

New tree opens access to marginal fields

The growing market for small and marginal field projects requires a new hardware solution. A new entry in the subsea market improves NPV of small, marginal fields by accelerating production and lowering capital expenditure.

AUTHOR

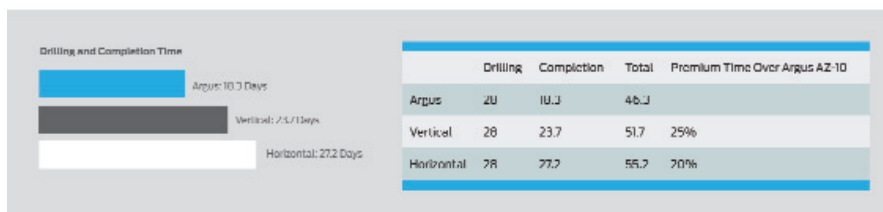
Earl Broussard, Argus Subsea

When evaluating the viability of a project, oilfield executives are driven by two critical metrics: project cash requirements and net present value (NPV) calculations. In simple terms, they authorize the project costs based on the revenue stream and schedule first oil or gas.

Integrated and non-integrated oil and gas companies work from project profitability models involving NPV modeling. Execution of these basic metrics is essential to project profitability and funding. Keeping profit growth moving positively allows access to future capital. This is the model for large and small oil and gas companies alike. This principle drives all major oil and gas companies to opt for larger reserves and pass over smaller fields — and it creates a niche for non-integrated companies that are interested in capitalizing on smaller fields and non-integrated oil companies.

Producing small fields

Traditionally, non-integrated oil companies do not have access to the large capital budgets that integrated major oil companies do to undertake development of billion-barrel fields. Drilling and production departments in non-major oil companies are responsible for the execution of these requirements. Engineering departments in these companies generally consist of a few drilling and production personnel. If a company is to properly execute



Using the AZ-10 tree shortens the time to first oil. (Images courtesy of Argus Subsea)

within budget, hardware and schedules in these departments need simple, straight-forward plug-and-play equipment that reduces risks to cost and schedule. This is generally where the picture gets clouded for the execution team. What equipment is available to meet the NPV target set by management for the project sanctioned?

In the beginning of a completions project, the biggest issue facing the project execution team is the drilling rig. Is there a rig on contract, or does the team need to go to a secondary market to fit the drilling and completion schedule?

Drilling rig availability spans from second generation to fifth generation rigs, with day rates ranging from US \$225,000 to \$750,000. If a drilling rig is available, the next step is assessing what hardware is available to complete the well, or multiple wells. The most economical solution, particularly in a single-well tieback, is to drill and complete the well in a single mobilization.

Generally, the selection for this hardware has resided within several large multinational companies that supply the global needs for the multibillion-dollar offshore and subsea markets. In

general, these manufacturers establish long-term, multiyear frame agreements. Like their integrated oil company counterparts, these manufacturers are focused on large fields using EPIC contracting methods. These facts have driven the subsea tree market deliveries to between 18 and 20 months ahead of completion schedules.

This issue has the potential to cause project delays or costly expenditures for small oil companies with relatively small projects. Small projects generally take a back seat to the larger market forces and larger returns the major manufacturers have come to expect. What's worse, all of these events increase the cycle time to production.

If the well is drilled without the tree, the project could move into an unprofitable arena, or the project's first oil could be delayed 20 months or more, which affects NPV. Recognizing this potential problem, the team looks for something that is readily available on the new and used tree market so it can make the schedule and the NPV number for project sanction. This can lead to a dead end (no available tree fits the bill) or a less-than-optimum tree type, tree architecture, and tool

suites available to complete the well.

