Project Controls Expo - 31st Oct 2012
Twickenham Stadium, London

Extending Earned Value Methodology To Track Scope And Performance For Key Labour Categories and Commodity Usage for Small To Large Industrial Projects

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About the Speaker

Roland Horat, Managing Director of Supertech Project Management (Australia) Pty Ltd. an international project management consulting company.

Roland is a specialist in Earned Value (EVPM) Based Project Management and Control systems.

Roland's company has developed the EVENGINE range of earned value based project control and reporting software in compliance with international and industry best practice. The software is featured at this Expo.

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Case Studies:

To illustrate the process, we draw on Supertech's participation in the development and maintenance of a number of industry projects such as:

Jindal Steel and Power's (JSPL) 12.5 MTA Steel Plant Project Control System.
http://www.jindalsteelpower.com/facilities/domestic/orissa/angul.aspx
We consider this to be a Large Industrial Project (Mega Project).

Industrial Plants and Refineries etc.

Commercial High Rise

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Case Study To Illustrate Coding Practice – JSPL Phase 1 (1.5 MTA) the work is divide into controllable and trackable work packs:

Nine (9) Technology Based Work Packs:

1. **CGP - Coal to Gasification Plant**
2. **LDP - Lime & Dolomite Plant**
3. **DRI - Direct Reduced Iron Plant**
4. **OXP - Oxygen, Nitrogen Plant**
5. **PB - Process Boilers**
6. **CAW - Coal Washery**
7. **SMS - Steel Melt Shop**
8. **SLC - Slab Caster**
9. **PML - Plate Mill**

Eight (8) Supporting Infrastructure Work Packs:

1. **PWR - HV Power**
2. **GDS - Gas Distribution System**
3. **RMHS - Raw Material Handling System**
4. **CTU - Central Utilities (Water Supply)**
5. **CCV - Central Civil (Earthworks, Roads & Drainage)**
6. **HSE - Housing**
7. **FGS - Liquid Fuel & Gas Storage**
8. **CMA – Compressed Air Plant**

How does this translate into a workable control system – the Software used?

- The **Work Packs** are represented in the Control System as **Projects.**
- **Projects** are collectively represented in the **Master Schedule to L3** using **Microsoft Project 2007,** with **Units of Work and Material (Commodity) Usage** held within the **EVENGINE** Project Control Software
- **Projects** are represented to **L5** in **Detailed Stand Alone Schedules** using **Primavera P6 Version 7 with assigned activity selected Labour & Non-Labour resources** for daily weekly scheduling purposes.

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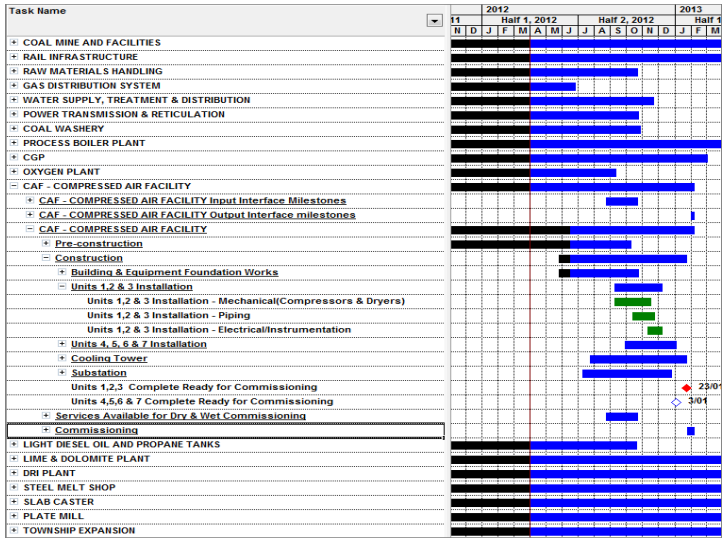
Case Study - Master and Detailed Schedule Level Purpose

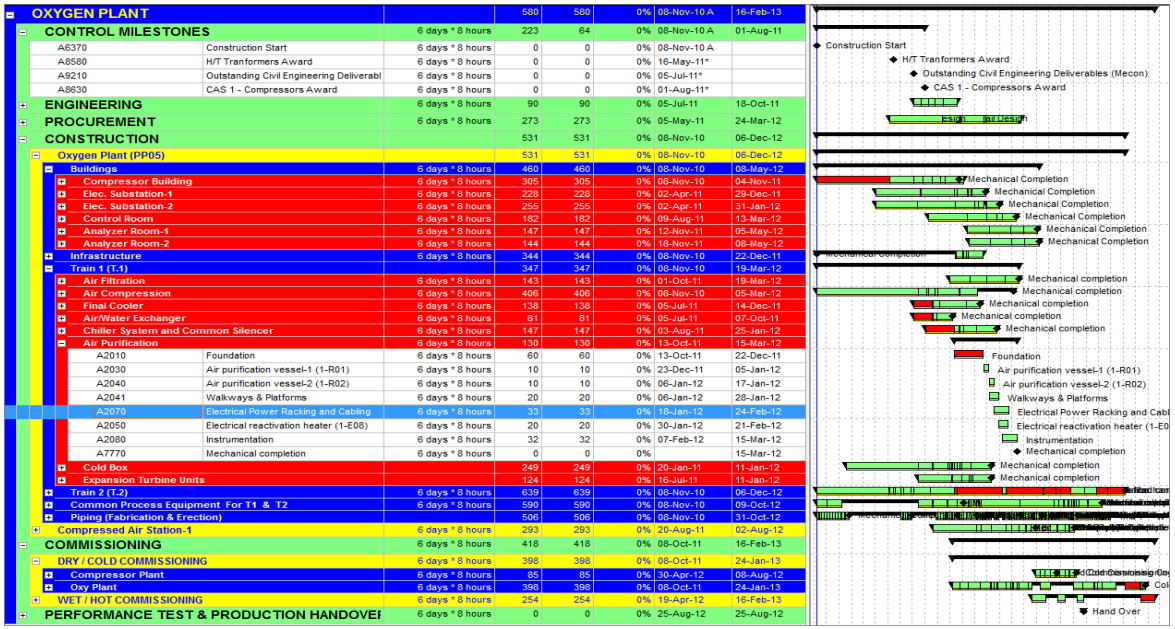


The Master schedule forms the basis of the Report Period Control And Tracking System For Units of Cost, Labour & Commodity Usage to WBS Level 3. Where:

- L1 = Project/Facility
- L2 = Engineering, Procurement, Fabrication and Sub-facility Construction
- L3 = Trade Based Construction – Excavation, Concrete, Structural Steel, Mechanical, Piping, Electrical & Instrumentation, Pre-Commissioning & Commissioning Control Units

The Detailed Stand Alone Schedule forms the basis of the Day To Day Detailed Activity Control System. Where:

- L1 = Project/Facility
- L2 = Engineering, Procurement, Fabrication and Sub-facility Construction
- L3 & L4 = Sub-facilities Construction Detail
- L5 = Trade Based Sequential Activity Execution (Resource Allocation)



OXYGEN PLANT			580	580	0%	08-Nov-10 A	16-Feb-13
CONTROL MILESTONES		6 days * 8 hours	223	64	0%	08-Nov-10 A	01-Aug-11
A6370	Construction Start	6 days * 8 hours	0	0	0%	08-Nov-10 A	
A8580	H/T Tranformers Award	6 days * 8 hours	0	0	0%	16-May-11*	
A9210	Outstanding Civil Engineering Deliverabl	6 days * 8 hours	0	0	0%	05-Jul-11*	
A8630	CAS 1 - Compressors Award	6 days * 8 hours	0	0	0%	01-Aug-11*	
ENGINEERING		6 days * 8 hours	90	90	0%	05-Jul-11	18-Oct-11
PROCUREMENT		6 days * 8 hours	273	273	0%	05-May-11	24-Mar-12
CONSTRUCTION			531	531	0%	08-Nov-10	06-Dec-12
Oxygen Plant (PP05)			531	531	0%	08-Nov-10	06-Dec-12
Buildings		6 days * 8 hours	460	460	0%	08-Nov-10	08-May-12
Compressor Building		6 days * 8 hours	305	305	0%	08-Nov-10	04-Nov-11
Elec. Substation-1		6 days * 8 hours	228	226	0%	02-Apr-11	29-Dec-11
Elec. Substation-2		6 days * 8 hours	255	255	0%	02-Apr-11	31-Jan-12
Control Room		6 days * 8 hours	182	182	0%	09-Aug-11	13-Mar-12
Analyzer Room-1		6 days * 8 hours	147	147	0%	12-Nov-11	05-May-12
Analyzer Room-2		6 days * 8 hours	144	144	0%	18-Nov-11	05-May-12
Infrastructure		6 days * 8 hours	344	344	0%	08-Nov-10	22-Dec-11
Train 1 (T.1)			347	347	0%	08-Nov-10	19-Mar-12
Air Filtration		6 days * 8 hours	143	143	0%	01-Oct-11	19-Mar-12
Air Compression		6 days * 8 hours	406	406	0%	08-Nov-10	05-Mar-12
Final Cooler		6 days * 8 hours	138	138	0%	05-Jul-11	14-Dec-11
Air/Water Exchanger		6 days * 8 hours	81	81	0%	05-Jul-11	07-Oct-11
Chiller System and Common Silencer		6 days * 8 hours	147	147	0%	03-Aug-11	25-Jan-12
Air Purification		6 days * 8 hours	130	130	0%	13-Oct-11	15-Mar-12
A2010	Foundation	6 days * 8 hours	60	60	0%	13-Oct-11	22-Dec-11
A2030	Air purification vessel-1 (1-R01)	6 days * 8 hours	10	10	0%	23-Dec-11	05-Jan-12
A2040	Air purification vessel-2 (1-R02)	6 days * 8 hours	10	10	0%	06-Jan-12	17-Jan-12
A2041	Walkways & Platforms	6 days * 8 hours	20	20	0%	06-Jan-12	28-Jan-12
A2070	Electrical Power Racking and Cabling	6 days * 8 hours	33	33	0%	18-Jan-12	24-Feb-12
A2050	Electrical reactivation heater (1-E08)	6 days * 8 hours	20	20	0%	30-Jan-12	21-Feb-12
A2080	Instrumentation	6 days * 8 hours	32	32	0%	07-Feb-12	15-Mar-12
A7770	Mechanical completion	6 days * 8 hours	0	0	0%		15-Mar-12
Cold Box			249	249	0%	20-Jan-11	11-Jan-12
Expansion Turbine Units			124	124	0%	16-Jul-11	11-Jan-12
Train 2 (T.2)		6 days * 8 hours	639	639	0%	08-Nov-10	06-Dec-12
Common Process Equipment For T1 & T2		6 days * 8 hours	590	590	0%	08-Nov-10	09-Oct-12
Piping (Fabrication & Erection)			506	506	0%	08-Nov-10	31-Oct-12
Compressed Air Station-1		6 days * 8 hours	293	293	0%	20-Aug-11	02-Aug-12
COMMISSIONING		6 days * 8 hours	418	418	0%	08-Oct-11	16-Feb-13
DRY / COLD COMMISSIONING		6 days * 8 hours	398	398	0%	08-Oct-11	24-Jan-13
Compressor Plant		6 days * 8 hours	85	85	0%	30-Apr-12	08-Aug-12
Oxy Plant		6 days * 8 hours	398	398	0%	08-Oct-11	24-Jan-13
WET / HOT COMMISSIONING		6 days * 8 hours	254	254	0%	19-Apr-12	16-Feb-13
PERFORMANCE TEST & PRODUCTION HANDOVER		6 days * 8 hours	0	0	0%	25-Aug-12	25-Aug-12

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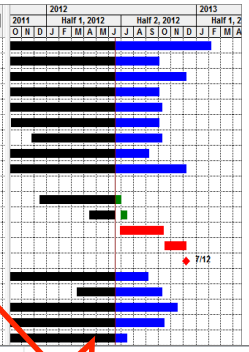
Case Study - The Master Schedule > Project Control Software Link

