CS468850

Brownfield Projects: Applying a Scalable AWP Approach with BIM360 & Forge Viewer

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Learning Objectives

- Learn how O3 and Autodesk® have partnered to produce a solution that can effectively scale AWP for brownfield projects and portfolios.
- Learn how to create and manage graphical and non-graphical work packages digitally on brownfield projects.
- Learn how to automate constraints, approvals, and workflows to support AWP best practices.
- Gain visibility into the status and progress of your portfolio of projects and cross compare contractors, areas, disciplines.

Description

Many Owner/Operators have recognized the value of Advanced Work Packaging (AWP) and have seen large projects benefit from streamlined project delivery and better collaboration. The following is an overview of how to successfully apply AWP best practices to a portfolio of small brownfield projects.

O3 Solutions' software suite, which leverages the Forge Viewer and BIM 360 Docs, provides an automated approach to project delivery to eliminate spreadsheets and manual processes during the work packaging creation and management process. The combined solution addresses how to scale AWP to small brownfield projects or a portfolio of projects and right-size the application of the AWP methodology.

O3's digital work package management solution is the first to help project teams create, update, approve, and progress work packages throughout their entire lifecycle—and automate the process when possible. The platform also supports robust reporting and analytics to keep all project stakeholders informed, with real-time information from the field. The data collected supports portfolio-level, cross-project comparisons across multiple contractors, disciplines, areas and other key criteria.

Speaker

Josh Girvin is the co-founder and CEO of O3 Solutions and is responsible for managing the team that markets and deploys O3's agile project management solution. O3 is a modern SaaS platform that includes a suite of solutions that leverages Advanced Work Packaging and agile best practices to disrupt the status quo for companies in industrial construction who want to improve productivity, safety, quality, and predictability.

Josh currently serves as the CII Advanced Work Packaging Community for Business Advancement co-chair for Performance and Benchmarking. He holds 12 US and International patents and graduated cum laude with a degree in Mechanical Engineering from Princeton University.

Introduction

This industry talk provides insight into how O3 Solutions leverages Autodesk BIM 360 Docs and Forge Viewer to implement a successful and scalable Advanced Work Packaging program. By providing relevant client stories and lessons learned from brownfield projects, this handout will serve as a reference for any organization seeking to implement a successful scalable Advanced Work Packaging program with digital solutions. The focus will be on O3 and the BIM 360 Docs and Forge Viewer integrations but will also reference the use of the AWP process to deliver a comprehensive and scalable AWP program. Also, this class and handout will highlight the benefits of using a modern SaaS platform that is purpose-built for construction to support an entire portfolio of projects with work package management, the visualization of work package status using a 3D model, and document management.
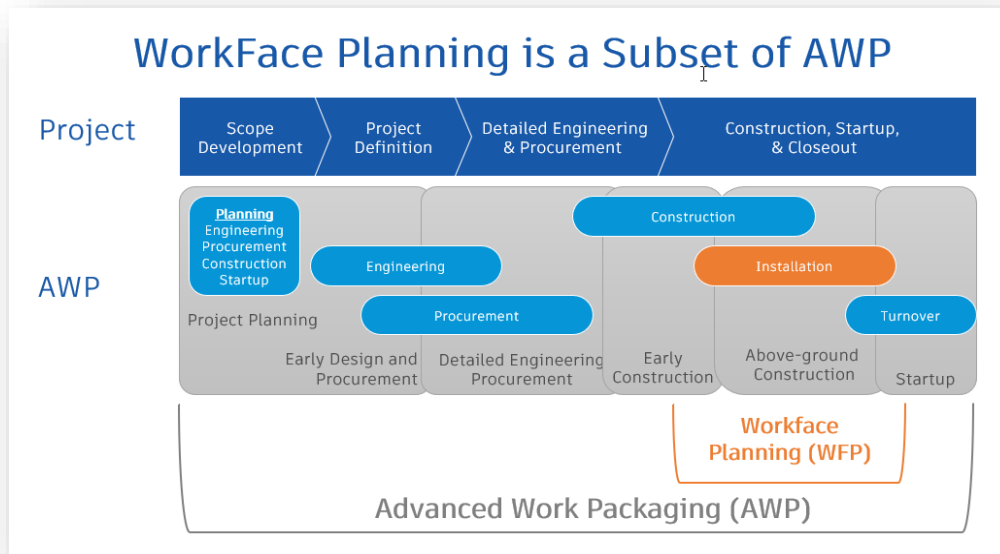
Advanced Work Packaging Background

