

WHITE PAPER / **INTEGRATED PROJECT DELIVERY**

INTEGRATED EXECUTION PRODUCES EFFICIENT, PREDICTABLE PROJECTS

by **Brad Schilhab**

The surge in upstream oil and gas production drives investment in midstream and downstream infrastructure.

Capitalizing on market conditions, owners want to get their product to customers quickly, efficiently and at an optimized cost. Innovative project delivery methods must be used to make projects successful.



Topline spending is forecast to increase in the United States and Canada in almost every industrial sector, according to the 2019 North American Industrial Market Outlook from Industrial Information Resources. The majority of this activity stems directly from high oil and gas production levels from shale plays, as well as from more conventional fields like the Permian Basin now using horizontal drilling and hydraulic fracturing to extract reserves from wells previously considered marginal or depleted. From upstream gathering infrastructure and midstream processing, transportation and storage, to downstream refining, chemicals facilities, plastics and manufacturing, there is a substantial amount of current and forecasted project activity in North America. But that growth comes with inherent challenges for owners and operators looking to increase speed to market, reduce risk and maximize investment.

INTEGRATED SERVICES EMPOWER FIT-FOR-PURPOSE SOLUTIONS

Delivering products to market “at the speed of business” is a complex endeavor with all of the baseline requirements of engineering and construction, including safety, quality, schedules and on-budget completion. From programs that include hundreds of small upstream well sites to multibillion-dollar midstream and downstream processing plants, contractor firms struggle with countless factors, like multioffice (often global) design teams, shortages of skilled labor and the corralling of vendors across the supply chain. By designating a single entity, risks can be mitigated. Moreover, this integration allows for greater flexibility in execution, giving contractors and owners more options as to how they approach these challenges.

CONSIDERING CONSTRUCTABILITY FROM DAY ONE

The biggest risk factor in any project is construction labor. From cost variability to quality and, most importantly, safety, the more you can do to reduce craft work hours in the field, the better. This all starts with the concept of constructability — finding the easiest and most efficient way to build a project.

Rather than designing a facility with an engineering firm and then hiring a construction constructor, industry

best practices demonstrate considerable benefits of having construction and engineering resources integrated throughout the design and construction phases. The Construction Industry Institute (CII) defines constructability as, “the optimal use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives.” CII prioritizes it as a core best practice because of the benefits it can offer: an average 4.3% reduction in project cost and an average 7.5% reduction in overall project schedule. According to the organization, other advantages include improved project safety, quality and security, and reduced environmental impact.

Many of these benefits result, in part, from greater teamwork and communications across the project team. Construction challenges can often be overcome with engineered solutions such as modularization.

In addition to avoiding unnecessary extensions to the schedule, constructability can compress the project timeline. An integrated team can more seamlessly chip away at the critical path to minimize the project’s total duration. Necessary adjustments happen early in the process on paper instead of later on in the field, reducing work hours, accelerating the schedule and enhancing safety. One CII study team estimated the benefits of early construction involvement to be at least 10 to 20 times the cost.

MODULARIZATION: AN ENGINEERED CONSTRUCTION SOLUTION

If the market is labor-constrained due to increased project activity, and mitigating labor-related issues has the biggest impact on a project, it only makes sense for owners and contractors to work together to determine how to best offset these labor shortages. One option, albeit not an answer for every project, is modularization.

A modular construction approach is one where much of the facility is assembled inside fabrication facilities and transported in shippable sections. Once on-site, these modules are set per the design and interconnected, minimizing time in the field. The alternative, more traditional approach is often called “stick built”

construction, where the parts, pieces and major equipment are fabricated, shipped and assembled “part-by-part” on-site.

Even when projects lend themselves particularly well to modularization, the approach still draws skepticism. A joint survey from Falls Management Institute (FMI), the Construction Users Roundtable (CURT) and CII showed that just 38% of owners expressed high acceptance of off-site construction. The survey listed lack of knowledge as a driving factor in slow adoption, as well as a preference for a design-bid-build delivery method.

But when project teams introduce the idea of modularization as part of an integrated engineer-procure-construct (EPC) delivery method, the payback can be dramatic.