Unique ID	Task Name	% Comp	Duration	Start	Finish
67108865	OX - OXYGEN PLANT	68%	488 days	1 May '11	5 Feb '13
67108866	Pre-construction	94%	397 days	1 May '11	1 Oct '12
67108874	Construction	64%	446 days	2 May '11	7 Dec '12
67108875	Compressor 2	77%	397 days	2 May '11	1 Oct '12
67108882	Compressor 1	71%	402 days	2 May '11	8 Oct '12
67108889	Air Filter 2	58%	281 days	5 Oct '11	1 Oct '12
67108894	Air Filters 1	61%	246 days	24 Nov '11	8 Oct '12
67108899	Cold Box 2 Air Separation Column ASU	72%	381 days	2 May '11	7 Sep '12
67108905	Cold Box 1 Air Separation Column ASU (Argon)	58%	446 days	2 May '11	7 Dec '12
67108906	Cold Box 1 Air Separation Column ASU (Argon) - Civil Works	100%	14.8 wks	2 May '11	8 Aug '11
67109011	Cold Box 1 ASU (Argon) - Civil Works (HE & Exp. Turbine)	90%	25.2 wks	15 Dec '11	18 Jul '12
67108907	Cold Box 1 Air Separation Column ASU (Argon) - Mechanical/Structural	54%	4.8 wks	14 Apr '12	14 Jul '12
67108908	Cold Box 1 Air Separation Column ASU (Argon) - Piping	0%	16 wks	28 Jun '12	12 Oct '12
67108909	Cold Box 1 Air Separation Column ASU (Argon) - Electrical/Instrumenation	0%	8 wks	15 Oct '12	7 Dec '12
67108910	Cold Box 1 Air Separation Column ASU (Argon) Complete Ready for Co	0%	0 wks	7 Dec '12	7 Dec '12
67108911	Air Purification Units (APU 2)	81%	379.5 days	2 May '11	6 Sep '12
67108917	Air Purification Units (APU 1)	38%	158 days	15 May '12	8 Oct '12
67108923	Cooling Towers	55%	390 days	2 Jun '11	16 Nov '12
67108930	Cooling Water (CW) Pump House	67%	366 days	28 Jun '11	15 Oct '12
67108937	Compressor Building	91%	339 days	1 May '11	14 Jul '12
67108942	Substation -2	71%	3[illegible]		
67109105	Substation 1	61%	4[illegible]		
67109012	Control Room	49%	1[illegible]		
67108950	Oxygen Buffer Vessels	37%	1[illegible]		
67108956	LOX Tank	77%	3[illegible]		
67108962	LIN Tank	77%	3[illegible]		
67108968	Pipe Rack Train 2	48%	2[illegible]		
67108972	Pipe Rack Train 1	45%	1[illegible]		
67108976	Common Pipe Rack	75%	2[illegible]		
67109062	Common Pipe Rack - Extension Till Utilities Battery Limit	56%	[illegible]		
67109113	Chilled Water Tower - Unit 2	59%	2[illegible]		
67109141	Chilled Water Tower - Unit 1	28%	1[illegible]		
67109153	Refrigeration Unit	0%	[illegible]		
67109159	Roads & drains	22%	[illegible]		
67108980	Services Available for Dry & Wet Commissioning	0%	[illegible]		
67108988	Dry commissioning	0%	[illegible]		
67108991	Wet Commissioning	0%	[illegible]		
67108994	Utilities Available From Oxygen Plant	0%	[illegible]		
67108995	Oxgen	0%	[illegible]		
67108996	Nitrogen	0%	[illegible]		
67108997	Argon	0%	[illegible]		



- Primary key used is the Project and Activity Unique ID
- **Microsoft Project** maintains all of the scheduling information: Current and Baseline
- **EVENGINE** refreshes by report period current and baseline schedule data

Project	Unique	Lev	Summ	Name	%Comp	BACC	BACQ	EACC	Qty Uni	WB	CA	OB	Resource	Stage/Pha	Area/Facil	User Defined 1	User Defined
Oxygen Plant	12	1	No	Compressor 2 - Civil - ASU2 Compressor	100.00%	1,300.00	1,300.00	1,300.00	mx3	3.2.1.1	18100-350	OXP	CON-MT-CN	1	18100	OXP-Compressor 2	RKD
Oxygen Plant	13	1	No	Compressor 2 - Mechnanical - ASU2 Compressor & Ancil Equipment	100.00%	197.00	197.00	200.00	T	3.2.1.2	18100-150	OXP	MEC-MT-TI	1	18100	OXP-Compressor 2	ALEI
Oxygen Plant	14	1	No	Compressor 2 - Piping - ASU2 Compressor	80.00%	4,000.00	4,000.00	3,000.00	ILM	3.2.1.3	18100-150	OXP	PIP-MT-IP	1	18100	OXP-Compressor 2	ALEI
Oxygen Plant	15	1	No	Compressor 2 - Electrical - ASU2 Compressor	0.00%	7,500.00	7,500.00	7,500.00	ILM	3.2.1.4	18100-150	OXP	ELE-MT-CB	1	18100	OXP-Compressor 2	ALEI
Oxygen Plant	16	1	No	Compressor 2 - Instrumentation - ASU2 Compressor	0.00%	1.00	1.00	1.00	No	3.2.1.5	18100-150	OXP	INS-MT-TF	1	18100	OXP-Compressor 2	ALEI
Oxygen Plant	19	1	No	Compressor 1 - Civil - ASU1 Compressor	100.00%	1,300.00	1,300.00	1,300.00	mx3	3.2.2.1	18100-350	OXP	CON-MT-CN	1	18100	OXP-Compressor 1	RKD
Oxygen Plant	20	1	No	Compressor 1 - Mechnanical - ASU1 Compressor & Ancil Equipment	100.00%	197.00	197.00	200.00	T	3.2.2.2	18100-150	OXP	MEC-MT-TI	1	18100	OXP-Compressor 1	ALEI
Oxygen Plant	21	1	No	Compressor 1 - Piping - ASU1 Compressor	70.00%	2,000.00	2,000.00	2,000.00	ILM	3.2.2.3	18100-150	OXP	PIP-MT-IP	1	18100	OXP-Compressor 1	ALEI
Oxygen Plant	22	1	No	Compressor 1 - Electrical - ASU1 Compressor	0.00%	7,500.00	7,500.00	7,500.00	ILM	3.2.2.4	18100-150	OXP	ELE-MT-CB	1	18100	OXP-Compressor 1	ALEI
Oxygen Plant	23	1	No	Compressor 1 - Instrumentation - ASU1 Compressor	0.00%	1.00	1.00	1.00	No	3.2.2.5	18100-150	OXP	INS-MT-TF	1	18100	OXP-Compressor 1	ALEI
Oxygen Plant	26	1	No	Air Filter 2 - Civil Works	100.00%	100.00	100.00	100.00	mx3	3.2.3.1	18100-300	OXP	CON-MT-CN	1	18100	OXP-Compressor 1	Petron
Oxygen Plant	27	1	No	Air Filter 2 - Mechanical	0.00%	3.00	3.00	5.00	T	3.2.3.2	18100-150	OXP	MEC-MT-TI	1	18100	OXP-Air Filter2	ALEI
Oxygen Plant	28	1	No	Air Filter 2 - Electrical/Instrumenation	0.00%	3,000.00	3,000.00	3,000.00	ILM	3.2.3.3	18100-150	OXP	ELE-MT-CB	1	18100	OXP-Air Filter2	ALEI
Oxygen Plant	31	1	No	Air Filters 1 - Civil Works	100.00%	70.00	70.00	70.00	mx3	3.2.4.1	18100-300	OXP	CON-MT-CN	1	18100	OXP-Air Filter2	Petron
Oxygen Plant	32	1	No	Air Filters 1 - Mechanical	0.00%	3.00	3.00	5.00	T	3.2.4.2	18100-150	OXP	MEC-MT-TI	1	18100	OXP-Air Filter2	ALEI
Oxygen Plant	33	1	No	Air Filters 1 - Electrical/Instrumenation	0.00%	3,000.00	3,000.00	3,000.00	ILM	3.2.4.3	18100-150	OXP	ELE-MT-CB	1	18100	OXP-Air Filter2	ALEI
Oxygen Plant	36	1	No	Cold Box 2 Air Separation Column ASU - Civil Works	100.00%	950.00	950.00	950.00	mx3	3.2.5.1	18100-350	OXP	CON-MT-CN	1	18100	OXP-Cold Box 2	RKD
Oxygen Plant	200	1	No	Cold Box 2 Air Separation Column ASU - Civil Works (HE & Exp. Turbine)	100.00%	340.00	340.00	340.00	mx3	3.2.5.2	18100-300	OXP	CON-MT-CN	1	18100	OXP-Cold Box 2	PETRON
Oxygen Plant	37	1	No	Cold Box 2 Air Separation Column ASU - Mechanical/Structural	100.00%	350.00	350.00	350.00	T	3.2.5.3	18100-150	OXP	MEC-MT-TI	1	18100	OXP-Cold Box 2	ALEI
Oxygen Plant	38	1	No	Cold Box 2 Air Separation Column ASU - Piping	26.52%	31,500.00	31,500.00	30,000.00	ILM	3.2.5.4	18100-150	OXP	PIP-MT-IP	1	18100	OXP-Cold Box 2	ALEI
Oxygen Plant	39	1	No	Cold Box 2 Air Separation Column ASU - Electrical/Instrumenation	0.00%	7,500.00	7,500.00	7,500.00	ILM	3.2.5.5	18100-150	OXP	ELE-MT-CB	1	18100	OXP-Cold Box 2	ALEI
Oxygen Plant	42	1	No	Cold Box 1 Air Separation Column ASU (Argon) - Civil Works	100.00%	950.00	950.00	950.00	mx3	3.2.6.1	18100-350	OXP	CON-MT-CN	1	18100	OXP-Cold Box 1	RKD
Oxygen Plant	147	1	No	Cold Box 1 Air Separation Column ASU (Argon) - Civil Works (HE & Exp. T	85.00%	300.00	300.00	300.00	mx3	3.2.6.2	18100-300	OXP	CON-MT-CN	1	18100	OXP-Cold Box 1	PETRON
Oxygen Plant	43	1	No	Cold Box 1 Air Separation Column ASU (Argon) - Mechanical/Structural	67.43%	350.00	350.00	350.00	T	3.2.6.3	18100-150	OXP	MEC-MT-TI	1	18100	OXP-Cold Box 1	ALEI
Oxygen Plant	44	1	No	Cold Box 1 Air Separation Column ASU (Argon) - Piping	0.00%	30,500.00	30,500.00	31,500.00	ILM	3.2.6.4	18100-150	OXP	PIP-MT-IP	1	18100	OXP-Cold Box 1	ALEI
Oxygen Plant	45	1	No	Cold Box 1 Air Separation Column ASU (Argon) - Electrical/Instrumenati	0.00%	7,500.00	7,500.00	7,500.00	ILM	3.2.6.5	18100-150	OXP	ELE-MT-CB	1	18100	OXP-Cold Box 1	ALEI
Oxygen Plant	48	1	No	Air Purification Units (APU 2) - Civil Works	100.00%	160.00	160.00	160.00	mx3	3.2.7.1	18100-300	OXP	CON-MT-CN	1	18100	OXP-APU2	PETRON
Oxygen Plant	49	1	No	Air Purification Units (APU 2) - Mechanical	100.00%	150.00	150.00	200.00	T	3.2.7.2	18100-150	OXP	MEC-MT-TI	1	18100	OXP-APU2	ALEI
Oxygen Plant	50	1	No	Air Purification Units (APU 2) - Piping	80.00%	3,000.00	3,000.00	3,000.00	ILM	3.2.7.3	18100-150	OXP	PIP-MT-IP	1	18100	OXP-APU2	ALEI
Oxygen Plant	51	1	No	Air Purification Units (APU 2) - Electrical/Instrumenation	11.11%	4,500.00	4,500.00	4,500.00	ILM	3.2.7.4	18100-150	OXP	ELE-MT-CB	1	18100	OXP-APU2	ALEI
Oxygen Plant	54	1	No	Air Purification Units (APU 1) - Civil Works	100.00%	160.00	160.00	160.00	mx3	3.2.8.1	18100-300	OXP	CON-MT-CN	1	18100	OXP-APU1	PETRON
Oxygen Plant	55	1	No	Air Purification Units (APU 1) - Mechanical	0.00%	150.00	150.00	200.00	T	3.2.8.2	18100-150	OXP	MEC-MT-TI	1	18100	OXP-APU1	ALEI
Oxygen Plant	56	1	No	Air Purification Units (APU 1) - Piping	0.00%	2,000.00	2,000.00	2,000.00	ILM	3.2.8.3	18100-150	OXP	PIP-MT-IP	1	18100	OXP-APU1	ALEI
Oxygen Plant	57	1	No	Air Purification Units (APU 1) - Electrical/Instrumenation	0.00%	4,500.00	4,500.00	4,500.00	ILM	3.2.8.4	18100-150	OXP	ELE-MT-CB	1	18100	OXP-APU1	ALEI
Oxygen Plant	60	1	No	Cooling Towers - Substructure	100.00%	800.00	800.00	800.00	mx3	3.2.9.1	18100-300	OXP	CON-MT-CN	1	18100	OXP-Cooling Towers	PETRON
Oxygen Plant	61	1	No	Cooling Towers - Superstructure Civil Works (Petron)	60.00%	800.00	800.00	900.00	mx3	3.2.9.2	18100-300	OXP	CON-MT-CN	1	18100	OXP-Cooling Towers	PETRON
Oxygen Plant	62	1	No	Cooling Towers - Mechanical	0.00%	30.00	30.00	100.00	T	3.2.9.3	18100-200	OXP	MEC-MT-TI	1	18100	OXP-Cooling Towers	GACTEL
Oxygen Plant	63	1	No	Cooling Towers - Piping	0.00%	12,000.00	12,000.00	12,000.00	ILM	3.2.9.4	18100-200	OXP	PIP-MT-IP	1	18100	OXP-Cooling Towers	GACTEL
Oxygen Plant	64	1	No	Cooling Towers - Electrical/Instrumenation	0.00%	6,000.00	6,000.00	6,000.00	ILM	3.2.9.5	18100-200	OXP	ELE-MT-CB	1	18100	OXP-Cooling Towers	GACTEL
Oxygen Plant	67	1	No	Cooling Water (CW) Pump House - Substructure (Petron)	100.00%	1,000.00	1,000.00	1,000.00	mx3	3.2.10.1	18100-300	OXP	CON-MT-CN	1	18100	OXP-(CW) Pump House	PETRON
Oxygen Plant	68	1	No	Cooling Water (CW) Pump House - Superstructure Civil Works	61.22%	700.00	700.00	900.00	mx3	3.2.10.2	18100-300	OXP	CON-MT-CN	1	18100	OXP-(CW) Pump House	PETRON
Oxygen Plant	69	1	No	Cooling Water (CW) Pump House - Mechanical	0.00%	40.00	40.00	100.00	T	3.2.10.3	18100-200	OXP	MEC-MT-TI	1	18100	OXP-(CW) Pump House	GACTEL
Oxygen Plant	70	1	No	Cooling Water (CW) Pump House - Piping	0.00%	2,000.00	2,000.00	2,000.00	ILM	3.2.10.4	18100-200	OXP	PIP-MT-IP	1	18100	OXP-(CW) Pump House	GACTEL
Oxygen Plant	71	1	No	Cooling Water (CW) Pump House - Electrical/Instrumenation	0.00%	6,000.00	6,000.00	6,000.00	ILM	3.2.10.5	18100-200	OXP	ELE-MT-CB	1	18100	OXP-(CW) Pump House	GACTEL
Oxygen Plant	74	1	No	Compressor Building - Substructure	100.00%	3,450.00	3,450.00	3,450.00	mx3	3.2.11.1	18100-350	OXP	CON-MT-CN	1	18100	OXP-Compressor Buil	RKD
Oxygen Plant	75	1	No	Compressor Building - Building Structural Steel	98.56%	832.00	832.00	832.00	T	3.2.11.2	18100-200	OXP	STS-MT-ER	1	18100	OXP-Compressor Buil	Jagannath Crack
Oxygen Plant	201	1	No	Compressor Building - Building Cladding	86.53%	10,000.00	10,000.00	8,090.00	Mx2	3.2.11.3	18100-400	OXP	CLD-MT-CL	1	18100	OXP-Compressor Buil	Spire Project

