

Primavera P6, Oracle Projects, and Agile for Integrated Project Manufacturing

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A large manufacturing firm uses an integrated model of Primavera P6 EPPM, Agile and Oracle Projects to facilitate engineer-to-order project manufacturing. P6 is used for project management, financial forecasting and progress reporting; Agile is used to report progress on engineering activities and Oracle's native Project Manufacturing functionality is used to create demand to drive the supply chain. How these systems were integrated, lessons learned and phase 2 goals will be discussed.

Overview of O2Works LLC

O2Works is one of the leading E-Business Suite services providers offering among the most experienced functional and technical consultants in the industry. We are a privately held Oracle E-Business Suite consulting firm that was founded in 2001 and has its principal offices in Dallas, Texas along with offices in Chicago, Denver and Virginia. Our hands-on resources average 15+ years of experience focused exclusively on implementing, upgrading, integrating, and extending Oracle's E-Business Suite to meet the challenging requirements of today's mid-size to Fortune 50 companies around the world. We are a Certified Gold level Oracle Partner firm and are very active in the Oracle Application User Group, where we are a Level 3 partner and frequent presenters at National, Regional, and Local conferences.

Overview of Powell Industries, Inc.

Powell Industries, Inc., headquartered in Houston, engineers packaged solutions and systems for the control, distribution and management of electrical energy and other dynamic processes. Powell markets include large industrial customers such as utilities, oil and gas producers, refineries, petrochemical plants, pulp and paper producers, mining operations and commuter railways.

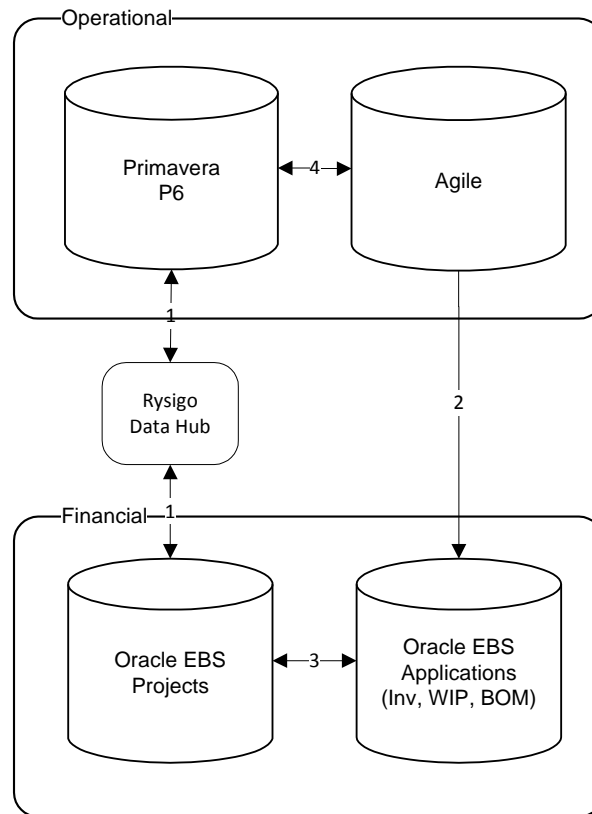
Overview of Project Synergy

Powell has been live on Oracle EBS version 11.5.10 since 2006, using the Financials, Manufacturing and Project Management application suites. Considering the growth of the company since that time, along with changes in business requirements, they decided to re-implement EBS version 12.1.3, rather than upgrade their existing footprint. Project Synergy was launched with this goal in mind, however all business processes were also re-designed in the process. Additional applications were identified to meet business requirements and specifically Agile and Primavera P6 are addressed in this paper.

Objectives

1. Discuss how Agile, Primavera P6 and Oracle EBS are tied together in this manufacturing environment.
2. Detailed discussion on the Primavera P6 configuration and the integration with Oracle EBS.
3. Detailed discussion on the Oracle EBS configuration and the integration with Primavera P6.

High-Level System Integration



Operational Systems

- Primavera P6 – Used for project management and scheduling capabilities.
 - Project Schedule
 - Project Resources
 - Project Progress
- Agile PPM – Used for product management capabilities.
 - Item creation
 - Bills of Materials
 - Engineering task management
 - Progress tracked by completion of deliverables

Financial Systems

- Oracle EBS Projects – Used as the financial system-of-record.
 - Financial Plans – Budgets, forecasts.
 - Revenue
 - Cost

- Oracle EBS Applications (Inv, WIP, BOM) – System of record for manufacturing activities.

