SpectraSphere fluid mapping-while-drilling service
Advanced PVT fluid properties play a vital role in estimating reserves, optimizing completions, designing surface facilities, and meeting production goals. However, these datasets are traditionally available only after performing conventional formation sampling.

SpectraSphere® fluid mapping while drilling service is the industry’s first to provide high-quality formation pressure measurements, in situ downhole fluid analysis, and representative fluid sampling—all in real time, while drilling.

The unique ability to fully understand reservoir properties during drilling operations opens up new dimensions in well placement and reservoir characterization while reducing costs. SpectraSphere service delivers these advantages in multiple environments—from enabling advanced knowledge of untapped reservoirs in exploration to derisking fluid analysis and sampling in highly deviated development wells.

Map reservoir fluids while drilling

Perform fluid analysis and acquire representative downhole fluid samples in the shortest possible time with the lowest possible risk.
Analyze and capture fluids fast... while drilling

A new generation of measurements
Schlumberger has been providing downhole formation testing solutions to operators around the world for decades. Industry-standard MDT® modular dynamic formation tester provides pump-controlled flow, real-time contamination monitoring, downhole fluid analysis, and modular architecture. Additionally, customers have used logging-while-drilling services such as the Stethoscope® formation pressure-while-drilling service for reservoir management, to optimize drilling and completions, and to minimize risk.

Building on the experience gained with these two technologies, the SpectraSphere service provides accurate pressure measurements, performs downhole fluid analysis, and produces high-quality samples while drilling. The result is operational efficiency that helps operators make better steering decisions and optimize productivity.

The new service comprises a pretest module that delivers a precise formation pressure-while-drilling measurement, fluid mapping module that includes a pumpout module for accurate flowline control and a unique downhole fluid analyzer for real-time fluid steering, contamination monitoring, and in situ fluid property measurements; and a sample carrier module to obtain the samples.

Understand complexities in fluids distribution and ensure that, through a deep understanding of fluid changes along the drilled wellbore and across the reservoir, the producibility of your reservoir is maximized.

Applications
- Reservoir fluid characterization
- Identification of compartments and lateral sealing boundaries
- Geosteering and well placement
- Formation testing in complex well profiles, including extended reach drilling and deepwater operations
- Field development planning

Benefits
- Facilitates early reservoir development decisions and production optimization
- Improves reservoir understanding through deep insight into fluid composition and distribution
- Enables productivity steering in development wells
- Mitigates risk in challenging environments because of reduced footprint on the wellbore
- Saves operating costs by streamlining well construction and reducing flat time

Features
- Advanced downhole reservoir fluid analysis, including:
  - Hydrocarbon fluid composition (C1, C2, C3, C4, C5, C6+, CO2)
  - GOR
  - Fluid typing
  - Fluid fractions
  - Fluid resistivity and temperature
- Real-time monitoring of mud filtrate contamination, fluid property changes, and system performance
- H2S-resistant flowline along with coupons at probe inlet to estimate H2S concentration
- Dedicated pretest module with high-precision Axton® dynamically compensated single quartz gauge, automated time-optimized pretests, and pumps-off measurement capability
- Electromechanical displacement unit with precise control of drawdown rates

Pretest module
This module can operate on its own as a stand-alone formation pressure-while-drilling tool or be combined with the SpectraSphere service pumpout module and sample carriers for fluid mapping operations. The pretest module performs all the functionalities of the industry-proven Stethoscope formation pressure-while-drilling service, including time-optimized and pumps-off pretesting. This module also includes:
- High-precision Axton quartz pressure gauge
- 30,000-psi pressure rating
- Large-diameter probe

Fluid mapping module
The downhole fluid analyzer (DFA) provides real-time reservoir fluid contamination estimation, compositional analysis, and in situ GOR measurements. The pumpout module (POM) contains an electromechanical positive displacement unit that enables accurate pump control for driving the pumpout process.

The pump has a nominal operating range of between 0.1 and 40 cm³/s. This system enables the sampling operation to be driven at a constant rate or constant drawdown pressure, providing precise flowline control to ensure that phase integrity of the fluid is maintained.

The POM also has a resistivity cell, a temperature cell, and two sensor bays that house the DFA. Because the POM requires mud circulation for generating power, the risk of differential sticking is reduced.

