A CASE STUDY: The value of portable wireline infrastructure for frontier exploration

Exploring one of the world’s largest natural gas finds in an area with no oilfield infrastructure

Halliburton’s unique, mobile wireline facilities provide cost-effective, reliable, support for operator’s deepwater exploration efforts in Tanzania.

OVERVIEW

With virtually no oilfield infrastructure or support services, Tanzania has turned into one of the hottest frontiers in the global oil and gas industry. One operator has already confirmed recoverable reserves of 10-13 trillion cubic feet of natural gas offshore in deep water. Despite the country’s lack of oilfield infrastructure and Halliburton’s lack of a fixed base there, Halliburton successfully supported that operator with cost-effective, wireline testing and sampling services on five deepwater exploration wells – two with sidetracks. The keys: portable infrastructure, proven technology and reliable processes that overcame logistical hurdles. Of special note: unique, containerized lab and maintenance operations. They were “ready to go” when they reached the rig. Shipped from Aberdeen, these mobile facilities successfully supported all of the wireline services needed – without large, fixed overhead costs. As a result, the operator gave Halliburton a new contract for potentially up to six more years.

CHALLENGE

<table>
<thead>
<tr>
<th>Logistics</th>
<th>SOLUTION</th>
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<tr>
<td>Tanzania has only one deepwater port, Dar Es Salaam. The nearest staging base to the deepwater wells is Mtwara, more than 250 miles south. Because of poor roads, all equipment had to be shipped via barge from Dar Es Salaam to Mtwara, then another 62 miles offshore to the rig.</td>
<td>Containerized R&amp;M and lab facilities</td>
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<td></td>
<td>Halliburton assembled and tested all equipment needed for Tanzania in Aberdeen, Scotland. Employees also rehearsed there for the unique requirements of the operator. Then the crew accompanied the equipment to Tanzania. Every job finished ahead of schedule and accomplished its objectives.</td>
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<td>No oilfield infrastructure and tight timetable</td>
<td>Exceptional planning/processes</td>
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<td>Because Tanzania had no oilfield infrastructure, all expertise and equipment had to be brought in from abroad. If it wasn’t on the ship, the client wouldn’t have it when needed. Moreover, the client expected Halliburton to begin operations less than six months from the award of contract.</td>
<td>Halliburton mobilized experts in the UK, Middle East and South Africa. Halliburton ordered long lead-time parts and assigned a regional coordinator ahead of the project award. Halliburton's processes covered everything from obtaining work visas to ways to legally expedite customs clearance.</td>
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<td>Extra expense due to threat of piracy</td>
<td>Greater efficiency</td>
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<td>Pirates operating in Somalian waters had expanded their operations into Tanzanian waters, threatening the rig, barges, crew and supply ships. Halliburton worked within the security parameters provided by the Tanzanian military and the customer to ward off pirates and keep everyone safe.</td>
<td>Military costs added pressure to get in quickly, operate efficiently, and get out without NPT. In each well, Halliburton performed focused sampling and a mini-DST in one run, saving the time of an extra deepwater run of 5,200 meters. The client saved money and everyone returned home safely.</td>
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Solving challenges.
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ABERDEEN TO DAR ES SALAAM TO MTWARA TO 100 KILOMETERS OFFSHORE

Halliburton staged the Tanzania projects from Aberdeen. Equipment and crews rehearsed operations and assembled equipment there. Then they traveled to Dar Es Salaam via ship, Mtwarra via barge, and the rig via supply ship. Everything and everyone were “ready to go” upon reaching the rig – despite encounters with pirates.

MAINTENANCE FACILITY IN A BOX

Halliburton designed containers for testing, preventive maintenance, calibration, troubleshooting and repairs to all tools, boards and components.

TWO RUNS REDUCED TO ONE

2,600 METERS

5,200 METERS

Mini-DST and focused sampling were combined in one run with the help of the reliable Halliburton Reservoir Description Tool (RDT™) tester. This saved a round trip to 5,200 meters.

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A one-well project turned into two wells then five. Halliburton completed wireline services on each ahead of schedule. As a result, the operator gave Halliburton a new two-year contract with two optional extensions, each for two additional years.

CONTRACT EXTENSIONS VALIDATE PORTABLE INFRASTRUCTURE APPROACH FOR FRONTIER PLAYS

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Solving challenges™

HALLIBURTON
In Tanzania, a country without any oilfield infrastructure, Halliburton provides cost-effective, local wireline support via “portable infrastructure.”

