Baseline Curve and the Forecast Curve are identical.



Now we will look at the effect of adding progress to the project. The status date has been moved to the 15th February and Task 1 and Task 3 have been marked as 40% complete. The should both be 100% complete.



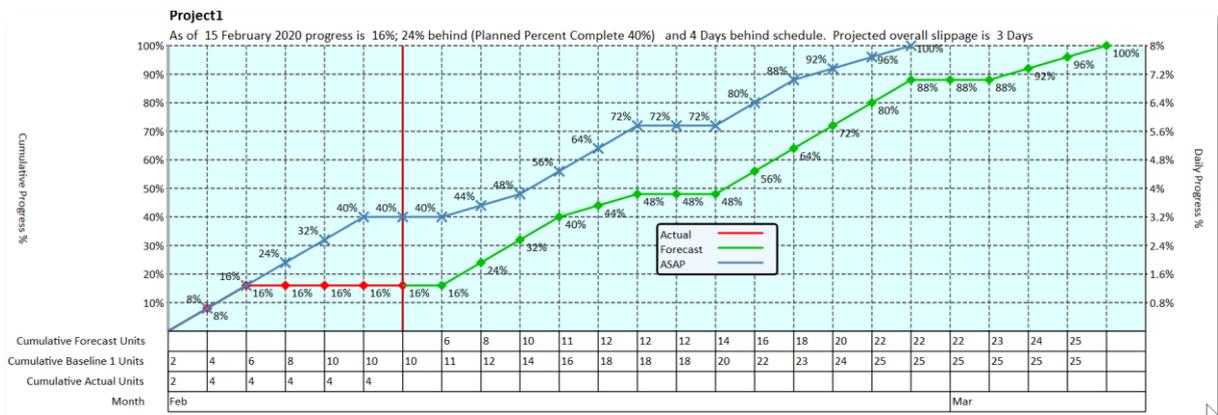
If we now recalculate the project it looks like this.



Looking at Excel our project data now looks like this (actual hours in red, remaining hours in green)

LIVE PROJECT	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb	29-Feb	01-Mar	02-Mar	03-Mar	04-Mar
Task 1	8	8																						
Task 2									8	8	8	8	8											
Task 3	8	8																						
Task 4																								
Task 5																								
Cumulative Hours	16	32	32	32	32	32	32	48	64	80	88	96	96	96	112	128	144	160	176	176	176	184	192	200
Cumulative Days	2	4	4	4	4	4	4	6	8	10	11	12	12	12	14	16	18	20	22	22	22	23	24	25

Project Tracker will now plot this to create the curve.



There are some additional items displayed now that there is some progress and these are explained below;

Progress is shown as 16%.

This is calculated by dividing the total actual days by the total days in the project i.e. 4/25

Planned percent complete 40%.

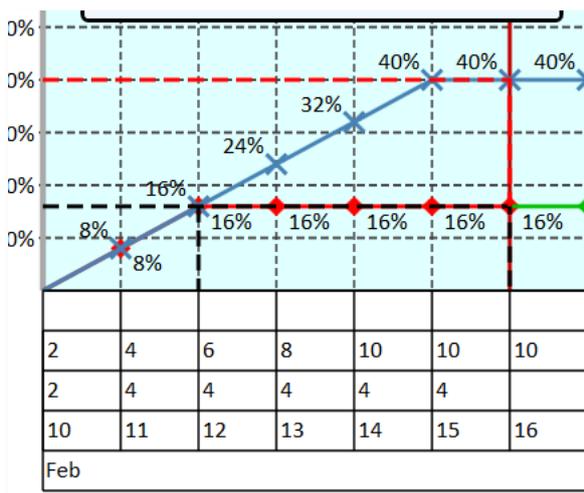
Both Microsoft Project and Primavera P6 don't display planned percent complete for duration as an overall value against the project.

Project Tracker calculates this by looking at the baseline date at the status date and calculating the duration that should have been completed. If we look at the Excel baseline data, we can see that at the 15th February we should have completed 10 days of task durations against a total days of 25. So, the planned percent is 40% (or 10/25).

BASELINE	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb
Task 1	8	8	8	8	8														
Task 2								8	8	8	8	8							
Task 3	8	8	8	8	8														
Task 4														8	8	8	8	8	
Task 5										8	8	8		8	8				
Cumulative Hours	16	32	48	64	80	80	80	88	96	112	128	144	144	160	176	184	192	200	200
Cumulative Days	2	4	6	8	10	10	10	11	12	14	16	18	18	20	22	23	24	25	25
Planned %	8%	16%	24%	32%	40%	40%	40%	44%	48%	56%	64%	72%	72%	80%	88%	92%	96%	100%	100%

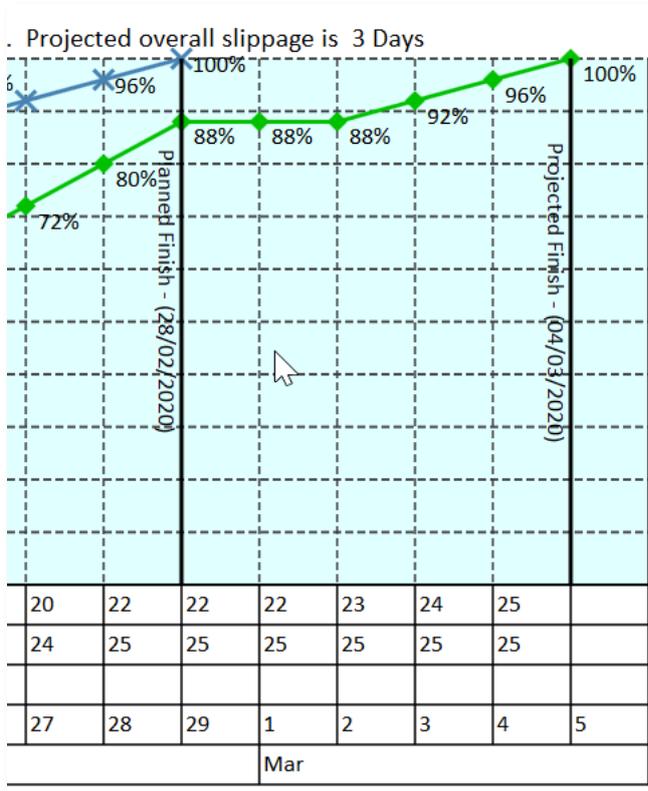
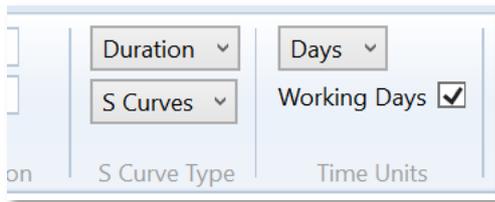
4 days behind schedule

This displays the days difference between the status date and the date where 16% (actual progress) should have been achieved. in the example below it is the difference between the 15th February and the 11th February.



Project Overall slippage is 3 days

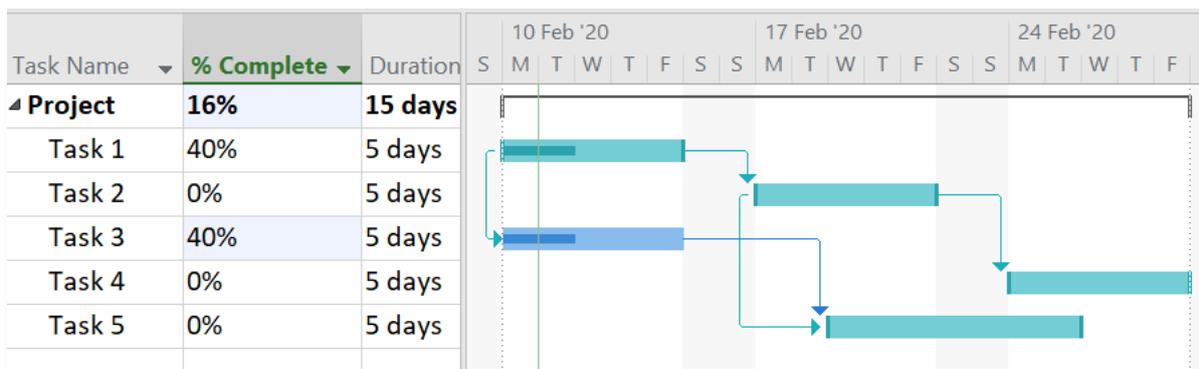
This displays the difference between the finish date of the current schedule and the finish date of the baseline. In this case it is 3 days as Working Days have been selected.



Effects of not recalculating the project.

If the project is not recalculated Project Tracker will do its own internal calculations to move uncompleted work to the right of the status date and completed work to the left of the status date.

If we look at our example without recalculating the project it looks like this;



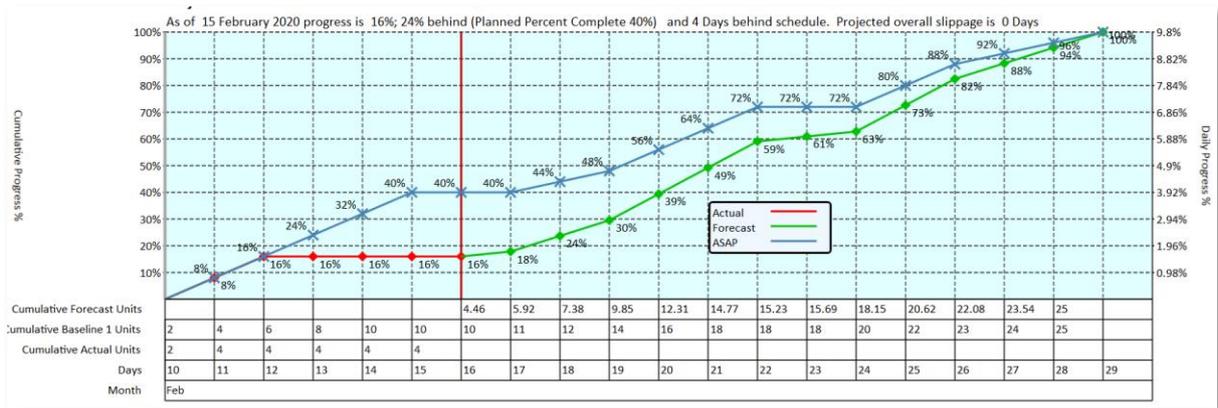
The Excel data would be as below;

LIVE PROJECT	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb
Task 1	8	8	8	8	8														
Task 2								8	8	8	8	8							
Task 3	8	8	8	8	8														
Task 4													8	8	8	8	8	8	8
Task 5										8	8	8		8	8				
Cumulative Hours	16	32	48	64	80	80	80	88	96	112	128	144	144	160	176	184	192	200	200
Cumulative Days	2	4	6	8	10	10	10	11	12	14	16	18	18	20	22	23	24	25	25

We can see that 48 hours of incomplete task durations are to the left of the status date (80-32).

Project Tracker will take that 48 hours and divide it by the remaining working days in the days in the project. In this case 13 days are remaining so an additional 48/13 (3.69) hours will be added per day to the cumulative totals to arrive at the final total of 25 days.

The resultant curve looks different due to the additional time being added. Additionally, the project has not slipped as the baseline finish date is still the same as the current schedule finish date.



