Integrated Cased-Hole Services

Maximum Well Performance
Maximize Flexibility. Optimize Results.

Halliburton has developed an unmatched ability to deliver cased-hole sensors and services on e-line, slickline or tubing with cross-trained crews capable of running any tool on any conveyance. This maximum conveyance flexibility results in true “fit-for-purpose” measurement, perforating and intervention solutions.

With an extensive range of cased-hole services that can be conveyed on e-line, slickline or tubing, Halliburton’s conveyance flexibility gives you the ability to use the right tool for the job and the same crew throughout the project, saving rig time and space.

Conveyance Flexibility Offers Significant Benefits:

- Consolidate multiple runs into one
  - Reduce rig time
  - Reduce response time
  - Reduce equipment footprint on a rig
- Consolidate multiple crews into one
  - Single focal point, single invoice
  - Simplify logistics, speeding up mobilization and demobilization
  - Reduce transportation costs, bed space and day rate charges
- Use the right tool for the job without constraints
  - Operate without rigs at times
  - Run high end services on client-owned or -supplied units
  - Optimize overall production strategies

No one offers the flexibility Halliburton does; other companies may offer some tools that run on different conveyances – but not all. Halliburton’s entire line of tools is fully conveyance-flexible, including some of the industry’s leading technologies in logging, perforating and slickline services.
Conveyance Flexibility Simplifies Operations

In the past, cased-hole services have required one specific means of conveyance or another. Two separate operations might have required two different crews, with transportation logistics creating delays, running up costs, and limiting options in choice of services.

Halliburton’s conveyance flexibility simplifies operations, leading to optimized solutions that keep logistic requirements at a minimum and create a smaller footprint.

Example: Consider an offshore platform where the operator has seen a decrease in production pressures and an increase in water production. The well has multiple perforation intervals and the customer must better understand which intervals may be the problem.

When lifting restrictions on the platform prevent a traditional electric line unit to be deployed, mobilizing a Halliburton slickline unit allows the operator to run multiple services to determine the best course of action: Production Logging tools to determine the production of each discrete interval; a Pulse Neutron to determine injection breakthrough if the well is in an injection field; and a Downhole Power Unit (DPU) tool to set plugs or packers and start remediation to control the water or abandon a lower interval.

Total conveyance flexibility can be achieved.

Conveyance Flexibility Lowers Costs

Conveyance flexibility provides quantifiable savings in time and expense. Our skilled technical people are equipped to deliver any cased-hole service on e-line, slickline or tubing, so you don’t need a separate crew for each operation.

These highly trained personnel combine superior technical expertise, knowledge and experience to maximize the value of Halliburton’s industry-leading technologies. You get the benefits of safer, quicker operations, with better insight and delivery.

This commitment to service excellence means you can depend on Halliburton to deliver the most efficient and cost effective services to help optimize your return on investment.

Halliburton Offers More

Total conveyance flexibility of our Integrated Cased-Hole Solutions gives you greater operational flexibility and more technical options, for true “fit-for-purpose” solutions that can lower OPEX and extend the life of a field.

Only Halliburton offers these critical advantages:
- Leading Conveyance Flexibility
- Broadest Array of Services
- Large Global Footprint
- Key Differentiating Technologies
- Problem-Solving Expertise
- Superior Operational Experience

Issue: Reduce NPT, Lower Operating Costs

Combination slickline/electric-line units eliminate crew, unit change-outs.

How much does it cost to swap out unit for multiple operations?

Because you can deploy Halliburton’s tools on any e-line, slickline or tubing, you don’t need a second unit to perform additional services.

On an offshore deepwater rig that can cost a million dollars per day, and a tool string can take six to eight hours or more for one round trip, these savings add up. And the more expensive the rig, the greater the potential savings.

Any Tool, on Any Conveyance.

Halliburton’s entire line of tools is fully conveyance-flexible, including industry leading technologies for measurement, perforating and intervention solutions:

Cased-Hole Logging Services
- Conventional Cased-Hole Logging
- Zonal Isolation and Pipe Inspection
- High End Production Logging and Analysis
- Pulsed Neutron / Cased-Hole Formation Evaluation
- Downhole Camera Services

Slickline
- Conventional Mechanical Interventions
- Zonal Isolation and Pipe Inspection - Memory
- High End Production Logging and Analysis - Memory
- Pulsed Neutron / Cased-Hole Formation Evaluation – Memory
- Perforating – Memory
- Combination Slickline/Cased-Hole Units

Perforating
- Conveyance on E-line, Slickline or Tubing, enabled by Custom Firing Systems
- Engineered Shaped Charge and Perforating Systems
- Advanced Modeling and Simulation
Success Stories

Case History: Discrete Solution Lowers Operating Cost for Deep Water Customer
Setting sump packers below sand control completions in deep water was traditionally accomplished by running the packer on pipe and setting with a hydraulic setting tool which could take approximately a day and a half. Sump packers are run below sand control completions to enable placement of the gravel pack around the screen section of the completion. At today’s rig rates this could cost up to $850,000 per day.

