

Offshore Equipment

Annulus B Measurement

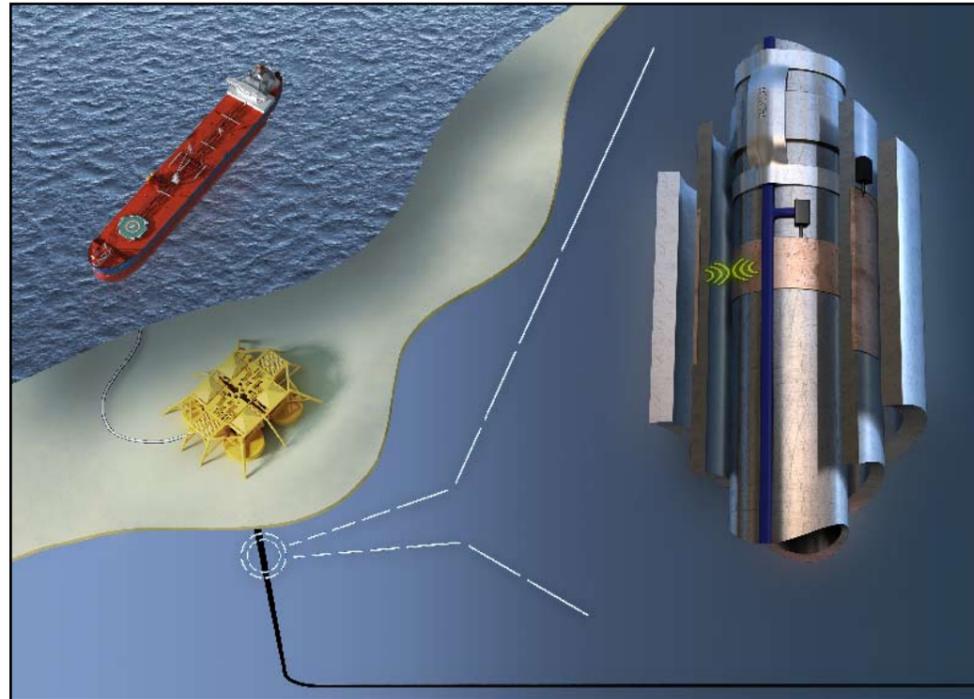
The annulus of an oil well is the space between two concentric objects. In a completed well, there are normally at least two annuli. The A annulus is the space between the production tubing and the smallest casing string, while the B annulus is located between different casing strings.

Cement seals behind the wellbore casing provide a barrier against the high pressures encountered deeper in the well. It is possible, however, for the cement sealing to deteriorate or become ineffective. Similarly, the casing may heat up and thermally expand due to the production flow, resulting in collapse. This loss in casing integrity can allow oil or gas to migrate vertically towards the surface along the outside of the casing.

The result of this is potentially catastrophic! It can result in hazardous situations, especially during workover operations where uncontrolled gas may escape to the surface as a shallow gas blow out. Injection gas can also pass through failed barriers in the casing systems.

So how can the operator verify the well's integrity? How would it know when to shut down the well because of barrier failures? One way of leakage detection is by pressure testing, however, this is hindered by the lack of access to the annulus B in subsea wells. Testing is both cumbersome and expensive, and the fault detection process is particularly time consuming. Another way of offsetting problems is by excessive and expensive over-dimensioning of casing to accommodate for worst case scenarios.

This prompted Roxar to develop an online pressure monitoring system called the Downhole Wireless PT Sensor System – Annulus B. The new wireless PT Sensor System and its permanent monitoring capabilities gives added certainty to the well integrity monitoring process as well as valuable input during well trouble-shooting. Not having to shut in wells because of the inability to verify barrier integrity provides operators



B annulus measurement

with potentially significant cost savings.

"The Roxar Downhole Wireless PT Sensor System – Annulus B represents a real step change in protecting subsea well integrity, as it tracks pressure in an area which was previously off limits for all operators," explained Terje Baustad of Emerson Process Management. "The new wireless instrument attaches to the same cable as the reservoir monitoring gauges and will detect any variations in pressure behind the casing string.

"It will provide early warning of these conditions and allow intervention or other remedial actions to be planned and implemented in a timely manner.

"For oil and gas operators planning subsea production or injection wells and looking for improved well integrity monitoring, and for government regulatory agencies overseeing safety and environmental protection, the Roxar Downhole Wireless PT Sensor System represents a milestone moment."

The system consists of an integrated downhole network (IDN) system to carry signals from the wellbore to the customer monitoring system with a downhole network controller card (DHNC) placed in the subsea structure and connected to a 1/4in electrical cable coupled to a tubing hanger penetrator and a series of up to 32 sensors distributed throughout the completion string.

Other key components of the system include a wireless reader, a wireless PT Transponder and antennae to monitor activity in the B Annulus, and a transponder and reader carrier.

The system works in conditions of -5–150°C and 0–10 000psi and it has an accuracy of ± 2.5 psi $\pm 0.18^\circ\text{F}$. It is qualified to last for a minimum of 20 years at temperatures of up to 302°F and pressures up to 10 000 psi.

The system is also based on an electronic wireless system, where the signals and power are transmitted wirelessly, ensuring a long life.

Riserless Mud Recovery

Statoil has signed a two year, NoK66m contract for the riserless mud recovery system (RMR) from AGR Drilling Services. The deal concerns rigs on the Norwegian continental shelf.

The contract also includes two optional extension periods of two years each which, if taken, will bring the estimated total value of the contract to NoK200m (US\$38m).

AGR, which has its head office in Straume, Norway, has performed 33 RMR well installations since 2004 for Statoil. The RMR provides a number of benefits.

Recycling

The option of reusing drilling fluid is closely connected with the higher success rate for top hole drilling.

Operators can employ drilling fluid of much higher quality because recycling makes both financial and environmental sense. This also means a reduction in the amount of casing needed to stabilise the borehole. At the same time, the fluid provides effective pressure control, thus keeping the oil or gas in place in the reservoir.

Cost savings

In its initial phase, RMR technology has been used exclusively during top

hole drilling operations. However, experience from the Caspian Sea clearly indicates that this same technology can be used successfully for deeper parts of the borehole.

As long as the operator can maintain the pressure balance using heavier drilling fluids with the correct viscosity, many short lengths of casing can be replaced by a few long ones. This concept requires the use of a pump to achieve effective pressure control.

The benefit for the operator lies in reduced drilling time, as well as potential reduced conductor/casing strings.

Riserless

The developers of the RMR system ponder a future where the entire drilling process using risers can be eliminated. In this case, the need for costly and heavy riser systems would be eliminated altogether. This project is feasible, and AGR currently have ongoing studies to successfully avoid the use of risers.

This latest contract with Statoil also includes the continuation of cutting transportation system (CTS) operations on two rigs, with provision for AGR to be optional CTS supplier on a number of others. Statoil has used CTS, which takes cuttings up to 2km away from the well area, on 209 wells since 1998.

- Oil and gas company E.ON Ruhrgas has signed a contract to use RMR for multiple wells on its Huntington Field in the UK sector. RMR has been used on the 36in and 26in sections using the jack-up rig Ensco 100.

- Statoil has signed an agreement for RMR on two deep-water rigs it has under contract in the Gulf of Mexico.

Statoil has already successfully used the RMR in the GoM from the Discoverer Americas drillship on the Krakatoa well in the Mississippi Canyon block at a depth of more than 620m (2000ft).

