Leveraging C3D® to Ensure Compliance of Site Execution Teams
Speaker Introduction

AMR EL-SERSY

Current:
• VP Marketing and Consulting Services (CCT)
• Group Manager Learning and Innovation (CCC)

Past:
• Deputy GM for the EPC business unit (CCC)
• Manager - Engineering & Construction systems (CCC)

*Ph.D. degree in Engineering and Construction Management from the University of California at Berkeley.*
Introduction to CCT

• CCT was established in 1998. Founders and Management have long construction experience in large Oil & Gas, Power & Infrastructure projects.

• Started as technology provider for CCC.

• Focused on development & implementation of Construction Management solutions.

• We help contractors with:
  • Project Control Strategies & Execution Plans
  • Data Preparation and Integration
  • Implementation of Project Control solutions
  • BIM Training

• Recognized as a Leading Construction Management solutions provider by several consortiums and organizations.

Awards:

2016: Technology & Knowledge Enabled Workforce Category Winner

Encord 5Di: “…the sole software company for fully-integrated 5D solutions for digital construction around the globe”

2016 & 2017: Best Hands-on-Tools-Time
MULTI PLATFORM INTERFACES

- xD Project Controls
- Construction ERP and Field
- Shop Drawings & Fabrications
- Handover, QA/QC
- Construction Fleet Management
- AWP Consulting Services

Electronic Content Management Platform
With BI, Workflows, Resource Management

Data Sources:
- Digital Pen
- Laser Scanner
- CAD Tools
- FI/CO
- WM / Inventory
- Standards Scheduling Tools
- Estimation Systems
- GIS
- Legacy

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We started our “AWP Journey” in Year 2004

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Name</th>
<th>Location</th>
<th>Start Date</th>
<th>End Date</th>
<th>Size (Mhrs)</th>
<th>Scope</th>
<th># IWPs</th>
<th>Disciplines</th>
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<tbody>
<tr>
<td>1</td>
<td>Sahil, Asab &amp; Shah (SAS) Full Fields Development</td>
<td>Abu Dhabi UAE</td>
<td>2009-01</td>
<td>2013-12</td>
<td>9.5 M</td>
<td>Construction</td>
<td>1800</td>
<td>Steel, Piping, U/G Electrical Trenches</td>
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<td>3</td>
<td>QFD Qusahwira Field Development (QFD)</td>
<td>Abu Dhabi UAE</td>
<td>2010-09</td>
<td>2013-04</td>
<td>6.6 M</td>
<td>Construction</td>
<td>900</td>
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<td>4</td>
<td>Al Jubail 10 HyCO Ammonia Plant</td>
<td>Saudi Arabia</td>
<td>2012-08</td>
<td>2014-10</td>
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<td>5</td>
<td>Wasit Gas Development Project, Package 1 - Inlet &amp; Gas Processing Facilities</td>
<td>Al Jubail Saudi Arabia</td>
<td>2012-12</td>
<td>2015-02</td>
<td>5 M</td>
<td>Construction</td>
<td>840</td>
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<td>6</td>
<td>Development (Phase I) (PE101) &amp; Expansion of Bab Gas Compression (Phase II) (PE102)-1</td>
<td>Abu Dhabi UAE</td>
<td>2013-09</td>
<td>2015-12</td>
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<td>Construction</td>
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<td>Jizan Refinery, Package 4 - Loading Arms Facilities &amp; Package 5</td>
<td>Jizan Saudi Arabia</td>
<td>2013-07</td>
<td>2018-03</td>
<td>14.5 M</td>
<td>Construction</td>
<td>5,000 (est.)</td>
<td>All Disciplines</td>
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<td>8</td>
<td>Mina Abdullah EPC Package 1, Clean Fuels</td>
<td>Kuwait Kuwait</td>
<td>2014-06</td>
<td>2018-01</td>
<td>16 M</td>
<td>Construction</td>
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<td>All Disciplines</td>
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<td>9</td>
<td>Rabab Harweel</td>
<td>Salalah Oman</td>
<td>2014-11</td>
<td>2019-04</td>
<td>13 M</td>
<td>Construction</td>
<td>6,500 (Est.)</td>
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<td>10</td>
<td>3GP Civil Installation &amp; Core Substation Works (FGP/WPMP)</td>
<td>Tengiz, Kazakhstan</td>
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<td>2020-05</td>
<td>7.5 M</td>
<td>Construction</td>
<td>200 (Est.)</td>
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How to Ensure Compliance of Site Execution Teams?