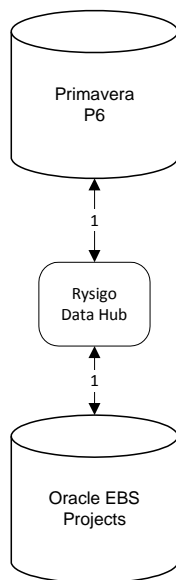
Project Structure

Powell uses a project structure where a top-level WBS in P6 (top task in EBS Projects) equates to a product offering. Projects are built in P6 using product templates and joined together by the project manager. Each product includes a further breakdown of Design (for engineering) and Execution (for shop-floor production) of the product:

- Product 1
 - Design
 - Design Activity A
 - Design Activity B
 - Execution
 - Execution Activity

WBS / Activity	Activity ID	EBS Task	Start	Finish	Planned Duration	Resource IDs	Planned Labor Units	Planned Labor Cost	Planned Expense Cost	Actual Total Cost
100001 Houston Prototype			03-Dec-12	05-Jan-13	6,312.0h		13,280.00h	1,325,000	0	0
Power Control Room Offshore			03-Dec-12	22-Dec-14	6,232.0h		8,600.00h	880,000	0	0
PentVar-Air Switchgear and Accessories ...			03-Dec-12	07-Nov-14	3,584.0h		5,024.00h	580,000	0	0
Design			03-Dec-12	20-May-13	952.0h		1,000.00h	180,000	0	0
Technical Review	2011000	02.01.01	03-Dec-12	18-Dec-12	96.0h	Alston,Jason	200.00h	20,200	0	0
Approval Drawings	2021000	02.01.02	19-Dec-12	07-Jan-13	96.0h	Alston,Jason	50.00h	5,050	0	0
Customer Review	2031000	02.01.03	08-Jan-13	23-Jan-13	96.0h	Alston,Jason	100.00h	10,100	0	0
Contract Review/Change Approval	A3800	02.01.04	24-Jan-13	30-Jan-13	40.0h	Alston,Jason	50.00h	5,050	0	0
Release to MFG	2051000	02.01.05	31-Jan-13	15-Feb-13	96.0h	Alston,Jason	100.00h	10,100	0	0
Record/Shop Drawings	2071000	02.01.06	18-Feb-13	07-Mar-13	112.0h	Alston,Jason	300.00h	30,300	0	0
As Built Drawings	2081000	02.01.07	08-Mar-13	20-May-13	416.0h	Alston,Jason	100.00h	10,100	0	0
Final Documentation	2091000	02.01.08	08-Mar-13	19-Mar-13	64.0h	Alston,Jason	100.00h	10,100	0	0
Execution			25-Feb-13	05-May-13	488.0h		1,024.00h	400,000	0	0
Fabrication			05-Mar-13	19-Apr-13	248.0h		1,000.00h	100,000	0	0
Queue Time	2101000		08-Mar-13	08-Mar-13	0.0h		0.00h	0	0	0
Fabrication	2111000	02.02	08-Mar-13	19-Apr-13	248.0h	021_Fab	1,000.00h	100,000	0	0
Kit			25-Feb-13	05-Mar-13*	48.0h		0.00h	0	0	0
10000102U02	A1160		25-Feb-13	25-Feb-13*	0.0h		0.00h	0	0	0
10000102U01	2121000		27-Feb-13	27-Feb-13*	0.0h		0.00h	0	0	0
10000102U09	A1170		04-Mar-13	04-Mar-13*	0.0h		0.00h	0	0	0
10000102U04	A1180		04-Mar-13	04-Mar-13*	0.0h		0.00h	0	0	0
10000102U05	A1190		05-Mar-13	05-Mar-13*	0.0h		0.00h	0	0	0
10000102U06	A1200		05-Mar-13	05-Mar-13*	0.0h		0.00h	0	0	0
10000102U07	A1210		05-Mar-13	05-Mar-13*	0.0h		0.00h	0	0	0
Production			05-Mar-13	06-May-13	368.0h		3,024.00h	302,400	0	0
Assembly	2131000	02.02	05-Mar-13	11-Mar-13	40.0h	021_ASLY	1,100.00h	110,000	0	0
Wire	2141000	02.02	12-Mar-13	19-Apr-13	232.0h	021_WIRE	1,100.00h	110,000	0	0
Powell Inspection	2151000	02.02	22-Apr-13	26-Apr-13	40.0h	021_PI	500.00h	50,000	0	0
Customer Inspection	2161000	02.02	29-Apr-13	01-May-13	24.0h	021_CI	24.00h	2,400	0	0
Ship Prep	2171000	02.02	02-May-13	06-May-13	24.0h	021_SHIP	300.00h	30,000	0	0
Ship	2181000	02.02	06-May-13	06-May-13	0.0h		0.00h	0	0	0
Warranty			07-May-13	07-Nov-14	3,112.0h		0.00h	0	0	0

