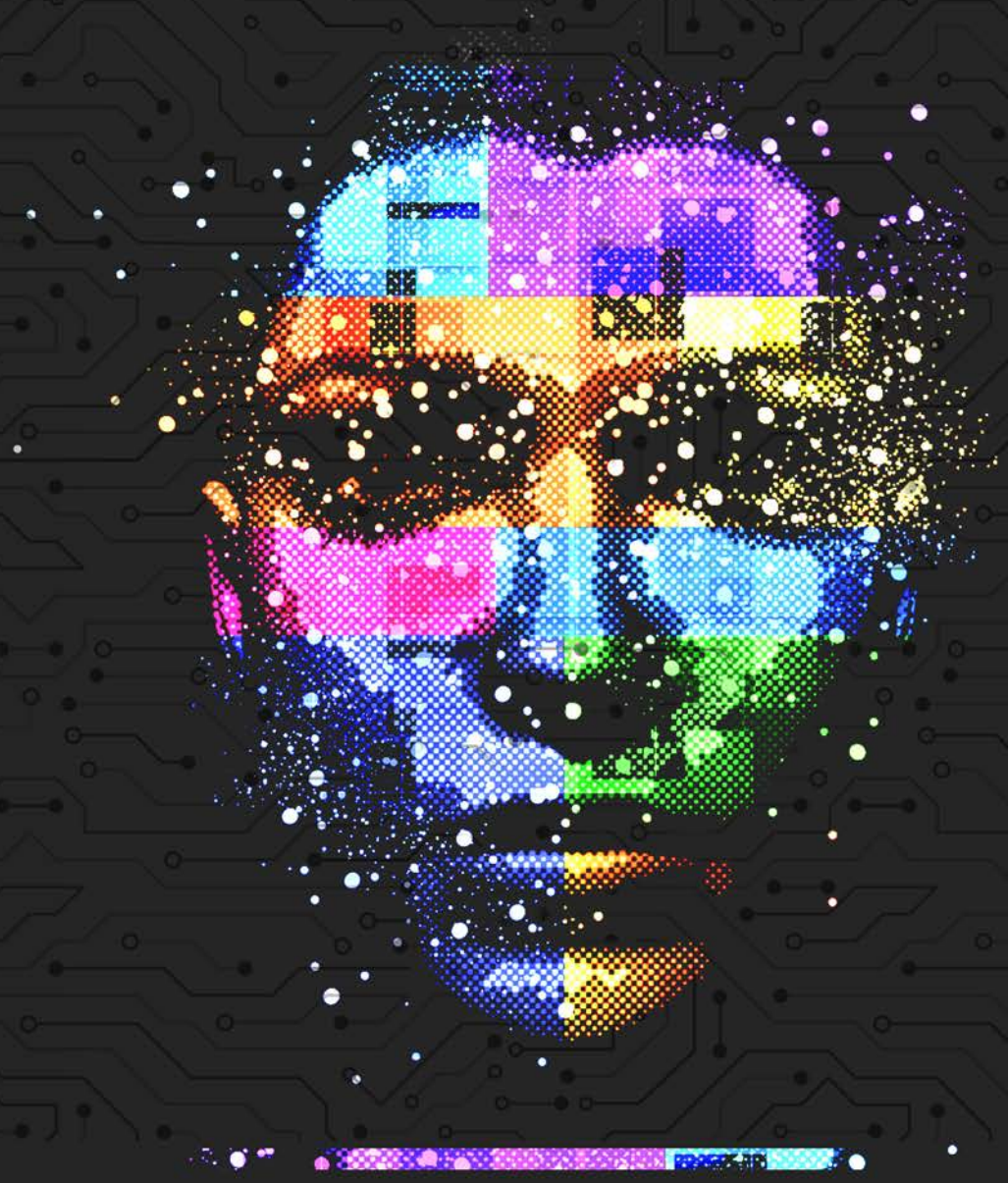
Rick Dunlap, BrandSafway, USA, outlines the cost- and time-saving benefits of implementing WorkFace Planning during refinery construction and maintenance operations.



SAVING FACE

A real-world scenario: four weeks into a refinery maintenance project, the welding and electrical crafts and inspectors have all radioed the access provider to request scaffolds built in several locations. After erection, the mobile crane operator finds that one scaffold is blocking construction. As a result of unplanned access requests, modifications on projects such as this can easily consume 35% of labour hours – often much higher – yet the typical budget allocates 15% or less for modifications.

