

OFFSHORE TECHNOLOGIES:

SURVIVAL OF THE FITTEST – AND THE MOST ADAPTABLE

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Can engineering evolution still offer the solution to new technical challenges offshore? Adapting existing technologies to overcome problems and secure better results has long been a feature of the offshore oil & gas industry. And, says Aquaterra Energy's Innovation Director Ben Cannell, change should still be a constant for service companies pursuing sustainable success...

For decades, our industry has embraced the classic principles of evolution: responding to changes in its environment to ensure it not only survives but thrives. And we have been on an evolving path since drilling began, from navigating the highs and low of the oil price to tackling a global pandemic.

In the North Sea and across the globe, the evolution of offshore technology and learning from our past will also play a vital role in reaching net zero goals. In the UK alone £416bn investment in such innovations will be required over the next 30 years to reach decarbonisation targets. Those who adapt their products and services accordingly will have the best chances at surviving.

And as the saying goes, to stand still in modern-day business is to go backwards. So, like many in the service sector, we continue to explore new ways to adapt our products for future industry trends and priorities.



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THE NEED FOR INNOVATION

It's not the conventional setting for evolution – the natural world, the physical environment – that provides the backdrop here. Nothing much about the North Sea has changed in that respect in the last 50 years or so. It's the industry environment – in terms of commercial and safety imperatives, and more recently, decarbonisation goals, for example – that drives the need for innovation to an ever-greater extent. It requires the identification and pursuit of technical advances that can yield a competitive and efficiency driven edge, in an often unpredictable operating arena. Such advances now rarely constitute a genuine step change in an increasingly sophisticated and mature market. More often than not, they result from the reimagining of the applications of existing products and services. Relatively minor modifications to those can – and do – realise major new opportunities to meet today's industry challenges.

The process of evolution has been evident from the earliest days of offshore exploration and production, when the principles of land-based wells were first applied in coastal areas and then when moving to deeper waters, from platforms to subsea infrastructure. Well-related practices in fact offer some useful illustrations of industry evolution in action. Many early subsea wells were comparatively small and susceptible to excessive loading (the first step in the evolution of surface wellheads and trees). At this point in time the semisubmersibles that installed them were also small, as to the BOP (blowout preventer) systems that were designed for shallow water

operations. These lightweight early semisubmersibles and BOP systems cohabited in balance with one another. Fast forward to today and some of the early wells remain and require abandonment, whilst other new subsea wells need to be installed. The light weight semisubmersibles and BOP systems of the past however, evolved into ever larger systems designed for harsh and deeper water applications, and are no longer suitable for shallow water operations where excess offset and BOP weight can cause serious structural and/or fatigue damage to both new and old subsea wellheads and trees.

Thankfully jack up rigs, have also evolved. They are much larger and can operate in much deeper water. In fact the harsh environment jack ups operating in depths of up to 150m means approximately 34% of the worlds subsea wells are in reach. The idea of using jack-up rigs, equipped with subsea HP risers and surface BOP, instead of semi-submersibles for subsea well drilling and abandonment campaigns grew in prominence given their capacity to address the loading and fatigue issues, while also reducing operators' costs. Today this trend continues and using jack-ups can provide benefits when addressing many industry challenges, particularly when thinking about operator decarbonisation goals. For example, they offer much less downtime in shallow water, meaning that you are not running a rig unnecessarily and creating more emissions than you need to. A typical mid-range jack-up produces 67.17 tonnes of CO₂e per day, versus a mid-range semi-submersible's 80.61 tonnes of CO₂e per day – in the race for net zero, every saving you can make counts.

AN EVOLUTIONARY TEMPLATE

At the same time, this approach required the support of a type of structural and pressure retaining barrier (subsea HP risers) to provide a conduit between the subsea wellhead or tree and surface BOP. It was in this context that our technical experts landed on the idea of repurposing casing and conductor-type pipes for the task several decades ago. These products were not specifically designed for the application and had some technical and operational constraints, but it proved possible to formulate a solution that was viable and proved the concept. Over the years further refinements have been made to our suite of products in this specialist arena to

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make them simpler and more efficient in deployment.

This evolutionary template has continued to demonstrate its value, not least in the context of our surface riser connector, the Aquaterra Quick Connect (AQC). It has provided the basis for the development of further connector solutions and innovation in recent years. The initial development of the AQC was based on the attributes of robustness, cost-savings for customers and reliability. The hydraulic option means it can be made-up in under five minutes and it can also be the subject of multiple breakouts for inspection and repair. Based on previous service report data, this creates savings of around one day of rig time, per unit, per well - providing an innovative solution to both optimising project costs, but also in terms of supporting carbon efficiency on

In an international industry where jack-ups are growing in status as a subsea well option, those same qualities have been protected as we've adapted our connector capabilities further. For the first time there is a connector that has been specifically designed for the jack up subsea market that addresses the limitations and constraints of the reproped casing and conductor systems in the evolutionary past. We believe our AQC-SR is the first connector in the market specifically designed for this type of application, one that's undergoing qualified testing for robust standards. Its fatigue performance, for example, renders it highly suitable for the subsea environment whilst being specifically designed to be made up and broken out many hundreds of times, while still maintaining a gas tight seal.

However, there is still a gap in terms of an internationally recognised standard for subsea riser operations from jack-up rigs. But again, the principle of evolution has come into play, and we've worked in tandem with customers to develop a subsea riser for jack-up rigs best practice document. A document that carefully stitches together parts of relevant codes to present a coherent approach from planning and analysis, through to offshore operations. In terms of product development, we've embraced the adaptability agenda by reshaping our connector capabilities into a natural

evolutionary step to create a completion and workover riser system using the same DNA from the AQC-SR connector - it too ties together those same fatigue-resistance and make-and-break qualities for a new and evolving lightweight intervention vessel market in the shape of the AQC-CW.

THE POWER OF TECHNICAL INNOVATION

Our strategy takes account of the ever-changing economics of offshore operations, and constantly reviews the existing suite of technological solutions to see how they can add value in even subtly different ways. Technical innovation has always been a central feature of our industry, and the best of those advances endure through industry change. Indeed they invariably possess the capacity to change with it – meeting new challenges and securing better outcomes. It goes without saying that transformation should continue to be embraced in our sector, especially as we grasp opportunities to support and ultimately help deliver the energy transition. Those who continue to celebrate fresh thinking are those who will continue to evolve – surviving the natural selection of our new energy landscape.

FIND OUT HOW WE CAN HELP TO SUPPORT YOUR RECENT ASSET WIN AND REDUCING ITS TIME TO FIRST OIL.

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ABOUT AQUATERRA ENERGY

From seabed to surface, oil and gas to wind and hydrogen, Aquaterra Energy is the offshore energy industry's first choice for offshore products, systems, and projects around the world. Swift, flexible, and responsive, Aquaterra Energy's engineers and analysts create the solutions customers need, while delivering operational improvements, efficiency gains and supporting decarbonisation efforts – whatever their circumstances.

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