Deepwater Capabilities

INDUSTRY-LEADING TECHNOLOGIES FOR DEEPWATER SOLUTIONS
Industry-Leading Capabilities Improve Efficiency and Reduce Risk

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

BEST DEEP WELL, DEEPWATER PACKAGE IN THE INDUSTRY

Halliburton has a full complement of wireline and perforating technologies that provide unique, industry-leading capabilities specifically engineered for deepwater formation evaluation. These solutions are designed to meet the extreme demands of the next generation of deepwater wells that will exceed 40,000 feet.

These solutions include:

» Industry-leading cable technology
» Industry-leading drum capacity
» Industry-leading capstan capability
» Industry-leading hydraulic jars
» Industry-leading surface unit capability
» Industry-leading high-pressure capability – 35,000 psi
» Industry-leading high-temperature capability – 500°F (260°C)

Reaching Deeper, Doing More – Safely

Together, these capabilities allow you to drill deeper faster and with less risk. It’s now possible to:

» Increase efficiency by using unique tool combinations
» Perform comprehensive full-suite TD logging in the deepest and highest-pressure wells in the industry
» Provide advanced formation evaluation technology in the highest temperatures and pressures
» Offer multiple technologies to address challenging well environments
» Deliver safe and reliable solutions in extreme operating environments

Not only are these capabilities comprehensive, they enable you to perform extremely challenging operations safely and routinely. Halliburton is a leading service provider of wireline logging and perforating in the most demanding wells in the world. Learn more on the pages that follow.
The Industry’s Most Versatile Capstan

With an over 18,000-pound tension-assist rating, the flexibility of the Halliburton capstan can handle virtually any situation. In deep and ultradeep 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

Other capstans are designed to work as the primary conveyance force. Our capstan is an assist system that uses the direction of the drum as input. Consequently, the drum and capstan work together to yield a dynamically balanced force.

Mounting Options

As opposed to conventional capstans, our technology allows for flexible mounting options. Optimized for each situation and client requirement, our powered capstan offers options for mounting, including on the derrick, deck, or in front of the unit.

Enhanced Safety Capabilities

In addition to optimized performance, the Halliburton powered capstan offers enhanced 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 the high-tension energy in the cable is directed into the well instead of exposing the rig-up equipment or the rig floor to a potentially hazardous situation. The derrick-mounted configuration provides the safest system in the industry, and has the added benefit of significantly reducing stress and torque applied to the cable and rig-up equipment.
The Industry’s Highest Capacity Unit and Drum

**SUPER COMBO WIRELINE UNIT**

The Halliburton surface unit is the industry’s only fully integrated wireline unit that is designed for openhole, cased-hole and slickline operations. By combining multiple functions into a single surface system, we can dramatically reduce the footprint of complex 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. The Super Combo unit helps simplify logistics, reduces operating time and has the most comprehensive capability of any winch unit in the industry.

The Halliburton Super Combo wireline unit is unique in the industry in that it does not always require the capstan for high-tension operations. The high-performance direct-drive winch system has the capability to apply more than 60,000 pounds of force. That’s 400% more force than a traditional chain-driven system. This can eliminate the requirement for a capstan in some situations.

**Prejob Modeling to Mitigate Risk**

Halliburton uses the Cerberus™ modeling system for prejob planning on every deepwater job. This system analyzes the tension profile on a job and determines the lowest-risk solution. The analysis allows us to customize each job for the safest optimum configuration, with the equipment required for the specific situation. Equipment variables include:

- Tool length
- Tool weight
- I-Wheel™ rollers
- Cable standoffs
- Tool standoffs
- Cable type
- Friction

In some cases, eliminating the capstan may reduce the complexity of a job without reducing operational performance. Additional analysis can include differential pressures and rugose boreholes.

**Large Openhole Drum Capacity**

Our standard deepwater high-strength drum holds over 42,000 feet of ultrahigh-strength PowerPull™ cable. In addition, we offer the industry’s largest wireline drum capacity with more than 47,000 feet of ultrahigh-strength cable. Halliburton routinely provides safe and efficient operations on the deepest wells in the industry.

Top left » Unlike many wireline systems, the versatile Halliburton wireline unit includes a cabin, drum and power pack that can be positioned in a configuration on the rig for optimal efficiency and safety.

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

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

**STRONGER, MORE RELIABLE CABLES**

The Halliburton PowerPull™ ultrahigh-strength wireline cables are rated at 40,000 pounds, with a safe operating tension of up to 30,000 pounds. This innovative cable is a significant advancement over previous high-strength wireline cables. The design of this ultrahigh-strength cable incorporates torque-balanced inner/outer armor and is extremely crush resistant, providing a step change in performance for wireline operations in deepwater wells. This capability has been proven to avoid expensive fishing operations on multiple ultradeepwater wells.

