Bentley
Advancing Infrastructure

Project Summary

Organization:
Insight-WFP

Location:
Houston, Texas, United States

Project Objective:

- Implement an advanced work packaging best practice using innovative construction WFP applications.
- Dynamically share data and enable self-service for project stakeholders to create and monitor clearly defined installation work packages.

Products used:
ConstructSim Planner, ConstructSim Work Package Server, Bentley Navigator

Fast Facts

- Owners' representatives and construction staff used tablets to view live packages and 3D images in the field, keeping everyone in sync.
- Construction contractors had 24/7 Web access to a single source of online documents they could search, pull electronic documents from, and revise with near zero lag time.

ROI

- The solution yielded an ROI of USD 36 million and resulted in project completion six weeks ahead of schedule.
- The project team completed 1.6 million work hours without a single lost time incident—a unique outcome for the industry.
- AWP best practices used in conjunction with Bentley software reduced project costs and time by determining the correct sequence of work and verifying materials availability.
- Weekly project reports provided a clear picture of reality, allowing contractors to make decisions based on a finite understanding of work fronts and actual progress.

Insight-WFP Leverages Bentley's ConstructSim to Drive Planning on Milestone Refinery Project

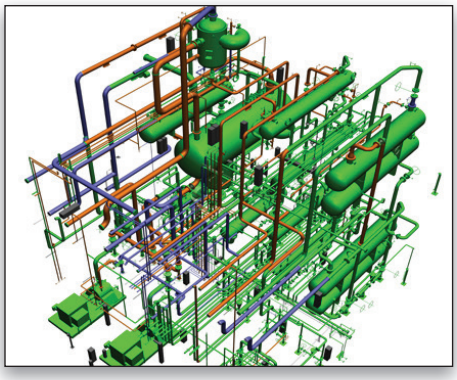
Advanced Work Packaging Optimizes Construction Work for Large Oil Refinery, Delivering Stable and Predictable Outcomes

Deliver Predictable Outcomes and Maintain Safety

Insight-WFP, a full-service WorkFace Planning (WFP) provider headquartered in Alberta, Canada, was engaged by a Houston oil refinery to apply an advance work packaging (AWP) methodology in an environment where construction planning was typically done on the fly. The USD 450 million project required the Insight-WFP team to deliver a stable construction environment with predictable project outcomes while also maintaining safety in the operational facility. To reach the milestone dates imposed by the contractor, the team needed clearly defined installation work packages.

"In the past, job planning was done by foremen who arrive at 6 a.m., see what manpower and materials are available, and then figure out how to keep workers busy for the day." This kind of inadvertent approach to work planning created too much risk in a fixed-price construction project—and the owner realized this—so they offered to pay for the cost of the planning and software needed to create a stable, predictable construction environment.

"The typical North American construction contractors are quite cavalier when it comes to planning," explained Geoff Ryan, PMP, Insight-WFP AWP specialist. Insight-WFP recommended ConstructSim Planner and ConstructSim Work Package Server, which together work to automate engineering, construction, and installation work packaging processes. But to move forward, Insight-WFP needed support from the information management team that would be using the software to build workforce plans in a controlled, systems-driven environment, as well as to win over the construction firm responsible for acting on those plans.



Advanced Work Packaging reduced the environmental impact of construction equipment, travel, and waste, yielding an ROI of USD 36 million and resulting in project completion six weeks ahead of schedule.

Implementing an Automated Work Packaging System

While the owner-operator agreed with implementing a WFP solution—and even funded the implementation—the contractors engaged to build the new refinery had reservations. "There was resistance during the first few weeks," noted Ryan. "But once the contractors saw the 3D images of project data from ConstructSim, they were on board. It was like a light came on. They quickly realized that the combination of planning and information management that came from ConstructSim was a win-win business model," he added.

Bentley worked with Insight-WFP and the client to implement ConstructSim, leveraging existing models to simulate work-based plans including construction constraints and priorities. The software's user interfaces were customized to ease and accelerate adoption by management and various contractors working on the project. With ConstructSim in place, project participants could define any number of work packages, and by using the solution's single source of online documents, they could search and access electronic documents, and manage all changes.

