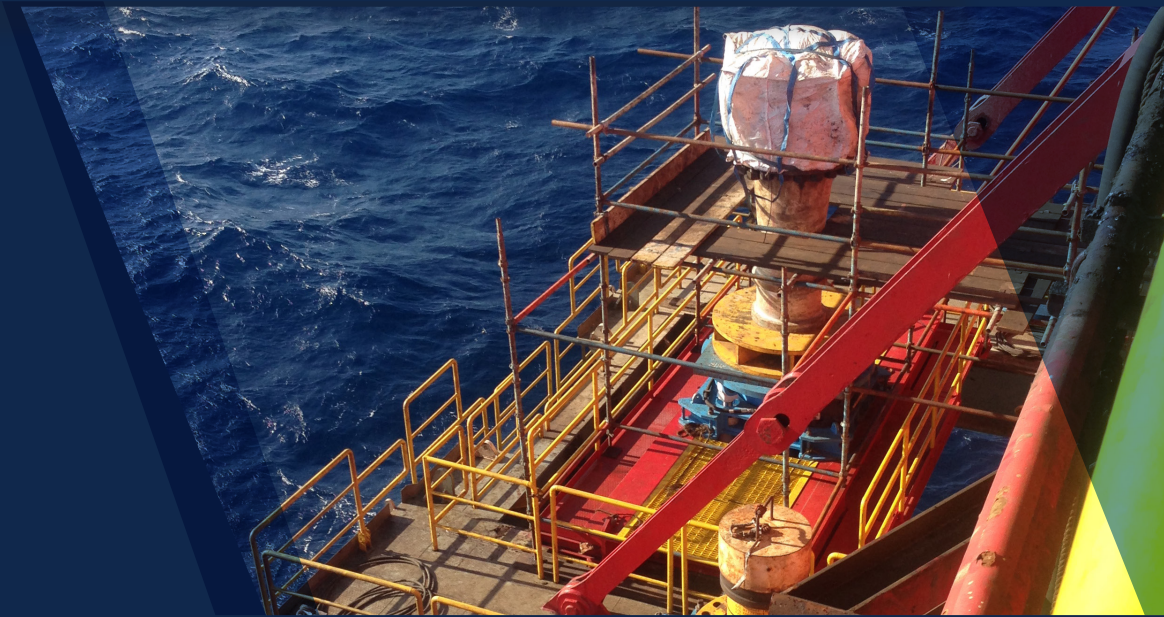


PRESSURE POINT:
**MAKING THE RIGHT
HPHT CHOICES**

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High pressure, high temperature (HPHT) developments offer new opportunities in mature basins – but they invariably pose safety, technical, cost and environmental challenges. Ben Cannell, Innovation Director at Aquaterra Energy, looks at how North Sea operators might take the heat out of the process...

Having understandably focused on less complex developments since the oil price downturn of 2014, positions had started to change during the stabilisation of 2019. Recent market uncertainty means that operators already developing or looking to develop HPHT wells need more certainty than ever that they can do it cost-effectively and handle technical challenges.

Over the past year we have seen an increase in the number and frequency of operators engaging with us as they assess their exploration and appraisal options in HPHT conditions. Of course, as the North Sea adjusts to the lower oil price, we expect to see some HPHT developments to be progressed and others put on hold.

However, UK government departments and industry organisations remain keen to push HPHT developments, and there is certainly a prize to pursue. The Culzean HPHT development, which began production in June 2019, is just one example: the largest gas project to be sanctioned in the UK in the past 25 years, it targets total recoverable reserves of up to 300million barrel of oil equivalent.



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DEFINING HPHT

The definition of HPHT is not fully defined within the industry: it's conventionally classified by a well pressure level of over 10,000psi, with an 'extreme' bracket of over 15,000psi.

However, the complexities are often essentially the same in any HPHT endeavour – and should perhaps prompt operators to fully assess all their options before deciding on their optimum drilling strategy.

FINDING A KEEPER

There has been a succession of larger-scale HPHT developments in the UKCS over the past decade or so in which the initial exploration and appraisal wells, drilled in conventional fashion from a jack-up rig, were subsequently discarded despite revealing a viable prospect, as the concept of converting an HPHT exploration well into a producer is compromised by technical issues, such as the commonplace failure of mudline hangar systems, as the extreme pressures and temperatures impose very high loads on the systems.

An HPHT exploration well is an expensive business – broadly speaking, deploying a jack-up rig to drill a HPHT well today costs in the region of £70million and many times more for the same well using a semi-submersible – so it would make economic sense to find a viable way to make it a 'keeper'. The question is: how?