Advanced Work Packaging (AWP) is a disciplined approach to improving project productivity and predictability through coordinated development of well-defined, constraint-free work packages. While AWP is a project execution methodology that extends across the entire project lifecycle from concept through commissioning, this talk focuses on the construction process within AWP which is referred to as WorkFace Planning (WFP). The WorkFace Planning process leverages two primary work package types: Construction Work Packages (CWPs) and Installation Work Packages (IWPs). A Construction Work Package is a defined scope of work segmented by a specific geographical work area for a single discipline, generally corresponding to a Level 3 Project Schedule activity. Construction Work Packages are aligned with an optimized path of construction developed through interactive planning sessions held early in the project planning process.

Installation Work Packages are developed from Construction Work Packages and represent a defined subset of the work meant to be executed by a single crew within a set one- or two-week time period. These packages include the estimated hours, and the resources needed such as contractors, equipment, materials, and safety requirements. The WorkFace Planning process includes the planning and scoping of packages as well as the management of those packages throughout their entire lifecycle. The management of these packages includes identifying and clearing of any constraints prior to the release of each package, ensuring the work is ready and crews can be productive in the field. One of the primary benefits of AWP is the increase in field productivity that results from proactive constraint management.

In general, AWP supports enhanced execution at the work front that reduces unproductive, non-value-added time and increases performance reliability and delivery predictability through alignment of planning and execution activities throughout the project lifecycle.

While the work packages most commonly used AWP are found in the installation process (Construction Work Packages and Installation Work Packages), full AWP includes work packages

that can be found throughout all stages of the projects including the contract/bidding process, engineering, procurement, scaffolding, testing, turnover, and more.

How Advanced Work Packaging & Workface Planning Relate in the Project Lifecycle

The relationship of these various packages can be summarized as follows:
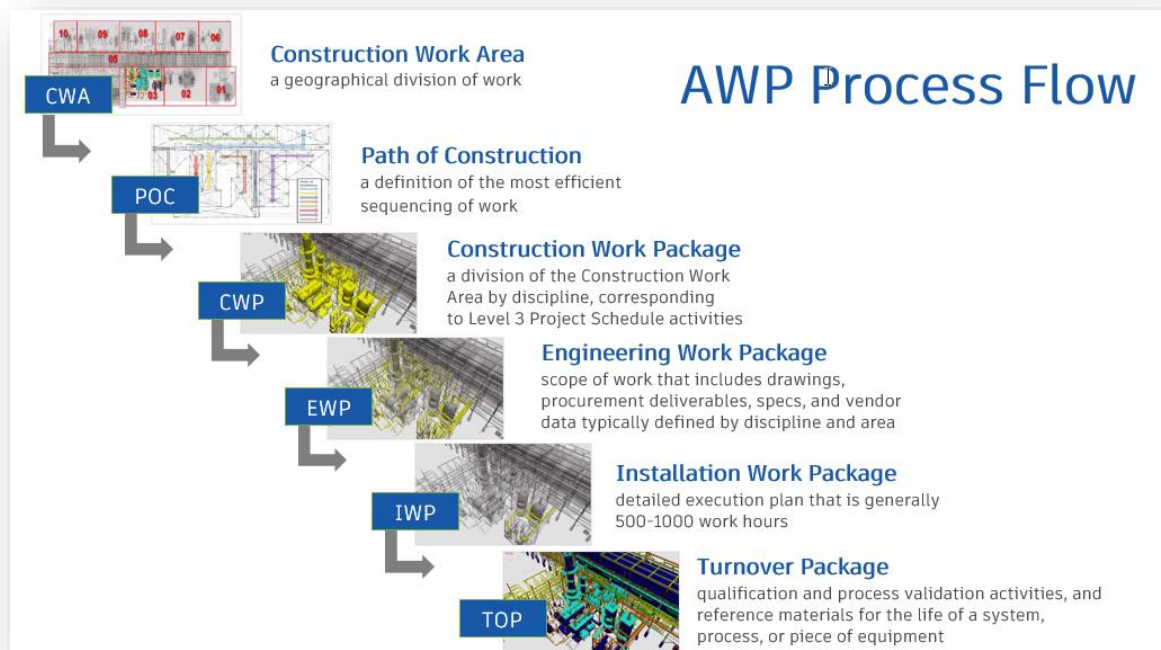
Sample Work Package Process Flow

