

# HANDLING THE TENSION

## CLAXTON'S NEW TILTING TENSIONING SYSTEM PUSHES THE BOUNDARIES OF WHAT CAN BE DONE TO HELP DRILLERS IN THE NORTH SEA

Although from a production perspective the North Sea's best days may now be in the past, the province still generates great examples of offshore engineering innovation, as this drilling riser project for BG Group plc illustrates.

About two years ago, BG Group plc approached Claxton to provide a conductor tensioning system to meet some unusually demanding requirements. The company wanted to drill in water depths of 78 m in the Jackdaw field using the Rowan Gorilla VI jackup drilling rig – nothing too out of the ordinary so far. However, as Chris Kyson, project engineering team leader, explains: "A combination of the way the rig was configured, the environmental conditions in the area and the fact that BG Group wanted the system to be capable of withstanding the sort of seas normally associated with a 50-year storm resulted in the need for a conductor tensioning system that could generate up to 400 t of load."

A more common rating for conductor tensioning systems in the North Sea is 300 t, which can easily be achieved using Claxton's positive-grip tension-ring systems. Presented with this challenge, Claxton went back to the drawing board and came up with a new tensioning system: one that would not only provide the required tensile loads but also tilt to reduce the bending stresses and wave-shock loading affecting the conductor.

"We were reluctant to resort to a welded tension ring in place of our positive-grip system because this would have meant having to set a precise space-out distance between the ring and the tension deck," says Kyson. "It is easy to get this wrong and create knock-on effects that compromise the integrity of the other elements of the conductor system. Instead, we opted to insert a machined rack, 37-in. long, into the conductor tension joint, which, with its outside diameter of 34 in., can pass through the rig's rotary table. In place of the ring, we have a two-piece adjustable nut that engages on the teeth of the rack and enables the space-out distance to be readily altered during the conductor installation process."

Perhaps more unusual than the tension rack was the tilting mechanism that was also incorporated into the conductor tensioning system to alleviate the wave- and current-induced stresses experienced by the conductor. To understand how this works, it is necessary to know that the tension in the system is generated by a series of four hydraulic cylinders acting against the floor of the tension deck upwards onto a tension plate. The four cylinders are connected between the deck and the tension plate via either concave

or convex bearing plates: the four on the deck floor are convex and the four on the underside of the loading plate are concave. During operation, the wave and current forces acting on the conductor are sensed and transmitted to the power unit that governs the movement of the individual hydraulic cylinders. By this means, the angle between the deck and the tension plate adjusts (tilts, gimbals and squats) to reduce the effective localised bending moment seen at surface by the riser. This reduces stress and therefore increases fatigue life.

Before the tensioning system was installed on the rig, it underwent tests in Claxton's workshops in Great Yarmouth, UK. The tilting mechanism was thoroughly checked, and the system was subjected to a 750-t test load. In October 2007, two Claxton engineers and a rig crew went out to the Rowan Gorilla VI, where they ran the conductor and installed the tensioning system. First, the hydraulic cylinders were fitted to the tension deck. These were then connected to their power pack and extended by 4–6 in. before the tension plate was added on top. The conductor, with its pre-installed rack section, was run through the centre of the tension plate via the rotary table; then, once the correct space-out had been achieved, the two-piece adjustable nut was attached to the rack.

"The system was installed within budget and on time, and subsequently performed exactly as we expected," says Kyson. "BG Group must have been impressed because it has recommended the system to Canadian Natural Resources (CNR), which is down to use the rig next."

Lockart Campbell, senior subsea engineer with BG Group, confirmed satisfaction with the system: "Our partnership with Claxton has worked well. I am confident in their ability, both to provide well-executed engineering solutions and to react to arising needs in a helpful and professional manner."

The tilting tensioning system is now back in Claxton's workshops being serviced before being reinstalled on the rig for CNR. Beyond this contract, Maersk has also expressed an interest in using it. Kyson concedes that this is not the first tilting tensioning system on the market, although he is not aware of another system that can also generate a tension of 400 t. Furthermore, he is proud of the fact that Claxton was able to provide the ideas, the engineering expertise and the people to devise and then quickly deliver a highly practical and reliable solution to its latest challenge.

