Different riser materials compete for acceptance

RESEARCH AND DEVELOPMENT of alternatives to steel drilling risers is still progressing, although not as fast as previously. As the industry moved further offshore into deeper and deeper waters, there was an initial concern about the weight of several thousand feet of steel riser in the water, even with buoyancy attachments.

There was also the concern of the weight of the risers when stored on deck. As a result, some companies began developing lighter alternatives such as risers made of composite materials, titanium and other lighter metals.

Noble's aluminum riser is ready to be shipped from the manufacturing plant in Russia to one of its deepwater semisubmersibles or drillships.

These alternative materials are significantly more expensive and have not gained much acceptance by the drilling industry as of yet regardless of the weight savings.

The industry has found that it has little problem adapting the traditional steel riser even to ultra-deepwater applications approaching 10,000 ft of water. Consequently, the impetus to develop alternatives to steel risers has slowed somewhat. However, one company is continuing its development of an aluminum alloy riser.

COMPOSITE RISERS

Several companies have been working on composite riser systems for a number of years. **Kvaerner Oilfield Products** installed several joints of composite riser on ConocoPhillips' Heidrun tension leg platform in the North Sea.

ABB Vetco Gray developed and manufactured a joint of composite drilling riser a few years ago that was sent to Brazil for testing in a string of steel riser in a Petrobras well. The choke and kill lines were also manufactured with composite material. That test has yet to be conducted. ABB manufactured a 25 ft composite riser joint for the test but there have been delays with the particular rig that was to be used. That rig is expected to be available this year and it is anticipated the test of the riser joint will be conducted then.

One of the obstacles with composite riser is the composite to metal interface for the riser joint connections. ABB solved that problem with its proprietary Geometric Trap, which is the system utilized to attach the standard riser end fittings and connections to the composite tube of the riser.

Stewart & Stevenson was developing composite choke and kill lines to be used with standard steel risers before Cameron bought the company's oilfield products line in 2002. Cameron has not pursued Stewart & Stevenson's developments. Cameron developed its own composite choke and kill lines about 20 years ago, according to **Stephen Walker**, Riser System Engineering Manager for Cameron, but the market at that time could not bear the cost of the technology.

Cameron also designed a titanium riser in conjunction with a drilling contractor, however, the riser was never built, again the victim of high costs.

According to Mr Walker, Cameron is not presently pursuing composite technology primarily because it does not appear there is a need for the technology since wells have been drilled in water depths approaching 10,000 ft with steel riser technology.

TIMING IS EVERYTHING

However, it appears that composites may have been the right idea but perhaps its development missed the timing. Composites can help reduce or eliminate some of the necessary modificatoins when upgrading a rig for deeper water operations.

For example, installed tension capacities could be minimized with composite risers, which could be ⅓ to ½ the weight of steel risers.

"If you took an existing string of steel riser on a rig that is rated for 5,000 ft of water," said **Lester Bruno** in ABB Vetco Gray's Capital Drilling Equipment's sales department, "and only put composite choke and kill lines or a composite auxiliary line on it, then you could probably take that rig to 6,000 or 6,500 ft without additional tensioning capacities, deck load considerations or buoyancy considerations."

"I think the development of composites missed the curve on the last spike in rig upgrades," Mr Bruno said. "We are behind the curve on that."

Mr Bruno also points out that the latest round of newbuild drillships resulted in vessels so massive that the weight of several thousand feet of riser in ultra deepwater and the effect on variable deckload probably wasn't even considered in the scheme of things.

The increased cost and delivery schedule for composite drilling risers are also factors in their acceptance. A joint of composite drilling riser could cost as much as 50% higher than a comparable steel joint.

"Deliveries are longer also," Mr Bruno noted, "which is another thing that might make composites more prohibitive."

Additionally, there are other technologies that are competing with the advan-

tages of composite risers. These include moves to slender wells and expandable tubulars.

"If you only need a 16-in. riser, 10,000 ft of that is a lot lighter than 21-in. riser," said **James Garipy**, Product Manager for Offshore Drilling Systems for ABB Vetco Gray. "So I think that is going to be a pacing item for composite riser development because it is taking away part of the niche that composite risers were going to take."

"If slender, compact wells and expandable tubulars really take off," Mr Garipy continued, "that is going to hurt development of composite drilling risers."

OTHER USES

Mr Garipy says the industry is still at the point where composite is still being evaluated, although he believes it is a feasible technology. As far as composite drilling risers are concerned, he believes drilling contractors are still going to be concerned about wear and tear on the riser during its continuous cycle of being run and racked back.

Mr Garipy believes that composite risers would be excellent for production risers since they are installed and remain stationary for years. The lighter weight will also benefit the newer design production units such as the smaller spars being developed.

With several of the earlier spars, the production risers are buoyed by air cans, which decoupled their weight from the spar structure. The latest iteration of spar technology has resulted in smaller units that put the tension for the production risers into the spar itself. This increases the tension budget for the spar because they have to hold the production riser.

"This is a good application for composites," Mr Garipy notes. "If you are going to have to tension the riser back to the spar, the original thinking was that the spar hull would have to be large to accommodate the high tension."

With the newer design smaller spars with tensioning systems, the lighter weight composite risers would be ideally suited, he said.

ALUMINUM RISERS

Another point against composites, according to Mr Garipy, is development of an aluminum riser such as the one **Noble Corporation** is currently testing. Choke and kill lines are also made of the aluminum alloy material. Noble is presently undergoing extensive testing of an entire string of aluminum alloy riser on its drillship Noble Leo Segerius working for Petrobras offshore Brazil. Noble has delivered a second string for use on its rigs in the Gulf of Mexico and additional strings are in the process of being manufactured.

Noble is associated with a Russian company for supply sources and the actual manufacturing of the riser, which is considered past the initial testing stage and is now in the production phase. The Russian company has experience in manufacturing aluminum tubulars, according to **Tom Prosser** with **Maurer Technology Inc.**, a Noble Corporation subsidiary. Russia is also one of a few countries that can afford to make aluminum alloy tubulars at a competitive price.

"The primary reason is that Russia has a good source of bauxite, which is converted into aluminum," he said, "and an inexpensive source for electricity to produce the refined aluminum."

Noble also is working with the American Bureau of Shipping (ABS) to obtain Type Approval classification to enable the use of aluminum risers worldwide.

The aluminum alloy riser is actually more than 90% aluminum with other materials to provide ductility. It is 40%-50% lighter than a steel riser, according to the company.

Due to the already light nature of the riser, less buoyancy material is generally required compared with a steel riser. In the case of the aluminum riser on the Leo Segerious, only a portion of the riser is clad with buoyancy material.

"The performance of this riser has been excellent," said Mr Prosser. "Stabbing is easy, the connections have all worked well and the installation and retrieval of the riser has gone very rapidly."

RELIABILITY

Like any other material, potential wear and corrosion can occur and that can be accelerated from the salt water and drilling fluids.

"In terms of corrosion," Mr Prosser said, "we're very fortunate that the riser has been designed well and has a good external cathodic protection system."

Noble is developing a system to reduce potential internal corrosion.

NOBLE'S RIG FLEET

Noble is currently planning to use its aluminum alloy riser system on other rigs in its fleet. Several of its Gulf of Mexico rigs will have the aluminum riser system beginning this summer.

Noble has been using the riser in around 4,000 ft of water offshore Brazil, but tests have been conducted that show the riser can be effectively applied in water depths to around 6,000 ft. Beyond that water depth to 10,000 ft will require thicker walled riser on which Noble will begin production in 2003.

A full string of aluminum riser probably could be manufactured in 6-8 months, depending upon the required length. ■