

Halliburton helped clients obtain clean samples in deepwater Gulf of Mexico

Halliburton tool helped increase sampling efficiency with 95 percent of the samples having less than five percent contamination



OVERVIEW

Low compressive strength formations in deep water can sometimes be as loose as beach sand. Conventional fluid testers are often unable to obtain clean samples or retrieve any samples at all from unconsolidated formations. As soon as the sampling tool starts collecting fluids, sand comes with it, contaminating the samples, plugging the equipment or eroding the sand face.

Halliburton's Reservoir Description Tool (RDT™) tester with Oval Pad helps mitigate and prevent sanding. The tester has a larger surface than competing tools. This reduces the pressure drop across the sand face, which, in turn, enables the tool to maintain a seal with the formation and collect a cleaner sample faster. Halliburton helped two operators in deepwater Gulf of Mexico obtain 95 percent of target samples with less than five percent contamination. One operator said these were the "cleanest samples" he had ever seen from the formation.

CHALLENGE	SOLUTION
<p>Retrieving samples in unconsolidated formations</p> <p>Two operators needed samples from four wells in an unconsolidated Pliocene reservoir, at depths ranging from 18,000 to 22,000 feet. These unconsolidated formations precluded the use of many conventional testers because solids would plug tools during downhole sampling operations.</p>	<p>Larger flow area with RDT tester with Oval Pad</p> <p>The RDT tester with Oval Pad has a larger flow area than other tools. At any given flow rate, the larger area results in less differential pressure across the sand face and less stress on the formation. Solids are less likely to move into the tool when formation fluids are produced.</p>
<p>Obtaining clean samples</p> <p>Previous sampling attempts with conventional fluid testers resulted in contaminated samples. The operators of these four wells needed high-quality fluid samples, with less than five percent contamination for an effective appraisal of the wells.</p>	<p>Variable pump rate led to sampling success</p> <p>The RDT tester has both the fastest and slowest pump rates in the market. Rates are matched to reservoir conditions in real time. The rate was reduced to avoid sand breaking away from the formation. Clean samples of less than five percent contamination were obtained in 95 percent of targeted zones.</p>
<p>Efficient fluid sampling and pressure measurements</p> <p>Deepwater operators need fluid samples and pressure gradient measurements collected quickly. Efficiency is as important as accuracy because of the cost of operating deepwater rigs. The two operators sought faster flow rates for drawdown and quick identification of pressure gradients.</p>	<p>RDT tester with Oval Pad collected samples faster</p> <p>The RDT tester with Oval Pad has a flow area of 15.09 square inches and flows at a rate four times faster than a conventional pad. The RDT tester also identifies pressure gradients 25 percent faster, obtaining five pressure points per hour. This saved the operators 2.5 hours and \$104,000.</p>

The larger pad size of the RDT™ tester with Oval Pad has a faster flow rate – at least four times faster than conventional testers – allowing cleaner samples to be collected more quickly.

4X
FASTER FLOW RATE

LARGER FLOW AREA

MORE THAN

15
SQ. IN.

The RDT tester with Oval Pad has a much larger surface area than other testers – 15.09 square inches of flow area. This larger area provides less differential pressure across the sand face during sampling and less stress on the formation at any given flow rate.

Halliburton obtained nearly 30 samples in depths ranging from 18,000 to 22,000 feet. 95 percent of the fluid samples collected were achieved with less than five percent contamination.

95%
OF SAMPLES

HAD LESS THAN
5%
CONTAMINATION

SAVED 2.5 HOURS AND
\$104,000

Halliburton was able to identify pressure gradients 25 percent faster than previous attempts, saving the operators 2.5 hours and \$104,000.

Halliburton's RDT™ tester with Oval Pad increased sampling efficiency with 95 percent of the samples having less than five percent contamination



Produced solids and plugged equipment hampered fluid sampling

Two operators appraising reservoirs beneath 7,000 feet of water in the Gulf of Mexico needed fluid samples and pressure measurements, but faced challenges due to the unconsolidated formations. Unconsolidated formations do not have much compressive strength and can be as loose as beach sand. The operators previously tried to collect samples from these formations, but those attempts resulted in solids flowing into the tools, plugging equipment and contaminating samples. The operators needed a reliable, efficient way to collect these fluid samples.



Halliburton is leader in unconsolidated sampling

Halliburton collaborated with the operators to collect fluid samples from four different wells. Halliburton recommended using the RDT™ tester with Oval Pad to collect samples. The unique capabilities of Halliburton's RDT tester with Oval Pad enable it to collect clean samples quickly where other testers have difficulty. The RDT tester with Oval Pad has three advantages over conventional testers: a larger flow area, the ability to control the pump rate, and a unique check valve. These advantages help prevent produced solids from entering the tester and contaminating samples.



Larger pad with more than 15 square inches of flow area

The Oval Pad provides a much larger surface area than other testers – 15.09 square inches of flow area. This larger area means less differential pressure across the sand face during sampling and less stress on the formation at any given flow rate. Solids are less likely to flow into the tool. The variable pump rate of the RDT tester can pump as slow as 0.1 cc/sec and as fast as 60 cc/sec – the slowest and fastest pump rates in the industry. These variable pump rates help keep the rate below the pressure differential that would cause sand to flow into the tool or alter the fluid. Real-time monitoring with Fluid Identification sensors also helps prevent sand from flowing into the tool.

Flow-Control Pumpout Section and check valves mitigated sand flow

The Flow-Control Pumpout Section helps provide clean samples even when sand enters the RDT tester. The pump is rated to handle 40 percent solid slurry. If sand flows into the tester, the pump can process it better than other testers. The pump also uses a unique mud check valve system that wipes the valve seat clean with every stroke of the pump. The use of this system helped keep solids from plugging equipment during the operation, minimizing downtime. Clean samples were collected for both operators in just 30 hours per well.

“These were the cleanest samples we’ve ever seen from this type of formation.”

Operator

Independent Oil & Gas Company

Halliburton's RDT™ tester with Oval Pad increased sampling efficiency with 95 percent of the samples having less than five percent contamination



RDT™ tester with Oval Pad designed for efficient operations

Fluid samples and pressure measurements taken from these four wells needed to be completed as quickly as possible because of the high cost of operations on deepwater rigs. The larger pad size on the RDT tester with Oval Pad has a faster flow rate — at least four times faster than conventional testers — allowing clean samples to be obtained more efficiently. Pressure measurements for fluid gradients were also obtained more efficiently. Halliburton identified pressure gradients 25 percent faster than previous attempts, saving the operators 2.5 hours and \$104,000.

95 percent success rate saved operators time and money

Innovative engineering combined with formation expertise provided samples with the lowest contamination rates obtained from this unconsolidated formation. Halliburton collected nearly 30 samples in depths ranging from 18,000 to 22,000 feet. 95 percent of the fluid samples collected had less than five percent contamination. Halliburton's efficiency and effectiveness saved the operators several days in nonproductive time.



Collaboration and on-site Halliburton experts promoted efficiency

Another key to the success of this operation was the collaboration between Halliburton and the operators. Halliburton experts with knowledge of unconsolidated formations were on hand to assist with real-time monitoring during sample collection. These experts worked with the operators to help make critical decisions during the sampling and interpret the data after the samples were collected.



Operators called samples "cleanest" they had ever seen

The operators were impressed with the performance of Halliburton's RDT tester with Oval Pad. One operator said, "These were the cleanest samples we've ever seen from this type of formation."