AWP Conference
October 2-3, 2018 • Houston, Texas

Measuring AWP Success

Featuring: Chris Tisdel, Mark Lambert, Jay Moser, Martin Swaine and Antonio Romero Monteiro
Introducing Today’s Panel Moderator

Chris Tisdel
President & CEO
Ruckus Innovation Consulting

Chris is the President and CEO of Ruckus Innovation Consulting assisting global companies in generating, prioritizing, and implementing breakthrough ideas to bring tangible business value.

Chris thoughtfully guides individuals and organizations through the journey of innovation utilizing experienced facilitation, research-informed visual and design-thinking methodologies, vision and value prototyping, implementation strategies, and fanatical collaboration workshopping. Chris has facilitated over 100 workshops with multiple organizations all across the globe, such as IKEA, Disney, Fluor, 3M, and many others.

Chris has over 25 years of experience as a catalyst for innovation, a strategic consultant, startup founder, and angel investor in design, engineering and technology industries. Chris’ former corporate experience includes Innovation Strategist with Autodesk, Inc.; Director, Global Enterprise Solutions with Gehry Technologies; and Director, Building Information Modeling with the State of Texas.
Introducing Today’s Panelists

Mark Lambert is responsible for Construction Management at Eastman Chemical Company’s Tennessee Operations. He has over 28 years of experience in the process industry in the areas of mechanical engineering, reliability engineering, area maintenance management, project management, and construction management.

Mr. Lambert is currently working on defining and building the WorkFace planning procedure and driving early integration of AWP projects at the Tennessee site. Eastman completes capital projects which range from new facilities and processes to traditional process improvement and revamp projects. Eastman is a global specialty chemical company that produces a broad range of advanced materials, additives and functional products, specialty chemicals, and fibers.

Mr. Lambert holds a B.S. in Mechanical Engineering from the University of Tennessee at Knoxville. He lives with his wife Lisa of 28 years in Blountville, Tennessee.
Introducing Today’s Panelists

Jay Moser - Shell
 Principle Technical Expert Construction & Fabrication
 Shell Project & Technology – Efficient Execution

Jay current responsibilities are to provide global expertise support internally and represent Shell in external industry standard organizations as PTE for construction and fabrication management in Capital Projects. This includes appointment and development of a network of Subject Matter Experts (SME’s) to adequately cover all relevant construction and fabrication management subjects. Jay also leads and maintains the global Construction Community of Practice (CCoP) and Global Hand on Tool Time (HoTT) program.

Jay has 30 years of Project Management experience and held many different roles during his career. Jay has a background in Project Management, Turnarounds, Construction Management, Operations, Engineering, Maintenance and Windfarm Management. Jay has worked for 18 years with Shell, 8 years with Texaco, 4 years with Huntsman.

Jay holds a B.S. in Civil Engineering, with expertise in Construction Management & Methods, from the University of Missouri-Rolla (now Missouri S&T). He lives with his wife Jennifer of 35 years in Montgomery, Texas. Jay has 2 children ages 27 (son) & 20 (daughter).

Rev. 2018-10-31
Introducing Today’s Panelists

Martin Swaine
4D5D Global Delivery Manager
Shell Project & Technology – Design & Digitalization

Martin and his teams’ current responsibilities are to support global capital projects and turnarounds in the deployment of AWP methodology & 4D & 5D technologies providing expertise support internally and externally to move the industry in the adoption of the new ways of working.

Martin has 33 years of Oil & Gas experience from Onshore, Offshore Upstream Greenfield and Brownfield and held many different design related roles during his career. Martin has a background in Design, Construction, Completions and Tech. Martin has worked for 16 years with Shell, 15 years with KBR, 2 years water treatment plants.

Martin is proud to be from the UK apprenticeship system from the eighties with HNC in Process Plant Design from Richmond, London and has challenged himself through different roles to gain experience and expertise in Design/Construction. He lives with his wife Karan of 28 years in Sheffield UK. Martin has 2 children ages 28 (son) & 25 (daughter).
Introducing Today’s Panelists

Antonio has 17 years of EPC industry experience, having held leadership and management roles as Site/Construction Management, Six sigma, Engineering, and Materials management on both new construction and retrofit projects. He has worked in the Chemicals, LNG, Pipeline, Power, Nuclear, and Telecommunication industries.

Mr. Romero Monteiro has played a centric role in the development and implementation of new technologies and innovative solutions on multiple projects; including Advanced Work Packaging (AWP), the digitization of work processes, utilization of mobile platforms, systems integrations, asset tracking systems, and personnel tracking systems.