**Tanzania – one of world’s largest recent natural gas finds**
Tanzania’s Energy and Minerals Minister estimates that the country’s 40 trillion cubic feet of natural gas reserves could more than double by 2015. Halliburton’s client alone has already proven 10-13 trillion cubic feet of reserves. But as with any frontier play, the operator’s exploration campaign has had its challenges.

**Deepwater development with no oilfield infrastructure**
Water depths range up to 3,000 meters. Tanzania has no oilfield infrastructure, few skilled oilfield workers, and only one deepwater port, Dar Es Salaam. Mtwara, the staging city for the operator’s offshore wells, is more than 500 kilometers south of Dar Es Salaam. The road cannot handle heavy oilfield trucks. All equipment bound for Mtwara must be transferred to barges and then transferred again to supply ships bound for drill rigs more than 100 kilometers from shore.

Further complicating things: Somalian pirates have now expanded their operations into Tanzanian waters and pose an ever-present threat. As a result, the Tanzanian military must guard all shipments and drill rigs, adding to the cost of operations. This places a extra imperative on speed and efficiency.

**Mobile facilities meet logistical challenges, technical demands**
Before being awarded a deepwater contract to provide wireline services in Tanzania, Halliburton had no permanent facilities there. For such remote, frontier plays, Halliburton uses portable infrastructure – standard 20 foot and 40 foot long shipping containers outfitted for repair, maintenance, testing, warehousing, and calibration of all equipment.

Before the contract award, Halliburton assigned a regional coordinator in Aberdeen, Scotland, to identify the operator’s needs, plan logistics, locate tools and spare parts that had long lead times, and begin building a team.

**Preparation eliminates delays, NPT**
After winning the contract, the team tested and assembled in Aberdeen all the equipment it would need in Tanzania, rehearsing special operations they would need to perform in the field for the client. Then, key members of the team travelled with the equipment every step of the way to the rig. All of the equipment arrived on schedule. During the five-well campaign, the customer’s objectives were all met.

**Established processes show the way in uncharted waters**
Halliburton’s unique processes helped ensure that nothing was left to chance. Built on lessons learned around the world during the last century, they include guidelines for everything from tool preparation and testing to descriptions on bills of lading that will speed shipments through customs.
In Tanzania, a country without any oilfield infrastructure, Halliburton provided cost-effective, local wireline support via “portable infrastructure.”

**Every job finished ahead of schedule**
Thanks to rigorous processes, the rehearsals in Aberdeen, and the Tanzanian military (which fended off pirates), every task on every well finished within the scheduled time. Rig-up was exceptionally quick, especially considering some of the complex tool strings, which required as many as 13 different components.

**Fluid sampling and mini-DST conducted on same run**
To eliminate what normally would have been a second 10,000-meter round trip in each well, Halliburton collected fluid samples from multiple depths and performed mini-drill-stem tests (DSTs) on the same run.

**New optical fluid analyzer delivers lab quality results downhole**
Halliburton also deployed its optical fluid analyzer. This game-changing technology produces lab-quality results downhole. The optical bandwidth of this new technology exceeds that of current, industry-standard optical fluid analyzers by tenfold (from 200 to 5,000 nm). As a result, a wider range of fluids can be identified in hostile conditions with higher certainty than ever before. It enabled Halliburton to analyze fluids being pumped through the RDT device and understand when contamination reached its lowest possible point. It thus helped collect the cleanest possible samples in the shortest time.

**Achieving multiple objectives in record run**
Halliburton performed numerous tests in both open and cased holes. They included VSPs, cement evaluation, NMR, sampling, coring, PVT and more. Halliburton combined numerous wireline modules to achieve multiple objectives in one run with maximum efficiency. Each tool performed flawlessly thanks to on-site maintenance and repair, which kept all tools in excellent operating condition and held NPT to a minimum. Halliburton’s work finished ahead of schedule on each of the five wells due to the efficiency of the team, its strategy and its tools.

**Operator rewards Halliburton with contract extension, additional work**
Initially, Halliburton’s wireline contract with the operator in Tanzania covered two wells. Based on performance and savings, the operator extended that contract to five wells, including two sidetracks. At the end of that contract, the client awarded Halliburton a new two-year contract with options for two optional extensions – each for two years. Together, they make this second contract a potential six-year contract. The new contract validates the efficacy and cost effectiveness of portable infrastructure for remote, exploratory frontier plays.

But the story doesn’t end there. The operator’s success in Tanzania opened the door for work in Mozambique and other parts of east Africa. Halliburton currently provides Wireline and Perforating services, Consulting and Project Management services, drilling fluids, drill bits, cementing, and completion tools to the client in the region.