A More Effective Way of Working

Insight-WFP used ConstructSim to provide transparency for the owner and drive consistency in work package development and reporting. ConstructSim's ability to communicate complex scenarios via 4D simulations kept workers on track, while progress was recorded for use in planning the next stages of construction. Stated Ryan, "In the past, people would be in a construction meeting while the scheduler walked through the sequence of the schedule, and then each person would leave with

"We have a very happy owner and contractors with a new business model, a scaffold company selling the virtues of planning with ConstructSim to their business partners, and new hope in an industry that's hungry for change. Our company has a solid business case for investing in information management to support advanced work packaging."

— Geoff Ryan, PMP, AWP Specialist, Insight-WFP

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Contact Bentley
1-800-BENTLEY (1-800-236-8539)
Outside the US +1 610-458-5000

Global Office Listings
www.bentley.com/contact

a different interpretation of next steps. But when they played the 4D simulations, everyone left with a shared understanding of the plan."

The visualizations stimulated conversations among the various contractors and teams regarding constructability, with safety as the utmost priority, and often led to changes in scheduling to optimize work efficiency and cost. For example, the solution represented the work associated with equipment, steel, and pipe objects visually as three different colors on the schedule. Rather than the typical day-to-day work planning that was done by foremen on the fly, site supervisors could create a series of work packages, each defining what a foreman and typical work crew could complete in approximately one week. The work packages accurately reflected detailed information about available materials, work crews, constraints, equipment orders, and deliveries and defined how to complete the work safely in the given time frame, optimizing productivity of work teams.

Progress was recorded in ConstructSim visually, with colors changing as objects were connected, aligned, and inspected. The result was a single version of truth representing how much work was completed and what can be done next—a clear picture of reality that allowed the construction contractors to make decisions based upon a full understanding of work fronts and progress.

The solution also provided a single source of online documents where construction contractors can search and pull electronic documents and make revisions with near zero lag time. By using Bentley Navigator on tablets in the field, the superintendents and foremen could access live packages and 3D images of the latest designs 24/7. "The foremen adapted easily to the natural structure of the work packages and appreciated the simple communication of complex scenarios through the use of 3D images and detailed drawings," elaborated Ryan. "As a result, we had virtually no issues with construction working off the wrong drawing. In fact, the process was so effective that contractors were able to scale down their document control departments and rely on ConstructSim Work Package Server and workforce planners as their source for project documents."

Gaining New Efficiencies

With the core work of the project defined as work packages, the chaos and inefficiencies associated with a typical construction project were dramatically reduced. Now that the piping contractors were confident in their work plan, they ordered scaffold in advance, ensuring it would be ready and fit for purpose before implementation. The advance order also allowed the supplier to optimize its processes enough to reduce the overall cost of scaffold from 25 to 1 percent of the total direct hours for labor.

Work crews were able to erect steel more efficiently, thanks to the addition of steel piece marker numbers from fabricators within i-models. "Work planners developed itemized material pick lists from ConstructSim, facilitating the bag-and-tag process in the material yard," noted Ryan. Markers were used to accurately track steel erection progress on ConstructSim in near real time.

Moreover, because the software enabled a direct correlation between the reality of visualized work package progress and the construction schedule, contractors could make better decisions based on a finite understanding of work fronts. This allowed them, for instance, to redirect work crews to accomplish work that could actually be executed, rather than wasting time on work fronts that lacked sufficient resources. "This resulted in a significant, positive impact on productivity, scheduling, and morale while substantially reducing project chaos," noted Ryan.

ConstructSim's ability to develop definitions around RFIs and change orders dramatically reduced the ambiguity around the cost and impact of changes. For example, when a contractor asked for higher compensation to account for the cost of additional pipe lengths required to complete a work package, management could use ConstructSim to identify the exact number and size of each additional pipe length, multiply this by the time required for each cut and bevel, and then document a data-based agreement all parties trusted.

World-class Safety Performance

Bentley's construction WFP software organized the efficient execution of work fronts, enabling project teams to complete the project in 1.6 million work hours without a single lost time incident—a unique outcome for this industry that's recognized as world-class performance. Much of this achievement is credited to the safety programs that flourished thanks to the organized implementation facilitated by ConstructSim.

Work crews were able to safely work faster and more efficiently. Most notably, crews installed pipe at 2.3 hours per foot compared to the typical 3-3.5 hours per foot, which is a 25 percent increase in efficiency. "Add this to the add-on effect of organized steel and pipe on instrumentation, electrical, installation, and turnover, and it is fair to say that the solution resulted in direct cost avoidance valued at approximately USD 36 million, or 8 percent of the total installed cost," stated Ryan. "The schedule was also reduced by about six weeks, enabling the company to save these labor costs."

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