Say we're talking about a well in the conventional HPHT range, with a pressure rating between 10,000psi and 15,000psi. rather than installing a mudline system with an exploration wellhead system at surface – and then making no further use of that investment once the drilling programme is complete – operators could look to install a subsea wellhead and deploy a subsea riser from a jack-up rig to facilitate the campaign.

Depending on the final production strategy, of course, the subsea well could then have a traditional subsea tree installed, or – as is far more common on HPHT developments – a surface tree could be installed. It's worth bearing in mind that the tie-back of subsea wellheads to a platform jacket with a dry tree is a proven concept in the North Sea and elsewhere.

The appraisal option of subsea wellhead and jack-up facilitated riser wouldn't necessarily be viable in every case, and would involve an additional small-scale outlay in elements such as casing programmes and cementing to support the well's eventual transition to production. But it would have the potential to take millions of pounds off the programme cost in the longer term.

The strategic challenge for industry, therefore, is to consider moving beyond the status quo in the HPHT market and make the cost calculation of drilling the well with a subsea wellhead, which could then be converted and tied back to existing offshore infrastructure be that a wet tree if well bore pressure permits or the tie-back to a platform jacket in order to use a dry surface production tree.

THE STRATEGIC CHALLENGE FOR THE INDUSTRY, THEREFORE, IS TO CONSIDER MOVING BEYOND THE STATUS QUO IN THE HPHT MARKET



The subsea riser/wellhead package of course eliminates the failure risks associated with the mudline hangar systems. In addition, managed pressure drilling (MPD) technology can be brought into play to offset other technical issues. Such surface systems, which in effect maintain a tighter more controlled drilling mud pressure, are pivotal in delivering safe well control especially where mud weight/well control/formation strength boundaries have narrow margins. The technology has been commonly used on jack-ups for some years in conjunction with subsea drilling riser systems.

All component parts in the riser/wellhead solution also use metal-to-metal for gas-tight seals, addressing the risk of leaks; a key consideration as HPHT developments frequently take industry activity into ever more environmentally sensitive areas.

CHANGING THE INDUSTRY'S MINDSET

The proposition does call for something of a change in industry mindset, moving on from the default position of using semi-submersible rigs for developments in water depths up to 150m or throw away exploration and appraisal HPHT wells. However, the lower day rates for jack-up rigs, the loading gains they deliver and the metal to metal sealing increase commercial, environmental and technical gains of the package.

Some operators may still be unfamiliar with the concept of deploying subsea risers from jack-up rigs, and such a knowledge gap can naturally fuel uncertainty. Therein lies a challenge for the supply chain: to raise the profile of an alternative solution that could make 'throwaway' wells a thing of the past as well as marginal fields economic due to the reduced cost of using a jack up rather than a semi-submersible. Crucially some service companies are moving away from simple widgets or single products to a complete end-to-end solution to help operators with the HPHT subsea risers from analysis and planning through to seabed to surface interfacing, support and management.



Equally, the technological advances associated with HPHT riser systems have perhaps not yet been fully articulated. Engagement between the operator community and the supply chain is key to ensuring the range of choices is fully understood.

At Aquaterra Energy, we want to be part of that process. It's still a niche market, but we're seeking to be at the forefront as we introduce to the market an HPHT subsea riser system that can work on wells up to 15,000psi. Possessing back-up seal technology, the system will be qualified and ready for offshore deployment during the first half of 2020, complete with full end-to-end support.

Most jack-up well campaigns we have worked on to date have involved pressures of under 10,000psi but it's undoubtedly a time of change. Whereas our subsea risers were previously used on wells less than 5,000psi, the new 'normal' is between 5,000 and 10,000psi, with more and more enquiries being received for projects with a shut in surface pressure up to 15,000psi.

FIND OUT HOW WE CAN HELP YOU REDUCE COST USING A HPHT RISER SYSTEM FROM A JACK-UP RIG

Contact us to learn more

ABOUT AQUATERRA ENERGY

Aquaterra Energy is a provider of equipment and solutions to the global oil and gas industry. The company provides services across the seabed-to-surface value chain, and specialises in riser systems and design analysis, tools and products needed during the first days of a well's operation. In addition they provide components for offshore structures, including the Sea Swift platform, which provides a technologically superior and more cost-effective alternative for subsea wells in shallow waters. Many of Aquaterra Energy's most popular tools and products are available on either a rental or purchase basis.

Find out more: www.aquaterraenergy.com