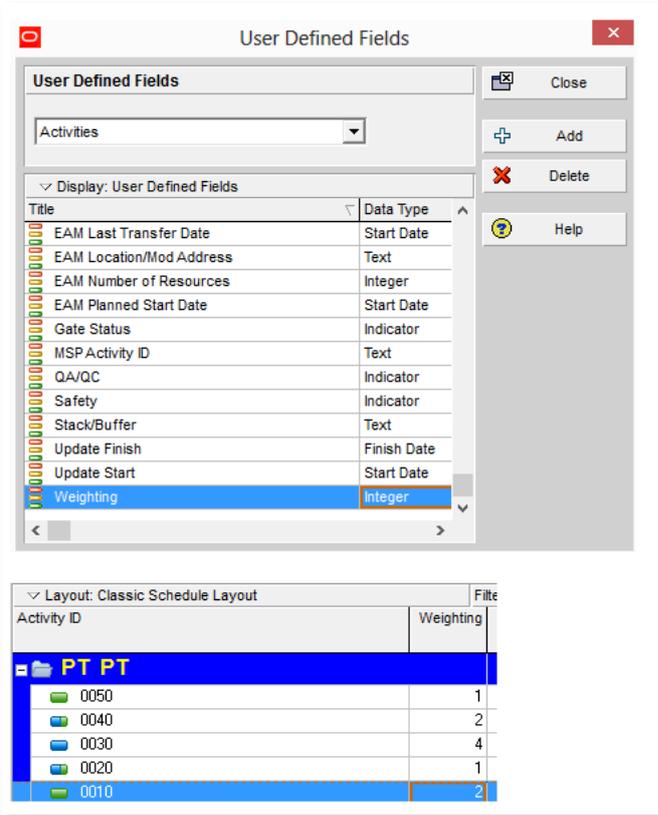
Applying Weightings.

When producing a duration-based curve each task is treated the same. Sometimes a task may be more important than another one, possibly due to importance, criticality or value. When doing cost or resource-based curves this is normally catered for by the task costing more or taking more effort to complete.

This can be achieved in a duration-based curve by weighting tasks. These are set as follows;

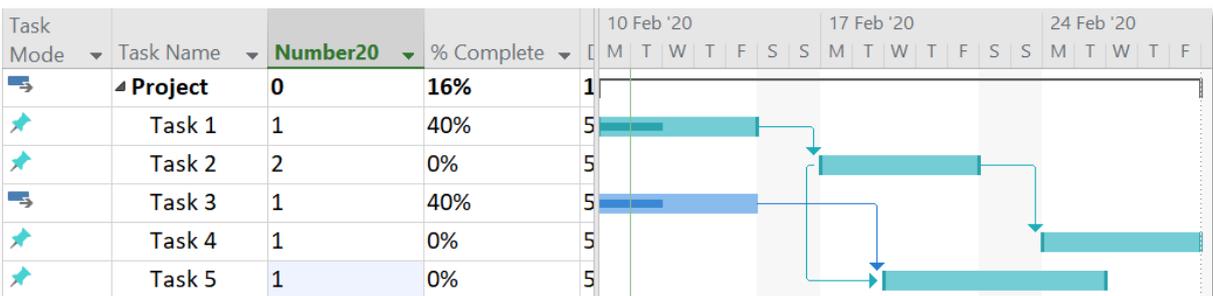
Primavera P6

Set a weighting for each task against an Integer User Field named Weighting



Microsoft Project

Set a weighting for a task using Number20 field.

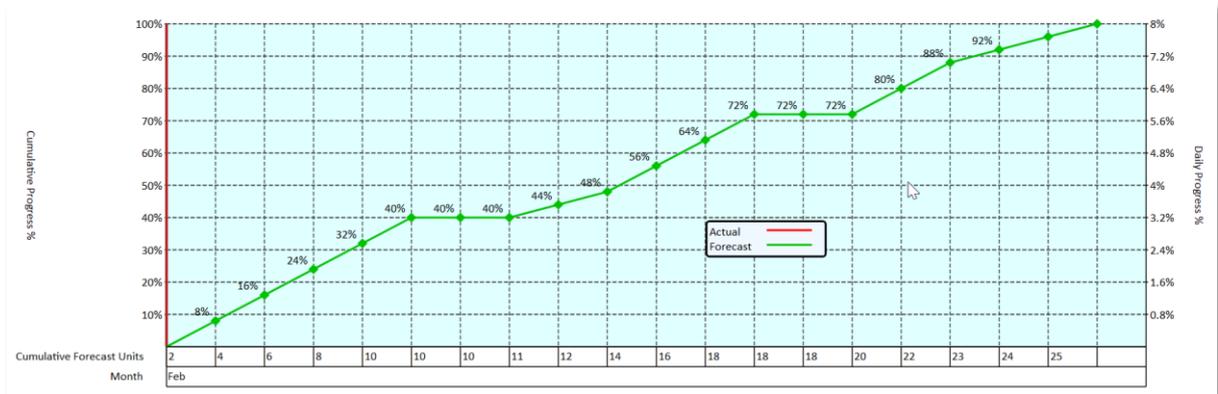


In the example above the Excel data spread would look this as Task 2 has a weighting of 2. The hours contributed to the project by Task 2 are doubled due to the weighting of 2.

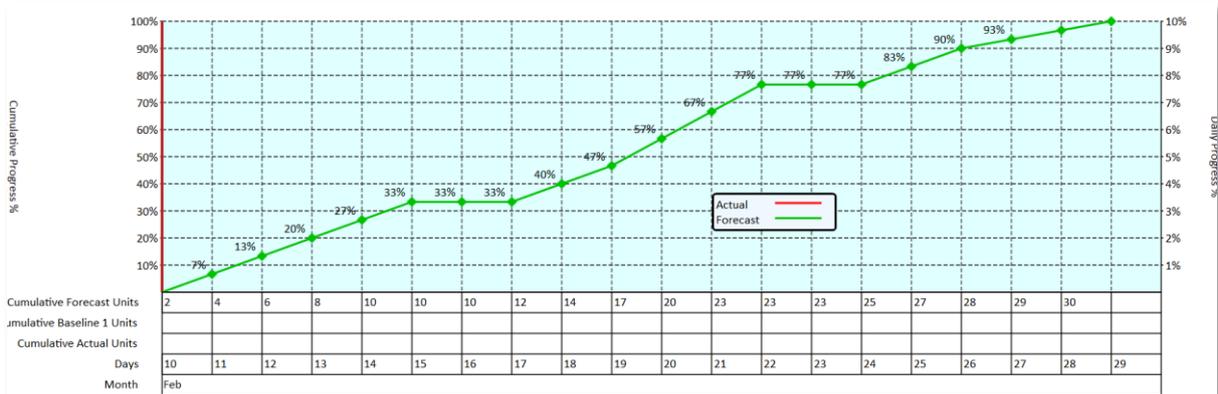
	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb
Task 1	8	8	8	8	8														
Task 2								16	16	16	16	16							
Task 3	8	8	8	8	8														
Task 4														8	8	8	8	8	
Task 5										8	8	8		8	8				
Cumulative Hours	16	32	48	64	80	80	80	96	112	136	160	184	184	200	216	224	232	240	240
Cumulative Days	2	4	6	8	10	10	10	12	14	17	20	23	23	25	27	28	29	30	30
Planned %	7%	13%	20%	27%	33%	33%	33%	40%	47%	57%	67%	77%	77%	83%	90%	93%	97%	100%	100%

The S Curve produced has a different shape to the one where all tasks were weighted as 1 (Note it is assumed all tasks have a weighting of 1 unless a specific weighting is set).

No weighting



Task 2 weighting set to 2



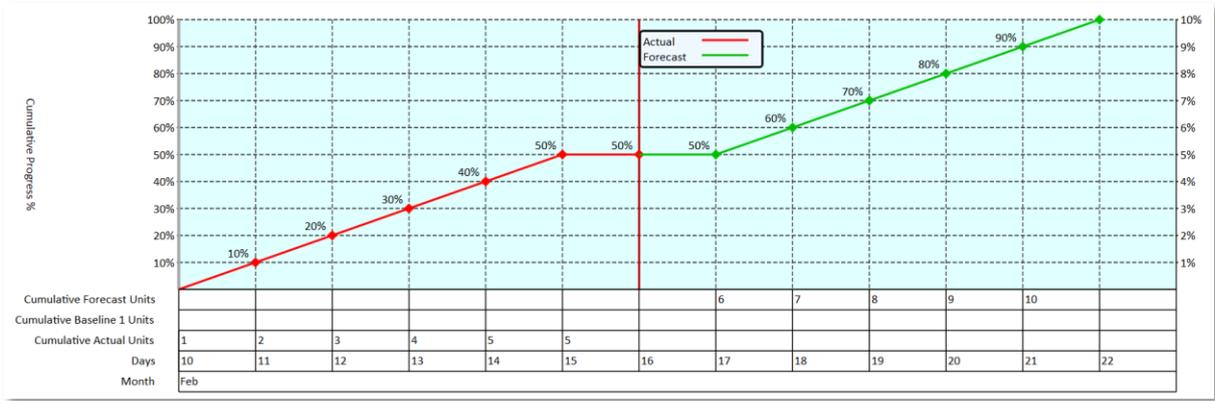
Physical % Complete

This works similarly to the duration option but adjusts the values to reflect the Physical % complete.

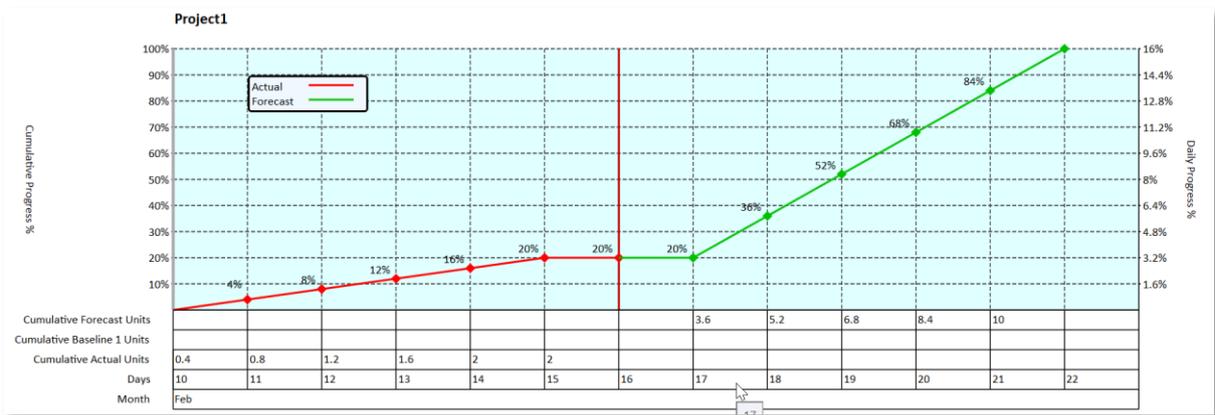
In the project below Task 1 is set to 50% duration % complete and 20% physical % complete.

Task Mode	Task Name	% Complete	Physical % Complete	Duration	10 Feb '20							17 Feb '20							
					F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
📌	Task 1	50%	20%	10 days															

The duration graph would look like this.



