Hostile Sequential Formation Tester-II (HSFT-II™ Tool) Highest Temperature Rated Wireline Formation Tester - 450 DEG F & 30,000 PSI*

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Abstract

Abstract Exploration and development wells are being drilled globally in increasingly deeper, hotter, and more hostile reservoirs. Successfully obtaining pressure and fluid-sample information requires a new generation of hostile-formation tester tools. This paper discusses the field trial results of a major service provider’s second-generation hostile sequential-formation testing tool that can operate in environments with temperatures up to 450°F and pressures up to 30,000 psi.

The first-generation tool, introduced in 2002, provided a wealth of experience in collecting pressure measurements and samples in formations of approximately 400°F. In the Gulf of Thailand (GOT), these hostile wells are typically slim hole and highly deviated, which increases the risk for tools to become stuck. The southern fields of the GOT are the most challenging, with higher geothermal gradients, relatively deeper burial depths, higher mud weights, reversal in pore-pressure profile, lower permeability, and depleted zones. Previous tool statistics showed that many pressure tests failed to obtain an effective pad seal because of the adverse borehole environment.

The new tool, with its dual pads and independent deployment configuration, can run two different probe pads that are designed specifically for different scenarios based on well conditions. Increased pad life enables the same tool to be run for an extended range of pressure test programs.

This case study reviews examples and job profiles to illustrate the best practices for HTHP testing. Success rates are tracked to demonstrate how the improvements have led to successful testing in progressively more hostile conditions. As of 2011, more than 40 jobs were completed
successfully. Conclusions are presented regarding the future of hostile formation testing and how the new technologies that are anticipated for these tools will continue to extend their capabilities.
Halliburton's New Hostile Sequential Formation Tester (HSFT-II™ Tool)

Introduction

This paper introduces Halliburton’s new HSFT-II™ formation tester, which is designed to operate in hostile conditions with temperatures up to 450°F and pressures up to 30,000 psi. The HSFT-II™ Tool is specifically designed to extend testing programs in challenging wells with sour conditions, high temperatures, high pressures, and high differential pressures, providing improved data quality and increased operational efficiency.

HSFT-II™ Tool Features

- **Multi-pad Technology**: The HSFT-II™ Tool features multi-pad designs to accommodate high differential pressures, which is critical in hostile conditions.
- **High Temperature Performance**: The tool can operate at temperatures up to 450°F, enabling testing in wells with high geothermal gradients.
- **Extended Pad Life**: The HSFT-II™ Tool has extended pad life, allowing for longer testing programs and saving rig time.
- **Data Quality Improvement**: Enhanced data quality due to improved testing at high temperatures and pressures.
- **Operational Efficiency**: Reduced operational time and increased productivity in hostile environments.

Applications

The HSFT-II™ Tool is particularly useful in Gulf of Thailand, South China Sea, and offshore China wells, as well as in challenging onshore environments such as tight sandstone reservoirs. This tool expands the limits of formation testing in hostile conditions, providing valuable reservoir information for improved development and production strategies.

Gulf of Thailand Geology

The majority of petroleum produced in Thailand comes from offshore Tertiary basins in the Gulf of Thailand. The Ko Kra Ridge and Gulf of Thailand Geology are particularly hostile, with high geothermal gradients and relatively deeper burial depths. The eastern portion is composed of the Pattani, and Malay Basins. These basins are hydrocarbon prolific areas containing Type I kerogen. The Miocene sources are fluvial flood plain and delta plain sediments. Sediments are non-marine in origin, mainly fluvial-transitional deposits. However, the eastern portion was differentiated from the western during the Neogene age.

Summary

- **Hostile formation testing at 450°F and 30,000 psi is now feasible**.
- **Higher temperature rating (HSFT-II™ Tool)**.
- **Saving rig time for high differential pressure testing**.
- **Improved data quality**.
- **Operational efficiency in hostile environments**.

Future Development

- **Slim Hole Fluid ID**: Resilience - density-based sensors, initial tests show it is possible to identify the fluid within 10 minutes.
- **Bubble point test**
- **Slim Hole Pump Out and PVT Quality Sampling**
- **In progress**

Halliburton’s New Hostile Sequential Formation Tester (HSFT-II™ Tool)

Highest Temperature Rated Wireline Formation Tester - 450 Deg F & 30,000 PSI

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