Integration 1 – P6/Oracle EBS Projects



Powell purchased Rysigo's Data Hub product to facilitate the integration between P6 and EBS Projects. Out-of-the-box, the Data Hub integrated the P6 project plan with the EBS project workplan. This integration includes projects, tasks and resource assignments from P6 to EBS and actual hours and cost from EBS to P6.

The Data Hub facilitates all project creation in EBS, adding tasks to these projects and performing resource assignments. Project information that is required for successful project creation in EBS (based on the EBS template) is held in native P6 fields (project owner), defined project codes (project type) or defined project User Defined Fields (customer number).

Information required for successful task creation in EBS is held in native P6 fields (responsible manager = task owning organization), defined activity codes (task type, service type), or defined activity User Defined Fields (task manager).

Project resources are defined on the EBS Planning Resource List and synchronized via Data Hub to create resources in P6. Quantities attributed to assigned resources in P6 are represented on the EBS workplan. Costing is performed in EBS using the rate schedules defined there and the planned cost brought back to P6.

Production		05-Mar-13	30-Apr-13	40d					3,024h	302,400
Assembly	02.02	05-Mar-13	11-Mar-13	5d	Greg Hill	021_ASLY	Assembly		1,100h	110,000
Material (Cost Collector)	02.02	05-Mar-13	30-Apr-13	40d	Greg Hill	021_MTL	Material		0h	0

Resource ID Name	Planned Units	Actual Units	Remaining Units	Remaining Units/Time	Planned Cost	Actual Cost	Remaining Cost	At Completion Cost
021_ASLY - Assembly	1,100h	0h	1,100h	220h/d	110,000	0	110,000	110,000

Planned

Task Details

Task Number02.02

Task NameExecution

Actions

Current Working Version

Go

Add to Bookmark

General

Schedule

Dependencies

Resources

Deliverables

Setup

Task Scheduled Start25-Feb-2013

Task Scheduled Finish30-Apr-2013

Planned People Effort4024 Hours

Planned Equipment Effort0 Hours

Views

View

Dates and Quantity

Go

Personalize

Simple Search

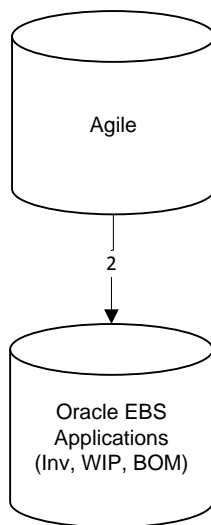
Task	Planning Resource	Scheduled Start	Scheduled Finish	UOM	Quantity	Actual Currency	Burdened Cost	Plan	Actual	View
02.02	021_ASLY	25-Feb-2013	30-Apr-2013	Hours	1100	USD	110000.00			
02.02	021_FAB	25-Feb-2013	30-Apr-2013	Hours	1000	USD	100000.00			
02.02	021_INSP	25-Feb-2013	30-Apr-2013	Hours	824	USD	82400.00			
02.02	021_WIRE	25-Feb-2013	30-Apr-2013	Hours	1100	USD	110000.00			
02.02	Material	25-Feb-2013	30-Apr-2013	Currency	80000	USD	80000.00			

Powell worked with Rysigo to expand their product to allow for a shared structure setup in EBS Projects and to identify particular activities in P6 as financial tasks for EBS. Powell did not require every activity in P6 to be a chargeable financial task in EBS so use of a shared structure with task-based mapping was a better fit for Powell.

Actual hours and cost incurred on the financial tasks in EBS Projects are interfaced back to the P6 project by the Data Hub. This allows for an accurate Estimate to Complete in both the EBS financial forecast and the P6 project plan.

The P6/EBS Projects integration depends on a manual process of synchronization that is performed in Data Hub. Project Managers have the access to Synchronize Project Financials, which integrates the current summarized P6 project plan with the working version of the EBS workplan. This synchronization sends planned quantities to EBS and returns the planned cost back to P6. Project Master Schedulers have the access to Synchronize Project Schedule, which performs the action of Synchronize Financials with the added function of publishing the EBS workplan. This distinction is important because publication of the EBS workplan triggers Integration 3 as explained later.