Project Tracker adjusts the duration done and remaining to reflect the physical %.



Cost

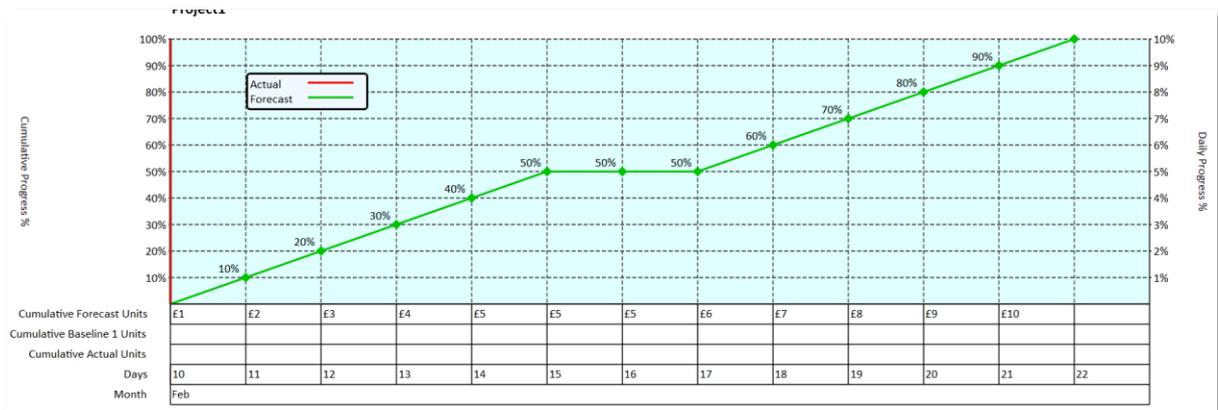
To see this graph requires costs having been added to the project.

Let's assume we have a simple project like the one below (these calculations are the same for Primavera P6 and Powerproject)

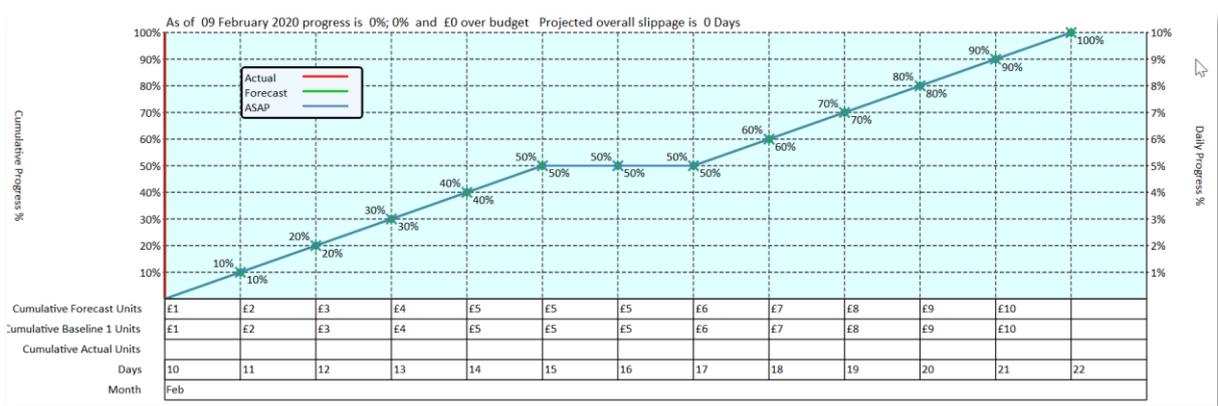
Task Name	Cost	% Complete	F	S	S	10 Feb '20					17 Feb '20					24 Feb							
						M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T		
Task 1	£10.00	0%																					
																							Labour

Project Tracker will analyse each task for each day of the project and calculate the cost per day to give a cumulative cost across the project.

In Project Tracker it looks like this;



Let's assume the project has been baselined. As the tasks haven't moved or changed durations the Baseline Curve and the Forecast Curve are identical.

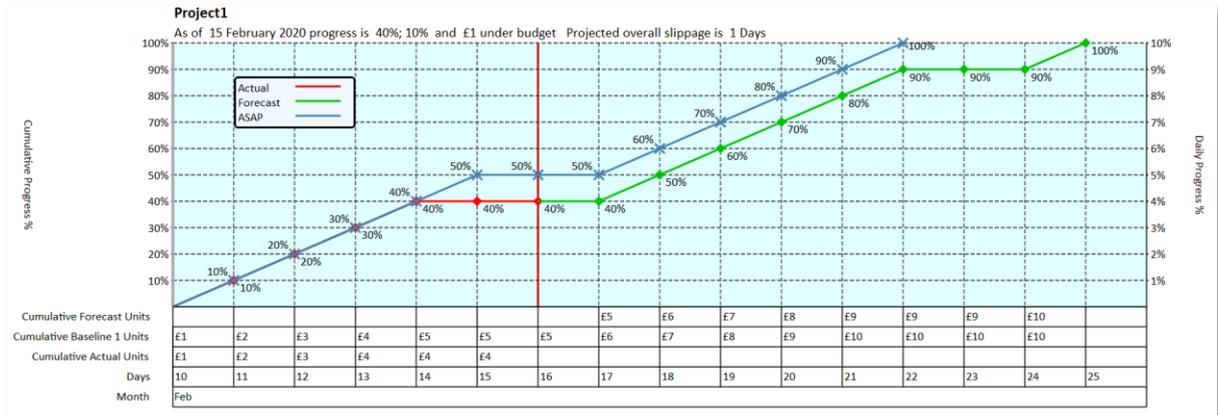


Now we will look at the effect of adding progress to the project. The status date has been moved to the 15th February and Task 1 has been marked as 40% complete. It should both be 50% complete.

If we now recalculate the project it looks like this.

Task Name	Cost	% Complete	10 Feb '20					17 Feb '20					24 Feb									
			F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	
Task 1	£10.00	40%																				

Project Tracker will now plot this to create the curve.



There are some additional items displayed now that there is some progress and these are explained below;

Progress is shown as 40%.

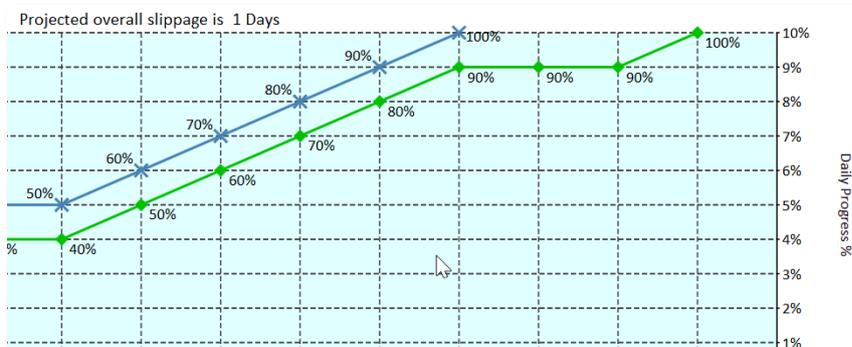
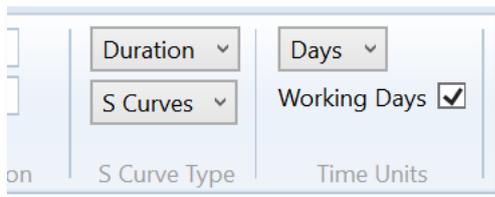
This is calculated by dividing the total actual cost by the total cost in the project.

10% and £1 under budget

Project Tracker calculates the planned spend at the status date which should be £5 or 50% of the total. As the project has achieved 40% or £4 the variance is 10% and £1.

Project Overall slippage is 1 days

This displays the difference between the finish date of the current schedule and the finish date of the baseline. In this case it is 1 days as Working Days have been selected.



Resource

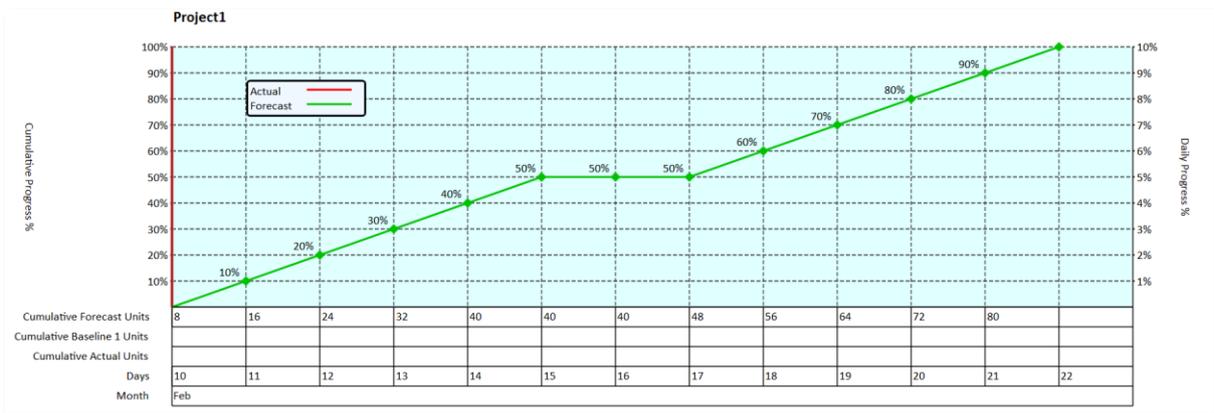
To see this graph requires resources having been added to the project.

Let's assume we have a simple project like the one below (these calculations are the same for Primavera P6 and Powerproject)

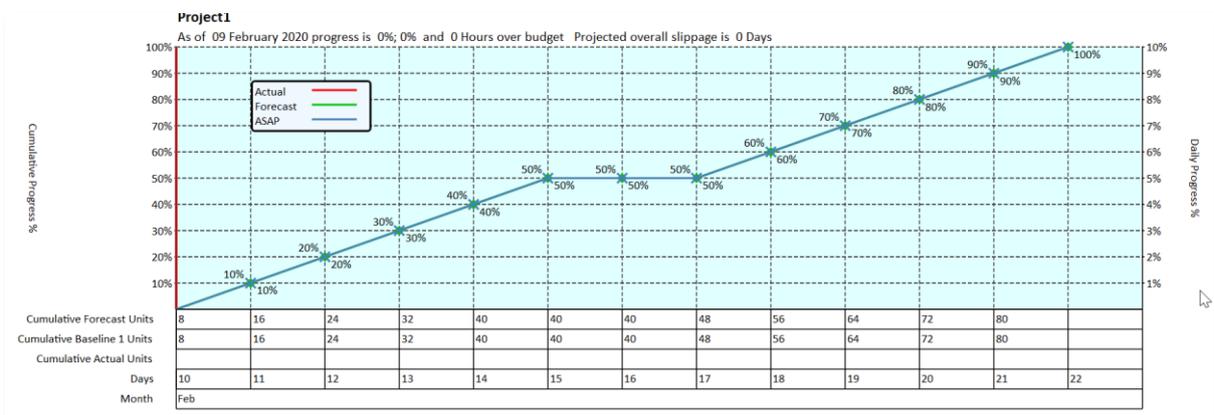
Task Name	Work	Cost	10 Feb '20							17 Feb '20							24 Feb					
			F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	
Task 1	80 hrs	£10.00																				
Labour																						

Project Tracker will analyse each task for each day of the project and calculate the work per day to give a cumulative work across the project.

