

PerspECCtive

Theme:
Annual Conference Theme

Gaining Capital Efficiency with Technology by Improving Insight and Understanding on Projects

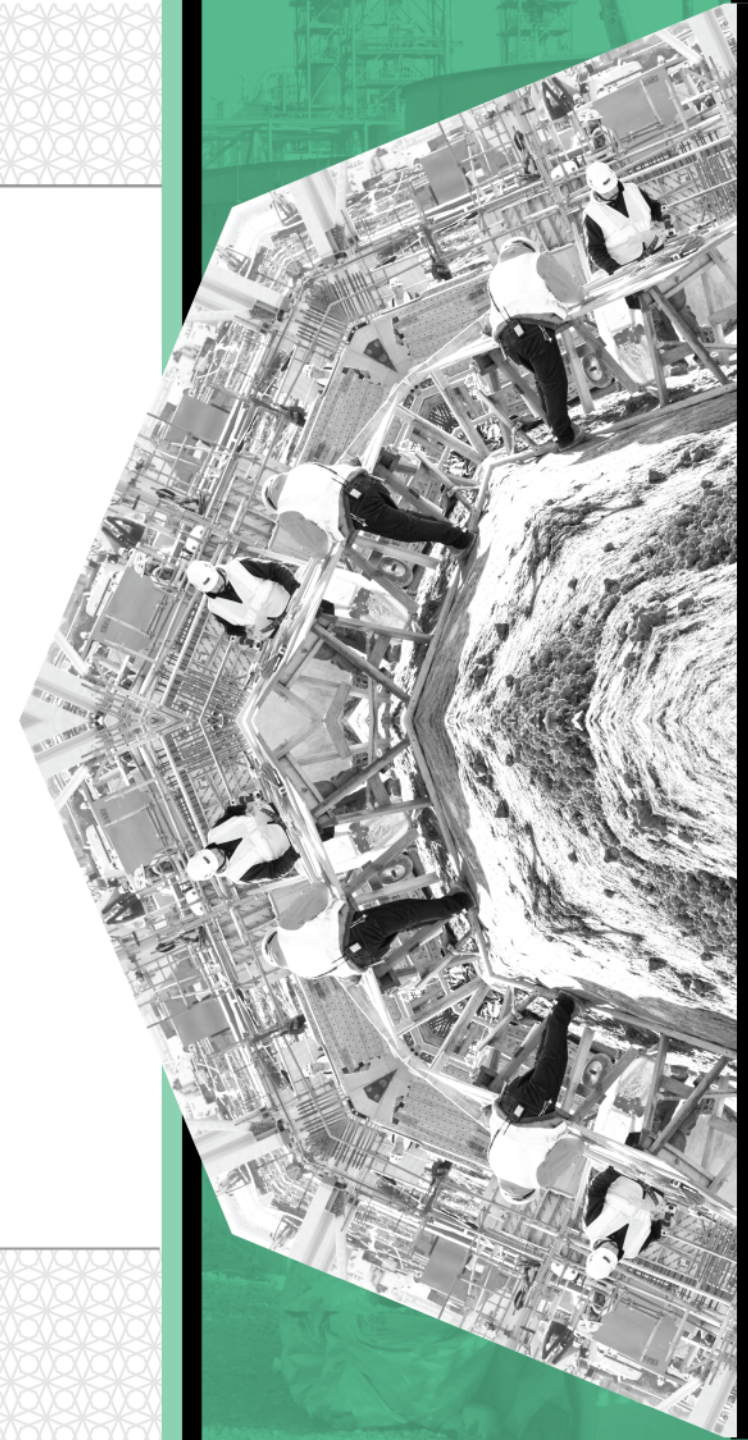
Maggie Friedemann, ExxonMobil
Bill Helms, Consultant and former Jacobs



Year:
2017

Date:
Sept. 6-9

Location:
Boca Raton, FL





Using data to get early **Capital Efficiency Gains**

Estimate example – cost, hours and quantities

Examples during Detailed Engineering - quantities

Gaining Capital Efficiency with Technology by Improving Insight and Understanding on Projects

