

# MEETING THE DEMAND FOR BARRIER PLUG INTEGRITY ASSURANCE

Well barrier installation practice is dictated by territory specific regulations, largely based on best practices. However, emerging technologies, tightening regulations, and demands from asset owners are gradually affecting the way we carry out in-well installations. Arild Stein, Engineering Manager, Interwell, tells us more

There are multiple issues involved in gaining proper verification of an installed well barrier, for example, when two wellbore barriers are installed in close proximity, or when the well's general ability to support an inflow test lacks. Well tubing and casing conditions can also be a major uncertainty factor for the barrier installation and the ability to establish a lasting barrier.

Governmental regulation varies across oil and gas regions, but in essence should not be far from the Norwegian Petroleum Safety Authority (PSA) statement that the expectation for any well is: the barrier condition needs to be known and understood, robust barriers are required to fulfill regulatory requirements and a more reliable verification of barriers is needed, especially when plugging and abandoning a well. (Reference – Johnny Gundersen, PSA)

However, according to a PSA survey from 2013-2014, it's clear that there is still room for improvement. The survey found that 59% of the platform wells analysed had barrier issues; hence the demand for verification is present.

## Technology and Design

The wireless Barrier Verification System (BVS) was developed to meet the demand for barrier plug integrity assurance. The system consists of a pressure sensor with a transmitter attached below the ISO14310 qualified barrier plug. A receiver device is mounted on top of the installation tool, and an additional pressure sensor forms part of the receiver to provide an accurate reference pressure measurement above the plug.

The BVS uses Extreme Low Frequency (ELF) telemetry to transfer signals through the barrier or surrounding wellbore / lithology to a receiver above the established seal. This is made possible without metallic or fluid contact. Under the anchoring / shield, the analog well values are logged and stored to memory, then digitalised, multiplexed and fed into a dual-tone modem and transmitted to a retrievable receiver above an established barrier.

The transmitter sends pressure readings and can record for multiple days depending on battery selection, wellbore temperature and logging frequency. The Receiver also records and stores the pressure information collected above the installed plug for reference and wirelessly receives the values from below the barrier plug. The measured pressure / drawdown testing recorded by the BVS together with the measurement of the installation parameters, provides valuable information to determine the overall quality of the barrier installed, as related to the casing or tubing it is installed in.

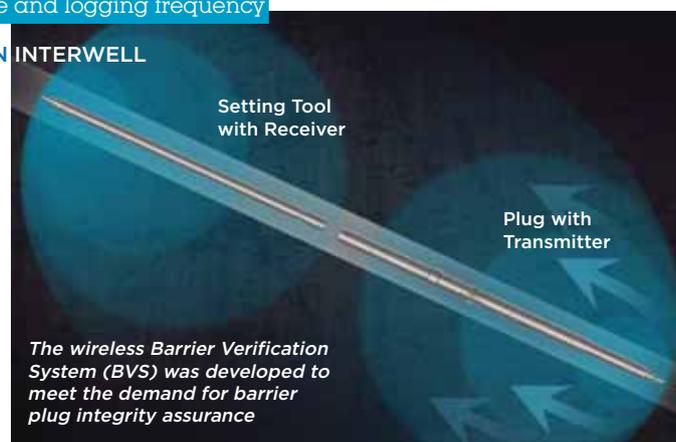
Installation parameters are recorded by Interwell's new Electronic Setting Tool (EST) which monitors and logs the full setting sequence and is able to detect variation in load being transferred to the barrier in the setting sequence. This provides the possibility to investigate the anchoring of slips and sealing sequence of the barrier in actual casings and tubings. Analysing actual physical parameters in the 'isolation

/ bonding' of the barrier will enhance knowledge and confidence. Comparing against previous recorded

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data from over 500 run profiles, allows the opportunity to verify the installed barrier, and assists in performance optimisation in the planning for new installed barriers.

## Value to industry

With the BVS and recording possibility of the setting parameters from the EST, operators can obtain a positive verification of well barrier and integrity with a higher degree of confidence. It can save operational time with a more efficient verification of the barrier, especially in low pressure wells with free gas.

The supply of downhole data from mechanical wireline operation available online and even in real-time, could be an important contributing factor when decisions have to be made immediately.