UNLOCKING THE MODULAR REVOLUTION
MODULARIZATION COULD FURTHER BOOST PRODUCTIVITY IF THE INDUSTRY COMMITS TO STANDARDIZATION

Modular construction has been a feature of new plant construction for heavy industry for over thirty years. However, while many projects are now realizing the productivity and labor benefits of offsite fabrication there is yet to be a widespread revolution in the way modularization is incorporated into plant design and construction projects.

Mammoet World spoke to two experts on how modularization might take the next step towards unlocking major efficiency gains for heavy industry: Koen Vermeltfoort and Fred Haney. Both Fred and Koen believe that the move from a concept of offsite fabrication to an integrated organizational approach to modular construction will take time and culture change. But modularization could make previously unaffordable projects a feasible opportunity through a combination of cross functional roles and a more disciplined approach to standardization.
What is driving the move towards modularization?
The fluctuation in the price of oil and the rising cost curve for oil production has led to critical reviews of capital projects. Capital savings are needed for projects to be feasible, which is where modular design can help. However, many ‘modular’ projects simply take a bespoke plant design and cut it into pieces to reduce labor costs and other risks.

So what is the next step?
The next step is for companies to approach modularization as an engineering standardization program. Standardization should be a way of working, a business problem rather than an engineering problem. There is a lot of standard equipment available, however clients often request customization, negating the benefits of standardization and leading to disillusionment with the concept of modularization.

Where are efforts currently focused regarding increased standardization?
Some elements of projects could more easily be standardized such as oil wells, helicopter pads, compressors and heat exchangers. By building a plant based on as many standardized pieces as possible, and designing something which can be used repeatedly for different projects, it is possible to gain the most efficiency from standardization.

Standardization enables designs to be re-used, both saving time at the design phase and also offering benefits from the ‘learning curve’ gained by reusing standardized pieces. Each project has a large number of interfaces. By reducing them you can speed up delivery and begin production earlier.

Is the potential level of modularization that is achievable recognized by oil and gas companies?
Not extensively. Applying standardization to an entire refinery is not where the best value can be found. But if you look a few levels down from the whole plant level there are many more recurring elements than people think, such as heat exchangers, which can be standardized.

One factor limiting a companies’ adoption of standardization and modularization is the focus on a single point estimate. When a specific single point output is identified at the start of the project and becomes the focus of the project, the likelihood is that a perfectly tailored facility will be designed for that point. If a modular approach is to be truly embraced, projects need to be viewed at a package level rather than focusing on just one feature.

How far have you gone towards quantifying the benefits, particularly the knock on effects?
A ‘look back’ assessment of previous projects identified 20% savings, of which around 10% came from knock-on effects such as preventing delay, 5% direct cost savings and 5% installation savings. Companies usually quantify benefits on a project by project basis. However the benefits of a modular approach are broader than you can capture from a single project. Therefore cross functional recording systems and processes need to be in place. These could fully identify and quantify the benefits across a company’s whole portfolio.

What is your suggestion for how companies can put something in place structurally to bring about more modularization?
All companies have standards departments. But a thought for the future is that project design teams will have one member of the team who provides an integrated perspective. In around five years from now there will be a new function of ‘module architect’ to view the whole picture and spot opportunities for optimization across projects. This function will work across commercial, technical and supply chain elements and also across multiple projects.
Fluor has a ‘modularization road map’. Because execution of modular projects can be more intricate than stick built construction, it requires careful planning and a wider viewpoint. This will require a new generation of engineers and a change in how projects are executed. Because of these changes and advances, it will take time to get the depth of experience across the industry.

What changes can organizations make that will take modularization to the next level?

The design of the modules themselves, while very important, is just one component. The key point is the execution of the project.

What is driving the move to increasing levels of modularization?

In many industries – including oil & gas, chemicals, power and mining – the current pressure to reduce costs is driving the increased implementation of modularization. Owners and industry leaders recognize that productivity is decreasing and these industries have lagged behind manufacturing which has steadily advanced through moves to increase use of modularization and standardization.

Fluor has been taking a lead in modularization; standardizing oil and gas plants, using methodologies to maximize modular construction and establishing the patented 3rd Gen Modular executionSM process. 3rd Gen Modular execution significantly increases the level of achievable offsite work by splitting the project into process blocks and then leveraging the module design to drive the plot plan. Through design and fabrication with electrical components and instrumentation built in, modules can be quickly assembled on site reducing commissioning time improving our clients’ time to market.

How do transport and lifting constraints impact on modularization?

Transportation constraints, particularly in land-locked locations, are a major factor that must be considered. Projects have encountered major problems in the past when there has been insufficient understanding of the module envelope size. By providing information up-front about services, potential solutions, equipment and experience, heavy lift and transport providers can influence the design and execution of projects, reducing the risks for their clients.

Fred Haney is an executive director for Fluor. He studied engineering in Victoria, Canada and has over 40 years of experience in engineering and construction of oil, gas, and refinery, chemical and mineral processing plants. He is one of Fluor’s subject matter experts for modularization and the champion to Fluor’s new execution methodology 3rd Gen Modular executionSM. Fred has participated on projects from front end engineering through to startup. Fred’s engineering background is the field of materials, corrosion, welding and quality.

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What do you think about the idea of a ‘module architect’ role?

At Fluor there are module managers or module coordinators who provide that overview. However there are a limited number of people with the skills and experience for that role. As modularization develops the pool of people with that expertise will grow. But at the moment it can be one of the roadblocks to more effective use of modularization. To get the most out of the modularization processes at Fluor we use a combination of in-house expertise with running workshops and providing external reviews, a ‘cold eye review’ of project plans to identify opportunities for further modularization and to spot potential problems.

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The area where a real culture change can and should occur, to enhance modularization, is through increased standardization- further developing and implementing standards for engineering, vendors, modules and construction. Engineering standards will continue to improve and be refined. Vendor standards will lead to standard packages and materials, similar to those found in the automobile and commercial building sectors. This will need to be supported by increased cataloging and electrical management of information.

It may take some time for change to take place but heavy industry needs to embrace modularization to maximize efficiencies.