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AspenTech Addresses EPC Challenges in the Age of Megaprojects

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Summary

ARC Advisory Group in Singapore met with executives from AspenTech to discuss the company's initiatives and solutions for engineering, procurement, and construction (EPC) companies.

AspenTech is increasing focus on its EPC customer segment, with a view to enabling companies meet the demanding expectations of owner-operators by improving capabilities in project estimation, cost containment, global execution, and process safety.

While EPCs have many potentially lucrative opportunities across the globe, they often face a challenging business environment. Process industry projects, particularly in the oil & gas sector, are getting bigger, more complex, and more globalized. This requires EPCs to attract, develop, and retain people with superior commercial, project management, and technical skills. At the same time, the EPCs face pressure from owner-operators to deliver projects within tight budgets and often-ambitious schedules. This is particularly true in the current market conditions resulting from the dramatic decline in oil prices, which require revenue-constrained owner-operators to keep a tighter rein on expenditures.

For AspenTech, EPCs represent a significant constituency for its process-industry software products, specifically, the Aspen Engineering Suite that includes Aspen HYSYS and Aspen Plus for the design, simulation and optimization of oil & gas and chemical processes; Aspen Basic Engineering for physical plant design; and project costing tools that fall under Aspen Economic Evaluation.

AspenTech is now increasing its focus on and investment for its EPC customer segment, notably in Asia, with a view to enabling EPCs to deliver

higher overall performance and increased value to clients by improving capabilities in project estimating, capital and operating cost containment, global execution, and process safety.

The Era of Megaprojects … and Mega Challenges

From Singapore to Dubai to London to New York and beyond, it is clear that we live in an age of megaprojects. Buildings are getting bigger and grander; and airports, ports, highways, railways and all manner of infrastructure come in increasingly eye-catching designs and in larger scale.

Some of the more visible examples of this trend towards more complex and costly projects include Singapore's $5.7 billion Marina Bay Sands complex, Dubai's 2,722 foot Burj Khalifa tower, London's $22 billion Crossrail expansion of its rail network, and New York's $1.6 billion MetLife football stadium, which features a skin of aluminum louvers and lighting that switches colors depending on whether the Giants or Jets are playing.

We're seeing a similar trend in the industrial realm, notably in the oil & gas sector. This already capital-intensive industry must now identify and develop energy resources in increasingly deeper waters, harsher climates, and remote regions of the world, and construct refining and LNG facilities to meet rapid energy demand growth in fast-growing regions such as China, India, and Southeast Asia.

As well as deep pockets, successful large-scale project execution requires high levels of project management and technical capabilities, comprehensive consideration of safety and environmental needs, and sensitivity to stakeholders such as local politicians and labor unions.

For owner-operators and EPCs, it all adds up to increased project risk. And the bigger project, the bigger the risk, as the inevitable scope creep has greater impact, and managing the activities and demands of hundreds of employees and myriad subcontractors becomes a significant challenge. The fact that many multi-billion dollar projects today are "first of a kind," only increases the risk of cost overruns and schedule delays.

For instance, in Asia-Pacific, this decade's Australian LNG megaprojects have become a reluctant poster child for huge cost overruns and delayed schedules. Notable among these is the Gorgon LNG project, which has run up an additional $17 billion cost beyond the planned $37 billion and is about two years behind schedule.

Elsewhere and overall, large process-industry megaprojects are just not performing very well. EY's 2014 study of 365 projects with an investment of above $1 billion in the upstream, LNG, pipelines, and refining segments of the oil & gas industry revealed an astounding 64 percent of these megaprojects exceeded budget and even more (73 percent) missed schedule deadlines.

With current project estimated completion costs 59 percent above the initial estimate, the cumulative cost of the projects reviewed increased to $1.7 trillion from the original planned $1.2 trillion. This incremental increase of $500 billion is a sharp indicator of the difficulties in successfully executing oil & gas industry megaprojects on time and on budget.

The potential disrupters to successful megaproject delivery are many. While some may be beyond of the control of the owner-operator and EPC, the majority are internal factors such as weak organizational processes, insufficient early-stage planning, inadequate project management, and an inability to staff the project with sufficient expertise and numbers of people.

Getting Better Estimates

In his presentation ("The True Cost of a Low Price LNG Project") at the October 2015 Gastech conference in Singapore that ARC attended, Heinz Kotzot of American EPC, KBR, pointed to "optimism bias" that results in many EPC project estimates significantly underestimating both project costs and duration as well as the associated project risks.

Developing higher quality, more realistic cost and schedule estimates is an aspect that AspenTech specifically addresses through its Aspen Economic Evaluation product set.

According to Mr. Kotzot, a low, overly optimistic bid is likely to result in larger escalation of final project costs, while a higher but more carefully planned and realistic bid will constrain escalation within a much narrower band. As a result, a key factor in successfully managing megaprojects is developing higher quality cost and schedule estimates. AspenTech specifically addresses this aspect through its Aspen Economic Evaluation product set.

