

**CHALLENGE**

- **Extreme pressure crushes equipment**

Downhole pressure and pressure from wrapping cable onto a spool can easily crush the conductors in the wireline cable. Tension-relief systems such as capstans or powered sheaves are typically used, but are expensive and cost hours of rig time

- **Tools get stuck in hole, requiring fishing**

Wireline formation testers can get stuck in the well for various reasons. This forces operators to fish the equipment out of the well. Fishing can take hours or even days of nonproductive time (NPT) and can ruin the tool, especially at high temperatures

- **Cooling equipment for multiple runs**

Extreme heat makes wireline formation testers vulnerable to damage. A vacuum flask surrounding the cable and tools provides insulation, but can be time-consuming. Most equipment has to be removed from the flask to properly cool and then reinserted before another trip downhole

# Halliburton provided reservoir pressure data in extreme conditions

Armstrong Louisiana, LLC set new temperature record during pressure test in South Louisiana

**Halliburton's record-breaking Hostile Sequential Formation Tester (HSFT-II™) tool set new standard and delivered reliable pressure data**

**Overview**

While drilling a well in South Louisiana, Armstrong Louisiana, LLC needed a reliable way to gather formation pressure data in very high temperatures and pressures. The company turned to Halliburton to handle the testing in these extreme conditions.

Halliburton's Hostile Sequential Formation Tester, the market's leading high-temperature wireline formation tester, is rated to handle temperatures reaching 450°F (232°C) for 11 hours at pressures reaching 30,000 psi. Halliburton made three descents down the well, easily handling the 422°F (217°C) well temperature, setting a new industry record for high-temperature pressure testing on wireline. HSFT-II™ tools logged a total of 30 hours of operating time above 400°F (204°C), proving its durability in the field and providing results no other formation tester has matched.



INCREASED  
**DEPTH**  
EQUALS  
INCREASED  
**HEAT**

422°



**25,000'**

*Temperature increased about 1.5 degrees every 100 feet below the surface in this high-pressure / high-temperature well.*

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*At only 3.25 inches, the average diameter of a coffee cup, the HSFT-II™ tool is lighter and smaller than most of its competitors. It also has the highest temperature rating of any wireline formation tester.*

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RECORD TEMP

**422°**F

*Halliburton successfully completed formation testing, setting industry records in the process by reaching 422°F.*

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*At 0.2 percent, the fishing rate of the HSFT-II™ tool is 25 times lower than the industry standard.*

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## Solution

### Crush-resistant cable saves time and money

Halliburton's unique wireline cable is crush-resistant, allowing it to withstand extreme pressures without damaging conductors inside. A releasable cable head lets operators pull to the maximum of the cable's capacity. This saves the cost of replacement equipment and rig time.

### HSFT-II™ tool and hydraulic jars prevent fishing

Halliburton's HSFT-II™ tool is only 3.25 inches in diameter – lighter and smaller than most competitors' – reducing the risk of getting stuck downhole. Hydraulic jars help knock stuck tools loose, freeing the tool and preserving the logging run.

### Insulation protects tool, cooling system saves time

A metal heat sink insulates the HSFT-II tool, allowing extended operations in HP/HT wells. And, a special system unique to Halliburton flows cold air throughout the vacuum flask, cooling the equipment faster and without the need for removal. tortuosity, producing a superior quality wellbore over other drilling methods.

## Extreme temperatures in South Louisiana well

Armstrong Louisiana, LLC needed reliable formation data testing for a high-pressure/high-temperature well in South Louisiana. Temperatures in this well increased approximately 1.5 degrees every 100 feet below the surface. So the deeper the well, the higher the temperature. At 24,000 feet, Armstrong knew temperatures in the well exceeded 400°F and needed a tool that could withstand those temperatures for several hours to complete the logging necessary to conduct these tests. The company also sought a solution that would save time and money. Armstrong turned to Halliburton, who recommended using its HSFT-II™ tool for this job.



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## HSFT-II™ tool exceeds industry standards and can perform in HP/HT

Halliburton's HSFT-II™ tool is the market-leading high-temperature wireline formation tester. This tool is rated 450°F (232°C) and is able to withstand the full temperature for up to 11 hours, and can withstand 400°F (204°C) for up to 24 hours. It is also tested to withstand pressures up to 30,000 psi. The HSFT-II tool is lighter and smaller than most of its competitors', reducing fishing risks associated with other wireline formation testers.

## Conveyance system designed to withstand extreme conditions

Armstrong needed to test at depths exceeding 25,000 feet, 400°F and 25,000 psi. So it required a complete conveyance system that could handle these extreme conditions. Halliburton recommended a solution that included crush-resistant cable, a releasable cable head, insulating vacuum flask and hydraulic jars.

## Wireline and releasable cable head saved equipment from crushing

The combination of downhole pressure and the pressure from wrapping wireline on a spool can easily crush the cable. Many companies are forced to use a tension-relief system such as a capstan or powered sheave. Halliburton's unique wireline cable is crush-resistant, enabling it to withstand extreme pressures without crushing conductors inside. A releasable cable head allowed operators to pull to the maximum of the cable's capacity. This saved hours of rig time and the cost of the extra equipment.



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### Size of HSFT-II™ tool and hydraulic jars prevented fishing

Another costly aspect of any wireline formation testing operation is the risk of tools getting stuck in the well. This leads to fishing operations that can result in two to three days of NPT and ruining the tool. The HSFT-II™ tool is only 3.25 inches in diameter, reducing the risk of getting stuck. In addition, hydraulic jars can help free stuck tools and preserve the logging run.

Halliburton was able to complete testing for Armstrong without fishing. In fact, the HSFT-II tool has not been stuck in a well in more than four years. At 0.2 percent, the fishing rate of the HSFT-II™ tool is 25 times lower than the industry standard. This reliability has saved companies millions of dollars US in NPT and lost equipment.

### Insulation and cooling system saved time and expense

The size of the HSFT-II™ tool makes it vulnerable to damage, but the insulation design reduces this risk. A metal heat sink attached to the tool's electronics pulls heat away from vulnerable components. This allows for extended operations in HP/HT wells.

Another Halliburton advantage is a special cooling system used for vacuum flasks. Vacuum flasks are routinely used to insulate wireline tools, but in most cases equipment has to be removed from the flask for proper cooling. Halliburton's system circulates cool air through the flask, cooling the equipment faster and without the need for removal, saving both time and money.

### Record temperatures achieved, additional testing planned

Halliburton successfully completed formation testing for Armstrong Louisiana, LLC, setting industry records in the process by reaching 422°F (217°C). The entire wireline testing campaign consisted of two trips to the well and three descents down the hole. Thirty-three tool sets logged 30 hours of operating time above 400°F. All three runs were made at depths greater than 24,000 feet.

Armstrong was thrilled with the record results from the pressure testing. This durable tool has been proven to withstand extreme temperatures and provide results no other tool in the industry has matched, making Halliburton a leader in HP/HT wireline formation testing.



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