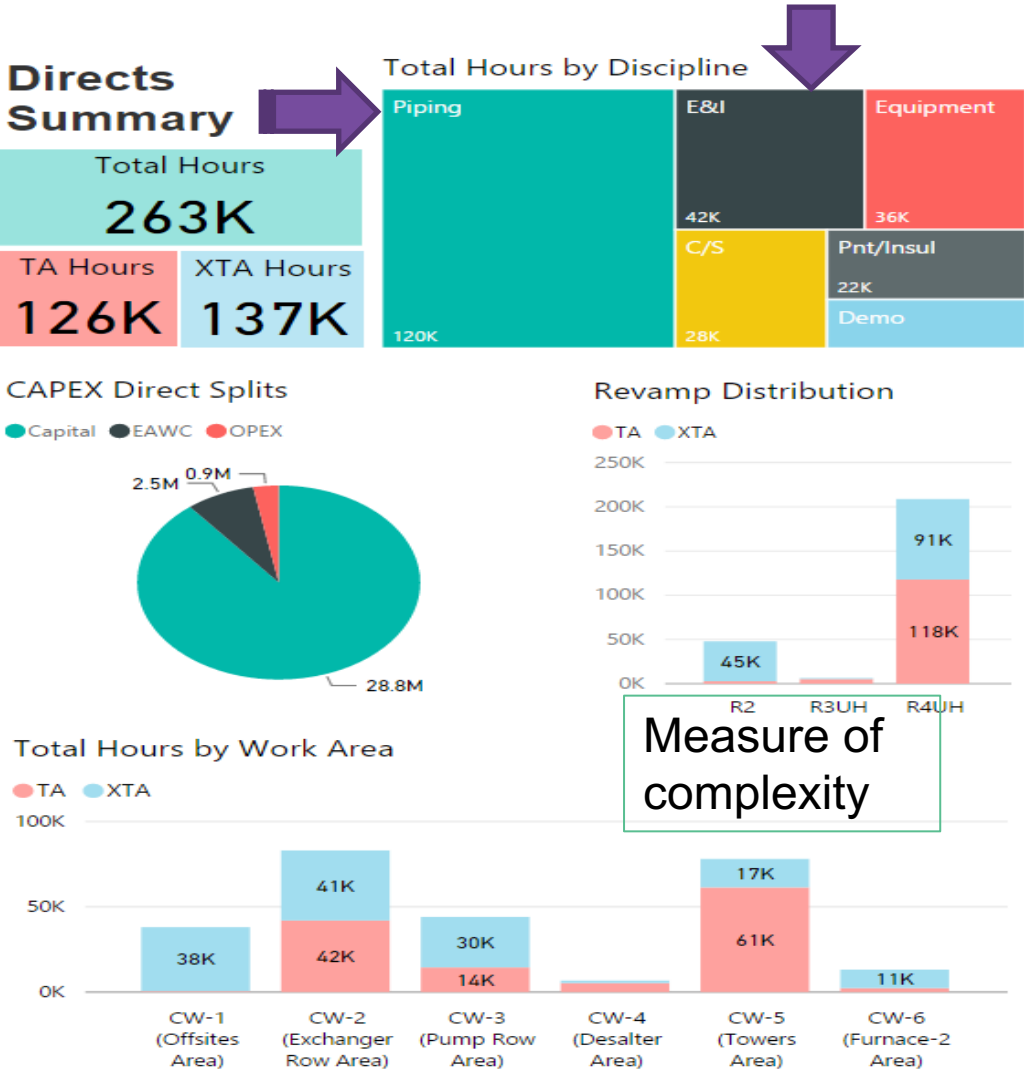
Using data to drive decision making in Estimating

- Exporting the estimate to Excel allows us to use data visualization software (Tableau and Power BI)
- The export captures all items in the estimate with cost, hours and quantities for each item
- Using visualization tools, we can focus the review with the design team to the most important items (highest cost, highest hours or quantity checks for key components)
 - Impact is shorter time in reviews
 - Less focus on what burned them on the last project
 - More emphasis on areas to go after for design optimizations and lower costs overall
 - Recognizes the influence curve is greatest in the early stages of a project and changes are less costly the earlier they are identified

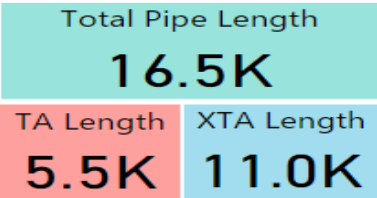
Using data to drive decision making in Estimating

- Examples of how cost engineers and design engineers work together to optimize:
 - Analysis of Total Installed Cost for vertical towers versus horizontal drum configurations
 - Analysis of heat exchanger shell size and number versus break points
- Cost engineers can use the data to change what designers do
 - 18” butterfly valves as specified were significantly more costly than 18” gate valves.
 - Result: design was changed, saving \$600k for project
 - Alloy materials can be significantly more costly than carbon steel, work with designers to optimize use of alloy or change type of alloy.
- If we can identify better optimized piping layouts early in pre-FEED, there is
 - Less pipe to design
 - Less insulation or paint or pipe supports (knock-on effects)
 - Less pipe to install
 - Fewer field hours, less supervision

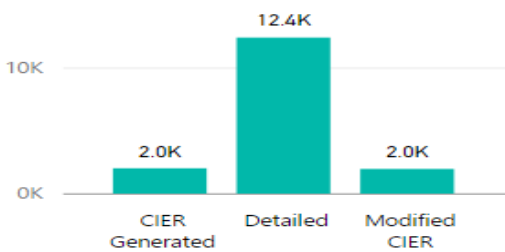
Visualization Software to Improve Review Effectiveness