**Run an Entire Job without Changing Cables**

Halliburton PowerPull cables are designed with a low-impedance conductor package. The impedance and capacitance of our deepwater cables allow operators to run all wireline services on even the deepest wells. Our deepwater power system and enhanced telemetry can operate without limitations on power or telemetry, and avoid wasting time changing wireline cables for individual services. This capability is critical for running advanced sampling services like the Reservoir Description Tool (RDT™) service and Xaminer® Rotary Coring Tool, individually or combined. In addition, complex logging services like the Xaminer® Array Sonic (XAST™), High-Fidelity Borehole Imager and Multicomponent Induction Tool (MCI™) services can also be run simultaneously.

**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 when tools get stuck downhole. In ultradeepwater wells, wireline cables are designed to operate with much higher loads. Halliburton uses a unique, field-proven, time-tested releasable cable head that is upgraded for 35,000-psi operations. When an operator needs to release the cable, the RWCH system is activated from the surface. This allows us to run far more tension on the cable without sacrificing the safety of a releasable cable head. Halliburton can also run a redundant mechanical weak point up to 20,000 pounds in conjunction with the RWCH system.

**REDUCE TOOL STRING FRICITION WITH I-WHEEL™ ROLLERS**

Deepwater operations often require extremely heavy tool strings 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 tool strings, 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.

**Unique Hydraulic Jar – LockJar® System**

Wireline jars are a proven technology for freeing stuck tools and avoiding expensive fishing operations. The Halliburton LockJar® system is the only wireline jar with a built-in hydraulic delay that allows operators to attempt to free a stuck tool string by pulling to the maximum safe tension of the cable before applying a jarring force. If the tools remain stuck after applying overpull for 40 seconds, the jars fire, applying significant focused force to free the stuck tool string. 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.
The Only 35,000-psi Tool Suite in the Industry

**DEEPSUITE™ HIGH-PERFORMANCE, HIGH-PRESSURE SENSORS**


This full petrophysical suite of tools includes a dipole Xaminer® Array Sonic Tool (XAST™) service, the Reservoir Description Tool (RDT™) service, Xaminer® Hostile Formation Tester (XHT), Xaminer® Multicomponent Induction (MCI) service, the industry’s only 30,000-psi 30-level borehole seismic array with triaxial 4-component geophones and the Xaminer® Rotary Coring Tool capable of working in a 35,000-psi 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.

The RDT/Rotary Coring combination offers the only combinable formation fluid and core sampling service in one trip into the well. Our Circumferential Acoustic Scanning Tool - Extended Range (CAST - XR™) openhole imaging tool is the industry’s only 35,000-psi acoustic imager that works in 18,000-pound wellbore fluid, and our Xaminer® Magnetic Resonance (XMR™) service is the industry’s only fully combinable 35,000-psi NMR tool.

Well integrity considerations start in the planning process of a well and continue throughout its life cycle. For new wells, we have created innovative technologies that can evaluate pipe and cement conditions in the toughest environments in the world. The CAST-XR/Pad Bond Tool (PBT)/Borehole Sonic Array Tool (BSAT™) combination is the industry’s only ultrahigh-pressure tool package that can operate in 35,000-psi, 18-lb/gal drilling fluid systems for both thin and thick pipes for pipe and cement evaluation. Through maturing of wells, we offer leading technologies in diagnostics for monitoring and locating integrity issues with our Electromagnetic Pipe Xaminer® V (EPX™ V) and Acoustic Conformance Xaminer® (ACXTM) services. And, for plug and abandonment operations, we have invested in new practices and technologies to save our customers time and money.

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**REACHING NEW HORIZONS in Formation Evaluation**

*Halliburton is the only company in the industry capable of logging and sampling ultradeep wells (45,000 feet and 35,000 psi). Operators can now gain valuable insights into a new generation of wells in extreme conditions. We have provided excellent borehole seismic data and recovered rotary coring samples where our competitors failed and stated it was impossible.*

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*Top » The Halliburton Xaminer® Coring tool includes the exclusive CoreVault® system that seals core samples under pressure to prevent fluids from escaping when the samples are brought to surface.*

*Right » The Halliburton dipole Xaminer® Array Sonic Tool can withstand the most extreme conditions in the industry’s harshest wells. It is a proven provider of excellent acoustic data through thick casing in ultradeep wells, extreme tension and compression.*
Tools that Can Take the Heat

HIGH-PERFORMANCE TOOLS WITH THE LATEST SENSOR TECHNOLOGY

Operators working in deep and ultradeepwater wells often encounter extremely high pressure and temperature that will cause standard tools to fail. The Halliburton 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 logging information available. These cutting-edge tools include array induction and dipole sonic sensors for petrophysical analysis.

