Deepwater Risk Mitigation

Industry-leading Formation Evaluation Technologies for Deepwater Solutions

FORMATION EVALUATION CAPABILITIES

Solving challenges.™
Industry-Leading Capabilities Reduce Risk

Deepwater wells are reaching farther and into higher-temperature and higher-pressure environments than ever before. The high financial, human and technical risks of deepwater exploration and production make it imperative to use the best equipment possible.

**Best Ultra-Deepwater Package in the Industry**
Halliburton now has a full complement of new wireline and perforating technologies that give you unique, industry-leading capabilities specifically for deepwater formation evaluation. These solutions are designed to meet the extreme demands of the next generation of deepwater wells exceeding 40,000 feet.

These new capabilities include:
- Industry-leading cable technology
- Industry-leading drum capacity
- Industry-leading capstan capacity
- Industry-leading hydraulic jars
- Industry-leading unit capacity
- High-pressure capability, exceeding 35,000 psi
- High-temperature capability, up to 500°F (260°C)

**Reaching Further, Doing More – Safely**
Together, these capabilities allow you to go deeper faster and with less risk. It’s now possible to:
- Make fewer trips by combining more tools safely
- Perform TD logging in the deepest, highest-pressure wells
- Take accurate readings in higher temperatures and pressures
- Meet extreme operating requirements and still maintain a generous safety margin
- Safely overcome sticking without damaging tools or cable

What makes these capabilities interesting is not just that they are the best in the industry. It’s that they can enable you to perform extreme operations safely and routinely. If you haven’t looked at Halliburton Wireline and Perforating Services lately, perhaps it’s time. Learn more on the pages that follow.
The Industry’s Highest-Capacity Capstan

With an 18,000-pound tension-assist rating, Halliburton’s new capstan is designed to handle virtually any situation. In deep and ultra-deep wells, this capstan is a critical component that enables us to operate safely without sustaining cable damage at higher tensions than ever before.

**Optimized Performance**
Many capstans are designed to constantly work against the force of the drum. Our capstan is designed using an assist system that takes the direction of the drum as input, so the drum and capstan are always working together.

**Mounting Options**
Unlike some competitive capstans, our capstan allows for flexible mounting options. Depending on the situation and client preference, the capstan can be mounted on the deck or mounted in the derrick.

**Improved Safety**
In addition to optimized performance, Halliburton’s powered capstan offers improved safety when it is mounted in the derrick. Not only are there fewer surface components exposed to high tension, but that tension is focused straight down the well. This means that if there is a problem, the high-tension energy in the cable is directed into the hole instead of on the rig floor or with the rig-up equipment. The derrick-mounted configuration can provide the safest system in the industry, and has the added benefit of significantly reducing the amount of destructive torque and tension applied to the cable and rig-up equipment.
Formation Evaluation Capabilities

The Industry’s Highest Capacity Unit and Drum

Versatile Wireline Unit
Halliburton’s latest control unit is the industry’s only wireline unit that is designed for open hole, cased hole and slickline operations. By combining multiple functions into a single unit, we can dramatically reduce the footprint of wireline operations on an offshore rig. And thanks to cross-trained experts, operators can benefit from more services delivered by fewer personnel on the rig. It also helps to simplify logistics and reduce the time between operations by having the necessary equipment in place.

Halliburton’s wireline unit is unique in the industry in that it does not always require the capstan for high-tension operations. Its high-performance direct-drive system allows the unit to pull more than 20,000 pounds of force safely. That’s about twice as much as traditional chain-driven systems, and enough to eliminate the requirement for a capstan in some situations.

Pre-Job Modeling to Mitigate Risk
Halliburton uses the Cerberus™ modeling system for pre-job planning on every job. This system quantifies the risk of a job and determines the lowest-risk solution. That allows us to customize each job to help prevent stuck tools or fishing operations by using the optimum and safest possible conveyance equipment for any specific situation. For example, in some cases, eliminating the capstan may reduce the complexity of a job without reducing operational performance.

Reliable Direct-Drive System
Traditional wireline units in the industry use a chain drive on the drum that can introduce the risk of a link breaking during a high-tension operation, which could then lead to an expensive fishing job. Halliburton’s wireline unit uses a robust hydraulic direct-drive drum system that helps mitigate the risk and allows for improved performance and safety.

HIGHEST-CAPACITY WIREFRAME DRUM WITH MORE THAN 8 MILES OF CABLE

Large Open Hole Drum Capacity
We now offer the industry’s largest wireline drum capacity with more than 44,000 feet of ultra-high-strength cable. This allows operators to successfully log wells approximately 10% deeper than competitive systems, expanding the operating capabilities for ultra-deep wells.