Mr. Romero Monteiro has an undergraduate degree in Civil Engineering from the University of Central Florida, and a Masters in Construction Management from University of Florida. He has authored several published papers and has been a guest speaker in multiple industry conferences. He lives with his wife and three sons in Houston, Texas.
AWP Maturity and Value Metric

<table>
<thead>
<tr>
<th>Performance Dimension</th>
<th>Maturity Stage</th>
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<tbody>
<tr>
<td></td>
<td>1 - AWP Early Stage</td>
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<tr>
<td>Productivity</td>
<td>Around 10% improvement</td>
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<tr>
<td>Cost</td>
<td>Project on budget</td>
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<tr>
<td>Safety</td>
<td>0 lost-time accident (TRIR below company average)</td>
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<tr>
<td>Schedule</td>
<td>Project experienced minor delays</td>
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<tr>
<td>Predictability</td>
<td>Significant deviation from baseline estimates</td>
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<tr>
<td>Quality</td>
<td>Rework in line with previous quality performance</td>
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Early Wins and Payoffs...

- Brings Construction planning into the early phases of the project.
- Provides better visibility to the progress in a given portion of the project:
  - Highlights areas that are falling behind plan and allows more efficient recovery planning.
  - Allows flexibility in construction execution.
- Provides a mechanism to maximize supervision time and tool time in the field.
Early Wins and Payoffs...

- Productivity improvements (less crew downtime).
- Improved tracking of work progress.
- Improved visibility of issues.
  - Improved communication between contractor(s) and owner.
  - Worker feedback used to improve downstream work.
  - Increased contractor ownership of issues and their resolution.
- Better constructability planning embedded into design phase.
Measurement - Back to the Projects Basics

*Eastman early integration*

- Project Safety Performance
- Cost
- Schedule
- Operability

✓ AWP – supports each element
✓ AWP – particularly addresses field productivity which correlates directly with Cost and Schedule performance
AWP Metrics – Hierarchy

Eastman early integration

- Project specific measures
- Program measures (company)
- Program maturity measures
AWP Metrics – Projects

Eastman early integration

A. AWP status and progress at the project level
   A. EWP status and measurement
   B. IWP release plan / status
      1. IWP constraints by category
      2. IWPs completed on schedule
   C. Percentage of project construction hours completed as IWP packages

B. Project performance
   A. Project budget and schedule conformance (predictability)
   B. Pf and Productivity (time on tools) – value add on this AWP project vs. the total project program
   C. Productivity (piping hrs/ft, structural hrs/ton, electrical hrs/ft raceway)
   D. Quality – punchlist items, non-conformances

C. User acceptance and feedback
AWP Metrics – Project status

Eastman early integration

• Where are we on our projects?
AWP Metrics – Program

*Eastman early integration*

A. Overall safety performance
B. Overall productivity – value add trend
C. Overall Quality
D. Overall implementation
   A. Percentage of total construction hours completed as IWP packages
   B. IWP packages completed on schedule
   C. Percentage of RFIs initiated by WFP vs. Field
E. Independent project benchmarking of project performance
AWP Metrics – Program status

Eastman early integration

• Where are we in our program?

- Remember to assess the “soft” aspects (communication, adoption, maturity of roles)
2012 – Project specific advancements in 4D seen.
- Mars B, Brent Decom, Malampaya 3

2013 – 4D Program developed
- Research phase - Across Industrial Construction
- CII, COAA, WFP, ToT, AWP
- Focused on Technology

2015 – 4D Program combined with Project Vantage
- Capital Projects Pilots identified

2017 – Pilots delivering Results
- Success levels driven by competent people, data quality, knowledge / adoption of AWP process and technology that delivers.
- Turnaround & Brownfield Pilots identified

2018 – Developing a robust approach to AWP
- Engagement with Industry AWP experts
- Contractual wording
- Company wide Awareness & Knowledge Material
- Cornerstone of the Shell Digital Project Delivery
- Champions – Owner & EPC
- Reporting and Analytics’
Data Flow Map

- **Data Standards Templates**
  - DEPs / CIFHOS

- **Replication Catalogue**
  - Standard Design

- **Engineering**
  - Material take-off, Equipment data, requisitions sheets
  - Isometrics, steel data, procedures
  - 3D Model, Isometric data, Key lists of objects, CWAs, CWP, EWP
  - Reference data, Test work packages, Completion work packages, Procedures, Essential drawings