- **EVENGINE** holds and maintains all current and baseline Earned Value Units for Cost, Work and Material (Commodity) Usage

Project Controls EXPO

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Project Control Data Requirements by Activity to undertake Earned Value Performance Measurement (EVPM) and Cost Engineering Reporting:

Field	Description	EVPM Cost Fields	EVPM Work Fields	EVPM Mat. Fields
Project	Project File Description	Yes	Yes	Yes
Unique ID	Uniquely identifies the task in the project plan	Yes	Yes	Yes
Outline Level	Describes the level the task occupies within the project Work Break Down Structure [WBS]	Yes	Yes	Yes
Summary	Yes - identifies a Summary Task within the WBS, No – Identifies a Task	Yes	Yes	Yes
Description	Description of the Task	Yes	Yes	Yes
%C	Precent Complete	Yes	Yes	Yes
ES	Early Start Date	Yes	Yes	Yes
EF	Early Finish Date	Yes	Yes	Yes
LS	Late Start Date	Yes	Yes	Yes
LF	Late Finish Date	Yes	Yes	Yes
BS	Baseline Start	Yes	Yes	Yes
BF	Baseline Finish	Yes	Yes	Yes
BS2	Second Baseline Start	No	No	No
BF2	Second Baseline Finish	No	No	No
BAC	Budget At Completion Cost	Yes		
BAC2	Second Budget At Completion Cost	No		
EAC	Estimate At Completion Cost	Yes		
SP	Sell Price or Revenue	No		
BACW	Budget At Completion Work		Yes	
BACW2	Second Budget At Completion Work		No	
EACW	Estimate At Completion Work		Yes	
BACQ	Budget At Completion Quantity			Yes
BACQ2	Second Budget At Completion Quantity			No
EACQ	Estimate At Completion Quantity			Yes
QTY. UNIT	Quality Unit			No
WBS	Work Breakdown Structure	No	No	No
CA	Control (Cost) Account/Work Package	No	No	No
OBS	Organizational Breakdown Structure	No	No	No
Stage/Phase	Project Stage and Phase	No	No	No
Area/Facility	Area and Facility	No	No	No
User Defined 1	User Defined field 1	No	No	No
User Defined 2	User Defined field 2	No	No	No
Profile	Resource Contour to be applied to Tasks	No	No	No

Mandated data fields are marked (Yes) and optional marked (No).

Combined data requirements for cost, work and material usage based productivity Indicator analysis:

Production Reports	Mandated EVPM Cost	Mandated EVPM Work	Mandated EVPM Quantity
Cost Per Units of Work	Yes	Yes	No
Cost Per Units of Quantity	Yes	No	Yes
Quantity Per Units of Work	No	Yes	Yes
Work Per Units of Quantity	No	Yes	Yes

Additional data requirements for Cost Engineering:

CA - Cost Account Characteristics	
Contract Or Purchase Order	
Commitment Lead	Commitment Date
Awarded Date	

Payment Terms		
BAC Payment Terms	EAC Payment Terms	SP Payment Terms

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Key Data Coding Requirements For Reporting

To facilitate reporting and control the project the following activity and resource codes are required:

- The (WBS) Work Breakdown Structure code for defining the Scope of Work and for mapping imported actual units of cost, work and material usage to WBS elements
- The (CA) Control Account code for defining work packages (contractual lumps of work) and for mapping imported actual units of cost, work and material usage to CA groupings of tasks
- The (OBS) Organizational Breakdown Structure code for defining departmental and organizational responsibility
- The Stage/Phase code used group tasks into project development and approval gates mirroring the development lifecycle
- The Area/Facility code used to identify and group dispersed facilities for complex mega projects and used to identify sub-facility work breakdown
- The User Defined Fields 1 & 2 codes used to further group tasks for specific tracking and reporting purposes
- Resource Code to track and group labour and material with common characteristics across the project

Additional Cost Engineering Specific CA Coding for Type Classification

- Awarded or Un-Awarded status – used for commercial and finance control
- Commercial Type: Contract or Purchase Order – used for commercial and finance control
- Committed or Un-committed status – used for finance control

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Case Study - Project Codes For Managing Data:

Stage/Phase	Description
Project Wide	
Unspecified CA	
1	Phase 1 - 1,500 MTA
2	Phase 2 - 4,500 MTA
3	Phase 4 -9,000 MTA

Stage/Phase - identifies three phases to the project.

Area/Facility - Identifies some 19 vertical technology and common horizontal areas and facilities to the project.

Area/Facility	Description
Project Wide	
Unspecified CA	
11100	Central Civil
12100	Plate Mill
13100	Lime & Dolomite PLant
13200	Raw Materials Handling 6
13300	Raw Materials Handling 1&2
13500	Rail Infrastructure
13900	Water Supply, Treatment & Distribution Systems
14100	Gas Distribution System
14200	Propane Tanks
14300	Light Diesel Tanks
14600	Power Transmission & Reticulation
14800	Process Boiler Plant
15100	Coal Wshery
16100	CGP
17100	DRI
18100	Oxygen Plant
18200	Compressor House
19100	SMS
19200	Slab Caster

CA	Description	Contract Purchase Order Type
Unspecified CA		
11100-100	Hanumanta Construction	
12100-100	BINZY	Contract
12100-200	GDC	Contract
12100-220	JSPL	Contract
12100-300	Leighton	Contract
12100-320	LPEngineering	Contract
12100-340	Multicolour	Contract
12100-360	PAPL	Contract
12100-380	Petron	Contract
12100-400	Raju enterp	Contract
12100-420	Saraswati	Contract
12100-440	Spire Project	Contract
12100-TBA	TBA	Contract
13100-100	Enviro bulk handling system	Contract
13100-200	EPC	Contract
13100-300	Hazee Baba	Contract
13100-320	Jose	Contract
13100-400	Mohan	Contract
13100-500	Petron	Contract

CA - Control Accounts – Identifies some 250 Contractors & Suppliers, Code describes both facility, contract number Description and Type.

OBS	Description
Project Wide	
Unspecified CA	
CAP	Compressed Air Facility
CAW	Coal Washery
CGP	Coal Gasification Plant
CU	Central Utilities
CVL	Central Civil
DRI	Direct Reduced Iron Plant
GDS	Gas Distribution System
LDO	Light Diesel Tanks
LDP	Lime & Dolomite Plant
OXP	Oxygen Plant
PB	Process Boilers
PML	Plate Mill
PRP	Propane Storage Tank
PWR	Power Supply
RAL	Rail
RMHS-01,02	Raw materials Handling
RMHS-06	Raw materials Handling
SLC	Slab Caster
SMS	Steel Melt Shop

OBS - Organizational Breakdown Structure- Identifies some 19 Departments responsible for project implementation and control.

User Defined 1	Description
Project Wide	
Unspecified CA	
220KV ACKIOSK	
220KV Oil burn/soak pits	
220KV Priority-2	
220KV Transformer-5 & 6 installation	
400/34.5 KV, 230 MVA	
400Kv Bay 10,11 & 12	
ACW Pump House	
ACW Switch Room	
Air Compressor and DM P/H	
Area 100 - Furnance	
Area 200 - Reducing Gas Heater	

User Defined Code 1 – List of some 292 Sub-facilities

User Defined Code 2 – lists some 158 major contractors and suppliers tracked for the project.