While traditional factor-based project estimating approaches use Excel spreadsheets, the model-based estimating basis of the Aspen Economic Evaluation family (Aspen Process Economic Analyzer, Aspen Capital Cost Estimator, and Aspen In-Plant Cost Estimator) uses volumetric models of process equipment to "pre-engineer" the plant. This provides cost estimators with more accurate and complete information to prepare more realistic estimates of capital costs. It also saves time and resources.

At S&B Engineers & Constructors of Houston, Texas, implementing Aspen Capital Cost Estimator helped reduce estimating time by 90 percent. Like many other EPCs, S&B operates in an increasingly "give us more for less" environment exemplified by smaller client budgets and more demanding project schedules.

As well as being able to provide faster responses to clients, the large productivity gain enabled S&B to move estimator resources previously concentrated on spreadsheet configuration to the far more value-added and useful work of analysis and evaluation.

Kuwait National Petroleum Company is an example of an owner-operator that became convinced of the benefits of model-based versus factor-based estimating after seeing estimate variances drop from 40 to 15 percent. KNPC now requires all EPCs to supply bids using Aspen Capital Cost Estimator.

Standardizing Designs, Improving Execution

With around 80 percent of capital costs and 90 percent of operating costs determined during the early design phase of a project, decisions made at this stage have a large bearing on total project costs and outcome.

In most cases, owner-operators are not best served by receiving a latest and greatest, so-called "gold plated" process plant design from their EPC. As well as likely being more expensive, it also increases project risks. EPCs should rather concentrate on delivering standardized, modular designs for process plant equipment, which can be replicated for use on later projects.

With Aspen Basic Engineering, users can bring in design templates from the Aspen HYSYS or Aspen Plus process modeling tools and adjust for the particular requirements of a new project. These adjustments are typically size, throughput, feedstock type, and geographical location of the project.

Aspen Basic Engineering also takes in adjusted (from a baseline) cost models from Aspen Capital Cost Estimator such that designs are described in terms of capital and operating costs as well as equipment specifications. Aspen Basic Engineering generates output in the form of process flow diagrams (PFDs), equipment lists, and datasheets.

WorleyParsons, an AspenTech EPC client headquartered in Australia, uses Aspen Basic Engineering to realize the benefits of reusable designs. For example, for a proprietary sulfur process developed in the software,

WorleyParsons saw savings exceeding 20 percent in terms of the level of effort needed for a subsequent design.

Aspen Basic Engineering also promotes collaborative working, another WorleyParsons goal, by providing a single, central repository shared by team members in distributed locations.

As projects increase in size and complexity and teams are globally dispersed, ensuring design consistency, managing engineering changes, and ensuring a "single version of the truth" become more critical for good project execution.

Facilitating Safety

After a number of high-profile incidents over the last decade, process plant safety is no longer a secondary consideration for owner-operators. The consequence for EPCs, however, is often project bottlenecks as they are tasked to correctly design critical safety elements such as pressure safety valves (PSV) and flare systems.

AspenTech tackles this pain point by incorporating over-pressure protection systems analysis within the Aspen HYSYS and Aspen Plus process modeling environments. This enables engineers to determine PSV sizing and rating in accordance with the required relief scenarios and develop flare network designs based on these same relief scenarios.

Asian EPCs – Learning and Growing

In Asia, Japan and Korea are home to a number of strong EPC companies such as Chiyoda, JGC, Samsung, and Daewoo; while China is playing catch-up by ramping up its expertise and activities in the sector through the engineering offshoots of owner-operators like Sinopec and PetroChina.

For AspenTech, the EPCs in these countries represent an increasingly high-priority market for its Aspen Engineering Suite of products. A key reason is the perception (of AspenTech executives) that the Asian EPCs are especially open to change in aspects such as reconfiguring business process workflows and investing in new tools to increase efficiencies.

Japanese EPCs tend to be the most evolved in terms of technology adoption. However, as the Koreans and especially the Chinese go beyond detailed engineering and construction and become more adept at the early-stage project

activities of conceptual design and FEED, AspenTech products like Aspen HYSYS, Aspen Plus and Aspen Basic Engineering become more relevant.

AspenTech's online training for its software tools is proving to be a hit in Asia, with many EPC customers observed to be using these at night and over weekends. This indicates an inclination get up to speed fast with the necessary skill sets. This urge to learn along with the openness to innovation bodes well for the future of Asia's EPCs.

Conclusions

Through its large investments in R&D and deep domain understanding of the chemical and oil & gas industries, AspenTech has evolved a set of technologically sophisticated products that serve the engineering, manufacturing and supply chain needs of these process-industry sectors.

For EPC companies tasked with designing and constructing increasingly complex and large-scale process plant facilities for demanding owner operators, AspenTech's suite of Engineering products are highly relevant and beneficial, enabling improved performance levels in areas valued and important to clients. Ultimately, these tools can help owner-operators and their EPC partners achieve the twin goals of implementing new facilities at targeted cost levels and commencing production on schedule.

While AspenTech continues to be a product-centric company, its customers are likely to appreciate a recent go-to-market move to become more customer driven by having strategic discussions to identify needs and communicating total solutions over individual products. However, this approach will also require judicious allocation of resources to be able to clearly articulate the applicability and value of AspenTech Engineering products to the company's large set of EPC customers.

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