The Benefits of Advanced Work Packaging

AWP holds the promise of fundamentally transforming the capital project delivery process by providing benefits shown below. Case study results have shown a strong relationship between AWP assessment and higher project performance, compared to traditional planning and execution processes.

The following are documented benefits of Advanced Work Packaging:
- Safety
- Productivity
- Efficiency
- Predictability
- Quality
- Adaptability

As a result of the efforts the Construction Industry Institute research teams, Advanced Work Packaging was promoted as a Best Practice in November 2015 (CII, 2015).

Why It's Important: Scaling Project Delivery for Brownfield Projects

Providing scalable solutions that enable AWP on small cap brownfield projects is important to driving overall efficiency and cost savings within an enterprise portfolio. While large cap projects can produce massive absolute savings from the use of AWP due to their large investment, moving the productivity needle at the enterprise level requires addressing small cap projects that make up the majority of project counts and for many organizations, the majority of their overall project investments.

Giga Projects $10B+ — 1

Mega Projects $1B+ — 10

Large Projects $500M — 100

Small Projects < $100M — 1000s
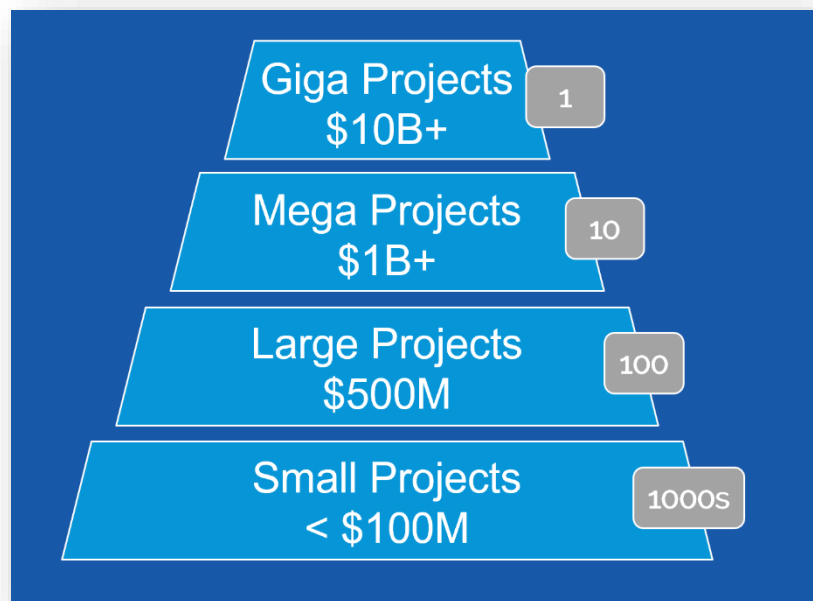
Sample Project Breakdown for Owner/Operators

Why It's Challenging: Scaling Project Delivery for Brownfield Projects

Traditionally, Owner/Operators and EPCs have focused their efforts on implementing Advanced Work Packaging on large, mega-, and giga-projects. Those projects generally take many years to plan and build and include multiple stakeholders. The size of the returns that can be gained by a 25% increase in field productivity on these projects are enough to justify a large investment of time, money, and change management to make AWP a success.