User Defined2	Description
Project Wide	
Unspecified CA	
A N Instrument	
ABB	
AGRIGOLD	
AK Engg	
ALEI	
All parties	
Allied Energy	
Allied Energy/Das const	
Alstom	
Amarpal Engg	
Anand Engineering	
Auro	
Baba Mani	
Bansal	
Basu	
BEVCON	
Bhaskar tanu	

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Case Study - Resource Codes for Managing Labour and Material (Commodity) Units

Resource Code Library		
Description	**Resource Code**	**Units**
Earthworks:		
Bulk Excavation & Removal From Site	ETH-MT-EW	mx3
EARTHWORKS-DRAINS	ETH-MT-DR	m
Labour		
Equipment Operators Skilled	ETH-LB-SK	Hrs
General Labour Semi-Skilled	ETH-LB-SS	Hrs
Equipment (Optional)		
Equipment Trucks	ETH-EQ-TR	Hrs
Equipment Excavator	ETH-EQ-EX	Hrs
Concete		
Materials		
Concrete	CON-MT-CN	mx3
Rebar in tonnes fix/place	CON-MT-RF	T
CONCRETE PILING	CON-MT-PL	
ARCHITECTURAL INTERIOR	ARC-MT-IN	Mx2
ARCHITECTURAL WORKS	ARC-MT-AR	
Rebar in tonnes cut and bend	CON-MT-BB	T
Formwork	CON-MT-FW	Mx2
Labour		
Skilled Labour	CON-LB-SK	Hrs
Semi-Skilled Labour	CON-LB-SS	Hrs
Equipment (Optional)		
Concrete pumps	CON-EQ-PU	Hrs
Cranes	CON-EQ-CR	Hrs
Agitation Truck	CON-EQ-AT	Hrs
Steelwork		
Fabrication		
Fabrication in tonnes off-site	STS-MT-FO	T
Fabrication in tonnes on-site	STS-MT-FB	T
Labour		
Erection/On Site Fabrication		
Erect-Structural Steel	STS-MT-ER	T
Erect-Skilled Labour	STS-LB-SK	Hrs
Erect- Semi-Skilled	STS-LB-SS	Hrs
Equipment Optional		
Cranes	STS-EQ-CR	Hrs

CURRENTLY IN USE	
CON-MT-CN	CONCRETE WORK
STS-MT-FB	STRUCTURAL FABRICATION-ONSITE
STS-MT-ER	STRUCTURAL ERECTION
ELE-MT-CB	ELECTRICAL CABLING
ETH-MT-EW	EARTH WORKS
PIP-MT-IP	PIPING WORK
MEC-MT-TI	MECHANICAL ITEMS (TECH.)
ARC-MT-IN	ARCHITECTURAL INTERIOR
STS-MT-FO	STRUCTURAL FABRICATION-OFFSITE
MEC-MT-CR	MECHANICAL ITEMS (CRANE)
MEC-MT-CH	MECHANICAL ITEMS (CHUTE)
INS-MT-TF	INSTRUMENTS NO.
MEC-MT-TK	MECHANICAL TANKS
MEC-MT-PU	MECHANICAL PUMPS
INS-MT-PC	INSTRUCMENTATION PANELS
INS-MT-CB	INSTRUMENTATION CABLING
MEC-MT-AC	MECHANICAL HVAC
PIP-MT-FP	PIPING FABRICATION
PIP-MT-IS	INSULATION PIPING
MEC-MT-FB	MECHANICAL FABRICATION
ETH-MT-DR	EARTHWORKS-DRAINS
CLD-MT-CL	CLADDING
CON-MT-PL	CONCRETE PILING
ARC-MT-AR	ARCHITECTURAL WORKS
REF-MT-RF	REFRACTORY

Resource Code – Lists some 25 labour and commodity codes being tracked.

- **Step 1 - Decide on Key Labour and Commodities for Tracking including their unit of measure**
- **Step 2 - Define the code list**
- **Step 3 - Assign code and BAC and EAC units to activities for tracking and reporting**

"LIST OF NIGP COMMODITY CODES" http://www.peelregion.ca/finance/purchasing/biddocs/vendapp/comcodes.pdf

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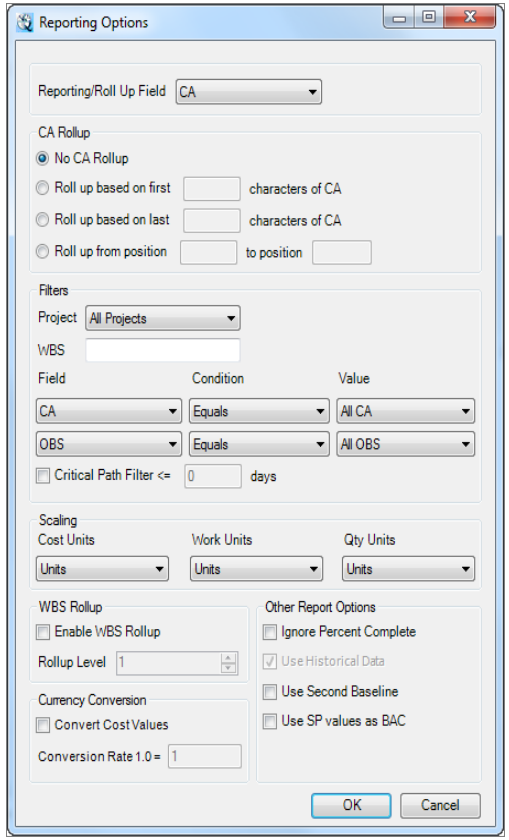
Application of Combined Filter Codes for Reporting



- Multiple Filtering Options:
  - Project
  - WBS
  - Cost Account (CA)
  - Stage/Phase
  - Area/Facility
  - OBS
  - Resource
  - User Defined 1&2

Purpose of filters is to drill down and focus on selected data depending on the report requirements
Type of report are characterised by:

- Project Progress Reports
- Financial Reports
- Contractor Reports
- Commodity Specific Reports
- Schedule Based Report

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Selecting and Grouping Filtered Data for Focusing Reports

Cost Management Reports

Workbook 12_08_31 COMBINED FACILITIES PROJECT EXPO.xlsx | Period Monthly | Report Options

Destination 12_08_31 COMBINED FACILITIES PROJECT EXPO.xlsx

Cost Management Report | Commitments Report and Graph | Metrics Report

Enable Cost Management Report

Report Fields

	Cost Early	Cost Late	Work Early	Work Late	Quantity Early	Quantity Late
EV	☑	☐	☐	☐	☐	☐
PV	☑		☐		☐	
AC/ETC	☑	☐	☐	☐	☐	☐
PSP	☐					
ESP	☑	☐				
SV	☐	☐	☐	☐	☐	☐
CV/WV/QV	☑	☐	☐	☐	☐	☐
SPV	☐	☐	☐	☐	☐	☐
P	☑	☐				
PP	☑	☐				
SPSV	☐	☐				
PVar	☐	☐				
SPI	☐	☐	☐	☐	☐	☐
CPI/WPI/QPI	☐	☐	☐	☐	☐	☐
SRI	☐	☐	☐	☐	☐	☐
SPSPI	☐	☐				
PPI	☐	☐				
TCPI(BAC)	☐	☐	☐	☐	☐	☐
TCPI(EAC)	☐	☐	☐	☐	☐	☐
VAC	☑		☐		☐	
VAC%	☐		☐		☐	

	Cost Early	Cost Late	Work Early	Work Late	Quantity Early	Quantity Late
%EV Comp(BAC)	☐	☐	☐	☐	☐	☐
%Spent(BAC)	☐	☐	☐	☐	☐	☐
%Spent(EAC)	☐	☐	☐	☐	☐	☐
%PV	☐		☐		☐	
%SV	☐	☐	☐	☐	☐	☐
%CV/%WV/%QV	☐	☐	☐	☐	☐	☐
%SPV	☐	☐				
%P	☐	☐				
%PP	☐	☐				
%SPSV	☐	☐				
%PVar	☐	☐				
IEAC(1)	☐	☐	☐	☐	☐	☐
IEAC(2)	☐	☐	☐	☐	☐	☐
IEAC(3)	☐	☐	☐	☐	☐	☐
IEAC(4)	☐	☐	☐	☐	☐	☐
MEAC	☐	☐	☐	☐	☐	☐
BAC	☑		☐		☐	
BAC2	☐		☐		☐	
EAC	☑		☐		☐	
SP	☑					
BAC Delta	☐		☐		☐	

Report Grouping: CA | Task | None | None

Data Date Range: ☑ To Status Period ☑ At Status Period ☑ At Completion ☐ Previous Period ☑ Remaining

Additional Fields: ☐ Include Project ☐ Include WBS ☐ Include Dates ☑ Include CA ☐ Include OBS ☐ Include Resources ☑ Include Stage

OK | Cancel

Multiple Grouping Options:

Cost Account (CA)

Task

OBS

Resource

Stage/Phase

Area/Facility

User Defined 1&2

Project

Committed/Uncommitted

Awarded/Not Awarded

Purchase Order/Contract

Multiple Data Selection:

- Metrics
- Indicators
- Predictors

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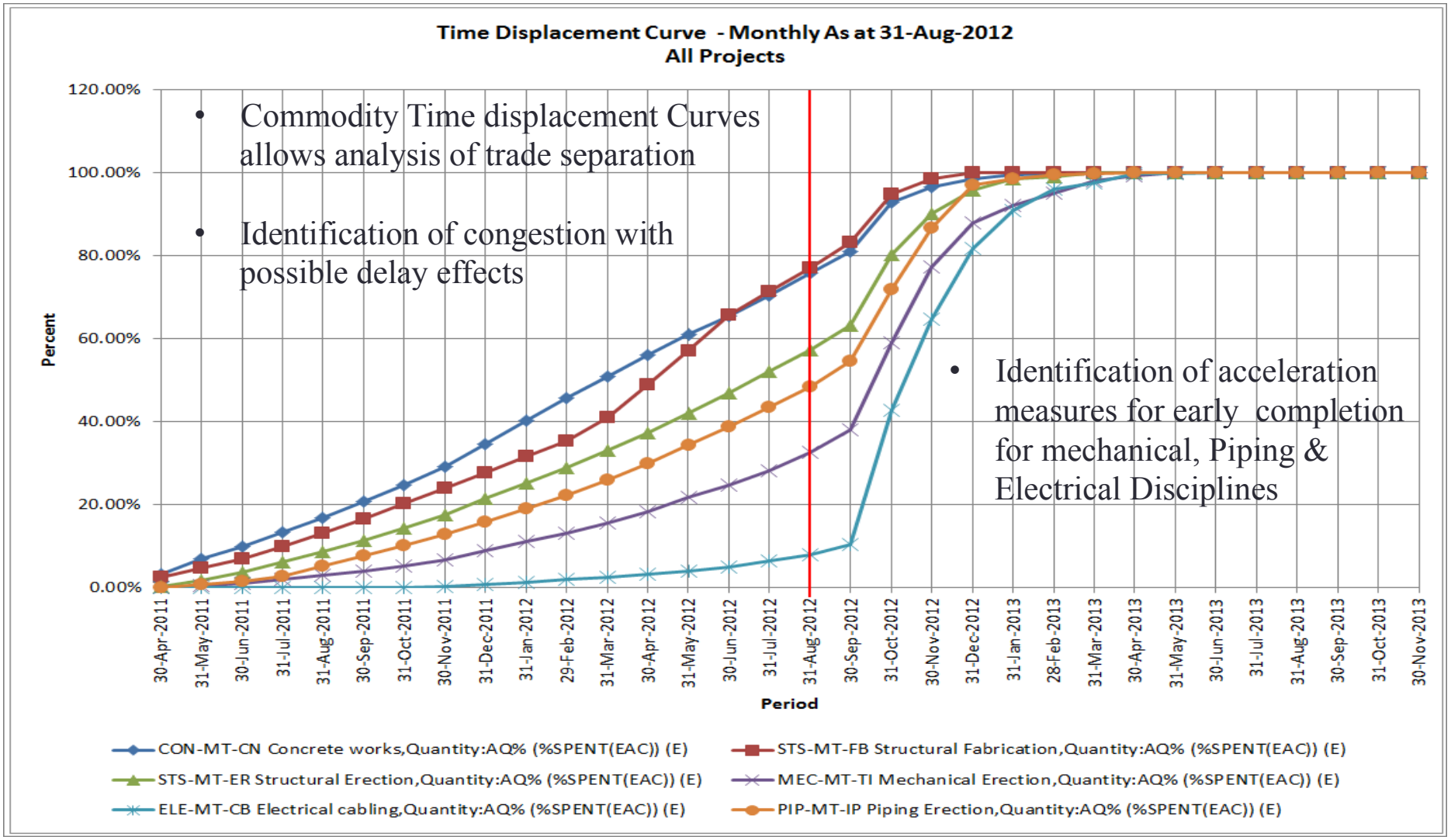
Representative Examples of Productivity Analysis Reports

