



3 Biggest Challenges in Modular Construction (and how to overcome them)

Photo courtesy of Global Process Systems

Modular construction is a strategy that was originally conceptualized for the offshore oil industry to allow large amounts of fabrication work to be done onshore. Since that time, a lot of things have changed and modular strategies for onshore projects have evolved, especially since the development of specialized tools, heavy-lift craneage and other specialist land transportation equipment made a lot of things possible.

So, why modularization? In a presentation delivered previously by Dr Neveen Moussa Principal – Sinclair Knight Merz about modularization, it has been highlighted that “modularization has the potential to enhance project outcomes for all stakeholders (owner, project delivery team, fabricators, contractors, suppliers), whilst offering the opportunity to reduce consumption of resources and promote sustainability for future generations”.

STICK BUILD EXECUTION VS FULLY MODULARIZED EXECUTION

Comparing the traditional Stick Build execution against Fully Modularized execution, some key advantages and disadvantages were identified:

Stick Build – Cheap skilled labor; Local fabrication center; Equipment/bulks sourced locally; Brownfields works; No port nearby; Port structural/spatial/tidal constraints; Infrastructure constraints; Local content laws; IR sabotage threats; Other logistical challenges; Transport equipment shortages

Fully Modularized – Difficult execution (environment remoteness, weather, etc.); No local fabrication capability; Skilled labor shortages; High cost of labor; Compressed schedule; Safety drivers; IR delay threats; Sustainability drivers

Arriving at the optimal position is project specific and requires a business case that must be established early on.

In a nutshell, modularization basically means breaking down large structures into smaller units. Through this procedure, the task of building up the structure becomes relatively easier and less expensive.

3 BIGGEST CHALLENGES

Handling large-scale projects with a lot of moving parts certainly require a lot of planning and contingencies. While one could argue that a million different things could go wrong, the biggest concerns in modular construction projects almost always revolve around Logistics, Hook-up and Sequencing.

Logistics

In a paper released by Foster Wheeler written by Richard Brookfield and Jeremy Cooke about modularization, it was argued that “important for every modular project is the maximum module size that can be fabricated, shipped and transported.

“Onshore modules typically range up to 5,000 tons, although the maximum practicable size and weight will vary from project to project dependent on the physical limitations of transportation routes and the availability of heavy-lift and transportation equipment,” it said.

In considering logistics, it is important to define fabrication location and transport & logistics constraints. Key things to note include:

- Identify alternative fabrication centers both local and overseas

- Survey site constraints in terms of labor availability/skills, rates, productivity, IR, local content laws, weather, environmental issues, permits, safety issues
- Site access, elevations, laydown areas, heavy lift footprint
- Survey all transport routes for physical constraints: power lines, bridges, roads, turning circles, etc.
- Look at available public Wharfs (structural strength) or alternative
- Material loading/off-loading facilities
- Identify tidal movements/depth and dredging potential at offloading port
- Identify vessel/barge/tug limitations: speed, draft, deck capacity, ability to discharge and acceleration characteristics
- Identify land transport axle limitations
- Define transport envelopes maximum & optimum) – these dictate maximum module sizes for each route

Hook-up

Hook-up and commissioning is a critical phase in the successful development of a modular construction project. Good planning and control is therefore essential.

In a paper entitled, The Planning and Control of Offshore Hook-up and Commissioning, the challenges involved in offshore hook-up and commissioning were spelled out:

The availability of beds offshore strictly limits the size of workforce which can be employed on hook-up work and, therefore, imposes a major constraint on the schedule. Hotel- ships can be used to supplement the number of permanent platform beds but will substantially increase the manpower cost.

In addition to bed limitations, manning levels are restricted by safety regulations and operating practice. The early commissioning of

Modular Construction and Prefabrication presents tons of benefits for the different stakeholders involved. To succeed, you need to be ahead of the game and take that important step to obtain the right knowledge and apply them to your own projects.

safety systems and equipment, such as the lifeboats, will be an important factor influencing the rate at which labor can be mobilized in the early stages.

Sequencing

With proper work schedule and sequencing, modules can allow for shorter durations of large cranes and other equipment in the field. Proper sequence for construction minimizes handling of equipment and modules. Dr Neveen Moussa shared some technical considerations in pre-assembly that covers sequencing and other considerations:

- Modularize around equipment not around structural steel and considering installation sequence
- Modularize only where economic (i.e., do not ship air)
- Maximize personnel access by including flooring, handrail, electrical access for cable installation, and complete access towers
- Sub-stations & control rooms and transformer kiosks (c/w distribution panels) to be fitted out as transportable units
- Consider alignment issues
- Consider construction sequencing and module placement
- Consider crane movement and laydown areas
- Temporary steel should be part of the structure as much as possible
- Adopt standard connection details, lifting points/lugs



A DEEPER UNDERSTANDING OF THE ISSUES INVOLVED

The ever increasing demand for cost-efficiency and safety in heavy engineering construction, prefabrication and modularization is fast becoming the preferred mode of construction. Given the challenges mentioned above, in addition to coordination, planning and project management, a deeper understanding of the issues involved and hearing recommended solutions from experts who had dealt with these issues first hand becomes crucial for the success of your own project.

Join Us

IQPC's [Offshore Modular Construction Summit](#) in **Houston** this **August 25th-27th** is gathering representatives from across the energy industry to benchmark the latest developments and strategize to effectively overcome the challenges ahead. Network with the industry's finest by joining Project Managers, Engineers, Construction Managers, Estimators, Transportation & Logistics Providers, and Fabricators to gain the perspectives of the people who matter most.

The poster for the Offshore Modular Construction Summit 2014 features a central graphic of three blue and white modular units. The main title is "Offshore MODULAR Construction SUMMIT" with the subtitle "Achieving Project Excellence Through Best Practices in Topsides Prefabrication". It lists the dates: "Pre-Summit Workshop Day: August 25, 2014" and "Main Summit Days: August 26-27, 2014". The poster highlights "2014 Case Study Presentations will focus on:" with categories: "Design and Safety of Topsides Modules", "Installation Processes", and "Transportation and Logistics". It also lists "Top 3 Benefits of Attending:" and "Gain Insight From Our Expert Speaker Faculty:" with several speaker profiles. At the bottom, it includes the website "www.OffshoreModularConstruction.com", the phone number "1 800 882 8686", and the email "enquiry@iqpc.org".

This conference will offer case studies, panel discussions, and interactive workshops to expand your knowledge and offer the actionable intelligence needed to optimize your project management strategies. Walk away with an increased ability to make informed decisions with the partners who can assist you in delivering projects on-time and on-budget.