Novel solution

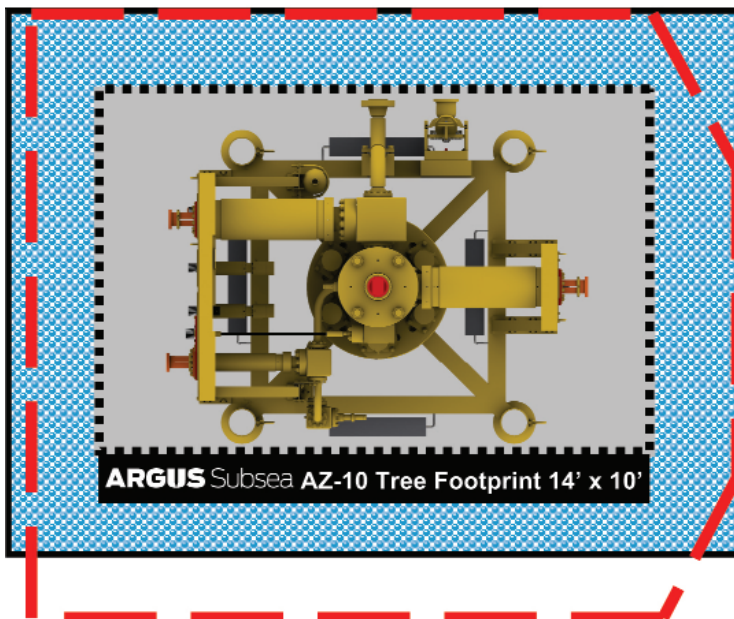
There is a solution to this problem, and that is to have an inventory of equipment ready to deploy inside the rig schedule. The Argus AZ-10 tree can be operated from any rig regardless of moonpool size or moonpool access through the V door or port side. If the rig can run the blowout preventer (BOP) stack, the Argus AZ-10 tree can be run.

A standard horizontal tree, weighing in excess of 100,000 lb, requires special handling. This special preparation can mean stripping the tree down for reassembly on the deck. Getting the tree into the moon pool provides another problem. Can the tree be moved to the moonpool and lowered into place? This step normally requires an enhanced fourth generation rig and a dynamically positioned (DP-2) vessel with a heave compensated landing system and an “A” frame to deploy the horizontal tree. Other considerations are the ancillary tools required to run industry-standard trees and additional boats required for third-party services. The ancillary equipment requires additional scheduling and personnel, which is not required in the AZ-10 system.

At 60,000 lbs, the Argus AZ-10 tree can be handled by second generation rigs using cranes from the boat to the moonpool without special preparation.

The Argus AZ-10 monobore vertical tree system was designed with offshore operations in mind. The design simplifies installation, which streamlines operations, making it particularly valuable in developing small and marginal fields.

Generation II Pool 18' x 14'



Red dotted line represents industry horizontal tree.

At 60,000 lbs, the new tree can be handled by second generation rigs using cranes from the boat to the moonpool and can be operated from any rig regardless of moonpool size or moonpool access through the V door or port side.

The essential features of the AZ-10 tree are:

- A universal tubing hanger system that can be installed in any manufacturer’s 18¾ in. wellhead system; and
- A concentric design for all downhole and tubing hanger to tree interfaces.

A fundamental feature of the system is the universal tubing hanger system that seals and locks in the production casing, sealing the production annulus. Once the BOP stack is removed, the tree is run, allowing concentric makeup to the tubing hanger for the production tubing, annulus, surface-controlled subsurface safety valve line, and downhole chemical and electrical feed through lines. The hanger system incorporates a lock and seal system that can fit in any manufacturer’s wellhead regardless of the inside latching, suspension, and sealing profile. Sealing is accomplished through a

sealing and mechanical lock system incorporated within the tubing hanger. The hanger system is designed to suspend practical tubing suspension loads and to resist pressure in loads of 10,000 psi in casing. Testing in both Q-125 and P-110 casing confirms the lockdown capabilities.

The new tree further simplifies the installation process by eliminating a number of steps, interfaces, and third-party services required for traditional horizontal and vertical trees. Many components of the tree have been simplified, and the design was developed with a focus on the basic

needs and requirements for trees in smaller field developments. The Argus AZ-10 tree system requires only five running tools to install versus 20-35 for comparable subsea tree systems.

Changing subsea requirements

As subsea field development costs and schedules increase, simplicity of subsea hardware is going to become more important. Technology must keep up with the needs of the customer — not just addressing new technical challenges for deep and ultra-deep water, but addressing the timing, installation, cost, and other needs for smaller field developments and well testing.

In an ever changing cost environment, it is incumbent on the industry to address the challenges of marginal offshore fields. If industry does not provide a cost-effective way to produce these reserves, many will not be produced.

When it comes to technology, sometimes the simple solution is the best. **EXP**