Operating facilities commonly have a group of smaller projects or several small to medium-sized brownfield projects in implementation simultaneously. These projects have a lower cost and shorter timeframe which makes implementing AWP cost prohibitive with legacy solutions that require significant upfront investment to implement. In addition, the change management challenge is far greater on these brownfield implementations due to the institutional inertia that exists within facilities that may have been operating in the same way with the same people for 30 years or more. The multi-project nature of these brownfield projects also introduces the additional challenge of divided project teams and constantly shifting priorities. With mega projects, the entire team is dedicated to a single project and a single means of executing that project with a defined technology stack. With brownfield portfolios however, teams work on multiple projects with different contractors leveraging different tools simultaneously.

In addition to these unique challenges, there are some advantages to introducing a new process at brownfield projects. These facilities often have embedded or preferred contractors that support multiple projects for an extended period of time. This provides the opportunity to introduce a new program like Advanced Work Packaging over time with a slower "crawl, walk, run" implementation schedule. With mega projects, the implementation approach is typically decided at the beginning of the project and then maintained over the course of the project which could be 5 to 8 years for a very large project. With the shorter durations of brownfield projects and the evergreen nature of the project funnel, it is possible to introduce change in smaller more manageable steps. For example, it is possible to start with the introduction of just non-graphical IWP creation on the first project and then introduce graphical IWP creation on the next project and then expand into CWPs and other work package types over time over a series of multiple projects.

Why A New Approach is Needed: Scaling Project Delivery for Brownfield Projects

Implementing AWP on brownfield projects at an existing operating facility can introduce many questions. These questions include:

- What should be done when 3D models are not available or are poorly attributed, preventing graphical work package automation?
- How should the organization implement a new process when multiple contractors are used on different projects and each company uses different engineering authoring tools?
- How should the organization address the fact that Project Management Teams are stretched thin and forced to operate in a reactive, firefighter mode, leaving little time for introducing new processes or technologies?
- What is the best way to handle change management when teams are stuck in institutional inertia, a result of the same resources managing projects the same way for decades?

One of the greatest questions facing the successful implementation of AWP on brownfield projects is how to address the lack of tools that are well suited for the environment. Traditional, legacy

applications that require on-premise, thick-client implementations also require an IT and data management investment that dwarfs the returns of AWP on a small cap project. A technology stack that takes 8 months and $2 million dollars to implement is not viable for a project whose total installed cost is $50 thousand dollars and has a duration of 4 months. This is why AWP has largely been limited to mega project implementations to date. With a duration of multiple years and costs in the billions, it is easy to achieve a positive return even with a significant upfront investment.

Solution: Leveraging Autodesk Forge Viewer & BIM 360 Docs

O3 Solutions has partnered with Autodesk® to leverage the Forge Viewer and BIM 360 Docs to deliver a comprehensive scalable AWP solution that is cost effective to implement and supports AWP across the entire project lifecycle from concept through commissioning. The cloud-based SaaS platform is designed to support an entire portfolio of projects and supports 3D models of any type and size. The combined solution also delivers status visualization for 10 out-of-the-box work package types.

The combined O3 and Autodesk solution includes:

Graphical Work Package Scoping – 3D virtual construction model for graphical work package development and visualization.

Disciplines, such as pipe and steel, tend to have well attributed models and the component representations in the model line up with the actual materials installed in the field. Through the integration between O3 and BIM 360 Docs, the models become visible directly within the O3 application using the embedded Forge viewer. Users are able to load 3D engineering models of any size and type into BIM 360 Docs and can then visually select components from the model individually or as a group to define the scope that will be included in a work package.

Non-Graphical Work Package Scoping – *Build packages without a 3D model using drawings, materials, equipment, and other non-graphical data.*

WorkFace Planners can easily add components to a new or existing work package by selecting them from a filterable list, which saves a significant amount of time in the work package creation process. If all the components in the model are well attributed, a package could be developed completely through the graphical interface. However, the reality is that many disciplines are not modeled to this level of detail. This is particularly true in brownfield projects where models tend to be less sophisticated than on new greenfield projects. With the support for both graphical and non-graphical scoping in the same combined solution, users can handle all package scoping regardless of the state of the 3D model.

Constraint Management – *Identify, visualize, and proactively remove constraints that are blocking or preventing work from being executed.*

Having the ability to clear constraints and release work packages to the field without any blocking items is a critical AWP best practice and is responsible for much of the productivity gains that have been documented with the use of AWP. The O3 platform is unique in that it focuses on constraint management and not just constraint identification.