At deeper well depths, downhole hydrostatic pressures can exceed the operating envelopes of conventional e-line conveyed explosive setting tools. An alternative solution to pipe conveyed sump packers is the non-explosive electro-mechanical setting tool, Downhole Power Unit (DPU®) tool. The DPU tool is rated for much higher pressure ratings than conventional setting tools and can apply greater setting forces. Additionally, the slow controlled applied setting force of the DPU tool helps ensure an accurate set of the sump packer.

Conveyed on electric line at less than a quarter of the time it takes to convey on pipe, use of the DPU tool in this case equates to approximately $650,000 in rig time savings.

Case History: Offshore Shelf Customer Lowers Operating Cost with ‘Complete Solutions’
The “Complete Solutions” offering is a “One Halliburton” package solution offering multiple conveyance technologies and multiple skilled personnel from a single platform. It offers single billing, multi-skilled personnel, and a multitude of services from a single platform, all focused on lowering operating expenses and innovative solutions to recompletions, plug and abandonment, and decommissioning services.

This Gulf of Mexico “Complete Solutions” service package involved cross product service offerings including pumping, cementing, completions, fluids and logging. In this case, the multiple technology solution and sharing of multi-skilled personnel enabled an approximate 15% savings to the customer over discrete more traditional offerings.
Differentiating Technology:
The industry’s most reliable Downhole Power Unit, the DPU - Intelligent Tool Series (DPU®-I), can be run on any conveyance to set and retrieve packers, plugs, and monolocks even under high pressure conditions. With an unmatched operating envelope, the electro-mechanical DPU-I tool provides slow precisely-controlled setting and feedback that increases reliability. And because the DPU-I tool is a non-explosive device, regulatory issues related to shipping and handling explosives are eliminated.

Fully combinable with a full range of PL tools, the (CAT™) device measures in a single plane across the diameter of the wellbore, rather than along it, to provide an accurate cross-sectional plot of fluid phases.

Issue: Tool Choice Compromise
Conveyance flexibility means you use the best tool for the job—without compromise.

Have you ever compromised on tool selection and regretted it later? With Halliburton's total conveyance flexibility, you can always use the right tool for the job, so you'll never have to compromise your strategy.

Every tool, from high end production logging tools to advanced perforating guns, can be deployed using the conveyance method that’s best for the project objectives. This allows you to implement the optimum strategy for your well, without being constrained by equipment limitations.

Halliburton's broad selection of equipment options and conveyance flexibility give you the ability to choose an optimal fit-for-purpose solution, enhancing the potential for maximizing well productivity.

And our commitment to Service Excellence extends beyond precision technology to include total conveyance flexibility in program design.
Case History: Versatile Solution Overcomes Limited Offshore Footprint - Asia/Pacific

A customer in Asia/Pacific needed to perforate through tubing for abandonment of a lower gravel pack zone. The un-manned platform had limited deck space and limited lift capability with the crane on board. Halliburton's solution was to provide a lightweight slickline unit and downhole tools for memory logging and perforating.

An initial run was made to record Gamma, CCL, Pressure and Temperature in preparation for the perforating run. The tool string was assembled to simulate the weight, length and OD of the perforating equipment for accurate depth control.

The second run was made using a JRC Millennium™ gun system, a Radio Frequency safe RED® detonator and the “Intelligent Trigger Device” firing system. A successful abandonment program followed the perforation program.

The versatility of Halliburton to provide services using existing lift capacities and platform deck space saved the Customer $200,000 and increased production on this well.

Differentiating Technology:
The most advanced technology of its kind, the “Intelligent Trigger Device” provides unsurpassed versatility and reliability. The Intelligent Trigger Device fires the Radio-Frequency safe RED® detonator line, providing reliable tool initiation of a variety of downhole explosive devices.

