Halliburton Makes Splash in Deep Water — Saving Operator USD 1.2 Million in Rig Time

SUCCESSFUL ACQUISITION OF CORES, SAMPLES, AND BOREHOLE SEISMIC DATA IN ULTRADEEP AND ULTRAHIGH-PRESSURE WELL

OVERVIEW
A deepwater operator with an ultra-deep and ultra-high-pressure well contacted Halliburton after a competitor could not meet the required number of rotary sidewall cores and other necessary data on its project. Halliburton was confident that the Xaminer® Coring Tool and borehole seismic tools, using quad-pack geophone technology, in combination with our industry-leading high-tension conveyance capabilities, could acquire the required data. The ability to combine innovative technologies enabled Halliburton to create a unique integrated solution, which in return improved job efficiency, reduced HSE exposure, and saved a day of rig time—valued at approximately USD 1.2 million.

CHALLENGES
Ultradeep and ultrahigh-pressure wells present many challenges for data acquisition. Among the obstacles this operator encountered was ensuring the successful and efficient retrieval of cores, fluid samples, pressure measurements, and seismic data amid conveying the tools safely to the required ultradeep depth. These operations needed to be performed under high tensions, while minimizing tool sticking and damage to the cable. A competitor on this same project had only minimal success attaining cores and was completely unsuccessful gathering useful VSP quality borehole seismic data due to the challenging environment.

SOLUTION
Halliburton had confidence that its industry-leading technology could acquire the data and provide the necessary solutions. Key technology in the Halliburton portfolio included the advanced Xaminer Coring Tool, which features maximized cutting torque, advanced core bit design, and downhole core detection. The Reservoir Description Tool (RDT™ Oval and Focused-Sampling Probes were combined in one string to allow for high-resolution pressures and low-contamination fluid samples in a single run. Borehole seismic data would be acquired from a Zero-Offset Vertical Seismic Profile (VSP) using 5 x 30,000-psi DeepSuite™ Receivers containing the advanced quad-pack geophones, yielding increased sensitivity and a higher signal-to-noise ratio.
Halliburton packaged this technology with the safest, most-versatile conveyance system in the industry. The Halliburton team recommended combining a Super Combo Unit (SCU) with an 18,000-lb Powered Capstan, 35,000-lb PowerPull™ Cable, Releasable Wireline Cable Head (RWCH), hydraulic LockJar® system, and I-Wheel™ rollers for successful wireline conveyance. This SCU uses a direct drive instead of a chain-driven winch system and is capable of independently pulling 22,000 lb.

A derrick-mounted Powered Capstan minimizes cable damage and is safer for personnel than typical capstans that sit on the deck. Together, both the SCU and Powered Capstan can pull up to 40,000 lb. The RWCH offers several advantages over a standard-tension cable head. It enables greater pulling of stuck tools at any depth and in any conditions, can support heavy tool strings by using the full strength of the wireline, regardless of depth, and electrically controls release from the surface. The Halliburton LockJar system provides a simple way to help avoid time-consuming and expensive stuck strings and fishing jobs in wireline logging operations. It can be activated multiple times in multiple intervals to free a stuck tool string and preserve a logging run without costly delays. I-Wheel rollers minimize differential sticking on stationary tools during pressures, sampling, and coring programs.

RESULTS
Due to the higher complexity of today’s wireline jobs, longer and heavier tool strings are required to provide the necessary solutions in the most efficient manner possible. Despite the challenging environment, the tools and conveyance system performed superbly and seamlessly.

Core Retrieval
The real-time monitoring capability of the Xaminer Coring Tool enabled the crew to detect with 100% accuracy if core retrieval was successful downhole prior to bringing the tool back to surface. These sidewall cores were the deepest, highest pressure cores ever cut in Halliburton history. Coring recovery was over 88%—far superior to the previous recovery rate of less than 5% when a competitor attempted to core the same reservoir. Additionally, the combination of core detection and high-capacity core tubes allowed for less runs, saving rig time—approximately USD 1.2 million.

Pressure Evaluation Services with Fluid Sampling
The RDT formation tester successfully captured all pressure and sample points in one descent over 33,000 ft and operational pressures over 31,000 psi, making these measurements the deepest sampling and pressure readings ever taken by Halliburton. Extended buildups were performed after sampling to obtain vertical interference tests (VITs) and mini-drillstem tests (mini-DSTs), checking for radial flow using pressure-derivative plots. Permeability, permeability anisotropy, and skin were efficiently obtained with less than 30-minutes buildup time.

Borehole Seismic Data Acquisition
Using the quad-pack geophones in the same environment, Halliburton provided excellent VSP data where the competition was unable to retrieve similar quality VSP data in nearby offset wells. The quad packs provided much higher sensitivity than data that could have been acquired by the competition. Real-time monitoring and processing of seismic data allowed for changes to the acquisition program ensuring solution accuracy, and using five EHP tools simultaneously resulted in substantial rig-time savings.
When stuck, the additional force from the LockJar system freed the RDT formation tester and Xaminer Coring Tool without damage to the logging equipment, allowing for the completion of the program. The Halliburton conveyance technology successfully deployed each tool string while safely pulling over 21,000 lb at multiple stationary points. The Halliburton derrick-mounted Powered Capstan is safer for people on the rig and safer for the cable itself. With the highest derrick-mounted tension assist in the industry, the Powered Capstan performed admirably on its deepest and highest tension job to date.

**Customer Value**

The novel integrated solution created by Halliburton improved job efficiency for high-quality coring, sampling, and seismic acquisition, ultimately saving rig time and approximately USD 1.2 million for the customer. The conveyance system reduced HSE exposure to personnel and prevented damage to the cable and tools despite the risks associated with operations in an ultradeep and ultrahigh-pressure environment. Halliburton performance on this job impressed the customer, and we are moving forward together on deeper, more challenging wells in deepwater environments.

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