- **Procurement Logistics**
  - Material to track, Shipments, ETA, arrivals
  - ASN, ETA

- **Fabrication**
  - Spools, Assemblies & Modules

- **Vendor**
  - Equipment
  - Spool, steel data

- **Track & Trace**
  - Material data & Locations
  - Materials To track

- **Construction**
  - Early Works > Mech
  - Complete
  - CWAs
  - CWP
  - EWPs
  - L1, L2, L3 Schedule data
  - L4/L5 Construction Schedule
  - Completions test results
  - Progress

- **Materials Management**
  - Stores, Laydown areas
  - Preservation Spares

- **Project Services**
  - Planning & Project Controls
  - Shell / EPC

- **Secondary AWP**
  - AWP Request
  - BOMs
  - Material Availability
  - Reference data, Test work packages, Completion work packages, Procedures, Essential drawings

- **Primary AWP**
  - Data Flow Map

- **CSU**
  - Completions > Start up
Indications and Learnings on Multiple Shell Projects

- Manpower efficiency increase of 12%
- Hands on Tool Time observed at 67%
- 25% improvement in field productivity comparing 2 similar projects

- 11% cost underrun against total project expenditure
  - $20M USD under budget

- Interface challenges ID’d in Engineering before hitting Construction

- Project delivered 3 months ahead of schedule
  - 6 months < forecasted schedule

- Rework at < 1%, target 3%
  - Quality inspections increased from 50% to 80%

- Streamlined Turnovers for Mechanical Completion

- Effective constraints management, timely decision making

- Zero recorded lost-time
  - Better safety statistics compared to previous projects

- Significant Reduction in Requests for Information (RFIs)
FEED Phase

J-AWP Key Success Measures

Engineering
• EWP Master Document List Definition (% Complete)
• EWP Material Takeoff (% Complete)

Procurement
• PWP Cover Page Definition (% Complete)

Construction
• Construction Work Packages Definition (% Complete)
• Subcontract CWP Alignment (% Complete)

Project Controls
• Level 3 Schedule AWP Integration (% Complete)
• TIC Estimate AWP Centric (Traffic Light)
Detailed Design Phase

J-AWP Key Success Measures

Engineering
• EWP Schedule Performance (+/- Days of variance)
• EWP Completion Progress (% Complete)

Procurement
• PWP Completion Progress
  • Requisitioning Progress (% Complete)
  • Purchase Progress (% Complete)
  • Delivery Progress (% Complete)

Construction
• IFTP Definition Progress
  • Pipe Testing (% Complete)
  • Electrical Testing (% Complete)
• FIWP Definition Progress (% Complete)
Detailed Design Phase

J-AWP Success Measures

EWP Schedule Performance

- Variance between Baseline and Actual

*CWA 900* Project Engineer - EWP-900CP-032 (Concrete Paving)

0 Completed 16-Jun-17 A 16
Detailed Design Phase

J-AWP Success Measures

Traditional Issuance Curves
- Only Measure Throughput
- Do not work well with AWP

J-AWP Sequenced Issuance Curves
- Applies Schedule allocation sequence to curve

Data Date
Construction Phase

J-AWP Key Success Measures

Field Installation Work Packages (FIWP)
- FIWP Start Readiness Status (Traffic Light)
- FIWP Safety Participation (% Crew Engagement)
- FIWP Installation Progress (% Complete)
- FIWP Schedule Performance (+/- Days Variance)
- FIWP Productivity Performance (PF Factor)
- FIWP Quality Score (Traffic Light)

Integrity & Functionality Test Packages (IFTP)
- IFTP Pre-Test Punchlist Count (# of Items – Control Chart)
- IFTP Installation Progress (% Complete)
- System Walkdown Punchlist Count (# of Items – Control Chart)
Q & A

Question and Answer Period
Question 1

From the Lessons Learned during your AWP implementations, what measures of success has worked and what has not?
Question 2

What do you use as your baseline for measurement?
Question 3

How do you distinguish benefits of AWP from other best practices?
Closing Thoughts

✓ Industry productivity/disruptive change - Collaborate with the industry – promote common metrics (industry productivity)

✓ Recognize and celebrate the Small Wins along the AWP journey.

✓ Contractors should have accredited champions in their organisation to drive the process from End-to-End.

✓ It is important to capture the benefit of AWP, so establish metrics/KPI’s to accomplish.
Thank You!

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Back-Up Questions

• How do you recommend companies that are starting their AWP journey, use metrics to build their value case for AWP?

• How do you set your baselines for the measurement of “hands-on tool time”?