

*The prototype Multi Purpose Tower, equivalent to a standard drilling derrick, after seven years of operation.*



## Slimbore puts niche vessel on new course

The Helix-owned *Q4000* has long focused on well intervention and construction work, but a recent upgrade has opened up new possibilities for this niche vessel. **Jennifer Pallanich** kicks off this month's drilling hardware review with a look at the DP3 semi's new slimbore drilling package.

The *Q4000*'s designers envisioned the vessel with a wide open flat deck outfitted with two pedestal cranes that allowed the company to mobilize equipment specific for whatever job it was destined for.

'It was meant to be plug-and-play, fit for purpose, pay for what you need,' says Kurt Hurzeler, commercial manager for Helix Well Ops. 'When we built the *Q* as an intervention vessel, the question with drilling people is they want it bigger, and from a commercial side you want it smaller because smaller is cheaper. At one time we thought the *Q* was bigger than it had to be for intervention work. But we found that it was sized about right for the type of work we were doing.'

Then, in 2006, Helix was looking to expand its deepwater development opportunities and bought Remington. The desire to explore and produce the fields led the company to decide to use its flagship vessel as an internal drilling and completion asset. Initially, the company planned to drill exploratory wells for data purposes only. In that way, Hurzeler says, the *Q4000* 'would be strictly an exploration/geophysical vessel'.

But following discussions with operating companies who wanted to be able to produce any hydrocarbons located through exploration, Helix revised its plans. A bigger hole was needed. With the slimbore package, he says, the *Q4000* will be able to work at about 60% of the ERT prospects, based on water depth and bottomhole pressures.

The refit followed in-house and outsourced engineering and design work and purchase and configuration of equipment. Delta Fabrication – the primary module provider – built the modules onshore. The modules were installed on vessel at the Gulf Copper shipyard while the *Q4000* was in last year for the upgrade and other modifications, such as the addition of two thrusters.

Historically, the vessel has not had the ability to deploy drill pipe with pressure control while on a well. For intervention work, Hurzeler says, the *Q4000*'s well pressure control is deployed and suspended through the Huisman Multi-Purpose Tower (MPT) derrick throughout the operation; in that configuration, the



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**Kurt Hurzeler, Helix Well Ops**

vessel cannot run drill pipe. To be able to run drill pipe, he adds, the vessel will have to suspend the riser from something other than the derrick. The answer came via installing passive heave compensation in the moonpool. That change reduced the usable area in the 39ftx22ft moonpool to 20ftx20ft. ‘For most of our operations, that’s more than adequate,’ he says.

The upgrade included a fluids treatment facility and mixing area. New dual NOV HEX pumps installed on the vessel have a combined 2300gal/min output of mud. Bulk storage was also added to provide an area for barite, bentonite and chemicals meant to be mixed with the mud.

The Hydralift top drive system is rated to 7500psi. The Huisman Multi-Purpose Tower serves as the derrick and has a hook load rating of 600t and 144ft of free lifting height.

‘The only downside really is there’s no vertical pipe rack back,’ says Peter Crawford, the Q4000 QEHS advisor. ‘Any pipe or stands of pipe are racked horizontally.’ To that end, the Hydralift horizontal pipe racking system has a 22.7t knuckleboom crane to assist in pipe transfer.

Other specs include the 7<sup>3</sup>/<sub>8</sub>in intervention riser system, eight riser tensioners, and two Schlumberger MD 1000 well service pumps. Liquid mud capacity is 1190 barrels surface with 1800 barrels reserve. Bulk mud capacity is four units holding 1500ft<sup>3</sup> each, while bulk cement capacity is two 1500ft<sup>3</sup> units.

The Q4000 carries a 3000m heavy weather ROV system. The vessel can accommodate 133 personnel and is 95.2m long, 64m wide and 8.1m deep. It has an operating draft of 15.1m and can work in waters to 10,000ft. Water depth is limited by

the length of the WROV umbilical and crane wire. It has 4000t of variable deck load. Adding the drilling equipment did not radically affect the usable deck space, the company says.