In Project Tracker it looks like this;



Let's assume the project has been baselined. As the tasks haven't moved or changed durations the Baseline Curve and the Forecast Curve are identical.

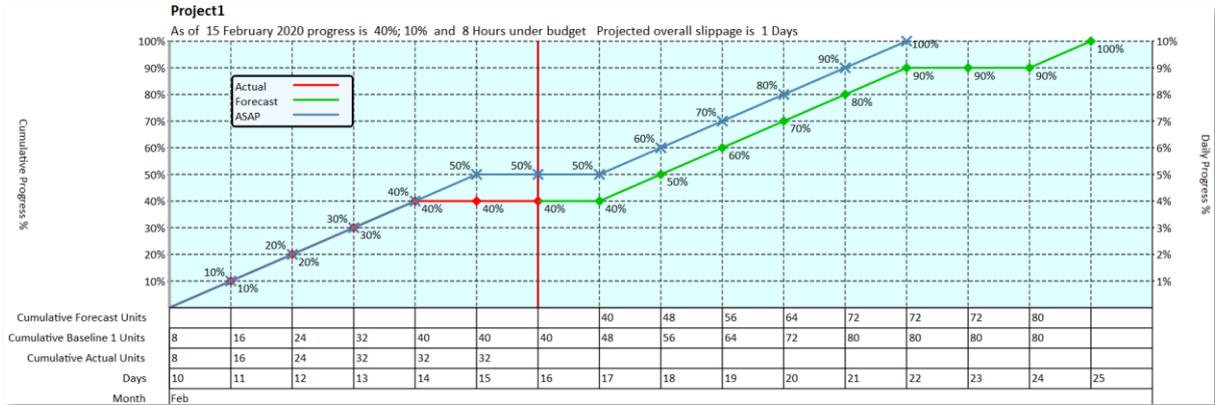


Now we will look at the effect of adding progress to the project. The status date has been moved to the 15th February and Task 1 has been marked as 40% complete. It should both be 50% complete.

If we now recalculate the project it looks like this.

Task Name	Work	Actual Work	% Complete	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
Task 1	80 hrs	32 hrs	40%																					

Project Tracker will now plot this to create the curve.



There are some additional items displayed now that there is some progress and these are explained below;

Progress is shown as 40%.

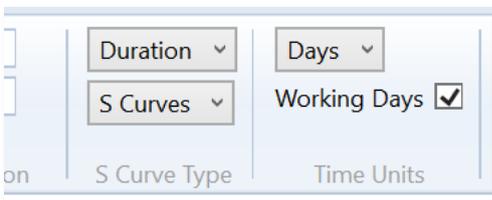
This is calculated by dividing the total actual work by the total work in the project.

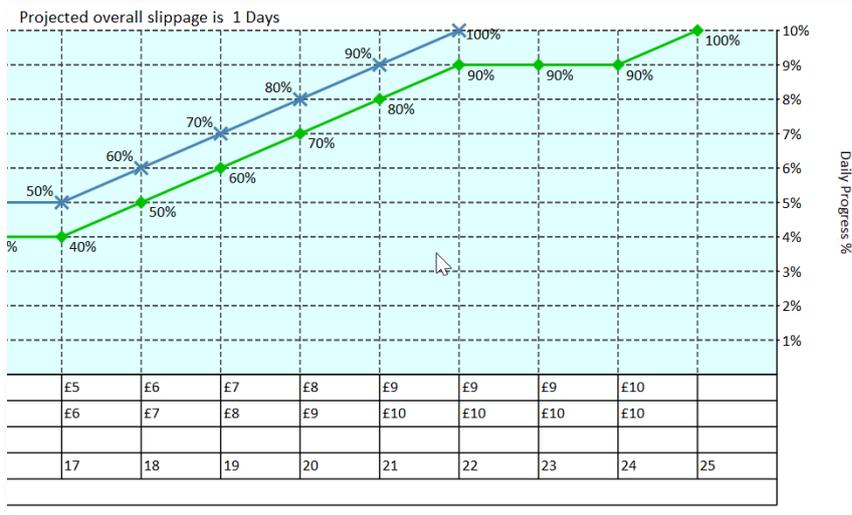
10% and 8 hours under budget

Project Tracker calculates the planned hours at the status date which should be 40 or 50% of the total. As the project has achieved 40% or 32 hours the variance is 10% and 8 hours.

Project Overall slippage is 1 days

This displays the difference between the finish date of the current schedule and the finish date of the baseline. In this case it is 1 days as Working Days have been selected.

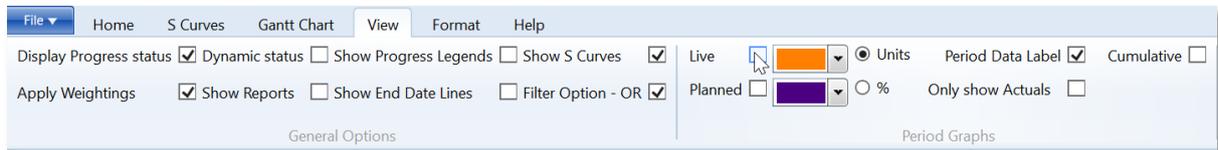




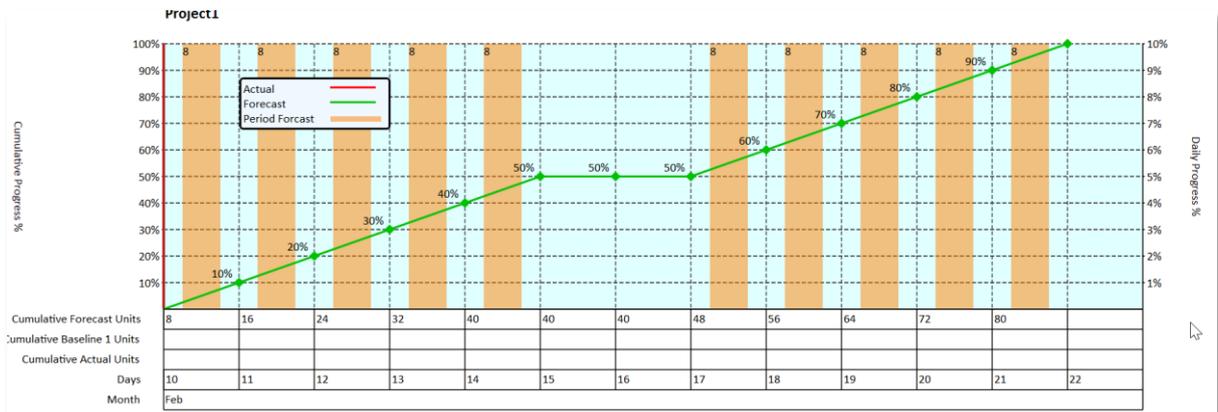
Resource Manpower

To see this graph requires resources having been added to the project. This is a special graph type specifically for looking at resource bar charts rather than concentrating on S Curves. The S Curve produced is identical to the resource one.

The only difference comes when used in conjunction with a period graph.

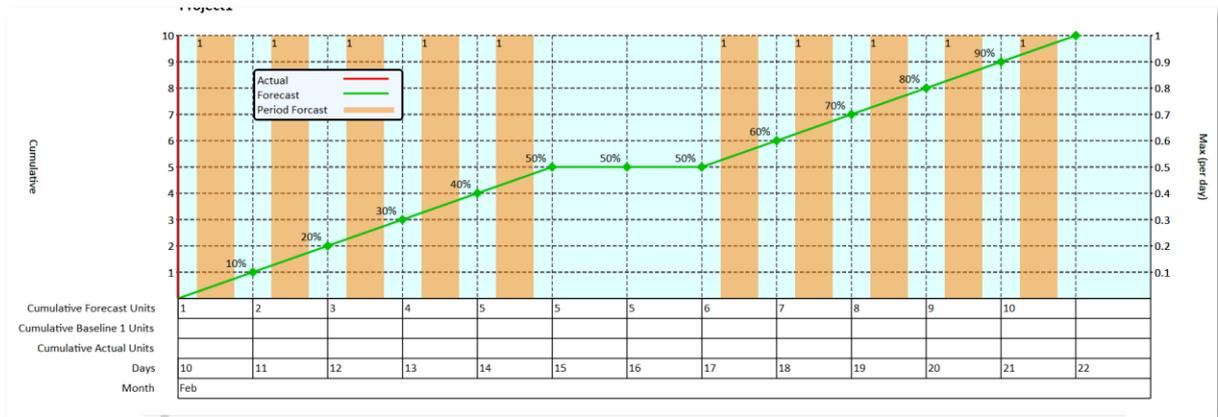


Using the standard resource graph, the period graph looks like this;



Period values are shown in man hours.

When the Resource manpower graph is selected the period values change to number of men working.

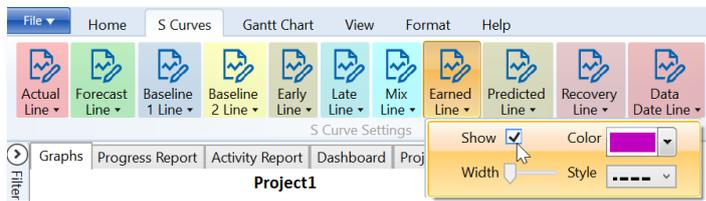


This is useful if you want to see the total labour force on a site for example.

Earned Value (Cost)

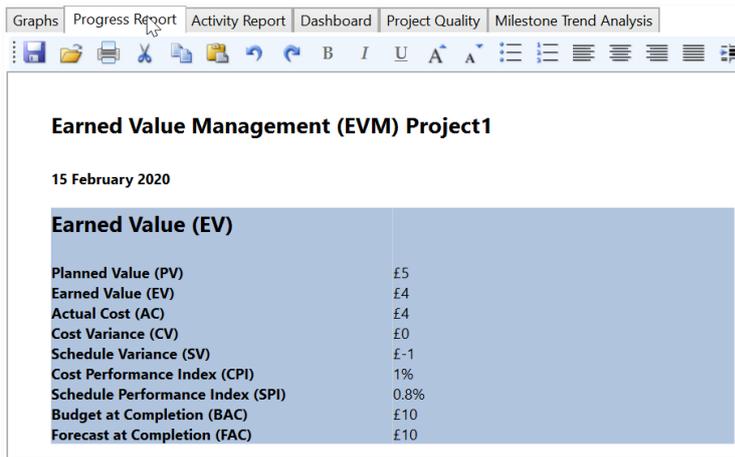
To see this graph requires costs having been added to the project.

The earned value line should be turned on from the S Curves tab.



It is recommended to create rows in the data table to reflect EV data.

Type	Unit	Description	Display Text
Cumulative	Units	Forecast	
Cumulative	Units	PV	
Cumulative	Units	Actual	
Cumulative	Units	EV	
Cumulative	Units	SV	
Cumulative	Units	CV	
Period	Units	SPI	
Period	Units	CPI	



The activity report also has changed.