Integration 2 – Agile / Oracle EBS Applications



Agile is the master for inventory items and Bills of Material at Powell. Items are created in Agile and interfaced to Oracle Inventory, including top-level engineered-to-order (ETO) items. Buy items are also created in Agile.

100005-03-1A Preliminary
Transformer • Transformer, Oil Filled, Three Phase... Unincorporated

Site: ALL Rev: Introductory Actions

Title Block Changes BOM Manufacturers Sites Relationships Where Used Attachments History

Page Two | Page Three

Save Cancel

* Number: 100005-03-1A 123

* Subclass: Transformer

Lifecycle Phase: Preliminary

* Description: TRANSFORMER, DRY TYPE, THREE PHASE, LOAD CENTER TRANSFORMER

Product Line(s):

Rev Incorp Date:

Rev Release Date:

Effectivity Date:

Part Category:

* Make / Buy: Buy

Default Lifecycle Phase for new items

EBS Short Description using Purchasing Category for this example

Subclass is used to classify Page 3 template where Part Category is for user's search

Bills of Materials are also created in Agile using these items. BOMs are then interfaced to the Oracle EBS Bill of Material application for downstream use.

100001-01 Preliminary
Assembly • PCR ETO Item Unincorporated

Rev: Introductory Navigator Actions

Title Block Changes BOM Manufacturers Prices Quality Relationships Where Used Attachments History

BOM

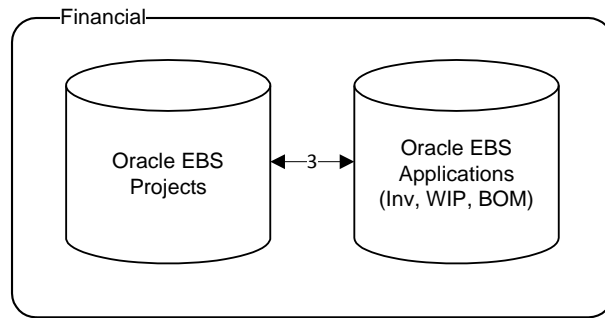
Views: Base View * Personalize

Add Remove Go To Expanded Display More

Item Number	Item Description	Item Lifecycle	Ph	Item Rev	Qty	UOM	Find Num
100001-01-1A	PANEL BOARD, AC THREE PHASE, CIRCUIT BREAKER, GE, SURFACE MOUNTED, 150A	Preliminary		1	EA	10	
100001-01-2	PANEL BOARD, AC THREE PHASE, CIRCUIT BREAKER, GE, TYPE AQ, SURFACE MOUNTED	Preliminary		1	EA	20	
9T83B3872G80	XFMR/GE 30KVA, 3PH, 4W, 480- HIGH EFFICIENCY	Preliminary		1	EA	30	
SS232UNVEB81U	INTERIOR FLUOR LIGHT, COOPER LIGHTING- METALUX, 120-277 VAC	Preliminary		17	EA	40	
F32T8/SP41/ECO	FLUORESCENT LINEAR LAMP, GE LIGHTING, 4', T8, 32W,	Preliminary		34	EA	50	
WQSS4FTB	WIRE GUARD, COOPER LIGHTING,	Preliminary		17	EA	60	
20AC3	3-WAY LIGHT SWITCH, PASS & SEYMOUR 20A,	Preliminary		2	EA	70	
LPX7DH	LIGHT, ACCESSORY, INTERIOR EXIT SIGN WITH LIGHTS COMBO,	Preliminary		2	EA	80	
2095	RECEPTACLE, GROUND FAULT, P&S,	Preliminary		3	EA	90	
EFSC275-2023GFI	GFI FACTORY SEALED EXPLOSION PROOF, DUST-IGNITIONPROOF GROUND FAULT (Preliminary		2	EA	100	
VMV7L2TWDM2UNV1	LIGHT, HAZARDOUS, OUTDOOR, CROUSE-HINDS CHAMP VMV7L LED SERIES LIGHT, C	Preliminary		2	EA	110	
9120	SMOKE DETECTOR, DUAL IONIZATION, BRK,	Preliminary		1	EA	120	
RM4	SMOKE DETECTOR RELAY MODULE,	Preliminary		1	EA	130	
100001-01-14	ANNUNCIATOR, WALL MOUNT, AMETEK SERIES 90A, MODEL #90A-N4PB-3H-4W-NPE	Preliminary		1	EA	140	
T-15EP	PHOTOCELL, CLASSIFIED, PMC, 120VAC,	Preliminary		1	EA	150	
13100G01-101S1015BB	POWL-VAC TEST CABINET	Preliminary		1	EA	160	
13520G01	UMBILICAL CORD ASSY FOR PVAC-AR TEST CAB	Preliminary		1	EA	170	
100001-01-30	PANEL BOARD, DC, CIRCUIT BREAKER, GE, TYPE AE, SURFACE MOUNTED, 125A BAR	Preliminary		1	EA	180	
THN2262DC	SAFETY SWITCH 600VDC 2P	Preliminary		1	EA	190	
100001-01-40	PCR, PCR LEG, 11 LIFTING LUG 15" CHANNEL AND 16" BEAM (PIN: 27176P04) WITH 3	Preliminary		4	EA	200	