‘The top deck is rated the same as original deck, so we didn’t really lose deck area; it just moved up a couple of stories,’ Hurzeler says.

The 13<sup>5</sup>/<sub>8</sub>in slimbore well package – added during a nine-month stint at the Gulf Copper shipyard – is designed to rely on a surface BOP (SBOP) for pressure control. Such a system has yet to be used in the Gulf of Mexico from a DP vessel, although it has been used in offshore areas like Southeast Asia and Brazil. Helix says it has received provisional approval from the US Minerals Management Service for the Q4000 to carry out drilling and completions work. ‘It’s not unique, never used before technology, but it’s new to the Gulf, and it’s new to Well Ops,’ he says.

The MMS has given Helix conceptual approval to use the Q4000 with a surface BOP only for cased hole workover situations, says Mike Conner, supervisor for technical assessment for the MMS. For a workover job, he says, Helix will have to complete an application that includes a site-specific application, a third-party review of the equipment and procedures, and qualification testing of the dual blind shear rams mandated in the conceptual approval. Helix will also have to carry out a risk assessment and place and test a shear device on the seafloor to prove it’s fit for service to gain full MMS approval. The MMS also requires an HAZID or HAZOP as part of the application.

An SBOP with a high-pressure riser system has been used on fixed structures in the Gulf of Mexico but ‘we’re even concerned about that now a little bit,’ Conner says, given the weather and metocean conditions in the Gulf. ‘We feel like we have Mars-type structure down-pat. We’ve done quite a few of them.’ The MMS has other concerns about the SBOP set-up with a DP vessel: ‘If you lose DP, then you’ve got a problem,’ Conner says – and the use of an SBOP in ultra-deepwaters where there may be only a single barrier, such as a riser system from a MODU, TLP or spar, further complicates matters. ‘We’ve only had one drilling riser fail in the Gulf of Mexico.

Generally, drilling risers are not a problem. But with that in mind, if you’re drilling and you have a problem with the single barrier high pressure drilling riser, you have a problem . . . especially in deepwater,’ Conner says. He notes the industry has had numerous riser disconnections from MODUs.

Safety concerns aside, he says the MMS understands the advantages of what the Q4000 is trying to accomplish. ‘It probably will happen with mitigation. There are mitigations you can do to make it safer,’ Conner says, and riser and integrity monitoring programs would be probable requirements. Likely candidates are wells with low bottomhole pressures, rather than an HP/HT well in ultra-deepwater, he adds.

‘Our riser telescopic joint is a little bit shorter than some of our competitors because we’re starting with a smaller riser,’ Hurzeler says. ‘We’re drilling capable, we’re completions capable, but it’s all couched in future terms until we get those permissions.’

A draw to operators, he says, is that the Q4000 will be more economic than other drilling options.

Helix’ flagship vessel, built by AmFels in Brownsville, Texas, and christened in 2002, can carry out well intervention and construction in water depths to 10,000ft. With the new package, the Q4000 can suspend 16in riser in 4000-5000ft of water and can suspend 13<sup>5</sup>/<sub>8</sub>in riser in 6000-7000ft of water.

‘Those become our operable limits – in terms of water depth and drilling and hole size,’ Hurzeler says.

The company expected the inaugural job to be on a Helix field, but that work has been pushed back to next year. Helix has yet to firm up a job for the Q4000 and the new drilling package but is in negotiations for completion work. He expects the Q4000 to remain in the Gulf for the foreseeable future; the vessel has about nine months of work contracted.

‘The Q4000 has always been a niche purpose vessel, and I think we’ll remain that on the drilling and completion side as well,’ Hurzeler says. ‘Whether we ever drill or complete, we’re a much better intervention unit now than we were prior to the upgrade.’ **OE**



Prototype NOV Hex fluid pumps after one year of service.