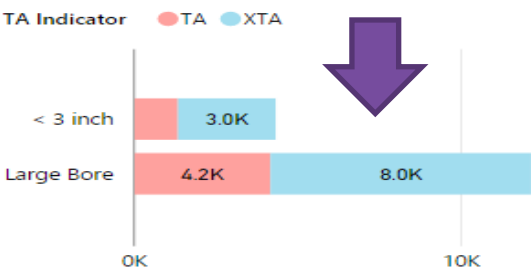
Piping Breakdown



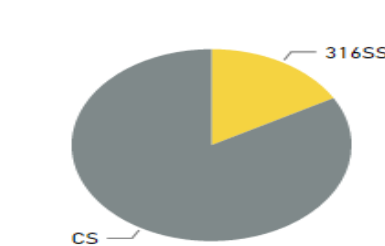
Piping Basis



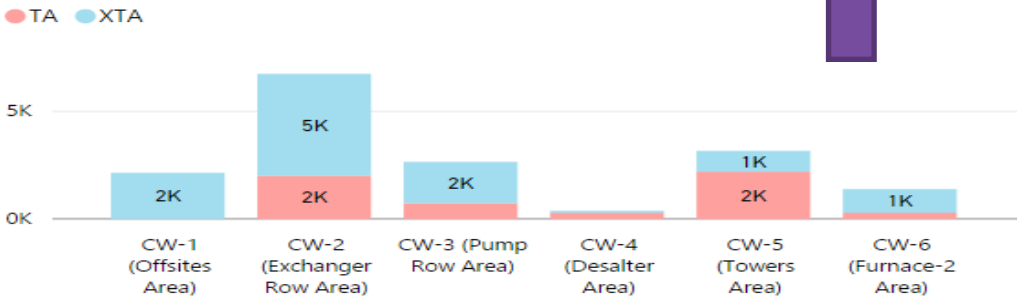
Pipe Length by Line Size



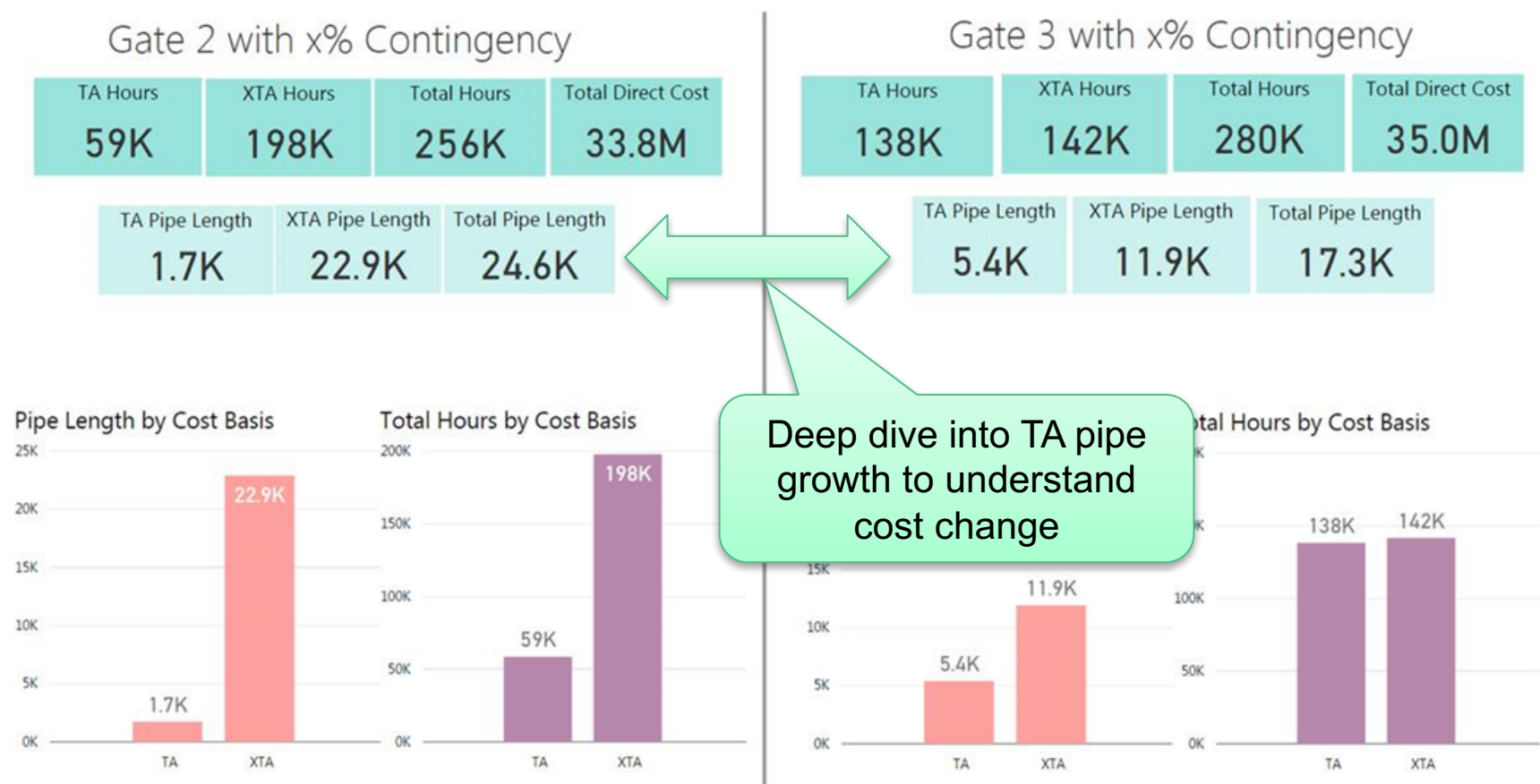
Pipe Material Split



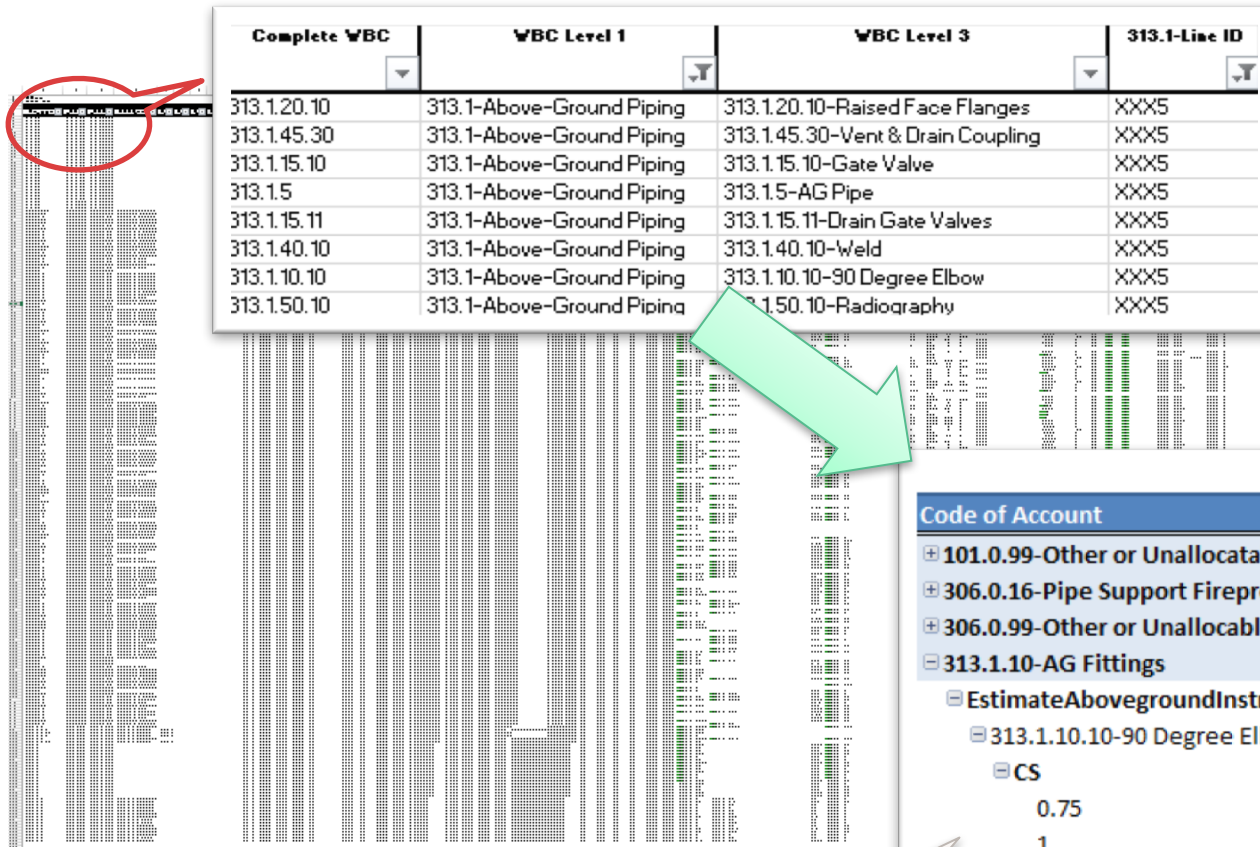
Pipe Length by Area



Visualization Software to Improve Review Effectiveness

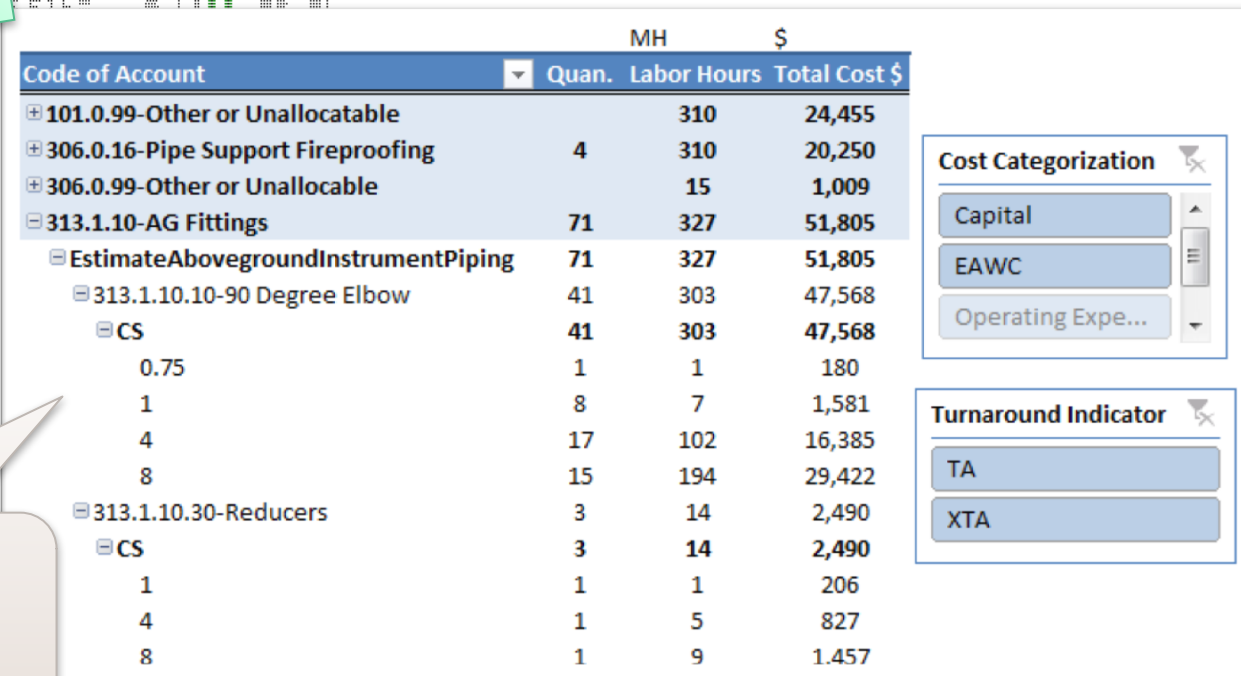


Enabling faster recast into EPC's Code of Accounts



Complete WBC	WBC Level 1	WBC Level 3	313.1-Line ID
313.1.20.10	313.1-Above-Ground Piping	313.1.20.10-Raised Face Flanges	XXX5
313.1.45.30	313.1-Above-Ground Piping	313.1.45.30-Vent & Drain Coupling	XXX5
313.1.15.10	313.1-Above-Ground Piping	313.1.15.10-Gate Valve	XXX5
313.1.5	313.1-Above-Ground Piping	313.1.5-AG Pipe	XXX5
313.1.15.11	313.1-Above-Ground Piping	313.1.15.11-Drain Gate Valves	XXX5
313.1.40.10	313.1-Above-Ground Piping	313.1.40.10-Weld	XXX5
313.1.10.10	313.1-Above-Ground Piping	313.1.10.10-90 Degree Elbow	XXX5
313.1.50.10	313.1-Above-Ground Piping	313.1.50.10-Radiography	XXX5

