**LLOG Evaluates Cement and Casing Integrity for Multiple Casings in a Single Descent, Deepwater GOM**

PowerFlex service’s one-run logging of three casing sizes from 7\(\frac{5}{8}\) to 11\(\frac{7}{8}\) in across dual-zone completion and 13\(\frac{5}{8}\)-in surface casing saves 12 hours of rig time.

**CHALLENGE**

Efficiently obtain required cement evaluation in a dual-zone completion across three casing sizes of 7\(\frac{5}{8}\), 9\(\frac{7}{8}\), and 11\(\frac{7}{8}\) in and a casing inspection log in the 13\(\frac{5}{8}\)-in surface casing.

**SOLUTION**

Deploy new PowerFlex* annular barrier evaluation service, which makes both pulse echo and flexural wave ultrasonic measurements in almost all mud weights, lightweight to heavy cements, and large-diameter, thick-walled casings to conduct both casing and cement evaluation across multiple strings in a single descent.

**RESULTS**

Satisfied regulatory requirements in a single wireline descent that logged all four casing sizes to obtain high-quality cement evaluation and casing integrity data while saving 12 hours of rig time.

Conventional cement evaluation requires multiple descents for multiple casings

A Mississippi Canyon well with three casing sizes across a dual-zone completion required cement evaluation. Verification of the surface casing integrity was also required. LLOG Exploration Co., LLC wanted to improve the efficiency of logging operations in meeting these objectives to minimize rig flat time by reducing the number of descents. The typical approach would require three wireline descents: conventional ultrasonic logging to confirm zonal isolation of the hydrocarbon-bearing sands in the 7\(\frac{5}{8}\)- and 11\(\frac{7}{8}\)-in liners, conventional sonic logging to determine top of cement in the 9\(\frac{7}{8}\)-in liner, and a conventional caliper log to verify casing integrity in the 13\(\frac{5}{8}\)-in surface casing.

**PowerFlex service expands ultrasonic logging capabilities**

PowerFlex annular barrier evaluation service significantly extends the operating range of ultrasonic cement and casing measurement to provide certainty for cement and well integrity evaluation. By integrating powerful new transducers with innovative new processing techniques, PowerFlex service effectively overcomes the challenges of signal attenuation in heavy muds, with performance proved in weights exceeding 18 ppg. Cements from ultralight to heavy weight can be evaluated in casing sizes up to 22 in and thicknesses up to 1 in.

Not only does PowerFlex service greatly increase wellsite efficiency via faster logging speeds, but enhanced wellsite processing enables a turnaround time of 2 hours or less from acquisition to receipt of the field answer product.

“LLOG Exploration thrives on and expects our service providers to contribute innovative and dependable solutions that generate cost reductions through operational efficiencies while maintaining the highest quality of that service. PowerFlex service met all of those targets by successfully achieving both cement evaluation and casing inspection objectives across four casing sizes in a single wireline descent, saving 12 hours of rig time on a drillship.Confirming well integrity during the completion process is critical, and this new technology gives us the confidence and speed that we need to achieve our objectives.”

Barney Paternostro  
Sr. Completion Engineer  
LLOG Exploration Co., LLC
Multiple-casing logging challenges are met in a single run

Schlumberger modeled the ultrasonic signal attenuation for the well environment and multiple casings to recommend running new PowerFlex service in combination with an array sonic tool. With its powerful measurement capabilities, PowerFlex service efficiently conducted cement evaluation in the 7¾- and 11¾-in casings and was also used for casing inspection of the internal radius and wall thickness in the 13¾-in section, in the same descent.

In a single run, PowerFlex service conducted cement evaluation across multiple casings, ranging from 7¾ to 11¾ in, and verified casing integrity for the 13¾-in surface casing. The 7¾-in liner was to be cemented to the top, as planned. The 11¾-in casing has the top of the lead cement clearly defined at 12,306 ft and the top of the tail cement is at 12,604 ft. At customer request, no data was acquired by PowerFlex service in the 9¾-in casing interval, and top of cement was identified from high-speed cement bond log (CBL) measurements.
Casing centralization was confirmed for the 13½-in free-pipe section, with a clear transition into the top of the liner at 8,400 ft. Casing contact points are at 8,600 ft on image map as well as from PowerFlex service’s third-interface echoes (TIEs), which enable imaging beyond casing.