Project Wide Commodity Specific Time Displacement Specific % S-Curves



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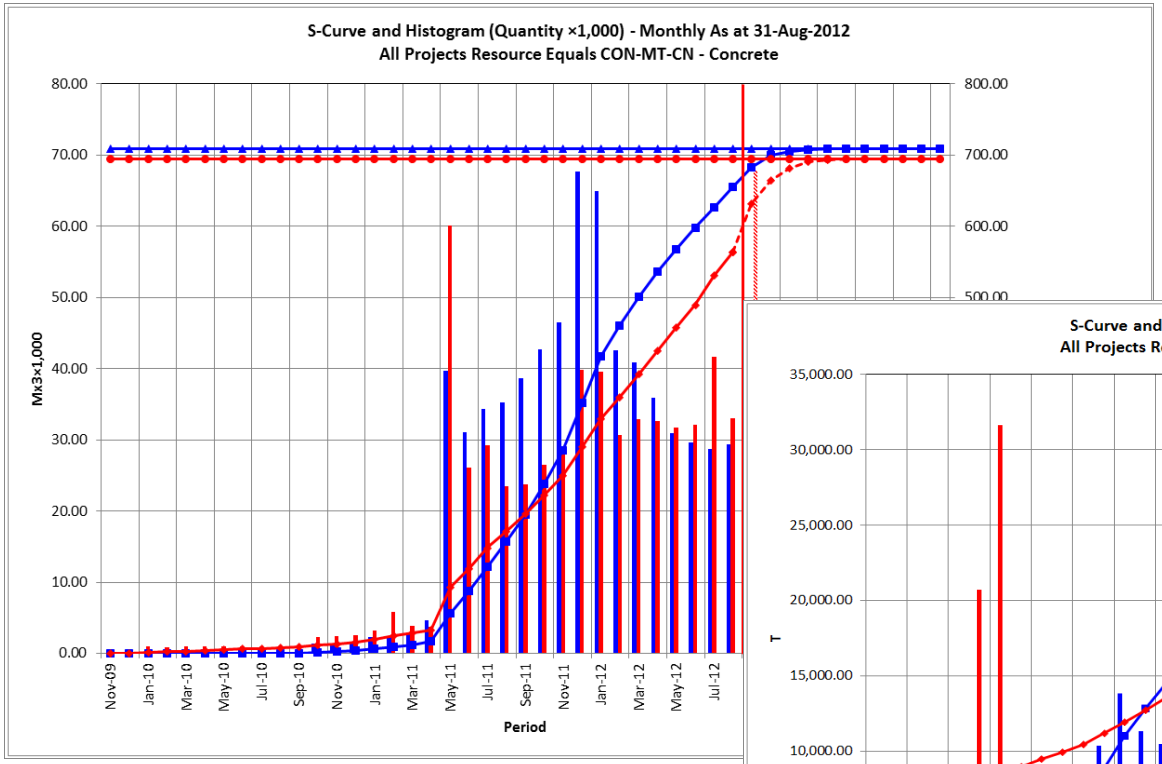
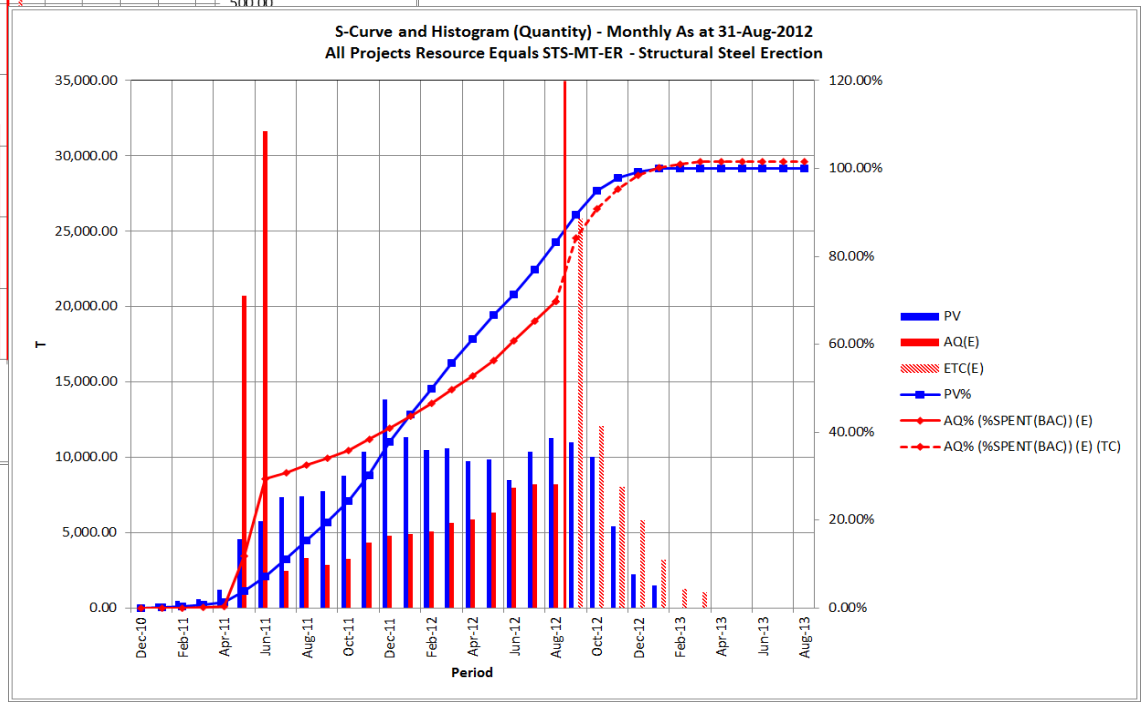
Representative Examples of Productivity Analysis Reports

Project Wide Commodity Specific – Concrete & Steel S-Curves & Histograms



- Commodity Concrete Placement - Actual Versus Planned
- Commodity Steel Erection with S-curve in % Completion - Actual Versus Planned



- Other commodity curves would be related to: Plate-work, Platforms, Hand Rail, Mechanical Installation, Piping Installation, Electrical Cable Tray, Cable, Terminations, Instrument Installation

- Used to assess period performance and feasibility of production rates to completion

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Representative Examples of Productivity Analysis Reports

Project Wide Commodity Specific Budgeted Concrete By Facility

Project: All Projects

Filter: Resource Equals CON-MT-CN - Concrete

	Area/Facility																	
	17100 - DRI	18100 - Oxygen Plant	15100 - Coal Wshery	14800 - Process Boiler Plant	16100 - CGP	12100 - Plate Mill	13300 - Raw Materials Handling 1&2	19100 - SMS	19200 - Slab Caster	13900 - Water Supply, Treatment & Distribution	13200 - Raw Materials Handling 6	13100 - Lime & Dolomite PLant	14100 - Gas Distribution System	14200 - Propane Tanks	14300 - Light Diesel Tanks	18200 - Compressor House	14600 - Power Transmission & Reticulation	Total	% Distribution
Simplex	27,784.00			26,482.50	20,466.00	10,587.00		37,132.16	10,881.00		34,635.00						14,885.00	182,852.66	25.79%
Petron	6,680.00	8,080.00			16,985.00	25,200.00	36,845.50			25,165.00								118,955.50	16.78%
GDC						70,915.00												70,915.00	10.00%
Viraj								10,582.76	33,734.16	14,530.00								58,846.92	8.30%
Leighton						26,190.00	15,195.00	2,831.00	4,611.00									48,827.00	6.89%
PB												12,774.00	19,230.00	1,160.00	325.00	6,300.00		39,789.00	5.61%
NCC							32,653.50											32,653.50	4.61%
Petron/Essar					21,935.00													21,935.00	3.09%
L&T								20,598.50										20,598.50	2.91%
Petron/L&T					12,758.00													12,758.00	1.80%
Essar/Petron/L&T,Other Civil					11,754.00													11,754.00	1.66%
Spiral											11,300.00							11,300.00	1.59%
Essar	791.00			9,160.00														9,951.00	1.40%
OATS	1,332.00						2,239.50				5,776.50							9,348.00	1.32%
RKD		7,950.00																7,950.00	1.12%
IVRCL	100.00							3,643.71	2,400.00									6,143.71	0.87%
L&T/Petron					5,755.00													5,755.00	0.81%
Hanumanta Construction					4,453.00													4,453.00	0.63%
GuruMaharaj							3,350.00											3,350.00	0.47%
Stacker Reclaimer2							2,500.00											2,500.00	0.35%
Paresh							2,084.00				272.50							2,356.50	0.33%
AGRIGOLD	300.00	1,950.00																2,250.00	0.32%
Petron/other civil					2,230.00													2,230.00	0.31%
Konark							2,180.00											2,180.00	0.31%
ECI			2,096.10															2,096.10	0.30%
Om Constructions	2,028.00																	2,028.00	0.29%
Simplex/L&T					1,700.00													1,700.00	0.24%
Satya sai - tarani	450.00																	450.00	0.06%
HR Constructions	394.00																	394.00	0.06%
L&T/Other Civil/Zeppline					350.00													350.00	0.05%
L&T/Zeppline/other					350.00													350.00	0.05%
MMM			260.00															260.00	0.04%
L&T/Petron/Other Civil					220.00													220.00	0.03%
MS Constrcution	220.00																	220.00	0.03%
Rath	194.00																	194.00	0.03%
KS Biswal	110.00																	110.00	0.02%
CRP infra Structure	60.00																	60.00	0.01%
Total	43,839.00	17,980.00	2,356.10	35,642.50	100,756.00	132,892.00	100,219.50	74,788.13	51,626.16	42,255.00	51,984.00	12,774.00	19,230.00	1,160.00	325.00	6,300.00	14,885.00	709,012.38	100.00%
% Distribution	6.18%	2.54%	0.33%	5.03%	14.21%	18.74%	14.14%	10.55%	7.28%	5.96%	7.33%	1.80%	2.71%	0.16%	0.05%	0.89%	2.10%	100.00%	

- Identifies the allocation of concrete quantities for placement to contractors by facility
- Percentage Distribution identifies over or under allocation of work to contractors

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Representative Examples of Productivity Analysis Reports

Project Wide Commodity Specific – Concrete – Remaining Work by Facility

Metrics Report - ETC(E) (mx3)

Project: All Projects
Filter: Resource Equals CON-MT-CN - Concrete

User Defined 2	Area/Facility																		
	17100 - DRI	18100 - Oxygen Plant	15100 - Coal Wshery	14800 - Process Boiler Plant	16100 - CGP	12100 - Plate Mill	13300 - Raw Materials Handling 1&2	19100 - SMS	19200 - Slab Caster	13900 - Water Supply, Treatment & Distribution Systems	13200 - Raw Materials Handling 6	13100 - Lime & Dolomite PLant	14100 - Gas Distribution System	14200 - Propane Tanks	14300 - Light Diesel Tanks	18200 - Compressor House	14600 - Power Transmission & Reticulation	Total	% Distribution
Leighton						22,555.00	12,451.00	0.00	411.00									35,417.00	27.19%
Simplex	1,455.50			2,815.50	808.00	0.00		0.00	1,488.00		5,612.00						4,483.00	16,662.00	12.79%
Petron	0.00	834.00			1,198.00	7,436.00	3,580.00			0.00								13,048.00	10.02%
GDC						11,503.97												11,503.97	8.83%
Essar	1,114.00			8,340.00														9,454.00	7.26%
PB												3,390.00	0.00	0.00	34.00	5,300.00		8,724.00	6.70%
Viraj								140.00	542.65	6,805.00								7,487.65	5.75%
L&T								6,728.00										6,728.00	5.17%
Essar/Petron/L&T,Other Civil					5,467.00													5,467.00	4.20%
Hanumanta Construction					3,290.00													3,290.00	2.53%
NCC							3,110.00											3,110.00	2.39%
Petron/Essar					2,052.00													2,052.00	1.58%
Stacker Reclaimer2							1,262.00											1,262.00	0.97%
Stacker Reclaimer3							730.00											730.00	0.56%
Simplex/L&T					520.00													520.00	0.40%
OATS	17.00						265.00				217.50							499.50	0.38%
GuruMaharaj							481.00											481.00	0.37%
Pratap Devta										454.00								454.00	0.35%
AGRIGOLD	209.00	220.00																429.00	0.33%
IVRCL	0.00							400.00	0.00									400.00	0.31%
Petron/L&T					375.00													375.00	0.29%
TBA	291.00						70.00											361.00	0.28%
Om Constructions	284.00																	284.00	0.22%
Pari Constructions							274.50											274.50	0.21%
Konark							220.00											220.00	0.17%
L&T/Petron					211.00													211.00	0.16%
Petron/Simplex					171.00													171.00	0.13%
Biswal	127.00																	127.00	0.10%
Meghana	125.00																	125.00	0.10%
Rath	124.00																	124.00	0.10%
MS Constrcution	123.12																	123.12	0.09%
Satya sai - tarani	63.50																	63.50	0.05%
KS Biswal	51.00																	51.00	0.04%
Sukantam	20.00																	20.00	0.02%
Total	4,004.12	1,054.00	0.00	11,155.50	14,092.00	41,494.97	22,443.50	7,268.00	2,441.65	7,259.00	5,829.50	3,390.00	0.00	0.00	34.00	5,300.00	4,483.00	130,249.24	100.00%
% Distribution	3.07%	0.81%	0.00%	8.56%	10.82%	31.86%	17.23%	5.58%	1.87%	5.57%	4.48%	2.60%	0.00%	0.00%	0.03%	4.07%	3.44%	100.00%	

- Identify the remaining quantity of work to be completed by facility by contractor
- Identifies over or under loading of contractors, used for redistribution of work

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Representative Examples of Productivity Analysis Reports

Project Wide Commodity Specific Concrete Remaining Quantity Period Targets and Placement Rates.