Each constraint in the solution is its own unique entity which can be assigned to a user for resolution, given a due date, moved through a workflow, tracked, and reported. This is important because it allows the combined O3 and Autodesk solution to visualize component availability during the work package graphical scoping process. Through the Forge Viewer, O3 can provide graphical context to users on component availability when they are selecting components to include in packages. This significantly reduces the time required to successfully scope packages that can readily be executed.

Workflows & Automation – *Configurable workflows and robust automation of package status, approval, progress, and tracking are critical to reducing the effort required to support AWP.*

Brownfield projects cannot afford to have an army of resources dedicated to managing the tool. Mega projects have the resources to justify dedicated data administrators for their AWP applications. This is not the case at small cap projects which contributes to why AWP has largely been reserved for mega projects to date. By reducing the management burden through automation, resources are able to focus on their process as opposed to the tool.

Status Visualization – *Leverage a 3D model to visualize key project data including status, progress, blocking items, and critical path to provide context to decision making.*

O3 has a wealth of data on the status and progress of the project. Prior to partnering with Autodesk, this data was available in 2D dashboards which provide great filtering and drill-down for complex data sets. With the embedding of the Forge Viewer, O3 has the ability to represent this information graphically in the 3D model which provides spatial context. Users can more easily and more rapidly reach meaningful insights when viewing the information in relation to the model.

Dashboards – *Reduce the time it takes to identify issues, make decisions, and take action to course correct with interactive views purpose-built for each stakeholder.*

Visualizing the data in the model for better context is critical to understanding the physical location of issues. Dashboards are valuable in that they allow for more complex analysis of detailed data. The embedded dashboards within the O3 application are particularly valuable for brownfield projects where dedicated teams to build one-off reporting solutions are not present. Mega projects often invest in an analytics team to develop and maintain reporting for the project. This is cost prohibitive on a small cap project where the salary of a single individual could meaningfully impact the total cost of the project. A simple to setup and use, out of the box solution for reporting and analytics reduces the burden on the project team and budget.
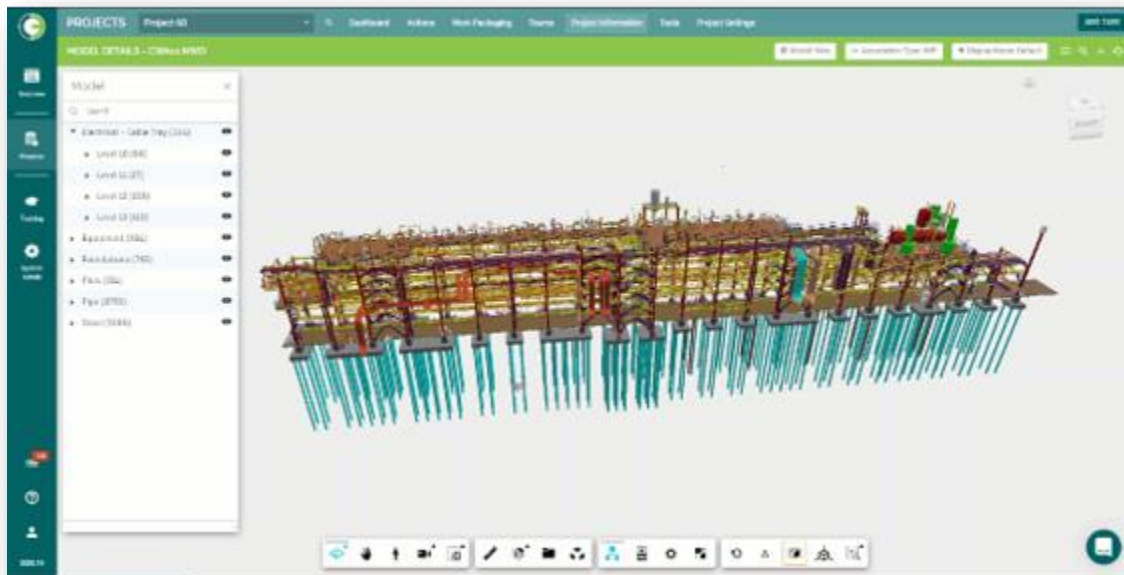
Creating Work Packages with a 3D Model

The Partnership with Autodesk to Use the Forge Viewer and BIM 360 Docs

O3 partnered with Autodesk to leverage the Forge Viewer and BIM 360 Docs to deliver a comprehensive and scalable AWP program. The combined solution is purpose-built for construction to support an entire portfolio of projects with work package management, the visualization of work package status using a 3D model, and document management.