Project Progress Report Project1 15 February 2020

Activity ID	Name	Percent Complete	Forecast Completion (FAC)	Budget Completion (BAC)	Actual Cost (AC)	Earned Value (EV)	Planned Value (PV)	Schedule Variance (SV)	Cost Variance (CV)	Schedule Performance Index (SPI)	Cost Performance Index (CPI)
	Project	40									
1	Task 1	40	£10	£10	£4	£4	£5	£-1	£0	0.8	1

Looking at the data table we can see the following;

Cumulative Forecast Units								£5	£6	£7	£8	£9	£9	£9	£10	
Cumulative PV Units	£1	£2	£3	£4	£5	£5	£5	£6	£7	£8	£9	£10	£10	£10	£10	
Cumulative Actual Units	£1	£2	£3	£4	£4	£4										
Cumulative EV Units	£1	£2	£3	£4	£4	£4										
Cumulative SV Units	£0	£0	£0	£0	£1	£1										
Cumulative CV Units	£0	£0	£0	£0	£0	£0										
Period SPI Units	1	1	1	1	0.8	0.8										
Period CPI Units	1	1	1	1	1	1										
Days	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Month	Feb															

The cumulative PV (Planned Value) reflect the baseline costs

The Cumulative Actual units show the actual cost of £4 (40% of £10)

The EV (Earned Value) units show the Earned Value. At the status date 40% of the cost had been completed, therefore the EV is 40% of the total baseline cost of £10

Cumulative SV (Schedule Variance) Units show the amount of money the EV is behind the where the PV should be. As the PV should be £5 there is a schedule delay of £1.

Cumulative CV (Cost Variance) units. In this case as there has been no change to the actual costs beyond the 40% of £10 the CV is 0.

Period SPI units shows 0.8 i.e. £4 (EV) / £5 (PV). A value below 1 shows the project is in delay

Period CPI units shows 1 i.e. £4 (EV) / £4 (AC). A value below 1 shows the project is in overspend

There are some additional items displayed now that there is some progress and these are explained below;

Progress is shown as 40%.

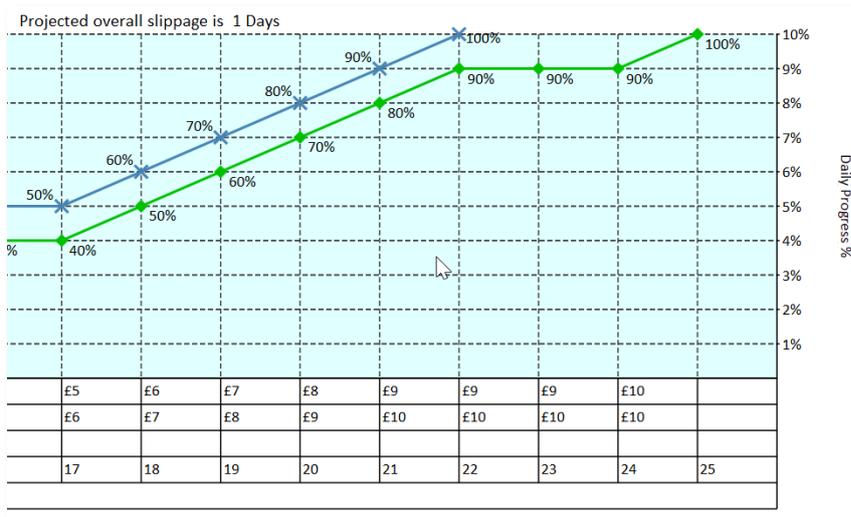
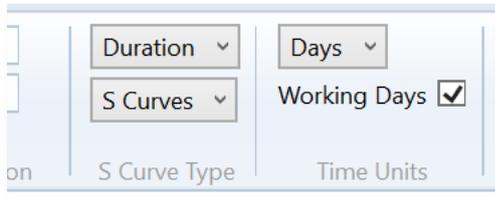
This is calculated by dividing the total actual cost by the total cost in the project.

10% and £1 under budget

Project Tracker calculates the planned spend at the status date which should be £5 or 50% of the total. As the project has achieved 40% or £4 the variance is 10% and £1.

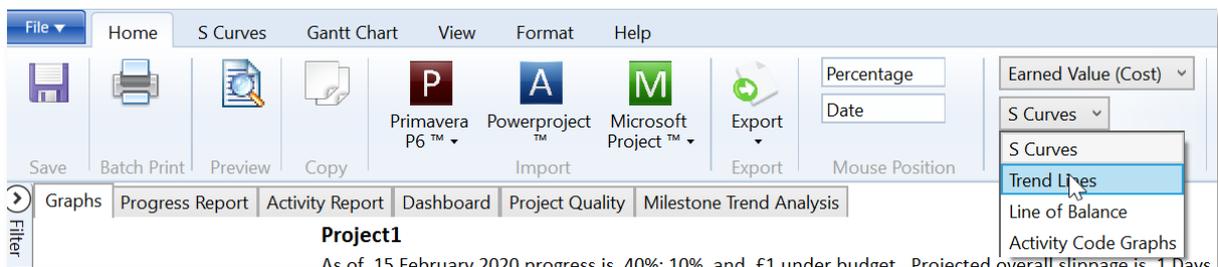
Project Overall slippage is 1 days

This displays the difference between the finish date of the current schedule and the finish date of the baseline. In this case it is 1 days as Working Days have been selected.

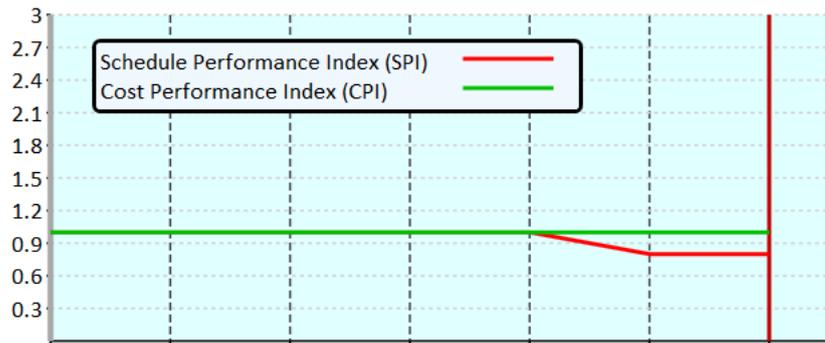


Trend Graphs

A useful addition to Earned Value Graphs is the Trend Line option.



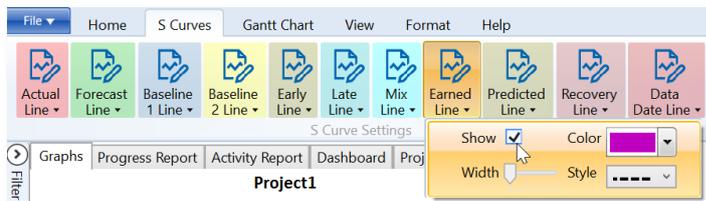
This plots a trend of CPI and SPI over time to show how well the project is performing.



Earned Value (Resource)

To see this graph requires resources having been added to the project.

The earned value line should be turned on from the S Curves tab.



It is recommended to create rows in the data table to reflect EV data.

Type	Unit	Description	Display Text
Cumulative	Units	Forecast	
Cumulative	Units	PV	
Cumulative	Units	Actual	
Cumulative	Units	EV	
Cumulative	Units	SV	
Cumulative	Units	CV	
Period	Units	SPI	
Period	Units	CPI	

Cumulative Forecast Units	£1	£2	£3
Cumulative PV Units			
Cumulative Actual Units			
Cumulative EV Units			
Cumulative SV Units			
Cumulative CV Units			
Period SPI Units			
Period CPI Units			
Days	10	11	12
Month	Feb		

Earned Value Management (EVM) Project1

15 February 2020

Earned Value (EV)

Planned Value (PV)	40 Hours
Earned Value (EV)	32 Hours
Actual Hours	32 Hours
CV (Hours Variance)	0 Hours
Schedule Variance (SV)	-8 Hours
Cost Performance Index (CPI)	1%
Schedule Performance Index (SPI)	0.8%
Budget at Completion (BAC)	80 Hours
Forecast at Completion (FAC)	80 Hours

The activity report also has changed.

Project Progress Report Project1 15 February 2020

Activity ID	Name	Percent Complete	Forecast at Completion (FAC)	Budget at Completion (BAC)	Actual (AC)	Cost (EV)	Earned Value (PV)	Schedule Variance (SV)	Cost Variance (CV)	Schedule Performance Index (SPI)	Cost Performance Index (CPI)
	Project	40									
1	Task 1	40	80	80	32	32	40	-8	0	0.8	1

Looking at the data table we can see the following;

Cumulative Forecast Units							40	48	56	64	72	72	72	80		
Cumulative PV Units	8	16	24	32	40	40	40	48	56	64	72	80	80	80		
Cumulative Actual Units	8	16	24	32	32	32										
Cumulative EV Units	8	16	24	32	32	32										
Cumulative SV Units	0	0	0	0	8	8										
Cumulative CV Units	0	0	0	0	0	0										
Period SPI Units	1	1	1	1	0.8	0.8										
Period CPI Units	1	1	1	1	1	1										
Days	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Month	Feb															

The cumulative PV (Planned Value) reflect the baseline work

The Cumulative Actual units show the actual units of 32 hours (40% of 80 hours)

The EV (Earned Value) units show the Earned Value. At the status date 40% of the work had been completed, therefore the EV is 40% of the total baseline work of 80 hours

Cumulative SV (Schedule Variance) Units show the amount of work the EV is behind the where the PV should be. As the PV should be 40hours there is a schedule delay of 8 hours.

Cumulative CV (Cost Variance) units. In this case as there has been no change to the actual work beyond the 40% of 80 hours the CV is 0.

Period SPI units shows 0.8 i.e. 32 hours (EV) / 40 hours (PV). A value below 1 shows the project is in delay

Period CPI units shows 1 i.e. 32 hours (EV) / 32 hours (AC). A value below 1 shows the project is in overspend

There are some additional items displayed now that there is some progress and these are explained below;

Progress is shown as 40%.

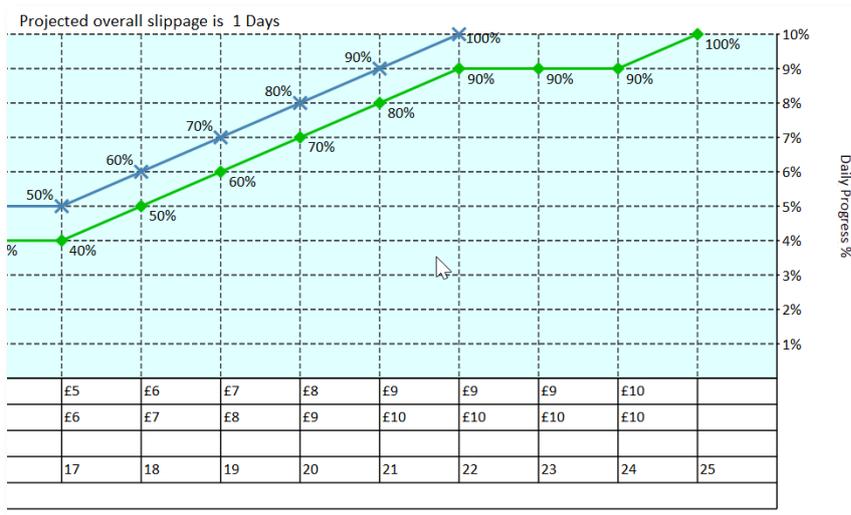
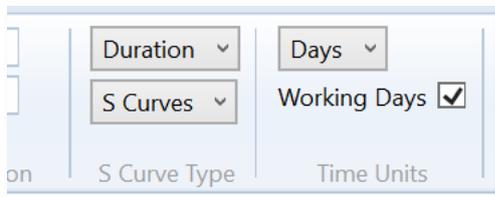
This is calculated by dividing the total actual work by the total work in the project.