Performance Report Detailed Period by User Defined 2 (mx3) - Monthly As at 31-Aug-2012
Using BAC2 as BAC
Project: All Projects
Filter: Resource Equals CON-MT-CN - Concrete

Project	WBS	Activity	User Defined 2		Start		End	Field	To Status	To Complete	Total	31-Aug-2012	30-Sep-2012	31-Oct-2012	30-Nov-2012	31-Dec-2012	31-Jan-2013	28-Feb-2013	31-Mar-2013
All Projects	N/A		AGRIGOLD	BS	2-May-2011	BF	9-Nov-2012	PV	2,914.19	55.81	2,970.00	47.79	30.08	19.94	5.79	0.00	0.00	0.00	0.00
				ES	2-May-2011	EF	9-Nov-2012	AQ(E)	2,541.00	429.00	2,970.00	8.76	209.00	143.85	76.15	0.00	0.00	0.00	0.00
All Projects	N/A		Biswal	BS	2-May-2011	BF	5-Sep-2012	PV	575.48	2.52	578.00	15.64	2.52	0.00	0.00	0.00	0.00	0.00	0.00
				ES	2-May-2011	EF	5-Sep-2012	AQ(E)	451.00	127.00	578.00	3.51	127.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		CRP infra Structure	BS	19-Oct-2011	BF	24-Aug-2012	PV	60.00	0.00	60.00	4.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	19-Oct-2011	EF	24-Aug-2012	AQ(E)	60.00	0.00	60.00	4.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		ECI	BS	1-May-2011	BF	24-Nov-2011	PV	2,096.10	0.00	2,096.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	1-May-2011	EF	24-Nov-2011	AQ(E)	2,096.10	0.00	2,096.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		Essar	BS	2-May-2011	BF	11-Jun-2013	PV	5,923.81	4,809.19	10,733.00	1,786.64	1,689.29	1,719.36	1,012.20	83.33	0.00	0.00	0.00
				ES	3-Nov-2011	EF	11-Jun-2013	AQ(E)	1,279.00	9,454.00	10,733.00	45.95	3,570.32	3,261.53	1,955.09	362.07	0.00	0.00	0.00
All Projects	N/A		Essar/Petron/L&T,Other Civil	BS	2-Dec-2011	BF	26-Nov-2012	PV	8,863.63	2,814.37	11,678.00	1,002.82	970.47	1,002.82	841.07	0.00	0.00	0.00	0.00
				ES	2-Dec-2011	EF	26-Nov-2012	AQ(E)	6,211.00	5,467.00	11,678.00	702.70	1,885.17	1,948.01	1,633.82	0.00	0.00	0.00	0.00
All Projects	N/A		GDC	BS	11-Oct-2011	BF	12-Nov-2012	PV	65,341.93	5,468.07	70,810.00	7,575.02	4,313.18	839.70	315.19	0.00	0.00	0.00	0.00
				ES	11-Oct-2011	EF	12-Nov-2012	AQ(E)	59,306.03	11,503.97	70,810.00	6,794.53	8,200.35	2,402.80	900.82	0.00	0.00	0.00	0.00
All Projects	N/A		Govindham	BS	1-Dec-2011	BF	10-Apr-2012	PV	812.00	0.00	812.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	1-Dec-2011	EF	10-Apr-2012	AQ(E)	812.00	0.00	812.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		GuruMaharaj	BS	29-Apr-2011	BF	20-Sep-2012	PV	3,304.08	45.92	3,350.00	87.62	45.92	0.00	0.00	0.00	0.00	0.00	0.00
				ES	29-Apr-2011	EF	20-Sep-2012	AQ(E)	2,869.00	481.00	3,350.00	55.95	481.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		Hanumanta Construction	BS	18-Aug-2011	BF	20-Feb-2013	PV	2,939.67	1,338.33	4,278.00	239.82	232.08	239.82	232.08	239.82	239.82	154.72	0.00
				ES	18-Aug-2011	EF	30-Dec-2012	AQ(E)	988.00	3,290.00	4,278.00	80.60	815.70	842.89	815.70	815.70	0.00	0.00	0.00
All Projects	N/A		HR Constructions	BS	15-Oct-2011	BF	31-May-2012	PV	394.00	0.00	394.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	15-Oct-2011	EF	31-May-2012	AQ(E)	394.00	0.00	394.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		IVRCL	BS	5-Oct-2011	BF	10-Oct-2012	PV	5,805.96	337.75	6,143.71	627.40	322.18	15.57	0.00	0.00	0.00	0.00	0.00
				ES	4-Nov-2011	EF	10-Oct-2012	AQ(E)	5,743.71	400.00	6,143.71	0.00	344.12	55.88	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		Konark	BS	10-May-2011	BF	20-Sep-2012	PV	2,101.10	78.90	2,180.00	150.48	78.90	0.00	0.00	0.00	0.00	0.00	0.00
				ES	10-May-2011	EF	20-Sep-2012	AQ(E)	1,960.00	220.00	2,180.00	134.07	220.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		KS Biswal	BS	24-Jan-2012	BF	6-Nov-2012	PV	49.88	15.12	65.00	7.00	6.77	7.00	1.35	0.00	0.00	0.00	0.00
				ES	24-Jan-2012	EF	6-Nov-2012	AQ(E)	14.00	51.00	65.00	1.96	22.84	23.60	4.57	0.00	0.00	0.00	0.00
All Projects	N/A		L&T	BS	24-Mar-2011	BF	22-Jan-2013	PV	10,173.90	5,168.10	15,342.00	2,741.17	3,860.20	1,293.91	5.06	5.22	3.71	0.00	0.00
				ES	24-Mar-2011	EF	7-Nov-2012	AQ(E)	8,614.00	6,728.00	15,342.00	778.00	4,924.32	1,795.61	8.08	0.00	0.00	0.00	0.00
All Projects	N/A		Sukantam	BS	2-May-2011	BF	10-Sep-2012	PV	744.66	9.34	754.00	39.10	9.34	0.00	0.00	0.00	0.00	0.00	0.00
				ES	2-May-2011	EF	10-Sep-2012	AQ(E)	734.00	20.00	754.00	38.30	20.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		TBA	BS	3-May-2011	BF	15-Nov-2012	PV	286.50	74.50	361.00	27.24	4.50	28.00	42.00	0.00	0.00	0.00	0.00
				ES	15-Aug-2012	EF	15-Nov-2012	AQ(E)	0.00	361.00	361.00	0.00	291.00	28.00	42.00	0.00	0.00	0.00	0.00
All Projects	N/A		Viraj	BS	2-May-2011	BF	27-Mar-2013	PV	57,001.95	2,044.98	59,046.93	1,344.40	756.58	462.35	283.37	196.60	124.75	112.68	108.65
				ES	2-May-2011	EF	27-Mar-2013	AQ(E)	51,559.27	7,487.65	59,046.92	570.01	3,161.06	2,246.36	858.59	536.12	247.11	223.19	215.22
								Field	To Status	To Complete	Total	31-Aug-2012	30-Sep-2012	31-Oct-2012	30-Nov-2012	31-Dec-2012	31-Jan-2013	28-Feb-2013	31-Mar-2013
								PV	616,106.39	78,567.57	694,673.96	44,567.04	38,300.41	22,727.33	10,574.76	4,197.68	1,654.64	684.68	123.08
								AQ(E)	564,424.70	130,249.24	694,673.94	33,084.54	67,910.87	32,049.03	17,293.71	8,848.79	2,726.85	877.19	237.80

- Used to analyse Contractor Performance against Baseline (Target) Values
- Used to assess the feasibility of meeting remaining target quantities for remaining periods
- Totals can be used to assess the requirement for consumables to be held in stock to sustain the work to completion

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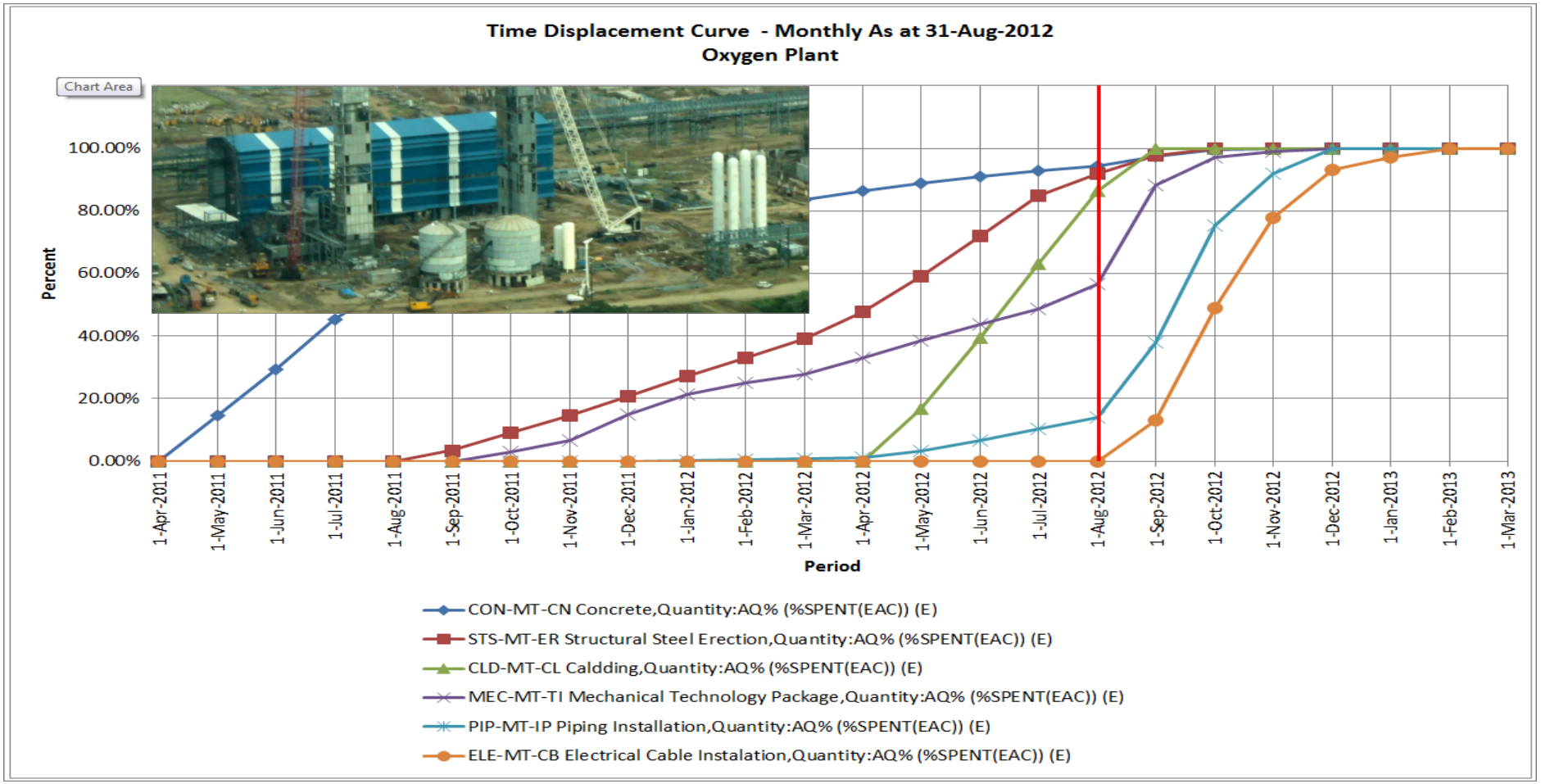
Representative Productivity Analysis Reports