Fortunately, leading edge access providers are now using WorkFace Planning (WFP) virtual planning and advanced work packages (AWP) to reduce control costs and shave days off of construction or turnaround time. WFP organises the execution of a construction project to deliver the right services to the right people at the right time. An AWP contains highly detailed, small

Figure 1. WFP advises bringing in access providers earlier in the planning process.

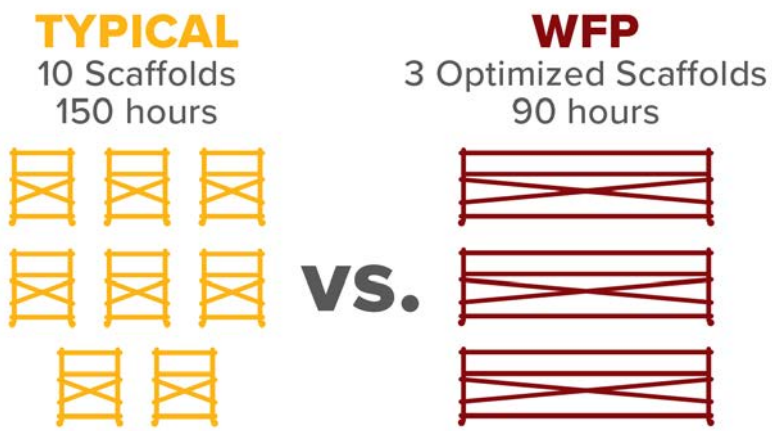


Figure 2. Comparison of a refinery maintenance project with and without WFP.

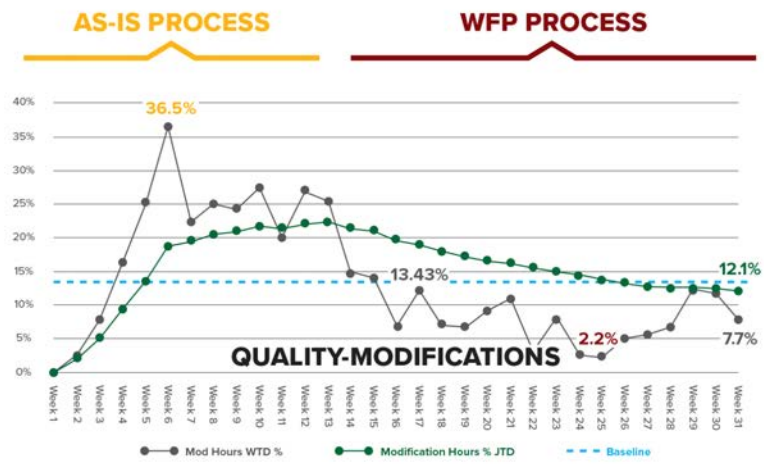


Figure 3. Modification hours with an as-is process vs with WFP implemented.

plans used onsite by the field crew to perform work in alignment with the WFP (also called an installation work package [IWP] or similar term).

WFP originated with the Construction Owner Association of Alberta (COAA) in the early 2000s to improve productivity on oil-related construction projects greater than CAN$300 million. The COAA committee determined the elements present during good productivity and those absent during poor productivity. In 2013, COAA and the Construction Industry Institute (CII, a US organisation) published 'RT-272 Enhanced Work Packaging: Design through WorkFace Execution (Best Practice)'.

WFP is accepted by large general contractors but still under-utilised. Its implementation remains relatively new for access planners, especially as they interact with the crafts requiring access during refinery construction, turnarounds, maintenance and repair. This article will demonstrate how WFP impacts three key areas: strategy/constructability, planning, and construction management/execution. Possible savings in these key areas are 5 – 10%, 10 – 20% and 5 – 10%, respectively. Savings are delivered through better productivity, smaller crews, fewer project interruptions and reduced opportunity for incidents.

Case study

Typical subcontractor engagement begins more than two-thirds of the way through a project (Figure 1). At this point, providing access quickly devolves into the ad hoc process depicted at the start of this article. Unfortunately, cost and time overruns can be common.

Figure 2 is an actual example of how WFP benefitted a US West Coast refinery maintenance project. The various crafts requested a total of 10 scaffolds in an area. Each of these scaffolds takes 15 hr to build, for a total of 150 hr. However, through WFP, the access requirements were consolidated into three optimised platforms that took a total of 90 hr to erect, reducing labour costs by 40%.