• Engineering & Procurement teams commitment to follow CWP/EWP based schedule (Owners Role)
• Early involvement of construction in CWPs scoping
• Site organization and level of authority of workface planners
• Experience of the workface planners
• Etc.

Our focus is on how a tool like C3D® can help in ensuring compliance of site execution teams with detailed plans.
What’s C3D®?

• C3D is a 3D-based solution developed for BIM-based project control approach. C3D® helps:
  • Organize project large information in a logical, structured and integrated method.
  • Manage construction at low level of detail.
  • Provide logical framework for project stakeholder to share and collaborate on different project information in integrated approach.
  • Establish "best practice" work processes identifying, organizing, integrating and presenting different project information.
Some Key C3D®’s Advantages

• Graphical and non-graphical data (scope, schedule, cost,..) accessible in one place in an integrated scheme.

• Database driven technology focused on integration and data management ...
Scope – Quantities

Various Calculations

Detailed Quantities

Automatic Calculation Based on WBS + Rules

Construction Model Data built progressively
### Scope – Cost & Resources

**BOQ Data**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Qty</th>
<th>Unit</th>
<th>Work Gr.</th>
<th>Cost</th>
<th>MH</th>
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<tbody>
<tr>
<td>03304</td>
<td>Cast-in-Situ Reinforced Concrete for Beams</td>
<td>1,367</td>
<td>M3</td>
<td>033040CR</td>
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<td>03302</td>
<td>Cast-in-Situ Reinforced Concrete for Columns</td>
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<td>M3</td>
<td>033020CR</td>
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<td>29,777</td>
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<td>03301</td>
<td><strong>Cast-in-Situ Reinforced Concrete for Walls</strong></td>
<td>4,758</td>
<td>M3</td>
<td>033010CR</td>
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<td>03101</td>
<td>Formwork for Walls</td>
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<td>M2</td>
<td>031010FW</td>
<td>770,630</td>
<td>112,394</td>
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<td>03200</td>
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<td>KG</td>
<td>032003RN</td>
<td>911,808</td>
<td>95,216</td>
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**Work Gr. Description**

<table>
<thead>
<tr>
<th>Work Gr.</th>
<th>Description</th>
<th>Qty</th>
<th>Unit</th>
<th>Cost</th>
<th>MH</th>
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<tr>
<td>033010CR</td>
<td>Cast-in-Situ Reinforced Concrete for Walls</td>
<td>1.00</td>
<td>M3</td>
<td>190.87</td>
<td>9.70</td>
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**Operations**

<table>
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<tr>
<th>Operation</th>
<th>Description</th>
<th>Qty</th>
<th>Unit</th>
<th>Cost</th>
<th>MH</th>
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<tbody>
<tr>
<td>CONR50</td>
<td>Structural Concrete RMC Grade 50</td>
<td>1.05</td>
<td>M3</td>
<td>133.63</td>
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<tr>
<td>CRPGCR</td>
<td>Labor – Concrete Placing</td>
<td>8.00</td>
<td>HR</td>
<td>10.28</td>
<td>8.00</td>
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<tr>
<td>CURING</td>
<td>Curing Concrete</td>
<td>1.00</td>
<td>M3</td>
<td>0.83</td>
<td>0.60</td>
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<tr>
<td>PLPCR</td>
<td>Plant Placing Concrete</td>
<td>1.00</td>
<td>M3</td>
<td>46.13</td>
<td>1.10</td>
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</table>