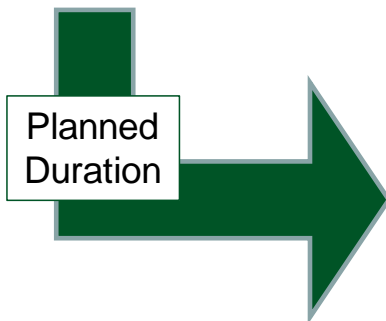
0 of 33 rows selected

Integration 3 – Oracle EBS Projects / Oracle EBS Applications



In addition to the standard Oracle EBS integrations between Projects and other applications, Powell built a custom update to the ETO item routings so that the durations of manufacturing operations could be scheduled in P6, integrated with the EBS project, and driven downstream to the discrete job. Planned durations in P6 are carried through to the lead times of the operations:

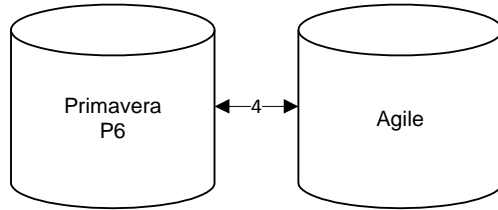
This screenshot shows the 'General' form in Oracle EBS Projects. The 'Details' section includes fields for Activity ID (P131000), Activity Name (Assembly), Activity Type (Task Dependent), and Location. The 'Status' section shows checkboxes for 'Started' and 'Finished', with dates '05-Mar-13' and '01-Mar-13' respectively, and an 'Activity % Complete' of 8%. The 'Durations' section has fields for 'Planned Duration', 'Actual Duration', 'Remaining Duration', and 'At Completion Duration', all with a value of 'Ed'. The 'Duration Type' is set to 'Fixed Duration & Units'. The 'Constraints' section has fields for 'Primary Constraint' and 'Secondary Constraint'. The 'Units and Costs' section on the right includes fields for 'Labor Cost', 'Planned Labor Cost', 'Actual Labor Cost', 'Remaining Labor Cost', and 'At Completion Labor Cost'.



This screenshot shows the 'Routings (021)' form in Oracle EBS. The 'Item' field is '23232' and the 'Alternate' field is empty. The 'Revision' is '00' and the 'Date' is '04-DEC-2012 10:13:06'. The 'Display' dropdown is set to 'Future and Current'. The 'Operations' section is expanded, showing a table of operations. The table has columns for 'Seq', 'Code', 'Department', 'Option Dependent', and 'Lead Time %'. The operations listed are: 10 ASLY (MFG), 20 WIRE (MFG), 30 PI (MFG), 40 CI (MFG), and 50 SHIP (MFG). The 'Lead Time %' values are 0, 22.25, 44.51, 66.76, and 88.92 respectively. The 'Option Dependent' column has checkboxes, all of which are checked.

This custom integration was added to the PA: Workplan workflow to run on workplan publication. The project workplan is published by the Data Hub during synchronization. This ensures that any change in schedule is sent from P6 to EBS, and that any un-released discrete jobs are also updated with the proper durations for the manufacturing operations.

Integration 4 – Primavera P6 / Agile



Powell again worked with Rysigo to build a custom interface between Agile Product Management and Primavera P6. Design activities in P6 are assigned to specific engineers as activity resources. This assignment, along with its schedule dates, is interfaced into Agile as a top-level task. Lower-level tasks held only in Agile build out the steps necessary to complete the design activity.