10% and 8 hours under budget

Project Tracker calculates the planned hours at the status date which should be 40 or 50% of the total. As the project has achieved 40% or 32 hours the variance is 10% and 8 hours.

Project Overall slippage is 1 days

This displays the difference between the finish date of the current schedule and the finish date of the baseline. In this case it is 1 days as Working Days have been selected.



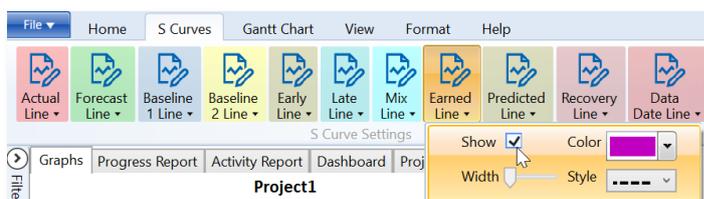
Earned Schedule (Cost)

To see this graph requires costs having been added to the project.

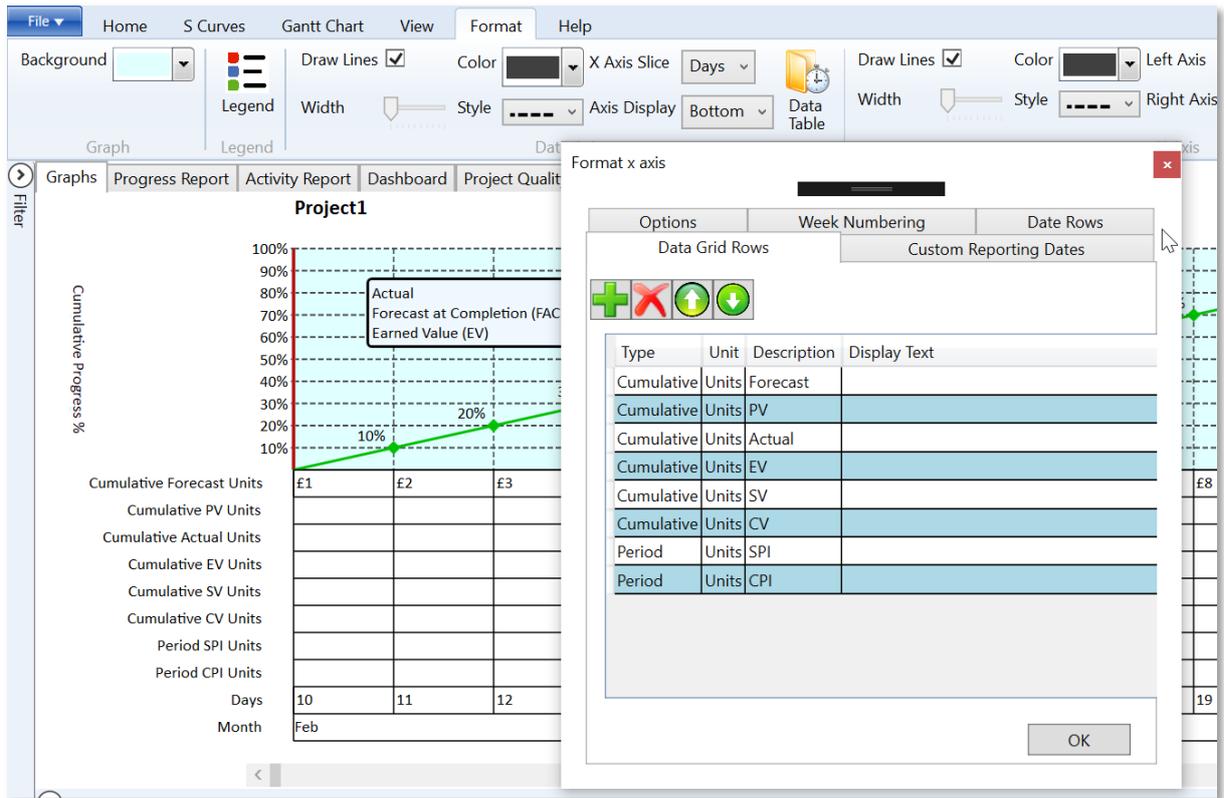
Earned Schedule is a slight variance to the Earned Value graph in that it tries to address the perceived inadequacies of SPI when the project is complete.

This document does not attempt to look at the benefits of Earned Schedule over Earned Value but good sources of information are at www.earnedschedule.com and [https://www.apm.org.uk/sites/default/files/protected/earned schedule.pdf](https://www.apm.org.uk/sites/default/files/protected/earned%20schedule.pdf)

The earned value line should be turned on from the S Curves tab.



It is recommended to create rows in the data table to reflect EV data.



The formula for Earned Value, Planned Value, Schedule Variance, Cost Variance, Schedule Performance Index and Cost Performance Index are not covered in this document as they are widely available for reference on the internet.

When an earned value type graph is selected legends change to reflect earned value results automatically.

Let's assume we have a simple project like the one below (these calculations are the same for Primavera P6 and Powerproject)

Task Name	Cost	% Complete	10 Feb '20				17 Feb '20				24 Feb			
			F	S	S	M	T	W	T	F	S	S	M	T
Task 1	£10.00	0%												
														Labour

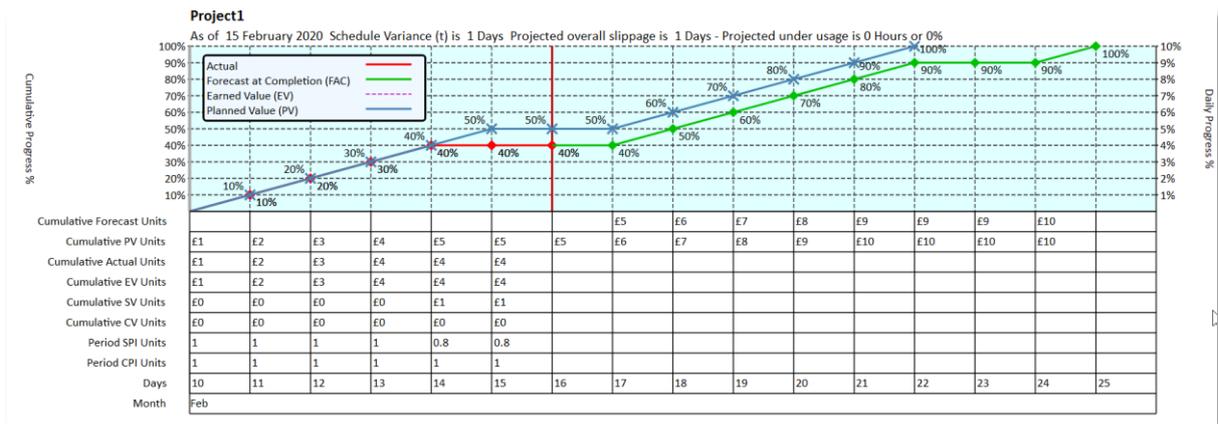
As with other graphs Project Tracker will analyse each task for each day of the project and calculate the cost per day to give a cumulative cost across the project.

Now we will look at the effect of adding progress to the project. The status date has been moved to the 15th February and Task 1 has been marked as 40% complete. It should both be 50% complete.

If we now recalculate the project it looks like this.

Task Name	Cost	% Complete	10 Feb '20				17 Feb '20				24 Feb			
			F	S	S	M	T	W	T	F	S	S	M	T
Task 1	£10.00	40%												
														Labour

Project Tracker will now plot this to create the curve.



The legend has changed from a normal graph type to show EV data. For example, the Forecast curve has changed to Forecast at Completion (FAC).

Additionally, the Progress Report has changed to show ES data.

Graphs Progress Report Activity Report Dashboard Project Quality Milestone Trend Analysis

Earned Value Management (EVM) Project1

15 February 2020

Earned Value (EV)	
Planned Value (PV)	£5
Earned Value (EV)	£4
Actual Cost (AC)	£4
Cost Variance (CV)	£0
Schedule Variance (SV)	£-1
Cost Performance Index (CPI)	1%
Schedule Performance Index (SPI)	0.8%
Budget at Completion (BAC)	£10
Forecast at Completion (FAC)	£10

The activity report also has changed.

Project Progress Report Project1 15 February 2020

Activity ID	Name	Percent Complete	Forecast Completion (FAC)	Budget Completion (BAC)	Actual (t)	Time	Earned Schedule (ES)	Planned Value (PV)	Schedule Variance (t)	Cost Variance (CV)	SPI (t)	Cost Performance Index (CPI)
	Project	40										
1	Task 1	40	80	80	32	Task 1	32	40	-8	0	0.8	1

Looking at the data table we can see the following;

Cumulative Forecast Units																					
Cumulative PV Units	£1	£2	£3	£4	£5	£5	£5	£6	£7	£8	£9	£10	£10	£10	£10	£10	£10	£10	£10	£10	£10
Cumulative Actual Units	£1	£2	£3	£4	£4	£4	£4														
Cumulative EV Units	£1	£2	£3	£4	£4	£4	£4														
Cumulative SV Units	£0	£0	£0	£0	£1	£1	£1														
Cumulative CV Units	£0	£0	£0	£0	£0	£0	£0														
Period SPI Units	1	1	1	1	0.8	0.8															
Period CPI Units	1	1	1	1	1	1															
Days	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25					
Month	Feb																				

The cumulative PV (Planned Value) reflect the baseline costs

The Cumulative Actual units show the actual cost of £4 (40% of £10)

The EV (Earned Value) units show the Earned Value. At the status date 40% of the cost had been completed, therefore the EV is 40% of the total baseline cost of £10

Cumulative SV (Schedule Variance) Units show the amount of money the EV is behind the where the PV should be. As the PV should be £5 there is a schedule delay of £1.

Cumulative CV (Cost Variance) units. In this case as there has been no change to the actual costs beyond the 40% of £10 the CV is 0.