- Minimizes overall recast time
- Minimizes black out period while recast is being done
- We also have a recast tool preformatted with several major EPC's COAs

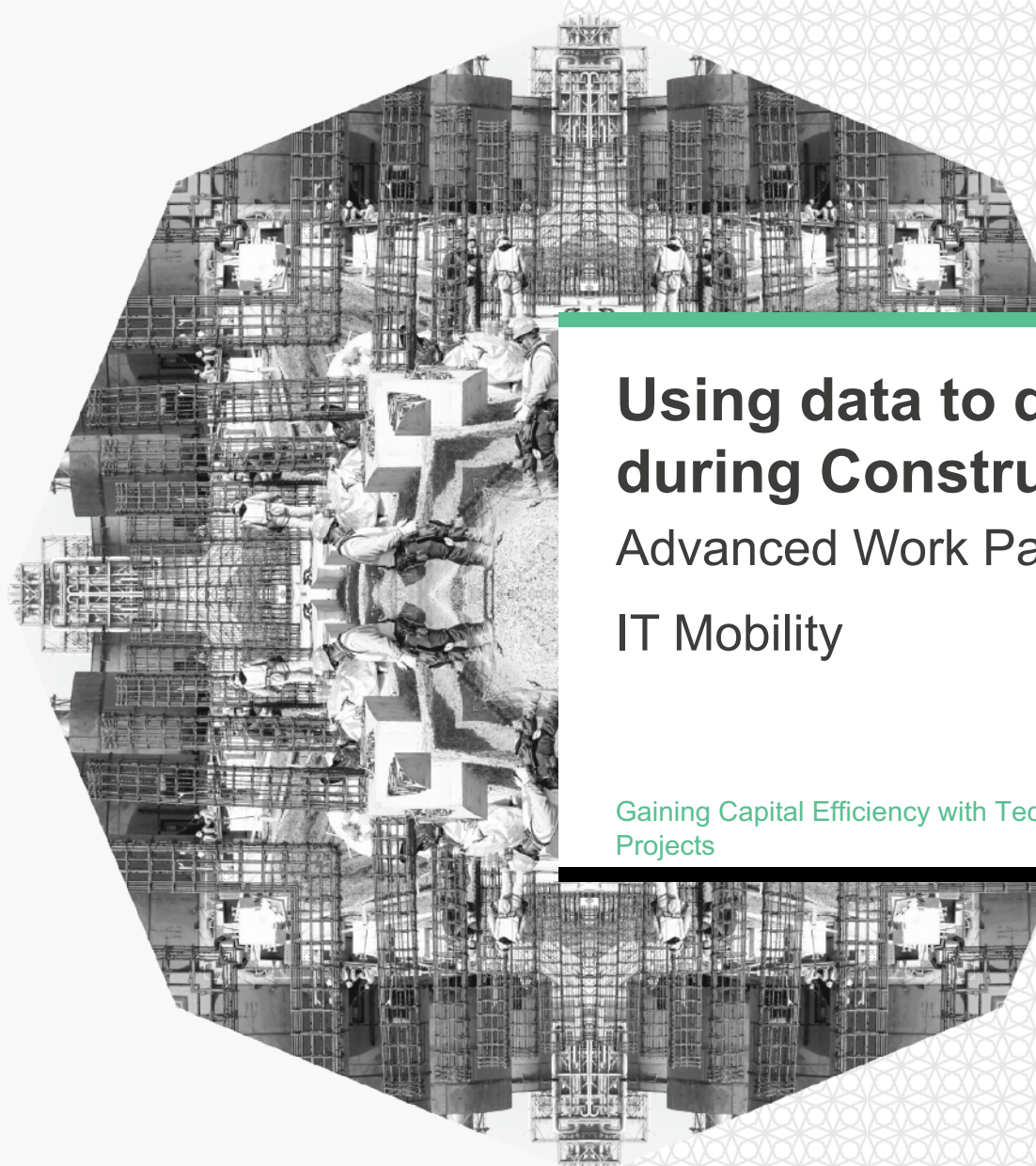


Code of Account	Quant.	MH	Labor Hours	Total Cost \$
+ 101.0.99-Other or Unallocatable			310	24,455
+ 306.0.16-Pipe Support Fireproofing	4		310	20,250
+ 306.0.99-Other or Unallocatable			15	1,009
- 313.1.10-AG Fittings	71		327	51,805
- EstimateAbovegroundInstrumentPiping	71		327	51,805
- 313.1.10.10-90 Degree Elbow	41		303	47,568
- CS	41		303	47,568
- 0.75	1		1	180
- 1	8		7	1,581
- 4	17		102	16,385
- 8	15		194	29,422
- 313.1.10.30-Reducers	3		14	2,490
- CS	3		14	2,490
- 1	1		1	206
- 4	1		5	827
- 8	1		9	1,457

Cost Categorization
Capital
EAWC
Operating Expe...