Using Filters for Facility Specific – Time Displacement Specific % S-Curves



- Details the production history and planned work to completion by % and discipline
- Identifies trade separation, congestion or acceleration

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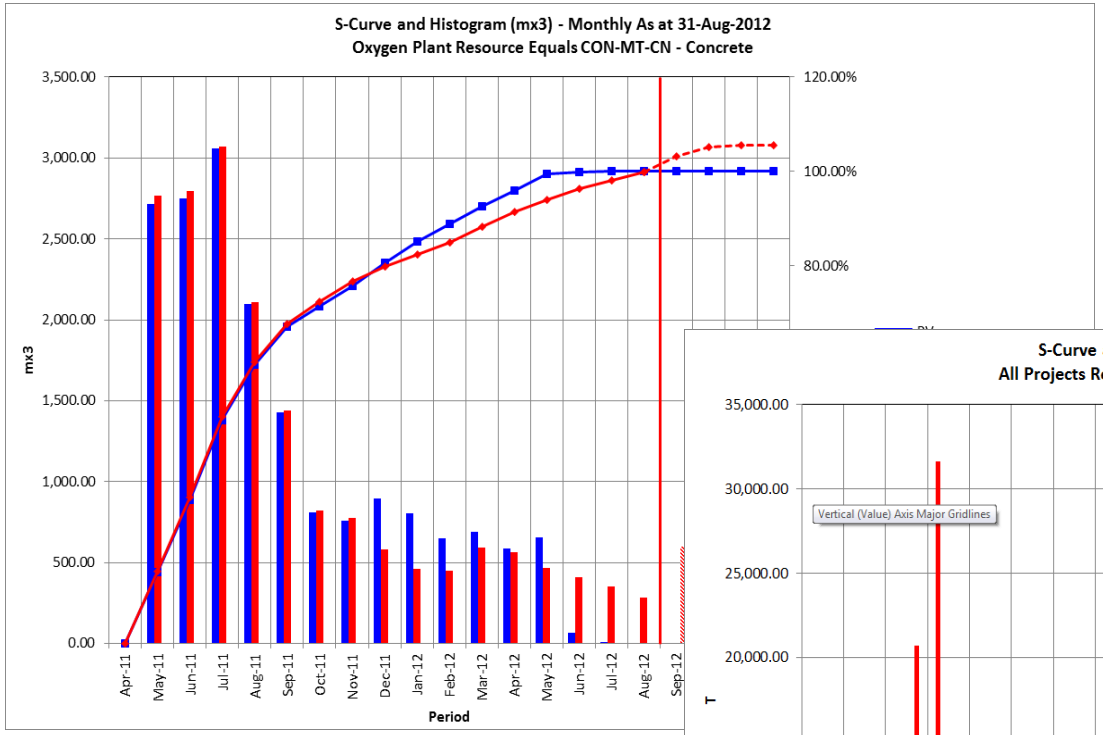
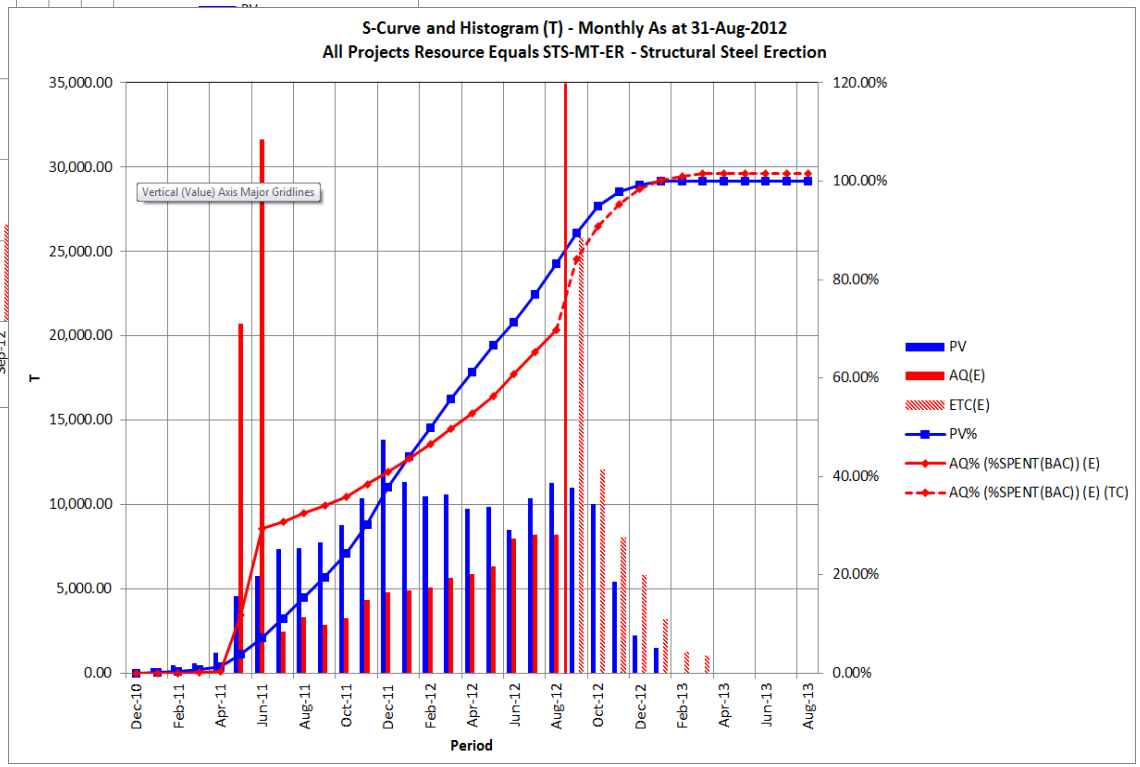
Representative Productivity Analysis Reports

Facility Specific – Concrete & Steel S-Curves & Histograms



- Commodity Concrete Placement - Actual Versus Planned
- Commodity Steel Erection with S-curve in % Completion - Actual Versus Planned



- Other commodity curves would be related to: Plate-work, Platforms, Hand Rail, Mechanical Installation, Piping Installation, Electrical Cable Tray, Cable, Terminations, Instrument Installation.

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Representative Examples of Productivity Analysis Reports

Facility Specific – Production Reports

Metrics Report - BAC (Quantity) - Monthly As at 31-Aug-2012
Project: Oxygen Plant
Filter: No Filter

		Resource						
		CON-MT-CN - Concrete	ELE-MT-CB - Electrical Cable Instalation	INS-MT-TF - Instrumenation	MEC-MT-TI - Mechanical Technology Package	PIP-MT-IP - Piping Installation	STS-MT-ER - Structural Steel Erection	CLD-MT-CL - Caldding
User Defined 2	AGRIGOLD	1,950.00						
	ALEI		65,000.00	100.00	2,050.00	106,000.00	260.00	
	GACTEL		12,000.00		70.00	14,000.00		
	Jagannath Cracker						1,152.00	
	LP ENGG.				70.00			
	Petron	8,080.00						
	RKD	7,950.00						
	Spire Project							10,000.00
	TBA		26,001.00		2.00			
	Total	17,980.00	103,001.00	100.00	2,192.00	120,000.00	1,412.00	10,000.00
	Total	mx3	LM	No	T	IN-LM	T	Mx2

- Contractor allocation of budgeted work for key commodity groupings
- Time phased Actual and Forecast to Completion Quantities against baseline or target period quantities for commodity based contracts
- Data is used to set and track period actuals against targets.

Performance Report Detailed Period by User Defined 2 (Quantity) - Monthly As at 31-Aug-2012
Using BAC2 as BAC
Project: Oxygen Plant
Filter: No Filter

Project	WBS	Activity	User Defined 2		Start		End	Field	To Status	To Complete	Total	31-Aug-2012	30-Sep-2012	31-Oct-2012	30-Nov-2012	31-Dec-2012	31-Jan-2013	28-Feb-2013	31-Mar-2013
All Projects	N/A		AGRIGOLD	BS	2-May-2011	BF	24-Jul-2012	PV	1,950.00	0.00	1,950.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	2-May-2011	EF	9-Nov-2012	AQ(E)	2,450.00	220.00	2,670.00	0.00	0.00	143.85	76.15	0.00	0.00	0.00	0.00
All Projects	N/A		ALEI	BS	10-Oct-2011	BF	4-Sep-2012	PV	173,246.78	65.22	173,312.00	2,601.22	65.22	0.00	0.00	0.00	0.00	0.00	0.00
				ES	7-Aug-2011	EF	21-Feb-2013	AQ(E)	17,651.00	151,791.00	169,442.00	4,450.57	30,349.73	57,814.89	35,770.87	20,891.22	4,151.79	2,812.50	0.00
All Projects	N/A		GACTEL	BS	4-Dec-2011	BF	16-Jul-2012	PV	26,070.00	0.00	26,070.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	7-Sep-2012	EF	1-Jan-2013	AQ(E)	0.00	26,200.00	26,200.00	0.00	1,573.56	10,437.78	9,534.38	4,568.57	85.71	0.00	0.00
All Projects	N/A		Jagannath Cracker	BS	12-Sep-2011	BF	26-Jun-2012	PV	1,152.00	0.00	1,152.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	12-Sep-2011	EF	20-Aug-2012	AQ(E)	1,152.00	0.00	1,152.00	86.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		LP ENGG.	BS	4-Dec-2011	BF	19-Apr-2012	PV	70.00	0.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	14-Apr-2012	EF	14-Jul-2012	AQ(E)	70.00	0.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		Petron	BS	2-May-2011	BF	18-Jun-2012	PV	8,080.00	0.00	8,080.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	2-May-2011	EF	23-Oct-2012	AQ(E)	7,546.00	834.00	8,380.00	286.27	597.24	236.76	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		RKD	BS	2-May-2011	BF	24-Dec-2011	PV	7,950.00	0.00	7,950.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	2-May-2011	EF	24-Dec-2011	AQ(E)	7,950.00	0.00	7,950.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		Spire Project	BS	21-Mar-2012	BF	25-May-2012	PV	10,000.00	0.00	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	10-May-2012	EF	15-Sep-2012	AQ(E)	7,000.00	1,090.00	8,090.00	1,903.51	1,090.00	0.00	0.00	0.00	0.00	0.00	0.00
All Projects	N/A		TBA	BS	4-Dec-2011	BF	31-Aug-2012	PV	26,003.00	0.00	26,003.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				ES	3-Sep-2012	EF	29-Nov-2012	AQ(E)	0.00	26,101.00	26,101.00	0.00	10,367.78	12,257.38	3,475.84	0.00	0.00	0.00	0.00

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Representative Examples of Productivity Analysis Reports

Facility Specific – Commodity Specific Productivity Reports

Cost Per Unit of Work
EVC/EVW Period (Budgeted Rate)
EVC/EVW Cumulative (Average Rate)
AC/AW Period (Actual Rate)
AC/AW Cumulative (Average Rate)
AC/EVW Period
AC/EVW Cumulative
ESP/EVW Period
ESP/EVW Cumulative
ESP/AW Period
ESP/AW Cumulative
PI – Period = (EVC/EVW) ÷ (AC/AW)
PI – Cumulative

Cost Per Unit of Quantity
EVC/EVQ Period (Budgeted Rate)
EVC/EVQ Cumulative (Average Rate)
AC/AQ Period (Actual Rate)
AC/AQ Cumulative (Average Rate)
AC/EVQ Period
AC/EVQ Cumulative
ESP/EVQ Period
ESP/EVQ Cumulative
ESP/AQ Period
ESP/AQ Cumulative
PI – Period = (EVC/EVQ) ÷ (AC/AQ)
PI – Cumulative

Work Per Unit of Quantity
EVW/EVQ Period (Budgeted Rate)
EVW/EVQ Cumulative (Average Rate)
AW/AQ Period (Budgeted Rate)
AW/AQ Cumulative (Average Rate)
AW/EVQ Period
AW/EVQ Cumulative
PI – Period = (EVW/EVQ) ÷ (AW/AQ)
PI – Cumulative

Quantity Per Unit of Work
EVQ/EVW Period (Budgeted Rate)
EVQ/EVW Cumulative (Average Rate)
AQ/AW Period
AQ/AW Cumulative (Average Rate)
AQ/EVW Period
AQ/EVW Cumulative
PI – Period = (EVQ/EVW ÷ (AQ/AW)
PI – Cumulative

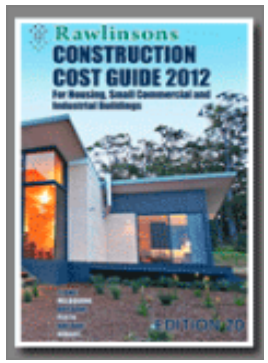
Cost Rates Per Work Definitions:
EVC/EVW = Earned Value for cost per Earned Units of Work.
AC/AW = Actual Cost per Actual Units of Work.
AC/EVW = Actual Cost per Earned Units of Work.
ESP/EVW = Earned Sell Price/Revenue per Earned Units of Work.
ESP/AQ = Sell Price/Revenue per Actual Units of Work.