O3 selected Autodesk as a partner based on the technical capabilities of the BIM 360 Docs and Forge Viewer tools. The SaaS delivery is critical to supporting a portfolio of small cap projects in a cost-effective manner. The ability to consume models authored in any engineering tool is a requirement for supporting brownfield projects. The modern, intuitive user interface of the applications reduces the change management and training burden which is also critical to overall effectiveness in a brownfield environment.

The Results: Brownfield Case Studies

To understand the value that O3, BIM 360 Docs, and the Forge Viewer provide for scaling AWP for brownfield projects, we have highlighted specific use cases documented by the project team. The combined solution supports a wide range of portfolio types and has been applied on a portfolio of small projects, a refinery operating facility with several simultaneous projects in various levels of execution, and an enterprise productivity improvement program that is a combination of operating facilities and a mega-project.

Case Study 1: Deep Water Portfolio

This case study involves 2 phases of implementation on a set of multiple offshore, Deepwater

assets for an Owner in the Oil & Gas industry. The first phase was an initial pilot followed by an expansion.

The portfolio implementation scope includes:

Phase 1
- • 4 Assets offshore
- • 46 Projects: Annualized Project TIC ~$30M
- • 78 Construction Work Packages
- • 148 Installation Work Packages
- • 4,500+ Constraints Identified
- • 1,000+ Constraints Closed

Phase 2
- • Added 3 additional assets
- • 7 More Projects ~$45M Total TIC

The scope of the combined software implementation includes:

- • Graphical & Non-graphical CWP creation and management
- • Graphical & Non-graphical IWP creation and management
- • Collaborative constraint management process across contractor and owner with 3D visualization of constraints
- • Managing all project actions in a collaborative, team-specific set of Kanban boards
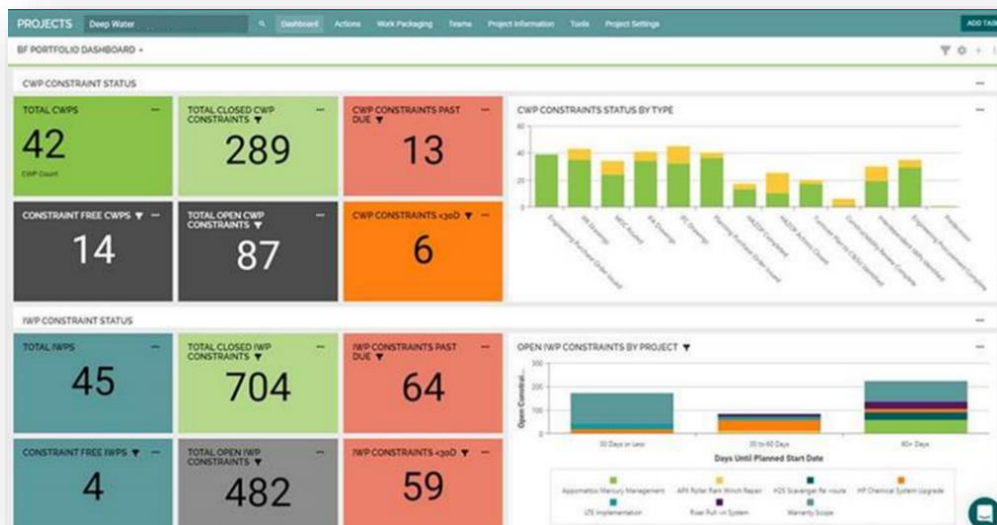
Cross Project Reporting & Analytics