Turnaround Indicator
TA
XTA

Automated Project Controls Recast summaries with easy filtering and drill downs



Using data to drive **Capital Efficiency** during **Construction**

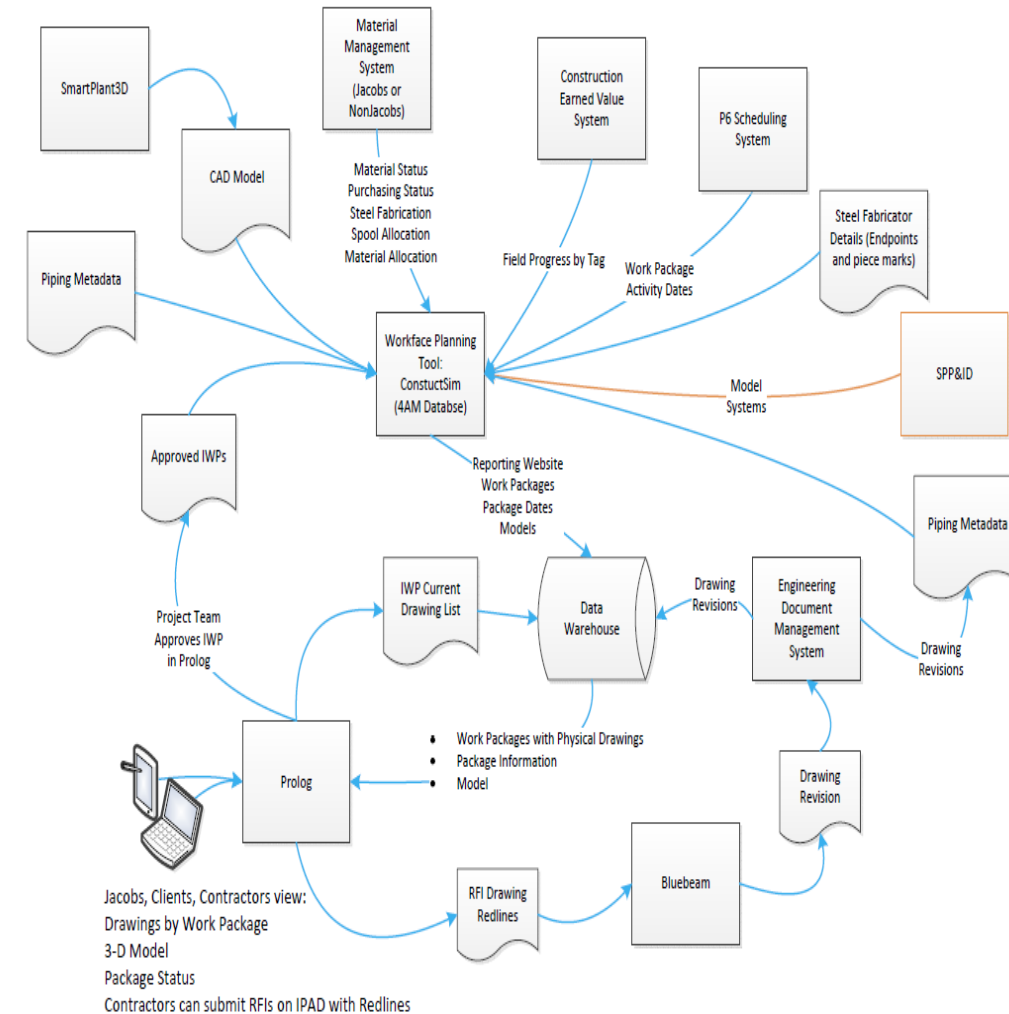
Advanced Work Packaging

IT Mobility

Gaining Capital Efficiency with Technology by Improving Insight and Understanding on Projects

Advanced Work Packaging

- Bringing Data together for better utilization
- Model, Drawings, Materials, Schedule, Install rates
- Visualize with a Model Navigator
- Recast the Master Document List into Constr. Work Packages
- Include Checklists, RFIs, Daily Work Journal
- Packages Approved Electronically
- Confirming with Subcontractors prior to start
- Deliver results through a Mobile Device