**Resource**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat</th>
<th>Rate</th>
<th>Currency</th>
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</thead>
<tbody>
<tr>
<td>1501 Semi Skilled Labor</td>
<td>LAB</td>
<td>1.47</td>
<td>US$</td>
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<tr>
<td>233912 Water (for Concrete Curing)</td>
<td>LOC</td>
<td>0.55</td>
<td>US$</td>
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</table>
Scope - Linking Data in C3D

Importing related data from Excel files

Linking data - external sources (e.g. EDMS)

Non-modelled objects & non-graphical data can be added to the scope using excel or database links
Scope – Linking Objects to Activities
Scope – Quantity Change Impact Analysis
Scope – Example Impact Analysis
C3D® – Work Packaging Workflow

**Define**
- Define the WBS (C3D Planner)
- Setting the CWPs (IWPs) Boundaries (C3D Planner)
- Define FEL template for each CWP (IWP) (VBC)
- Check Crews/category/trade/Capacity

**Link**
- Link CWP/IWP with WBS
- Link CWP/IWP with FEL Data

**Identify**
- Identify IWPS for upcoming 3 Months
- Checking and clearing FEL items: Procurement, Engineering etc.

**Issue**
- Specify work in sequence (objects and operations)
- Issue the three weeks look ahead work orders
- Update the operation progress: Completed, Uncompleted (punch items)
## Example WBS- Progress

<table>
<thead>
<tr>
<th>Level 1: Construction Project</th>
<th>OGD II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2: Construction Areas</td>
<td></td>
</tr>
<tr>
<td>Level 3: Sub Areas</td>
<td></td>
</tr>
<tr>
<td>Level 4: CWP</td>
<td></td>
</tr>
<tr>
<td>Level 5: Primavera Activities (CWP-per discipline)</td>
<td></td>
</tr>
<tr>
<td>Level 6: Objects Level (IWP)</td>
<td></td>
</tr>
<tr>
<td>Level 7: Operation Elements (Work Order)</td>
<td></td>
</tr>
</tbody>
</table>

Each operation can be assigned to only one crew/subcontractor.
AWPs Definition  

CWPs Definition  

IWPs Definition  

FEL Templates Definition  

Select CWPs for FEL  

IWPs Sequencing
C3D provides workface planners the ability to generate 3-weeks look-ahead work orders taking into account IWP's priority schedule.
Identifying Erectable spools

Package released for piping

Spool Erected

Spools in Lay down ready for erection
Identifying Spools Ready for Erection
Identifying Spools to Send For Painting
Assigning Spools to Forman
Work Order Reports
Work Order – Progress Reporting Using Digital Pen
Steel Structure Work Orders
Summary

- Construction Data Model is needed. Model has to reflect construction sequence. Model has to integrate objects with their related quantities, time, cost and quality information.
- The Work Breakdown Structure has to be detailed to level of work by one crew.
- Scope (quantities) definition and tracking of changes are key for proper control of site activities.
- The site Organizational Breakdown Structure (OBS) has to be part of the construction data model. Crew capacities, work assignments and progress reporting have to managed by the AWP/WFP tool.
- Introducing work orders enables effective assignment of work to various crews.
- The AWP/WFP tool should have the “intelligence” to issue work orders in order to clear constraints ahead of the planned IWPs.
- Site crews shouldn’t proceed with any work (receive material, get permits, ..) except with the scope as-defined in approved work orders.
- Work orders serve as both scope assignment document as well as progress & pending constraints reporting.
- **C3D® is an intelligent BIM-based site control tool that provides powerful methods to manage scope, integrate project control data, plan and manage CWPs/ IWPs, and manage site crews using work orders.**
Thank You!