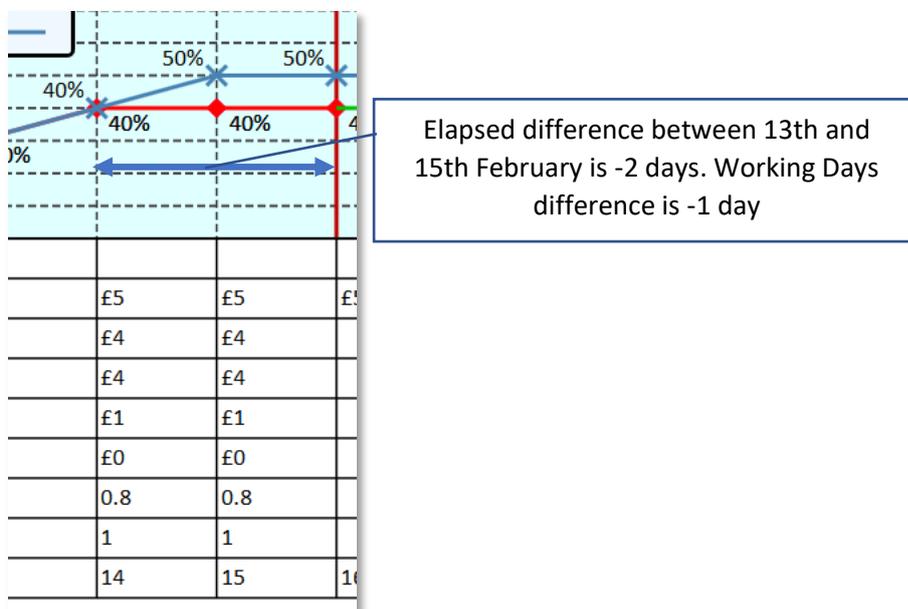
Period SPI units shows 0.8 i.e. £4 (EV) / £5 (PV). A value below 1 shows the project is in delay

Period CPI units shows 1 i.e. £4 (EV) / £4 (AC). A value below 1 shows the project is in overspend

The only difference between an Earned Value Graph and an Earned Schedule graph is the header;

As of 15 February 2020 Schedule Variance (t) is -1 Days Projected overall slippage is 1 Days - Projected under usage is 0 Hours or 0%

The value Schedule Variance (t) is at the heart of the Earned Schedule method. This shows the difference between the status date where the Earned Value was achieved and the date on which it should have been achieved on the Planned Value line.



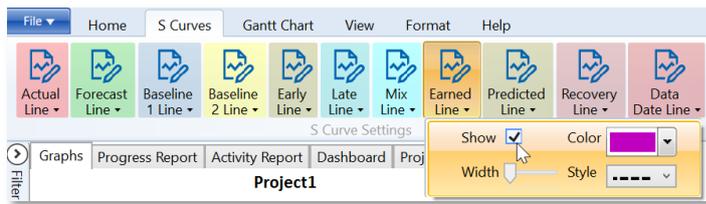
Earned Schedule (Resource)

To see this graph requires resources having been added to the project.

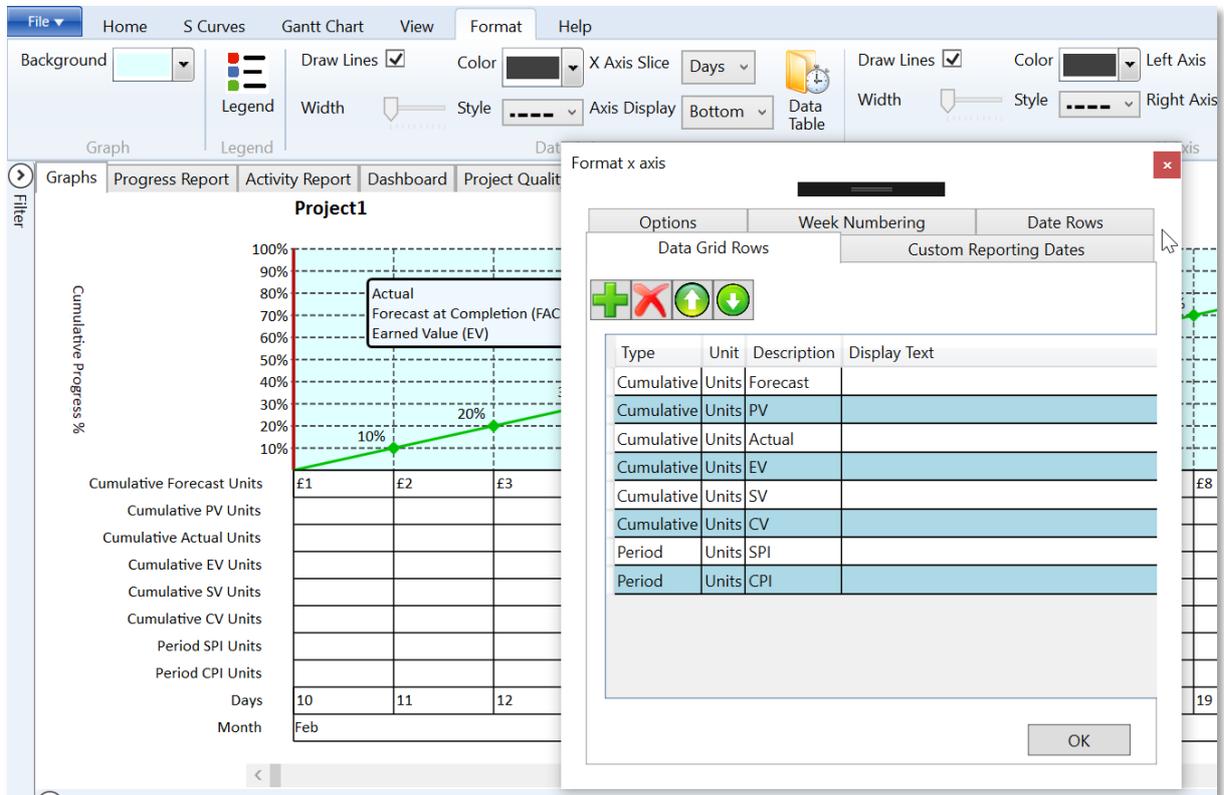
Earned Schedule is a slight variance to the Earned Value graph in that it tries to address the perceived inadequacies of SPI when the project is complete.

This document does not attempt to look at the benefits of Earned Schedule over Earned Value but good sources of information are at www.earnedschedule.com and [https://www.apm.org.uk/sites/default/files/protected/earned schedule.pdf](https://www.apm.org.uk/sites/default/files/protected/earned%20schedule.pdf)

The earned value line should be turned on from the S Curves tab.



It is recommended to create rows in the data table to reflect EV data.



The formula for Earned Value, Planned Value, Schedule Variance, Cost Variance, Schedule Performance Index and Cost Performance Index are not covered in this document as they are widely available for reference on the internet.

When an earned value type graph is selected legends change to reflect earned value results automatically.

Let's assume we have a simple project like the one below (these calculations are the same for Primavera P6 and Powerproject)

Task Name	Work	Cost	10 Feb '20				17 Feb '20				24 Feb			
			F	S	S	M	T	W	T	F	S	S	M	T
Task 1	80 hrs	£10.00												

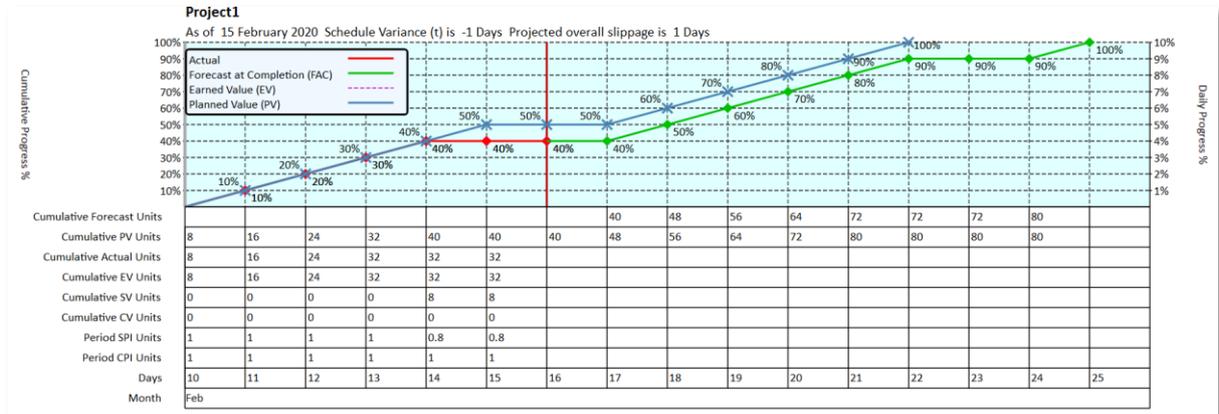
As with other graphs Project Tracker will analyse each task for each day of the project and calculate the work per day to give a cumulative amount of work across the project.

Now we will look at the effect of adding progress to the project. The status date has been moved to the 15th February and Task 1 has been marked as 40% complete. It should both be 50% complete.

If we now recalculate the project it looks like this.

Task Name	Work	% Complete	10 Feb '20					17 Feb '20					24 Feb '20													
			F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
Project	80 hrs	40%																								
Task 1	80 hrs	40%																								

Project Tracker will now plot this to create the curve.



The legend has changed from a normal graph type to show EV data. For example, the Forecast curve has changed to Forecast at Completion (FAC).

Additionally, the Progress Report has changed to show EV data.

Earned Value Management (EVM) Project 1

15 February 2020

Earned Schedule	
Planned Value (PV)	40 Hours
Earned Value (EV)	32 Hours
Actual Hours	32 Hours
CV (Hours Variance)	0 Hours
Schedule Variance (SV)(t)	-1 Days
Cost Performance Index (CPI)	1%
Schedule Performance Index (SPI)(t)	0.8%
Budget at Completion (BAC)	80 Hours
Forecast at Completion (FAC)	80 Hours
Actual date	16/02/2020
Earned Schedule	14/02/2020

The activity report also has changed.

Project Progress Report Project1 15 February 2020

Activity ID	Name	Percent Complete	Forecast Completion (FAC)	at Budget Completion (BAC)	at Actual (t)	Time	Earned Schedule (ES)	Planned Value (PV)	Schedule Variance (t)	Cost Variance (CV)	SPI (t)	Cost Performance Index (CPI)
	Project	40										
1	Task 1	40	80	80	32		32	40	-8	0	0.8	1

Looking at the data table we can see the following;

Cumulative Forecast Units								40	48	56	64	72	72	72	80	
Cumulative PV Units	8	16	24	32	40	40	40	48	56	64	72	80	80	80	80	
Cumulative Actual Units	8	16	24	32	32	32										
Cumulative EV Units	8	16	24	32	32	32										
Cumulative SV Units	0	0	0	0	8	8										
Cumulative CV Units	0	0	0	0	0	0										
Period SPI Units	1	1	1	1	0.8	0.8										
Period CPI Units	1	1	1	1	1	1										
Days	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Month	Feb															

The cumulative PV (Planned Value) reflect the baseline work

The Cumulative Actual units show the actual units of 32 hours (40% of 80 hours)

The EV (Earned Value) units show the Earned Value. At the status date 40% of the work had been completed, therefore the EV is 40% of the total baseline work of 80 hours

Cumulative SV (Schedule Variance) Units show the amount of work the EV is behind the where the PV should be. As the PV should be 40hours there is a schedule delay of 8 hours.

Cumulative CV (Cost Variance) units. In this case as there has been no change to the actual work beyond the 40% of 80 hours the CV is 0.

