Leading oil company overcame logistical challenges to develop major frontier finds in deep water

OVERVIEW
This operator began a deepwater exploration campaign in Indonesia, which expanded across international borders into the Philippines. The remote locations and limited infrastructures created extreme logistical challenges. The operator and Halliburton had to transport critical equipment back and forth across Indonesia, Malaysia and the Philippines. In addition, fractured carbonate reservoirs and gas hydrates presented many technical challenges.

Halliburton built new facilities, leveraged existing supply ports and sent subject-matter experts on site. Efficient logistics, custom technologies and on-site collaboration helped the operator drill a wildcat well in Indonesia 21 percent ahead of schedule. In the Philippines, the oil company set a record for the deepest well drilled in the country.

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<th>CHALLENGE</th>
<th>SOLUTION</th>
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<td>Reserve replacement</td>
<td>Local experience</td>
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<td>To replenish reserves, the oil company found itself exploring increasingly remote locations, which created greater logistical challenges. And, because so much about these reservoirs was unknown, the operator needed to collect extensive data.</td>
<td>Halliburton sent leading experts and rig crews to Indonesia and the Philippines to provide logistics, geological and geophysical support. Experience and consistent personnel helped the operator continually increase efficiencies.</td>
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<td>Frontier play</td>
<td>Meticulous planning and communication</td>
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<td>Though Halliburton had limited infrastructure in Indonesia, it had no infrastructure in the Philippines. Its nearest port was more than 550 kilometers away — about a day-and-a-half sail. Any hitch in the supply chain could easily cost the operator millions of dollars in nonproductive time (NPT).</td>
<td>Halliburton leveraged existing infrastructure, built new facilities and stored multiple backups on site to support remote operations. Teams developed a project quality plan to ensure safety and compliance with various customs regulations without slowing down operations.</td>
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<td>Carbonate reservoirs and gas hydrates</td>
<td>Innovative evaluation and modeling technology</td>
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<td>The exploration wells were located in karstified carbonate reservoirs. Intricate fractures and unpredictable porosity changes make carbonates some of the most complex reservoirs to characterize, model, manage and drill. In addition, gas hydrates — and the hazards associated with them — threatened well and platform stability.</td>
<td>Halliburton recovered various core samples, took acoustic velocity measurements while drilling and performed oriented fluid sampling using a navigation sub. The data improved understanding of the formation, allowing Halliburton to determine optimal mud weight and create an effective lost-circulation strategy.</td>
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A CASE STUDY: Deepwater exploration in Indonesia and the Philippines

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Closest supply port 550 km

Because of the Philippines project’s remoteness and lack of infrastructure, Halliburton supported it from facilities in Malaysia and Indonesia. The closest port was in Labuan, Malaysia – about 550 kilometers away.

Throughout the Asia Pacific exploration campaigns, the oil company operated in 1,500+ meters of water.

1,500 to 2,200 meters of water THROUGHOUT CAMPAIGN

Solving challenges.™

Halliburton

Saved

$8 MILLION

Modified GeoTap® Plus formation pressure tester helped the operator reduce rig days, eliminate casing string and save approximately $8 million.
Operator sought to replenish reserves through a frontier play
This international oil company embarked on a deepwater exploration campaign off the coast of Indonesia which soon expanded into the Philippines. Throughout the campaign, water depths ranged anywhere from 1,500 meters to 2,200 meters. The region’s remote location, limited infrastructure, gas hydrate accumulations and fractured carbonate reservoirs provided a host of new, unique challenges. Halliburton had to establish new ports, leverage existing facilities and stockpile supplies to support exploration with minimal risk.

Operator ranked Philippines as one of its more difficult projects
Halliburton had no infrastructure in the Philippines. The nearest port was in Malaysia, more than 550 kilometers away. Halliburton coordinated and fast-tracked the movement of personnel, supplies and equipment across three international borders. This involved obtaining import and export permits for every country and gaining approval from national, state and local governments.

On-site experts provided 24/7 planning and communication
Adding to the challenges: an Indonesian mandate that prohibited geological data from leaving the country. Halliburton sent leading subject-matter experts on site to deliver quality control and timely data analysis. Teams from both companies met daily to ensure that results consistently met expectations.

Consistent crews helped transfer knowledge and improve efficiencies
Halliburton used the same crews in Indonesia and the Philippines. This improved collaboration, knowledge sharing and efficiency. Through lessons learned, teams decreased rig days and fluid costs, resulting in considerable savings. For example, in one well, a modified GeoTap® tool helped reduce rig days by eliminating a casing string. This saved the operator approximately $8 million. In another well, Halliburton executed a 60-degree build 21 percent ahead of target.

Oil company needed accurate data about complex reservoirs
To learn the production potential of these deepwater exploration wells, the operator gathered extensive data. The area is characterized by heavily karstified carbonate reservoirs. This presented several technical challenges. First, most carbonate reservoirs contain natural fractures that can range from microscopic to a mile long. Second, porosity and permeability varies significantly throughout these reservoirs. Because of this, it can be difficult to obtain complete data, create accurate models and drill without incurring circulation losses.
International oil company unlocked new reserves in remote deep water

Customized Halliburton technology delivered critical well information
Halliburton recovered and analyzed various core samples. Then, Halliburton used a QBAT™ multipole LWD sonic tool and modified GeoTap® Plus formation pressure tester to take downhole measurements, such as porosity, permeability and pore pressures while drilling. Halliburton even created a modified Reservoir Description Tool (RDT™) probe to take fluid samples using a navigation sub. Using INSITE Anywhere® Service, experts analyzed the data in real time. This allowed the operator to adjust drilling parameters as needed.

Halliburton ran additional gamma ray, resistivity and triple combo evaluations with openhole wireline to ensure data was as complete as possible. With thorough knowledge of the reservoir, the operator and Halliburton were able to safely drill through gas hydrates, identify and avoid fractures, determine optimal mud weight and develop an effective lost-circulation strategy.

New mud plant helped ensure zero NPT due to lack of fluids
To provide an adequate drilling fluids supply, Halliburton built a custom, $2.6 million liquid mud plant (LMP) in Indonesia. It featured a 12,000 bbl base oil storage facility with a 7,000 bbl non-aqueous fluid storage and mix tank, 4,800 bbl brine plant and a 9,000 ft³ foot bulk plant. For wells in the Philippines, Halliburton stored mud from the Indonesia plant on multiple support vessels near the rig. Teams also worked with a Malaysian operator to set up a backup LMP facility as a contingency.

Halliburton managed circulation losses and continued supplying fluids without impacting operations. This contributed to zero NPT due to lack of product or technical delivery. The oil company recognized Halliburton for providing the best fluids support for a new rig start-up.

Operator overcame extreme logistical and technical challenges
In addition to fluids support, the operator recognized Halliburton for its safety leadership, personnel, technical support and efficiency. Through creative logistics, thorough preparation and state-of-the-art technology, the oil company successfully operated in one of the most remote exploration plays in the world.

Drilled deepest well in the Philippines
Halliburton helped the operator drill the first well in the Philippines campaign ahead of schedule and under budget. At 5,000 meters total depth, the well set a record for the deepest well ever drilled in the country.