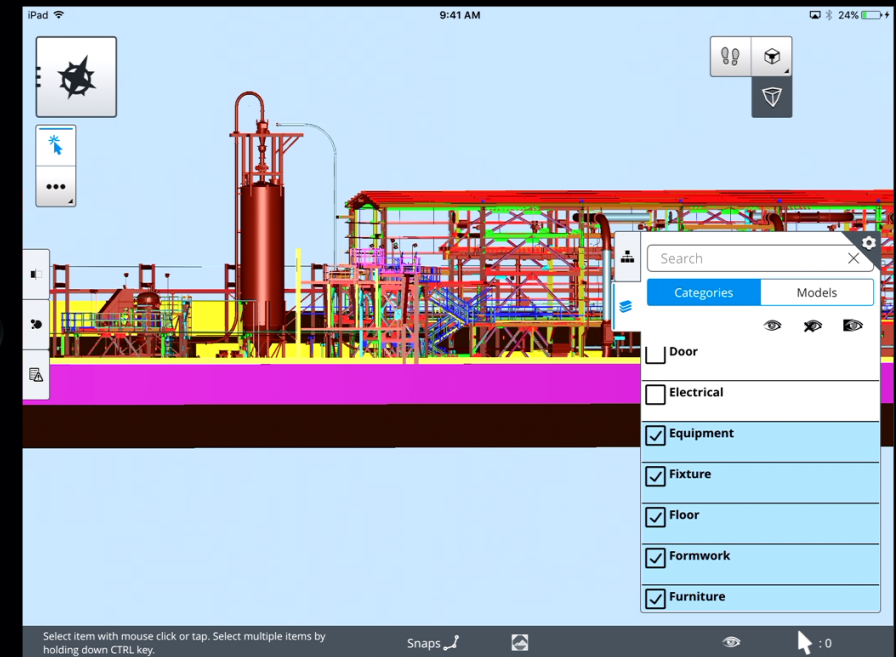
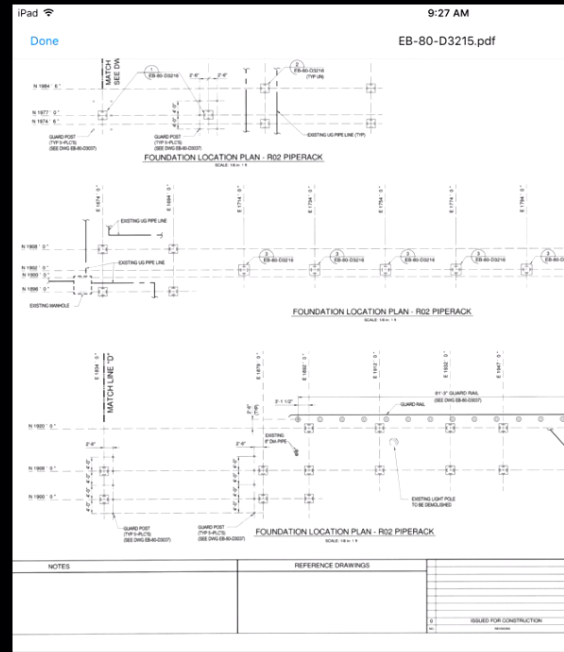
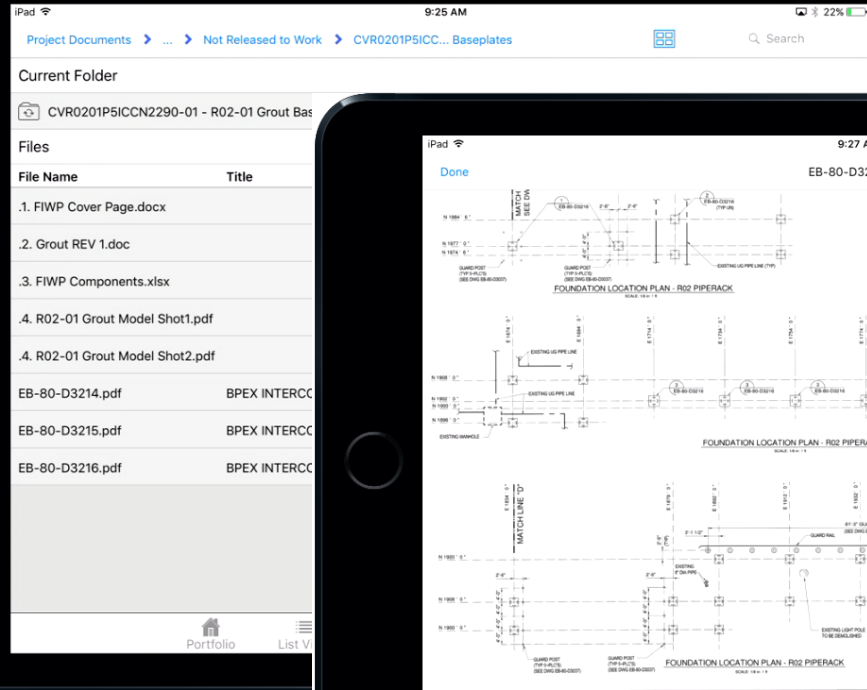
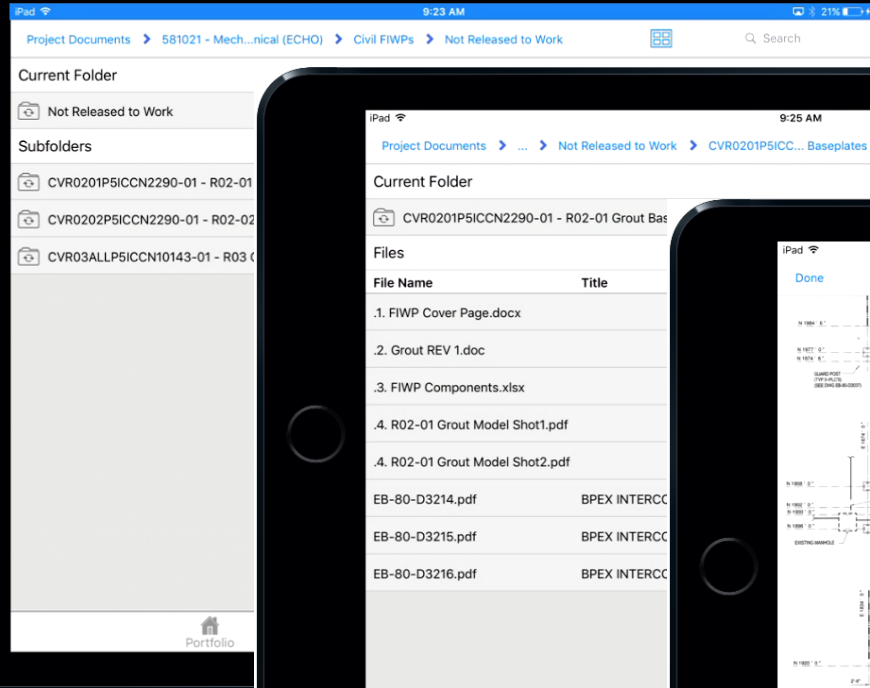
Mechanical Contractor Package