Halliburton's advanced slickline services offer the ultimate in flexibility, with a range of tools that provide an innovative alternative to conventional methods for depth control, plug and packer operations, perforating, and memory logging. The Advanced Measuring System (AMS™) provides depth measurement accuracy and records depth, line speed, and line tension data.

Issue: Reduce Personnel Requirements
Conveyance flexibility means you only need one crew on the rig to handle all services.

Have you ever been delayed by bringing in different crews for logging, perforating or intervention? Because Halliburton's crews are cross-trained to provide an extensive range of cased-hole services that can be conveyed on e-line, slickline or tubing, you only need one crew on the rig to handle all services. That saves on transportation, bed space and daily crew rates.

Halliburton personnel bring problem-solving expertise and superior operational experience to every job. Extensive and on-going training prepares each of our professionals to skillfully deliver the full range of our services, maintaining the kind of operational continuity and efficiency that helps produce optimum results.

When you can do everything needed with one crew instead of two, the impact is significant: Logistics are simplified. Costs are reduced. And operations are safer overall.

Actuated by unique, user-defined sequence of events. Halliburton’s Intelligent Trigger Device can combine a unique number of cycles of different pressures at different intervals with different durations. Only after all programmable conditions are met will the Intelligent Trigger Device trigger the gun.
**Case History: Crew Savings Add Value in North Sea Operation**

On a recent job in the North Sea, an operator wanted to perforate and test two separate zones in a well. The procedure was to deploy a TCP perforating assembly and completion to perforate the first lower zone. An automatic releasing device dropped the fired guns into the rathole, allowing access to the formation for drill stem testing to be conducted.

After testing the lower zone, slickline was run to shift a tool in the completion string and release the tailpipe below the packer, dropping it into the rathole. This allowed a thru-tubing perforator to be run on e-line and perforate an upper interval. Production Logging Tools were then run on electric line to characterize the production from the perforated intervals.

All of this was performed with a single cross trained Halliburton crew and a combination slickline/e-line unit. This reduced the number of personnel required to perform a variety of services, as well as reducing transportation costs for personnel. Overall cost savings to the customer was 20%.

**Differentiating Technology:**

Halliburton provides high-end Production Logging measurements via SRO or memory, and the in-depth analysis for a true answer product. In addition, combinability with the RMT reliability delivers the highest quality measurements for simultaneous Oil Saturation answers in fresh or high salinity environments.

A world leader in shaped charge and perforating hardware design and manufacturing, Halliburton’s Jet Research Center (JRC) offers a full line of high performance deep penetrating and big hole charges and gun systems. Ranging in size from 1 9/16” to 7” OD for TCP and e-line applications, this offering includes the world’s first 30,000 psi rated 7” gun system. In addition, JRC specialty products deliver high end applications such as dynamic underbalance, propellants, extreme overbalance, and modeling support to optimize each method. Complementing the gun systems, a full range of firing systems and ancillary tools ensure the best perforating design for your well.
Our Uniquely Integrated Solutions Deliver Maximum Value

Conveyance flexibility enables Halliburton to deliver innovative and integrated cased-hole solutions that provide you with extra value in the face of increased technical and economic challenges.

We have the technology and personnel in place around the world to deliver true “fit-for-purpose” Integrated Cased-Hole Solutions for:

- Recompletions
- Well Plug and Abandonment
- Decommissioning
- Pipe recovery, Subsea
- Thru-Tubing Rigless Solutions
- Reservoir evaluation and production monitoring

Part of our service philosophy is Halliburton’s emphasis on comprehensive and on-going training for our personnel. A culture of continuous training equips them with the multi-discipline knowledge and professional skills to run any tool on any conveyance.

The ability to combine technologies enables Halliburton to create uniquely integrated solutions that can help reduce operating costs, increase recovery, and extend the economic life of the well. That’s maximum value.

The Halliburton Advantage:

- Technology -- Halliburton’s entire line of tools is fully conveyance-flexible, including some of the industry’s leading technologies in logging, perforating and slickline services
- Trained Personnel – Professional, cross-trained crews are capable of running any tool on any conveyance
- True “Fit-for-Purpose” Solutions -- Maximum conveyance flexibility results in true “fit-for-purpose” measurement, perforating and intervention solutions

The unique Halliburton Perforation Flow Laboratory simulates actual well conditions and pressures to address deficiencies in surface tests. This gives insight into physical phenomena occurring in the reservoir during complicated perforating and multi-phase flow events. This provides operators with information needed to design perforating systems and solutions that optimize a well’s production.

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