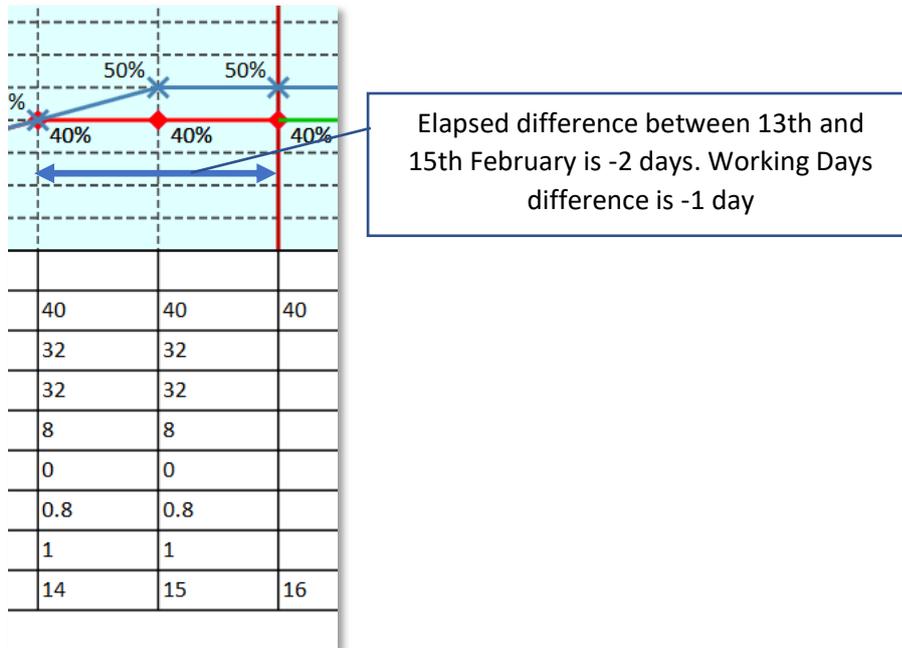
Period SPI units shows 0.8 i.e. 32 hours (EV) / 40 hours (PV). A value below 1 shows the project is in delay

Period CPI units shows 1 i.e. 32 hours (EV) / 32 hours (AC). A value below 1 shows the project is in overspend.

The only difference between an Earned Value Graph and an Earned Schedule graph is the header;

As of 15 February 2020 Schedule Variance (t) is -1 Days Projected overall slippage is 1 Days

The value Schedule Variance (t) is at the heart of the Earned Schedule method. This shows the difference between the status date where the Earned Value was achieved and the date on which it should have been achieved on the Planned Value line.



Earned Duration

To see this graph doesn't require resources or costs having been added to the project.

Earned Duration is a variance to the Earned Value graph in that it doesn't require resources or costs to have been assigned to the project to perform its calculations.

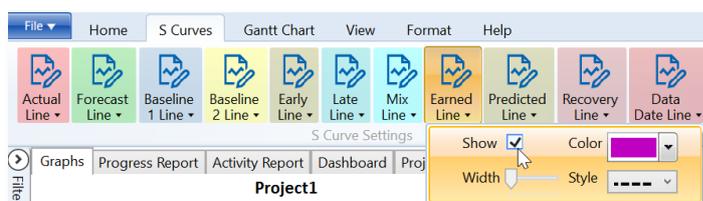
It is fundamentally an extension of the Duration S Curve Type detailed earlier in this document with the addition of Earned Duration data.

This document does not attempt to look at the benefits of Earned Duration over Earned Value but good sources of information are at

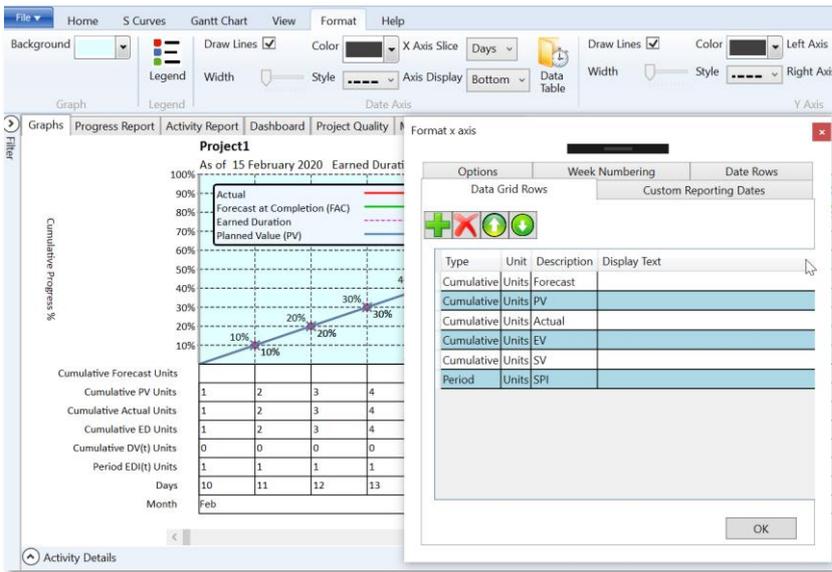
<http://www.pmknowledgecenter.com/sites/default/files/files/Vanhoucke%20et%20al,%20TMN,%202015.pdf>

"The Earned Duration (ED) concept (Khamooshi & Golafshani, 2014) was created to address the shortcomings of Earned Value and Earned Schedule due to the usage of cost-based data as proxies for assessing the schedule performance of projects. Its foundation lies in the exclusive usage of time-based data for the generation of physical progress indicators. Thus, schedule performance indicators become free from any dependency on planned cost values, and therefore, are no longer influenced by them"

The earned value line should be turned on from the S Curves tab.



It is recommended to create rows in the data table to reflect EV data.



The formula for Earned Duration, Planned Duration, Duration Variance, and Duration Performance Index are not covered in this document as they are widely available for reference on the internet.

When an earned value type graph is selected legends change to reflect earned value results automatically.

Let's assume we have a simple project like the one below (these calculations are the same for Primavera P6 and Powerproject)

Task Name	% Complete	Duration	'20					10 Feb '20					17 Feb '20							
			W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	
Task 1	0%	10 days																		

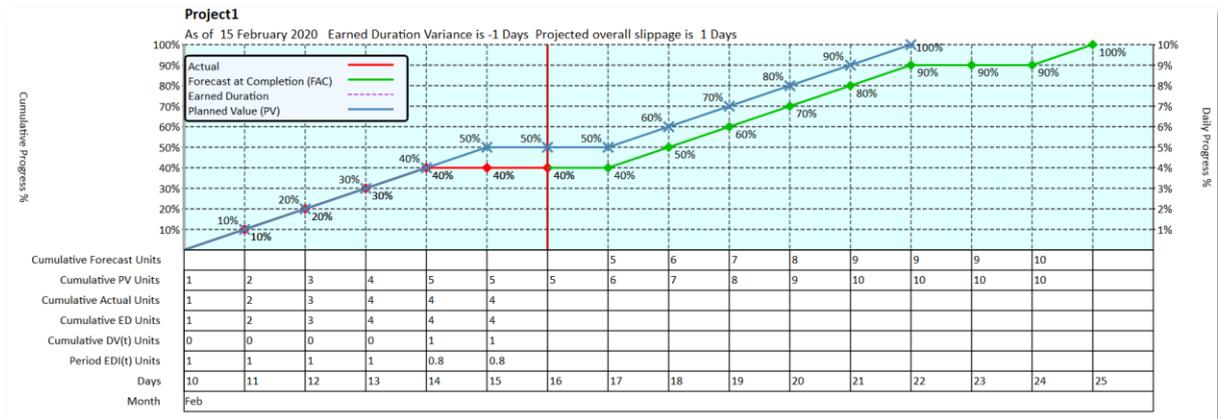
As with the Duration graph Project Tracker will analyse each task for each day of the project and calculate the duration per day to give a cumulative amount of duration across the project.

Now we will look at the effect of adding progress to the project. The status date has been moved to the 15th February and Task 1 has been marked as 40% complete. It should both be 50% complete.

If we now recalculate the project it looks like this.

Task Name	% Complete	Duration	'20					10 Feb '20					17 Feb '20					24 Feb '20							
			W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T		
Task 1	40%	10 days																							

Project Tracker will now plot this to create the curve.



The legend has changed from a normal graph type to show EV data. For example, the Forecast curve has changed to Forecast at Completion (FAC).

Additionally, the Progress Report has changed to show ED data.

Earned Value Management (EVM) Project1

15 February 2020

Earned Duration

Planned Duration	5 Days
Earned Duration	4 Days
Actual Duration	4 Days
Actual Duration Variance	0 Days
Earned Duration Variance	-1 Days
Actual Duration Variance index	1%
Earned Duration Index	0.8%
Budget at Completion (BAC)	10 Days
Forecast at Completion (FAC)	10 Days

The activity report also has changed.

Project Progress Report Project1 15 February 2020

Activity ID	Name	Percent Complete	Forecast at Completion (FAC)	Budget at Completion (BAC)	Actual (t)	Time	Earned Duration (ED)	Planned Duration (pd)	Earned Duration Variance (t)	Cost Variance (CV)	EDI (t)	Cost Performance Index (CPI)
	Project	40										
1	Task 1	40	80	80	32	32	40	-8	0	0.8	1	

Looking at the data table we can see the following;

Cumulative Forecast Units							5	6	7	8	9	9	9	10		
Cumulative PV Units	1	2	3	4	5	5	5	6	7	8	9	10	10	10		
Cumulative Actual Units	1	2	3	4	4	4										
Cumulative ED Units	1	2	3	4	4	4										
Cumulative DV(t) Units	0	0	0	0	1	1										
Period EDI(t) Units	1	1	1	1	0.8	0.8										
Days	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Month	Feb															

The cumulative PV (Planned Value) reflect the baseline work

The Cumulative Actual units show the actual units of 32 hours (40% of 80 hours)

The ED (Earned Duration) units show the Earned Duration. At the status date 40% of the task had been completed, therefore the EV is 40% of the total baseline work of 80 hours

Cumulative DV(t) (Duration Variance) Units show the amount of work the ED is behind the where the PV should be. As the PV should be 40 hours there is a duration variance of 8 hours.

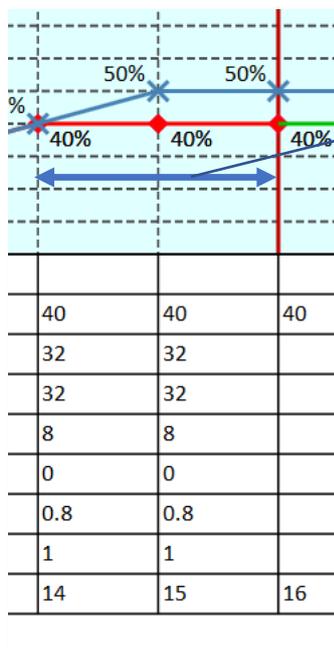
Period EDI(t) units shows 0.8 i.e. 32 hours (EV) / 40 hours (PV). A value below 1 shows the project is in delay

The header shows the Earned Duration summary at the status date;

Project1

As of 15 February 2020 Earned Duration Variance is -1 Days Projected overall slippage is 1 Days

The value Earned Duration Variance (t) is at the heart of the Earned Duration method. This shows the difference between the status date where the Earned Duration was achieved and the date on which it should have been achieved on the Planned Value line.



Elapsed difference between 13th and 15th February is -2 days. Working Days difference is -1 day