This particular WFP opportunity presented itself approximately four weeks into the project. Modification hours grew unchecked (Figure 3) because access users were not accountable for presenting when, where and how they needed access in a timely fashion. The work-to-date (WTD) modification rate would have continued its linear rise. Fortunately, a WFP intervention occurred in week six. Implementing WFP established communication lines with all the crafts and aligned their access needs. By week 15, the modification rate dropped below the target rate of 12.1% and remained better than projected for the duration of the project.

One key aspect of WFP is the ability to respond to a request for access with an interpretation of the request and to discuss whether the interpretation is adequate or appropriate. The process removes modification hours because the access user can examine a visual work package and amend their initial request at no inconvenience to either party.

Early engagement

Referring back to Figure 1, WFP advises refinery operators to engage access providers after they define

Figure 4. Virtual plan for crane locations.

the scope of the project. This enables the provider to present new access solutions, methodologies and technologies for consideration before it is too late to incorporate them.

Operators almost immediately equate 'access' with 'scaffold.' However, some situations may not require a full scaffold build-up, especially those that only need access at the upper reaches of a structure. Here, powered suspended access solutions (e.g. swing stages or baskets) or suspended access solutions that create a factory-like floor may be able to reduce access costs and erection/dismantle time.

In many cases, scaffold remains the best solution, but even scaffold is changing. For example, metal decking can replace plywood and provide a more repeatable, safer approach while eliminating waste. Other new solutions include lightweight aluminium truss systems that easily span 30 ft gaps. Trusses can create an elevated work platform or can be used to provide support for weather protection over large work areas.

With new solutions available, early engagement enables access providers to develop a more accurate estimate and timeline, eliminate waste and enhance safety for all users. Refinery operators can feel more confident about the authorisation for expenditure because it was supported by a sound process.

Virtual planning

The most dynamic method of aligning access needs at the WorkFace combines the power of engineering software such as Navisworks from Autodesk with 3D design models, surveys, laser scanning, photogrammetry, LIDAR, drone technology and more. Access companies now employ scanning technologies that calculate X, Y and Z points for every object within a refinery and then pair them with visual data and engineering files. They can create a virtual plant tour even if no previous engineering files exist. Such spatially aware data is especially useful when there are substantial variations between the original design and the as-built facility.

A digital-capture reality can be linked to measurements, metadata, work instructions and tag/ID numbers. As a result, virtual planning serves the needs of general purpose and critical-scope activities of numerous stakeholders (crafts, planning, safety, operations and procurement) during all phases of work.

As a real example, consider an electrical team that needed access to a delayed coker unit. The team alerted the access provider and the access team called up a virtual representation. After evaluating data, the access provider quickly designed a scaffold, placed it in 3D space, confirmed the design with the craft and then created the advanced work package. By pre-kitting scaffold materials, the access provider further enhanced efficiency. A virtual walk-through also enhanced safety planning.

In another example, laser scanning data enabled a mobile crane operator to virtually plan all crane locations, lifts and rotations to reduce waste and avoid idle crews (Figure 4). Instead of multiple disruptions where the access provider had to dismantle the scaffold to enable a lift (because either the crane could not get close enough or because scaffold blocked the lift path), virtual planning eliminated all but one (necessary) dismantle and rebuild.

Transactional data

The final component of WFP/AWP combines planning software with scannable tags (such as via QR codes) for operator badges and access locations. Instead of manual data entry in an archaic spreadsheet or paper timesheets, the access provider captures transactional data every time it builds, dismantles, modifies or inspects the access solution. Given that refinery maintenance projects repeat over time, a tag history can generate a complete material report and associated costs. With transparency in WTD and job-to-date data, refinery operators have greater insight into where they are paying for access and how much it costs.

For the access provider, tags can provide location data on components for better material management, and enable more accurate estimating and more responsive and accurate cost reporting.

Conclusion

A turnaround can easily require 100 000 or more person-hours and 2500 scaffolds. Failure to plan, organise and communicate access needs with the contractors and skilled trades inherently leads to cost overruns and conflicts. Conversely, aligning them from the start has saved one refinery operator US$500 000, and that does not take into account the benefit of bringing the plant back online in less time or the reduced standby time of the various crafts requiring access.