Sample carrier module (SCM)
The SpectraSphere service can be fitted with up to four carriers, each holding up to three Department of Transportation (DOT)-certified PVT containers. They are either 450- or 250-cm³, single-phase N2-compensated bottles that are mounted on the outside of the drill collar and protected by articulated shields.

These DOT-certified containers are designed to be removed from the SCM on the rig for draining on site or at a PVT laboratory. Up to four SCMs may be combined in a single BHA to increase the number of sample bottles per run.
Enhance the value of the SpectraSphere service

Real-time mud fluid mapping at the reservoir scale

The SpectraSphere service can be used with the GeoSphere™ reservoir monitoring while-drilling service to continuously monitor and map fluid properties in real time. By integrating SpectraSphere service fluid typing with the GeoSphere service, it is possible to observe how the fluid properties change through a wellbore to maximize the productivity of your reservoir.

Benefits

- Enhanced pressure measurements through dual mud fluid monitoring
- Enhanced formation evaluation through fluid mapping
- Improved well placement through fluid mapping

Applications

- Fluid typing and fluid identification
- Fluid monitoring and fluid identification
- Fluid characterization and fluid identification
- Fluid analysis and fluid identification

The SpectraSphere service provides accurate pressure measurements, performs dual mud fluid monitoring, and produces high-quality samples while drilling. The result is operational efficiency that helps operators maximize wellbore productivity and reservoir development.

The SpectraSphere service provides the ability to monitor fluid properties through the entire wellbore, including the near-wellbore and the formation. This information can be used to optimize reservoir management, to optimize well placement, and to improve field development planning.

Integrating this information with SpectraSphere service data delivers advancement in real-time reservoir structural and fluid map. Using deep, directional electromagnetic measurements, the SpectraSphere service can be used with the FLAIR service to determine the exact location of the reservoir fluid.

SpectraSphere service data is easily incorporated into Petrel platform models, keeping the subsurface models live. Data acquired by the SpectraSphere service is more than just data; it’s information that helps you bring all of your wellbore data into one enhanced environment.

Available services

- GeoSphere™ reservoir monitoring while-drilling service
- FLAIR service
- SpectraSphere service

The combination of the FLAIR and SpectraSphere services enables a continuous fluid profile qualification of reservoir fluid properties and composition through at-surface quantification of reservoir fluid properties and composition.

Data acquired by the SpectraSphere service can be used to design completions programs that yield increased production. Enhanced pressure measurements can also be used to optimize your entire completion strategy and reservoir development planning, and operations. Using information from all of the different services, you can bring all of your wellbore data into one enhanced environment.

Surface logging can complement fluid mapping data acquired using the SpectraSphere service. Accurate at-surface formation evaluation with zero added risk.

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SpectraSphere service case studies and specifications

- **Eni Receives Industry-First While-Drilling Analysis of Hydrocarbon Composition, Gulf of Mexico**
  Eni used fluid mapping while drilling to obtain in situ fluid properties in a wildcat exploration well and to acquire reservoir-representative downhole samples. The downhole fluid analysis accuracy was later confirmed by lab testing.

- **SpectraSphere Service Saves Hess 3 Days Offshore Malaysia**
  Hess Corporation reduced risk and optimized its logging program with while-drilling formation pressure and fluid analysis in a highly deviated wellbore that intersected a pressure-depleted zone, which increased the risk of differential sticking.

- **Saudi Aramco Validates Drilling Decisions with SpectraSphere Service in Multilateral Horizontal Well**
  Real-time fluid property analysis and LWD data delivered definitive high-quality fluid information and minimized operational risks in the Middle East.

Module Specifications:
- Pretest Probe Module
- Fluid Mapping Module
- Sample Carrier Module

**SpectraSphere fluid mapping-while-drilling service**
High-quality formation pressure measurements, in situ advanced downhole fluid analysis, and representative fluid sampling—all in real time, while drilling.
Real-time decisions require real-time fluid analysis. The SpectraSphere fluid mapping-while-drilling service is the only technology that provides high-quality formation pressure measurements, in situ downhole fluid analysis, and representative fluid sampling, all while drilling—so you can make better steering decisions and optimize reservoir productivity.

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