High-Temperature Formation Tester
The latest version of the Halliburton Hostile Sequential Formation Tester (XHT™) tool routinely performs pressure tests and fluid sampling in temperatures approaching 450°F. The efficient design is smaller and lighter than competitive tools on the market and includes a powerful, high-speed pump module to clean up samples rapidly. The unique tool design allows us to operate in a wide range of sizes, from very small to large boreholes. The XHT tool is the ideal choice for mission-critical, high-temperature formation testing up to 450°F and high-pressure formation testing up to 35,000 psi.

High-Pressure, High-Temperature Coring Tool
Our Xaminer® Coring Tool (XCT™) system has the capability to take large 1.5-inch diameter cores. Competitive large-size coring tools struggle to operate in high temperatures and pressures where the XCT tool excels. It is designed to operate in challenging wells up to 400°F and 35,000 psi. The XCT tool is uniquely combinable with the RDT™ tool to acquire pressures, fluid samples and cores on a single trip into a well. It offers the most power at the bit in the industry, allowing us to obtain core samples where competitive tools are unable to perform. Additionally, the XCT tool has consistent, excellent downhole core detection, featuring two independent core measurements downhole—the length of the core while cutting and the recovered core—with precise accuracy. Among its record-setting performance is the successful sample recovery in challenging environments approaching 35,000 feet, 30,000 psi and 4,400-psi differential pressure. It routinely achieves over 90% recovery in the Lower Tertiary Wilcox Formation in the Gulf of Mexico. The tool works on the same high-strength wireline used to perform logging services, which simplifies 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 cable jars and releasable cable heads so operators can use the most advanced tools in the most extreme wells with fewer concerns about high-temperature operations.

For a recent customer, 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.
Advanced Solutions for Mitigating Risk

THE HALLIBURTON FREE-POINT TOOL (HFPT) IS CHANGING STUCK PIPE FREE-POINT DETERMINATION FROM AN ART TO A SCIENCE

Old-fashioned free-point tools required a large amount of guesswork to pinpoint the location of stuck pipe, resulting in nonproductive time and potentially hazardous situations. The Halliburton HFPT is the industry-leading free-point tool, providing the safest, most straightforward and fastest way to locate stuck pipe. It measures the magnetic-field characteristics of the mechanically stressed pipe to determine the precise stuck vs. free point of the pipe in significantly less than half the time of traditional tools. Alternative older techniques require tensioning and torquing the pipe repeatedly in a trial-and-error process. Halliburton reduces 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 combination units capable of running both slickline and wireline. Our industry-first Super Combo unit provides openhole, cased-hole and slickline services in one unit. This minimizes our footprint on the rig, and allows operators the option to run the best technology available for their situation, without wasting time during costly deepwater operations.

The RELAY™ Digital Slickline System is the new intelligent conveyance for well intervention operations that combines the versatility and efficiency of traditional slickline with real-time data-streaming capabilities for reducing uncertainty in your deepwater interventions.

Moby – A Safer Seismic Source Deployment System

Halliburton has extensive deepwater experience in borehole seismic operations. The unique Halliburton Moby source deployment system can safely convert any large offshore boat into a seismic source vessel. Moby enables the operator to deploy and retrieve guns quickly and safely without using the traditional single-point lift crane system. It can be operated remotely, removing personnel from harm’s way. Halliburton currently offers the industry-leading 30,000-psi, 30-level triaxial 4-component borehole seismic array with high-side indicator. This array can be expanded to over 60 high-pressure levels to reduce rig time. This system has been proven to acquire excellent subsalt data in wells deeper than 30,000 feet and over 10,000 feet of salt.
Experience, People, Processes and Safety

SIGNIFICANT EXPERIENCE IN DEEP WATER

Halliburton has successfully completed thousands of deepwater jobs globally. We leverage that global experience to develop deepwater-specific processes and procedures to increase efficiency, minimize risks and improve operations in any deepwater environment. We routinely perform operations on wells drilled in the 35,000-foot range, including some of the deepest wells ever drilled in the Gulf of Mexico, exceeding 36,000 feet.

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 industry. Our personnel are ready to meet any challenge encountered by our clients.

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 the Halliburton 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.