Civil FIWPs not released for Work

Baseplates Details

Drawings

Location in the Model



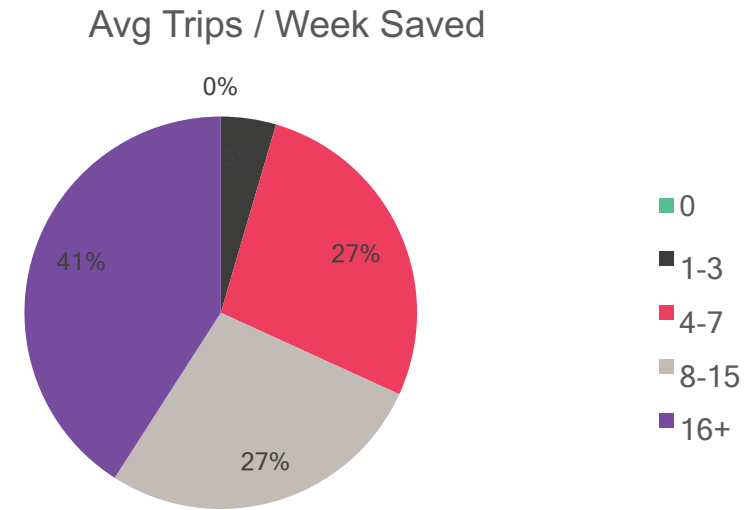
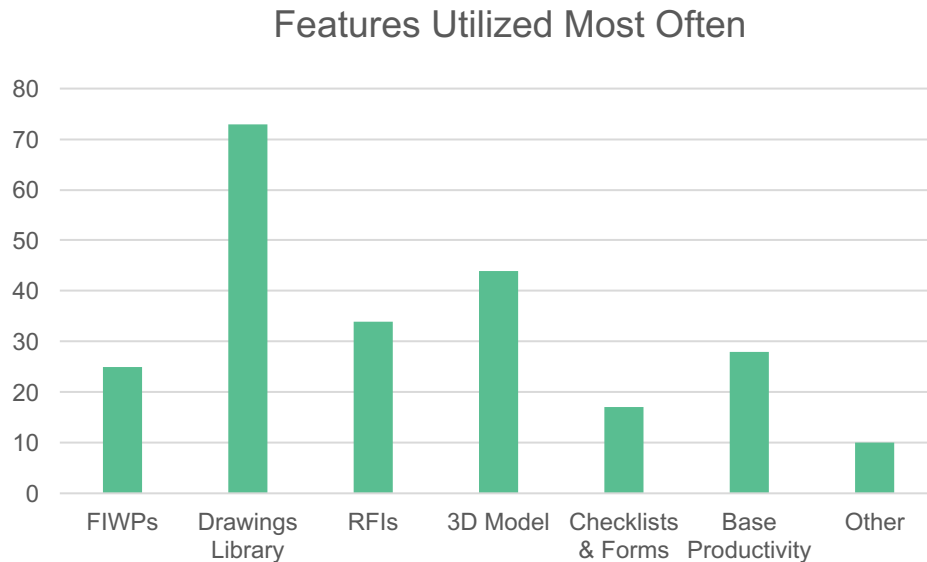
Advanced Work Packaging - Results

- Early results are anecdotal:
 - Project Engineers find Requests for Information (RFIs) much faster by taking a picture with the iPad and send it back to the home office without leaving the field
 - Foremen spend more time in the field with the Field Installation Work Package information right at hand
 - “Walk through” the model for orientation and safety discussion in the field
 - Data Input Forms on the iPad allow instant access, filled out in field, and submitted directly rather than having to go back to trailer to handle paperwork



Hard data/soft data for AWP

- Surveyed Mobility users (Foremen, Field Engineers, QA/QC Subcontract supervision) on pilot project:
 - All said faster access to information
 - 80% said very positive experience with iPads on the project



Hard data/soft data for AWP

- Ultimately looking at Advanced Work Packaging to deliver productivity improvements for capital projects
 - Our target is fewer construction hours per project
 - Hoping for, but not counting on, schedule improvements versus original plan
 - Main driver is not just capital efficiency, it is the recognition that our project portfolio is greater than we have done to date and we need to deliver projects cheaper and faster with the same owner resource pool.
 - Soft data
 - Lower attrition of craft personnel - on the theory that a Better Planned Job is Better to Work On
 - Fewer RFIs – on the theory that a Better Planned, Construction Driven Project will have less clashes
 - More efficient construction - on the theory that a Better Planned, Construction Driven Project will have material in the order needed
- Collaboration on Project Controls between Owner and Contractor
 - In addition to standard percent complete based on deliverables, can do percent complete by Engineering Work Package
 - Development of skyline charts for FIWP development and installation
 - Looking at ways to use data to understand what's late and why, is it on critical path, action plan to correct

Summary

- Use of data to drive decisions helps both the Owner and the Contractor deliver projects on schedule and on budget
- Data driven decisions occur across the entire project arrow, through estimating, FEED, Engineering and Construction
- We believe use of data is a **competitive advantage** for the industry

- Questions?

- Thank you for attending this presentation