Search Results » 100001 Houston Prototype » -02 PowlVac-AR Switchgear and Accessories - Type 2 Design

-02 PowlVac-AR Switchgear and Accessories - Type 2... Not Started

Project

Overall Status: ●●●●●
 Schedule Status: ●●●●●
 Cost Status: ●●●●●
 Resource Status: ●●●●●
 Quality Status: ●●●●●

Summary | Gantt Chart | Lock | Navigator | Actions

General Info | **Schedule** | Dependencies | Team | Content | Workflow | Collaboration | Attachments | History

Schedule

Views: Base View * | Personalize

Add | Remove | Expand | Add Resources | Add Dependency | More

Name	Desc	Owner	Project State	Type	Status	Start	End	Duration	Duration Type	Overall Status
Technical Review		Jason Alston	Active	Task	Not Started	03-Dec-2012 0	18-Dec-2012 0	12	Fixed	Off Track
Approval Drawings		Jason Alston	Active	Task	Not Started	19-Dec-2012 0	07-Jan-2013 0	14	Fixed	On Track
Customer Review		Jason Alston	Active	Task	Not Started	08-Jan-2013 0	23-Jan-2013 0	12	Fixed	On Track
Contract Review/Change Apprc		Jason Alston	Active	Task	Not Started	24-Jan-2013 0	30-Jan-2013 0	5	Fixed	On Track
Release to MFG		Jason Alston	Active	Task	Not Started	31-Jan-2013 0	15-Feb-2013 0	12	Fixed	On Track
RecordShop Drawings		Jason Alston	Active	Task	Not Started	18-Feb-2013 0	22-Mar-2013 0	25	Calculated	On Track
Mechanical Engineering		Justin Coletta	Active	Task	Not Started	18-Feb-2013 0	22-Mar-2013 0	25	Fixed	On Track
Wiring/Conduit Design		Jason Alston	Active	Task	Not Started	18-Feb-2013 0	22-Mar-2013 0	25	Fixed	On Track
As Built Drawings		Jason Alston	Active	Task	Not Started	22-Feb-2013 0	14-May-2013 0	58	Fixed	On Track
Final Documentation		Jason Alston	Active	Task	Not Started	22-Feb-2013 0	06-Mar-2013 0	9	Fixed	On Track

0 of 8 rows selected

Engineers working in Agile create document packages related to their deliverables on the project – engineering drawings.

Approval Drawings » 100003-01D

100003-01D
Document • Document Package for 100003-01

Preliminary
Unincorporated

Site: ALL Rev: Introductory Actions

Title Block Changes BOM Sites Relationships Where Used Attachments History

Relationships Views: Base View Personalize

Add Remove Edit Rule More Save Cancel

Name	Description	Current Status	Rule	Type
-01 Type 439 Design(100003 Powell UK Prototype)	Type 439 Design	In Process		Project
Approval Drawings(100003 Powell UK Prototype)	01.01.02	Not Started	When 100003-01D is "Development", set Approval Drawings to "Complete"	Task
Record/Shop Drawings(100003 Powell UK Prototype)	01.01.06	Not Started	When 100003-01D is "Released", set Record/Shop Drawings to "Complete"	Task

0 of 3 rows selected

As these deliverables and tasks are completed, progress is tracked inside of Agile. The Rysigo-developed interface sends the latest progress to the P6 activity, keeping the Project Manager up-to-date.

01 Non-Seg Bus Duct Design

01 Non-Seg Bus Duct Design
Project • Non-Seg Bus Duct

In Process

Overall Status ● ● ●
Schedule Status ● ● ●
Cost Status ● ● ●
Resource Status ● ● ●
Quality Status ● ● ●

Summary Gantt Chart Lock Navigator Actions

Lessons Learned

Downstream impacts to upstream scheduling activities is important to consider in this type of integration. Synchronizing a project schedule from P6 to EBS has a direct impact on shop floor activities, since updated schedule dates are fed into item routings (Integration 3). Security is important here so Rysigo separated the synchronization functions for Powell:

- Synchronize Project Financials – Given to project managers. Integrates the P6 project plan with the working version of the EBS workplan only. This provides for latest forecasted cost to be fed back to P6 without triggering an update to the item routings as that is done via workplan publication in EBS.
- Synchronize Project Schedule – Given to project master schedulers. Performs the above integration with the added publishing of the workplan. This gives the master schedulers final approval of project schedules and update to shop floor activities.

Phase 2 Considerations

Powell would like to automate the Synchronize Project Financials function so that a project manager does not have to login to Data Hub in order to process updates to their P6 project plan in EBS and have updated planned cost in P6. This manual step is cumbersome for project managers and automation here would greatly streamline the process.