	Case Name: **PET Packaging**	Sector	Engineering	
OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be		Baseline Schedule	Schedule with resources	
			Schedule with costs	
		Risk Analysis	Random simulation	
			One of nine std. scenarios	
Submitted by	N/A		User defined distributions	
Date	November 12, 2013	Project Control	Automatic tracking	
File Name	C2013-05 PET Packaging.p2x		Tracking based on user input	

1. Project description

Project authenticity

The installation of a new sprinkler system at the production site of a PET packaging manufacturer.

The project consists of activity and cost data that were obtained directly from the actual project owner.

2. Project properties

2.1. Baseline Schedule

General	
# Activities	28
Planned Duration (PD)	521 days*
Budget At Completion (BAC)	874.554 €
Renewable Resources	-
Consumable Resources	-

Network topology	
Serial/Parallel (SP)	14%
Activity Distribution (AD)	69%
Length of Arcs (LA)	0%
Topological Float (TF)	80%

* standard eight-hour working days

2.2. Risk Analysis

Random simulation by ProTrack was performed using the default symmetric triangular risk distribution profiles.

Cost sensitivity			
	avg [%]	std dev [%]	skew [-]
CRI-r	0.0	0.0	N/A
CRI-rho	100.0	0.0	N/A
CRI-tau	100.0	0.0	N/A

Time sensitivity			
	avg [%]	std dev [%]	skew [-]
CI	3.6	12.9	3.5
SI	27.5	22.2	2.1
SSI	4.3	15.5	3.5
CRI-r	1.6	15.8	3.2
CRI-rho	11.0	15.7	3.1
CRI-tau	8.1	12.8	3.3

Resource sensitivity			
	avg [%]	std dev [%]	skew [-]
CRI-r	N/A	N/A	N/A
CRI-rho	N/A	N/A	N/A
CRI-tau	N/A	N/A	N/A

The remarkable results for cost sensitivity can be explained by the absence of variable activity costs.

2.3. Project Control

2.3.1. Simulated forecasting accuracy

The accuracy of time and cost forecasting methods has been evaluated based on Monte Carlo simulation runs using the risk profiles described in section "2.2. Risk Analysis". Based on these risk profiles, the Mean Absolute Percentage Error (MAPE) and Mean Percentage Error (MPE) has been calculated to evaluate the expected accuracy of the time and cost predictions, EAC(t) and EAC, respectively.

Simulated EAC(t) accuracy		
method - PF	MAPE [%]	MPE [%]
PV - 1	25.8	24.1
PV - SPI	31.1	29.4
PV - SCI	31.1	29.4
ED - 1	15.6	13.6
ED - SPI	31.0	29.3
ED - SCI	31.0	29.3
ES - 1	31.8	31.6
ES - SPI(t)	42.4	42.3
ES - SCI(t)	42.4	42.3

Simulated EAC accuracy		
method (PF)	MAPE [%]	MPE [%]
1	N/A	N/A
CPI	N/A	N/A
SPI	N/A	N/A
SPI(t)	N/A	N/A
SCI	N/A	N/A
SCI(t)	N/A	N/A
0.8 CPI + 0.2 SPI	N/A	N/A
0.8 CPI + 0.2 SPI(t)	N/A	N/A

According to the MAPE values[1] the best performance for time forecasting can be expected from the unweighted Earned Duration method. Cost forecasting is not relevant since there are only fixed activity costs in this project.

2.3.2. Tracking description

Manual tracking was performed over 31 tracking periods with a length of approximately one month. The Real Duration and Real Cost mentioned in section "2.3.3. Earned Value Management" are based on manual user input.

The tracking information obtained from the project owner and introduced in ProTrack includes actual activity start dates and durations, but no actual activity costs.

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[1] The MAPE gives the best indication for the forecast accuracy (the lower the MAPE, the more accurate the method) since all deviations from the targeted real duration (real cost) are cumulated, whereas for the MPE underestimates can be compensated by overestimates and vice versa, possibly leading to an overly positive evaluation of a certain method. However, the MPE can provide useful information about the nature of the deviations, i.e. does the method rather underestimate or overestimate the real duration (real cost)?

2.3.3. Earned Value Management

2.3.3.1. Performance metrics

	CV [€]	SV [€]	SV(t) [d]	CPI [-]	SPI [-]	SPI(t) [-]	p-factor [-]
avg	0	-139.615	-112.16	0.94	0.70	0.55	0.96
std dev	0	97.379	58.78	0.25	0.27	0.22	0.08
final	0	0	-152.00	1.00	1.00	0.77	1.00

2.3.3.2. Time forecasting

PD	521 days

Real Duration	673 days

Late	29.17%

EAC(t)			Real Accuracy	
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	604.18	58.02	11.3	-10.2
PV - SPI	758.88	287.44	27.2	12.8
PV - SCI	758.88	287.44	27.2	12.8
ED - 1	603.77	38.33	10.3	-10.3
ED - SPI	778.61	274.18	24.3	15.7
ED - SCI	778.61	274.18	24.3	15.7
ES - 1	640.19	42.77	5.8	-4.9
ES - SPI(t)	954.57	394.11	44.9	41.8
ES - SCI(t)	954.57	394.11	44.9	41.8

2.3.3.3. Cost forecasting

BAC	874.554 €

Real Cost	874.554 €

On Budget	0.00%

EAC			Real Accuracy	
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	874.554	0	0.0	0.0
CPI	874,554	0	0.0	0.0
SPI	1,137,217	413.185	30.0	30.0
SPI(t)	1,300,453	587.15	48.7	48.7
SCI	1,137,217	413.185	30.0	30.0
SCI(t)	1,300,453	587.15	48.7	48.7
0.8 CPI + 0.2 SPI	902.22	34.467	3.2	3.2
0.8 CPI + 0.2 SPI(t)	912.335	38.937	4.3	4.3