World’s First Corrosive Hostile Environment Gun System

The Halliburton Corrosive Hostile Environment (CHE™) perforating system helps provide exceptional corrosion protection from H₂S, CO₂, saltwater immersion, corrosive vapors and other hostile environments due to its transmission properties. It targets corrosive environments, which would deteriorate standard components over time leading to increased downhole debris. This could potentially damage tens of millions of dollars of surface production equipment when flowed to surface. Initially designed to help protect the Shell Prelude, an estimated USD 12.6 billion floating liquefied natural gas (FLNG) facility from produced debris, the CHE system needed to survive downhole without significant deterioration for +/- 20 years.

The CHE system is a step change for perforating in hostile environments. This complete solution addresses the new challenges experienced as the industry moves to exploit hostile reservoirs. The special CHE materials can more than triple the service life of components. This allows access to reservoirs that once were not technologically and economically viable to produce. More information about the CHE gun system can be found in OTC-26615-MS paper, Development of the World’s First Corrosive Hostile Environment CHE Gun System.

Halliburton personnel, both in the field and in the lab, contribute to our continued leadership in deep water.
XSpace™ Platform

COLLABORATIVE DATA MANAGEMENT FOR EFFICIENT WORKFLOW AND SUPERIOR DECISION MAKING

The Halliburton XSpace™ data management platform is a one-stop solution for your file management needs across the entire well life cycle. It manages all data types from drilling and evaluation through completions and production, including interventions and eventual abandonment. This dynamic, easy-to-use management platform offers a simple, convenient way to acquire and/or publish aggregated well data, making workflow tasks more efficient to complete. It allows for close collaboration between all project team members, enabling better decision making. This scalable solution has the flexibility to cover the full range of projects—from a single well to the most complicated multiwell projects.

The XSpace™ platform enables creation of a project that can store and distribute project-level data and have links to authorized wells. Activities are sub-repositories of a project or well and can have mirroring of entitlements from the parent or completely different entitlements assigned to maintain high flexibility. It has a workflow manager called checklists that enables efficient tracking and review of documentation to fulfill processes, procedures, or regulatory requirements. Critical file items can be created that are a way to highlight very important or niche data sets to streamline their access. Critical files items or checklists can be applied to a project, project/activity, well, or a well/activity for overall flexibility.
The Safest, Most Efficient Choice for Formation Evaluation in Deep Water

Halliburton is a leading provider of safe and successful formation evaluation in deep water. The innovative solutions that we offer feature new capabilities that are redefining wireline capabilities in ultradeepwater projects globally. Our new technology and capabilities are enabling our clients to drill deeper and to evaluate the most challenging wells in deep water. When you’re ready to evaluate a 40,000-foot well in deep water, Halliburton is ready to meet the challenge.

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<td>Highest capacity drum available with a capacity of 47,000 feet of ultrahigh-strength cable</td>
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<td>Extreme operating cable tensions</td>
<td>PowerPull™ cable, rated to 40,000 pounds, yielding 30,000-pound operational pulling capacity</td>
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<td>Running complex, heavy tool strings safely</td>
<td>Versatile 18,000-pound powered capstan can be configured for derrick or deck mounting, providing optimal performance and safety</td>
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<td>High-pressure environments</td>
<td>DeepSuite™ advanced FE technology rated up to 35,000 psi</td>
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<td>Acquiring high-quality data in HPHT wells</td>
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<td>• I-Wheel™ rollers minimize friction between tool and wellbore</td>
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<td>• Tool swivels</td>
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<td>Freeing stuck tools</td>
<td>LockJar® system frees stuck tools without damaging them, eliminating costly fishing jobs in over 90% of stuck tool situations</td>
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<td>Stuck drillpipe or casing</td>
<td>Industry-leading Halliburton Free-Point Tool (HFPT) quickly and safely locates free point to remedy these difficult situations</td>
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<td>Reliable cable-release system</td>
<td>With over 20 years of proven reliability, the Halliburton Releasable Wireline Cable Head (RWCH™) system does not rely on cable tension to activate</td>
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<td>Safe seismic source deployment</td>
<td>The unique Halliburton Moby system is the safest, most efficient system available to convert any offshore vessel into a fully capable seismic source vessel</td>
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<td>Pulling and setting crown plugs</td>
<td>RELAY™ Digital Slickline System combines traditional slickline with real-time data-streaming capabilities</td>
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<td>Pressure and fluid sampling</td>
<td>Industry-leading capabilities with probes, pumps and simultaneous pressures up to 35,000 psi with the Reservoir Description Tool (RDT™) and Xaminer® Hostile Formation Tester (XHT) services</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.