The unit features fully redundant logging and control systems for improved reliability during mission-critical operations.

Unlike many wireline systems, Halliburton’s wireline unit and drum are two separate components that can be placed anywhere on the rig for optimal efficiency and safety.

Cerberus™ is a trademark of NOV CTES.
The Industry’s Highest Capacity Cables and Only Hydraulic Jars

**Stronger, More Reliable Cables**
Halliburton’s ultra-high-strength wireline cables have the highest breaking strength in the industry at 35,000 pounds, with a safe operating capacity of up to 23,000 pounds of tension. This results in an operating safety margin of 12,000 pounds, the highest in the industry. The ultra-high-strength cables also feature extreme crush resistance, making these cables the most reliable option for wireline operations in deepwater wells.

**Run an Entire Job without Changing Cables**
Halliburton cables are designed with the industry’s lowest-impedance conductor package. The impedance and capacitance of our deepwater cables allow operators to run all wireline services, in even the deepest wells, without any limitations on power or telemetry – and without wasting time changing wireline cables for individual services. This is critical for running advanced sampling tools and services such as the Reservoir Description Tool (RDT™) or new CoreVault™ system.

**Releasable Wireline Cable Head – RWCH™ System**
Traditional wireline tools have included a mechanical release system that allows the operator to increase the pull on the line to detach the cable in case the tools get stuck downhole. In ultra-deepwater wells, wireline cables are designed to operate with much higher loads, and it would be impractical to create a release system that depends on that much breaking force just to release the cable head. Instead, we use a unique and field-proven releasable cable head that is a single, solid device. When the operator needs to release the cable, the RWCH system is activated from the surface. This allows the operator to run far more weight on the cable without sacrificing the safety of a releasable cable head, enabling Halliburton to routinely operate at higher tensions in tougher environments than our competitors.

**Unique Hydraulic Jar – LockJar® System**
Wireline jars are a proven technology for freeing stuck tools and avoiding expensive fishing operations. However, each time the jars are activated, there is a risk that tool electronics may be damaged, requiring an additional run to complete the job. Halliburton’s LockJar® system is the only wireline jar with a built-in hydraulic delay that allows operators to attempt to free a stuck toolstring by pulling to the maximum safe tension of the cable before applying a jarring force. If the tools are still stuck after pulling for 30 to 45 seconds, the jar fires, applying significant focused force to free the stuck toolstring. This delay greatly decreases the likelihood of damaging a stuck tool, improving reliability and ultimately saving rig time and reducing costly fishing operations. Results from the LockJar system have proven to be more than 90% successful in retrieving stuck tools industry-wide.

**Reduce Toolstring Friction with I-Wheel™ Rollers**
Deepwater operations often require extremely heavy toolstrings that reduce the amount of overpull that can be used to free stuck tools. Halliburton uses I-Wheel rollers that create low contact areas on wireline toolstrings, reducing friction by up to 60%. The rollers are adaptable for various tool and hole sizes, so they provide a simple way to mitigate the risk of having to perform time-consuming fishing jobs. The reduced friction also enables wireline conveyance in situations that previously required tractors or pipe-conveyed logging.
DeepSuite™ High-Performance, High-Pressure Sensors
Halliburton’s DeepSuite™ tools represent the latest generation of formation evaluation technology. DeepSuite tools feature industry-leading pressure capabilities up to 35,000 psi. These tools are ideal for meeting the challenges of ultra-deepwater wells.

This full petrophysical suite of tools includes a dipole Array Sonic Tool, a Reservoir Description Tool (RDT™) and the Hostile Rotary Sidewall Coring Tool (HRSCCT™) systems capable of working in a 35,000psi well, along with other advanced measurement sensors. And with additional DeepSuite tools in development, we are continuing to push the limits of the operating environment for formation evaluation tools.

Opening New Horizons in Formation Evaluation
Halliburton is the only company in the industry capable of logging ultra-deep wells (40,000 feet) that exceed 30,000 psi. Operators can now gain valuable insights into a new generation of wells with extreme conditions.
Tools that Can Take the Heat

**High-Performance Tools with the Latest Sensor Technology**
Operators working in deep and ultra-deepwater wells often encounter extremely high pressure and temperature that can cause inferior tools to fail. Halliburton’s HEAT™ Suite tools are rated up to 500°F and 30,000 psi, so they can withstand even the most hostile environments.

The latest generation of HEAT Suite tools includes state-of-the-art sensor technology for the most accurate possible logging information. These cutting-edge tools include array induction sensors and dipole sonic sensors for petrophysical analysis.