Cost Per Unit of Quantity Definitions:
EVC/EVQ = Earned Value Cost rate per Earned Units of Quantity.
AC/AQ = Actual Cost per Actual Units of Quantity used.
AC/EVQ = Actual Cost per Earned Units of Quantity.
ESP/EVQ = Earned Sell Price/Revenue per earned Units of Quantity.
ESP/AQ = Earned Sell Price/Revenue per Actual Units of Quantity used.

Work per Quantity Definitions:
EVW/EVQ = Earned Value Units of Work per Earned Value Units of Quantity.
AW/AQ = Actual Units of Work per Actual units of Quantity used.
AW/EVQ = Actual Units of Work per Earned Value Units of Quantity.

- Productivity reports measure and benchmark project performance against industry published Key Performance Indicators [KPIs].
- Benchmarking identifies where improvements can be made to lower costs, increase productivity and profitability.
- Publications with Productivity Constants:

Rawlinsons Construction Cost Guide



Rawlinsons Process Engineering Handbook

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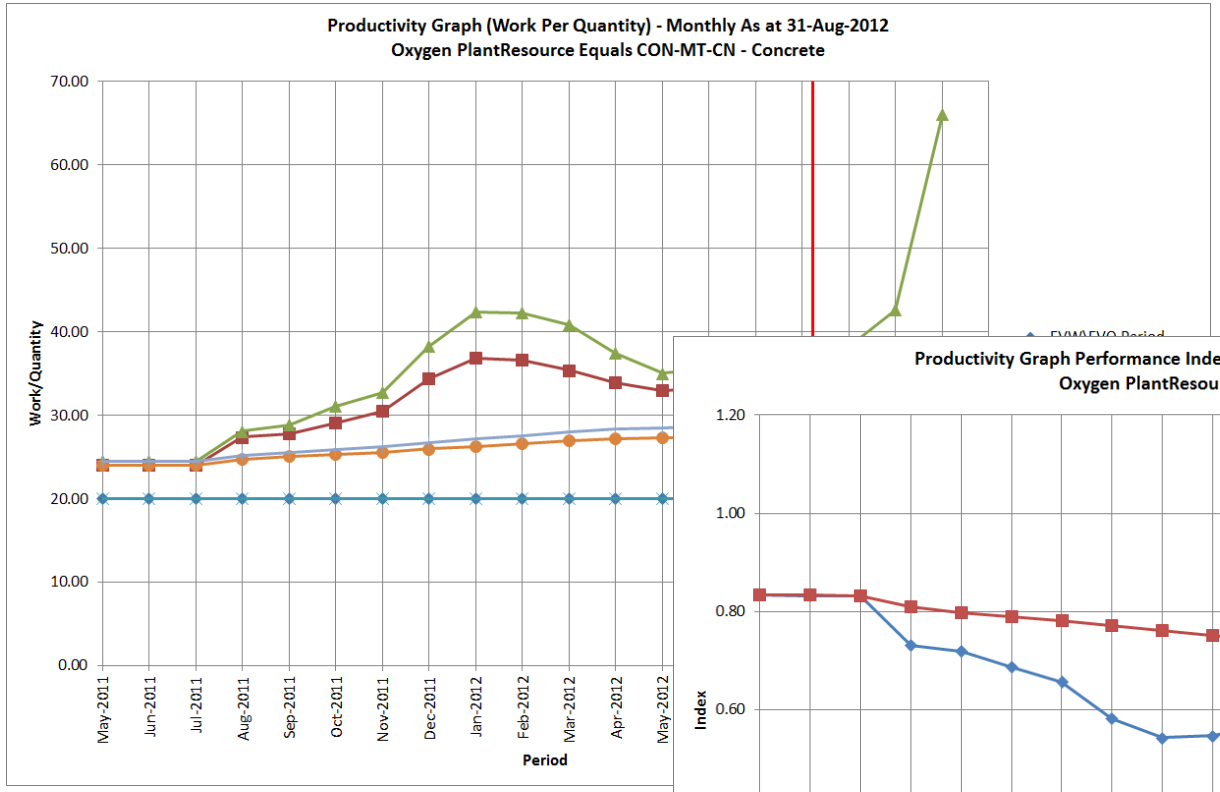
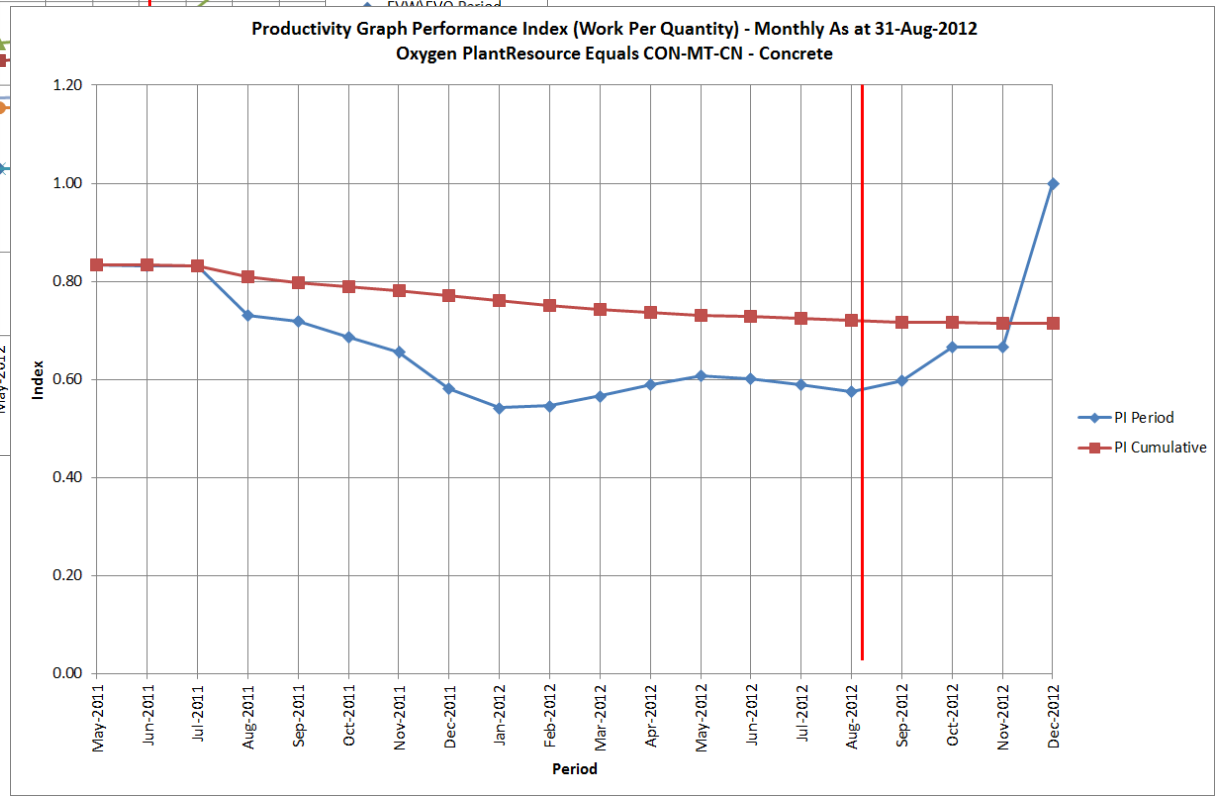
Representative Examples of Productivity Analysis Reports



- Graph illustrating productivity period and average rates over time for comparison against industry constants



- Performance index period and average over the life of the project for specific commodities.

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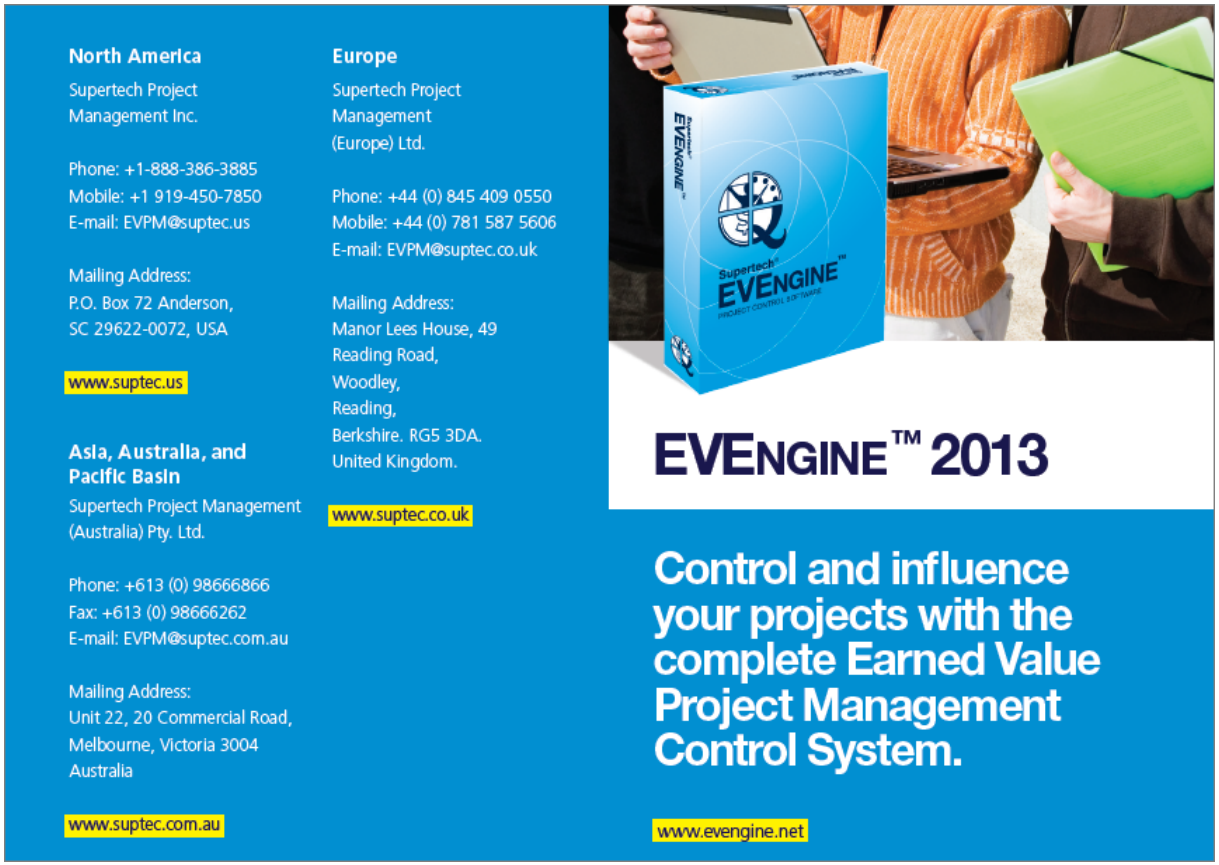
Conclusion

Q & A

Contact Details - Local and Internationally



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