The benefits realized to date include:
- • Standardization of approach across 100's of small projects
- • Consistent definition of progress across multiple contractors
- • Real-time visibility into project status allowing for optimization of limited offshore resources

The lessons learned to date include:
- Self-paced, online training for AWP is an excellent alternative to in-person, especially during COVID-19
- Small projects can be managed as CWPs rather than individual projects to reduce overhead effort

The next steps for expanding the implementation include:
- Roll-out across the entire Deepwater business unit
- Incorporation of BIM360 Mobile for access to IWPs in the field

Case Study 2: Refinery Operating Facility

This case study involves the implementation of the combined solution at an existing refinery / chemical plant for the management of a portfolio of small cap, brownfield projects. Upon implementation, this project team was not familiar with AWP. Part of the early implementation included development of the small cap AWP program for the owner as well as training of the site resources in both workface planning and advanced work packaging.

The portfolio implementation scope includes:

Active Projects: 13
Total Projects: 56
1,070 Construction Work Packages
1,150 Installation Work Packages

The scope of the combined software implementation includes:

- Graphical & Non-Graphical Package Development - CWP & IWP development using both 3D model components and engineering & materials lists
- RFI Tracking - Transitioned from spreadsheets and email to software and automation resulting in quicker resolution times
- SWPs & Scaffolding – Tracking and managing scaffold constraints
- Materials - Automatically creating constraints as part of material analysis. Cross referencing IWP requirements against material inventory to auto create / clear material constraints
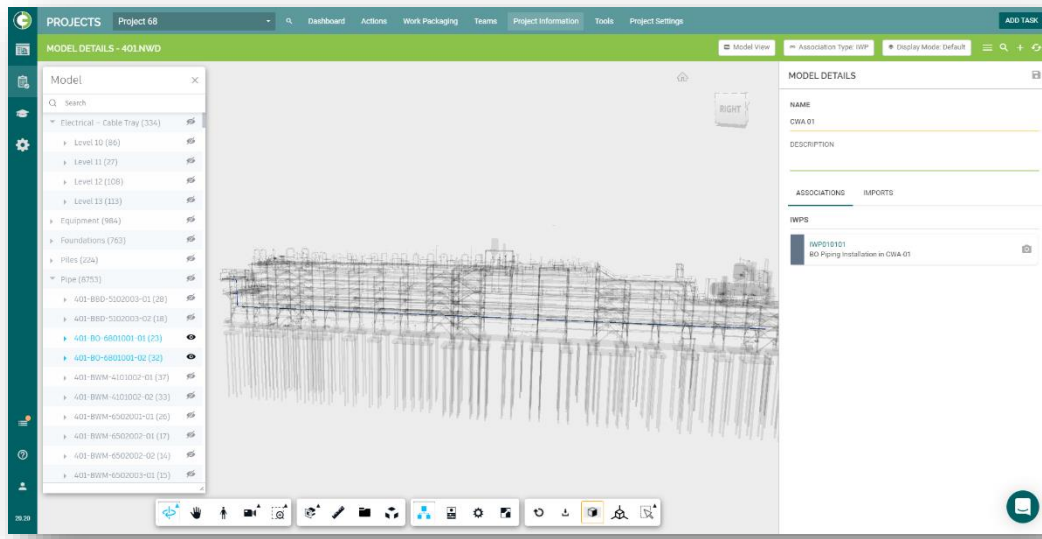
Graphical Installation Work Packaging Scoping

The benefits realized to date include:
- 18% increase in field productivity of AWP projects over non-AWP projects
- Enhanced visibility, collaboration, and accountability

The lessons learned to date include:
- Change Management at operating facilities is particularly challenging due to institutional inertia
- Engineering tends to be the least motivated to change due to the majority of the AWP benefits being realized by construction. Engineering is asked to adjust their process with little benefit directly realized by their team. Change management from the top down that provides a clear view of the overall benefit to the project is critical to getting engineering on board.

The next steps for expanding the implementation include:
- Graphical creation and visualization of packages beyond CWPs and IWPs including scaffolding, testing, turnover and engineering work packages.