**High-Temperature Formation Tester**
The latest version of Halliburton’s Hostile Sequential Formation Tester (HSFT-II™) tool routinely performs pressure tests and fluid sampling in temperatures up to 450°F (232°C). The efficient design is smaller and lighter than most of the tools on the market, so it can operate even in small wellbores, making it the ideal choice for mission-critical, high-temperature formation testing.

**High-Pressure, High-Temperature Coring Tool**
Our Hostile Rotary Sidewall Coring Tool (HRSCT™) system takes large 1.5-inch diameter cores. But where many large-size coring tools struggle to operate in high temperatures and pressures, the HRSCT tool is designed to operate in wells reaching 400°F (204°C) and 35,000 psi. As an added bonus, it works on the same wireline used to perform other logging operations.

**Full Conveyance Package Rated to 500°F**
Halliburton has a complete package of risk-mitigating conveyance solutions rated to 500°F. This package includes cables, jars and releasable cable heads, so operators can use the most advanced tools in the most extreme wells with fewer concerns about failure due to temperature.
Advanced Solutions for Mitigating Risk

**New Halliburton Free-Point Tool (HFPT) is Changing Art to Science**

Old-fashioned free-point tools required a large amount of guesswork and trial-and-error to pinpoint the location of stuck pipe, resulting in a lot of nonproductive time and potentially dangerous situations. Halliburton’s new HFPT is the safest, easiest and quickest way to locate stuck pipe. It measures the magnetic characteristics of metal to see exactly where the pipe is sticking in less than half the time of traditional tools, which require tensioning the pipe repeatedly. That helps to reduce the financial and technical risks associated with stuck pipe.

**World Leader in Slickline Services**

Halliburton is the world leader in slickline services. We have a complete portfolio of services and innovative combo units capable of running both slickline and wireline. Having both services available on the rig gives operators the option to run the best tools for their situation, without wasting time during operations.

**Industry Leading Tubing-Conveyed Perforating for Deep Water**

We offer a full range of charges and gun systems appropriate for virtually any type of formation. Additionally, Halliburton’s Advanced Perforating Flow Laboratory is the only facility in the world that can simulate perforating conditions found in deep and ultra-deepwater wells. This capability allows us to develop shaped charges specifically for deep water that can dramatically improve perforating efficiency.

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**Safest Seismic Source Deployment System in the World**

Halliburton’s unique Moby source deployment system does not require a crane on the back deck of a vessel, which helps the operator deploy and retrieve guns quickly and safely. The Moby system can be operated remotely, keeping personnel out of harm’s way. Additionally, Halliburton has extensive experience with borehole seismic operations, and offers a multilevel downhole geophone array rated to 30,000 psi.
Experience, People, Processes and Safety

Significant Experience in Deep Water
Last year alone, Halliburton completed more than 800 deepwater jobs globally with more than 35,000 operating hours. And we have leveraged that global experience to develop deepwater-specific processes and procedures that help minimize risk and improve operations in any deepwater environment.

Resourceful Personnel
Halliburton specifically seeks out experienced and resourceful personnel who understand the challenges of deepwater plays. We also invest in extensive training and competency programs to ensure that every deepwater job is handled by some of the most knowledgeable experts in the field.

Commitment to Service Quality and Safety
Halliburton believes safety is everyone’s business. That is why every person at every location worldwide makes safety awareness his or her number one priority. Every member of every Halliburton team is tasked with taking personal ownership of his or her own safety and the safety of others.

Service quality is embedded into each element of Halliburton’s delivery process. From the development of unique solutions to the manufacture and delivery of our products and services, service quality is a continuous focus of each member of the Halliburton team.

Halliburton personnel, both in the field and in the lab, contribute to our continued leadership in deep water.
The Safest and Lowest-Risk Choice for Formation Evaluation in Deep Water

Halliburton has absolutely everything needed to help safely and successfully perform jobs in any deepwater environment. The innovative solutions that we offer feature new capabilities that are redefining what is possible in ultra-deepwater plays and enabling new levels of risk mitigation for operators.

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<td>- HFPT quickly and safely locates free point</td>
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Unmatched Capabilities

Halliburton Wireline and Perforating Services now has a full complement of technology for deepwater formation evaluation. This new technology gives you unique, industry-leading capabilities, allowing you to go deeper faster and with less risk.

- INDUSTRY-LEADING Unit Capability
- INDUSTRY-LEADING Capstan Capability
- INDUSTRY-LEADING Drum Capacity
- INDUSTRY-LEADING Cable Technology
- INDUSTRY-LEADING Hydraulic Jars
- HIGH-PRESSURE 30,000 to 35,000-psi Capability
- HIGH-TEMPERATURE 500°F Capability

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

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