The modularization process maximizes efficiency, with tightly controlled processes and workflows that minimize material waste and increase quality. Climate-controlled production spaces mean weather unpredictability is eliminated, reducing delays. Incorporating modularization elements can shave significant time off the project schedule. The approach also allows project teams to reduce time to completion by paralleling processes.

Although not the best application for every project, modularization (or even partial modularization) can be considered as a viable potential option to help meet a project’s business objectives when the owner selects an integrated EPC provider. Due to the density of equipment on modules, operations and maintenance can be an issue. Firms with module design and installation experience and full life cycle capabilities can optimize the design of a modularized facility to see that it can be safely, cost effectively and efficiently maintained.

RIGHT PEOPLE, RIGHT SKILLS, RIGHT TIME

Modularization is certainly one option in addressing one of the industry’s biggest challenges: finding qualified resources as a high percentage of people in the engineering and construction industry reach retirement age. But you cannot reduce field hours to zero — every construction project needs people on-site to build the unit or facility. Skilled labor shortages are an ongoing,

critical issue throughout North America — and especially in the Gulf Coast, where tens of thousands of oil and gas industry-related jobs are open at any time.

Firms that can supply clients with multiple construction options are better equipped to meet owners’ project needs than those that have no solution, such as engineering-only firms or single-solution companies that are either construction management only or direct-hire only. Each approach, aside from the “no solution” option, has its benefits and its drawbacks. The key is finding the right answer that best meets the unique needs of the project.

A construction management/multiple-subcontractor approach, where the EPC company acts as the prime contractor, benefits owners by reducing administrative costs and often reducing overall cost by competitively bidding various components of the project. Commercially this can be attractive, but if the prime contract holder does not have good relationships with its suppliers



then options might be limited as to what subcontractor companies will work on the project. The prime contract holder doesn't "own" its personnel, and therefore all activities are negotiated between companies rather than directed by the prime's project management team. Additionally, activities such as safety programs and workforce training are subject to the subcontractor's programs. While vetted through supplier registration programs, these systems still vary between contractors and do include an additional risk element that may or may not be worth the cost savings captured using this method.

When a construction firm has its own labor force, it has the capability to allocate those workers exactly where clients need them. What's more, a direct-hire workforce is fit for purpose, with the experience and know-how to address specific project needs.

The mindset of a direct-hire workforce can also offer notable advantages. A laborer sees a career rather than a short-term job, leading to greater engagement and an increased sense of pride. Workers stay longer, so increased institutional knowledge is gathered and applied to projects. Teams that work together longer also work together better — and the safety culture becomes stronger over longer periods of time. These intangible benefits for workers offer tangible benefits for clients.

Owners benefit most from firms who have the full spectrum of solutions available and can execute in accordance with the best approach for that project.

MAXIMIZING BLENDED CAPABILITIES

When the architects, engineers, construction management and craft labor on a project team are all part of one company, they follow one clear path from concept to completion. Construction professionals review the design as it's generated, weaving a focus on constructability throughout the process. Environmental work is integrated throughout because the environmental specialist sits right down the hall from the project manager. The team relies on the same processes and technology — and may even sit in the same hub — enabling communication thousands of times over the course of a day.

Of course, every project demands a tailored solution and that can mean the inclusion of internal professionals and external vendors to the team. Even if a client opts for only some services as part of the EPC process, the client benefits from the cohesive feel that results from the overall, unified approach.

FINDING ADVANTAGES IN A COMPETITIVE MARKETPLACE

Owners and operators in the oil and gas industry need every advantage to compete in a challenging marketplace. But with challenges come opportunity. Strategically introducing modular elements and relying on direct-owned labor can positively impact quality, safety and schedule. Integrating those elements into an EPC delivery process where all parties are laser-focused on construction dramatically amplifies the benefits.

BIOGRAPHY

BRAD SCHILHAB is a department manager for Burns & McDonnell. He has worked over 20 years in the engineering and construction industry. His roles have included project management, construction management, contract administration, project controls and project troubleshooting. He has experience with a variety of project types including gas processing, combined-cycle power, petrochemical, liquefied natural gas and refining.