Case Study 3: Enterprise Field Productivity Program

This case study involves the implementation of the combined solution across an enterprise portfolio of projects with an Owner in the Oil & Gas industry. The intent of this implementation was to standardize the process for field productivity data collection and presentation.

The enterprise program implementation scope includes:

Operating Facility A
- 56 Projects in 2019
- 28 Projects in 2020

- 15 Observers

Operating Facility B
- 8 Projects in 2020
- 17 Observers

Multiple Megaprojects
- In Implementation

The scope of the combined software implementation includes:

- Mobile Data Collection - Dedicated iPad application for data collection in the field
- Cross-Project Reporting - Ability to easily compare projects, contractors, areas, disciplines, etc.
- Data Visualization - Ability to visualize productivity data in the 3D model context
- Enterprise Roll-Up - Global roll-up of data across the entire enterprise portfolio
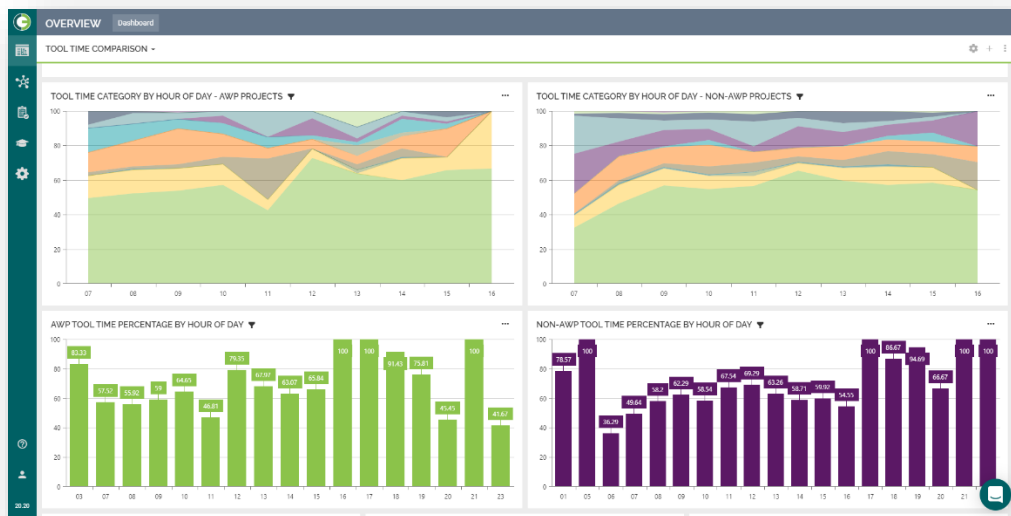
Cross-Project Reporting for Tool-Time Productivity

The benefits realized to date include:
- Apples to apples comparison across projects enables meaningful comparison which drives continuous improvement over time
- Standardized data collection through purpose-built app reduces human error and increases timeliness

The lessons learned to date include:
- Training on tool time measurement process is critical to standardized data collection

The next steps for expanding the implementation include:
- Extend productivity data status visualization beyond the basic 3D model representation to provide additional context around areas that require attention

Key Takeaways

1. Moving the needle for a portfolio requires addressing small cap projects
2. On premise, thick client solutions are cost prohibitive for scalable AWP
3. Small Cap Projects have greater change management challenges than greenfield
4. Cross-Project Reporting Requires Multi-Project SaaS Solutions
5. Status Visualization enables context for faster, better decision making
6. Creating all work packages in one source supports a single view of work packaging program
7. Standardized cross-project reporting enables continuous improvement
8. Autodesk's solution was ideal for extending O3's offering into 3D VCM modeling

Conclusion

O3 Solutions, powered by Forge and BIM 360, supports a portfolio of small brownfield projects leveraging Advanced Work Packaging best practices with an automated approach that eliminates spreadsheets and manual processes. The combined solutions address the overall strategy and right-sizing AWP for each project. It's the first true work package management solution purpose-built for brownfield, small cap project teams to create, update, approve, progress, and automate the work packaging process throughout the entire project lifecycle. The combination of Autodesk's BIM 360 Docs and Forge Viewer with the O3 platform address the key issues that have historically prevented AWP from being effectively scaled to support small cap projects.