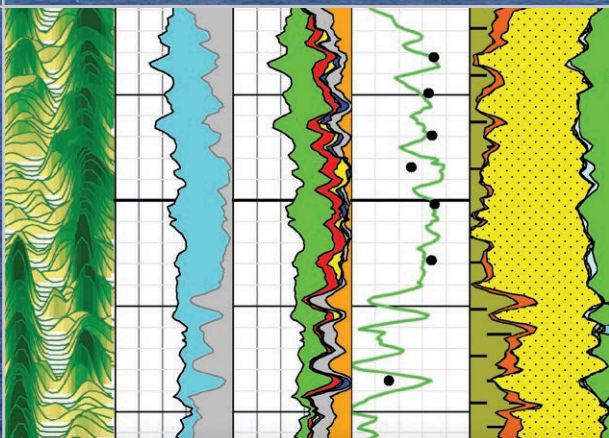


Schlumberger



proVISION Plus

Magnetic resonance-while-drilling service

Unlocking the **full potential** of complex reservoirs



proVISION Plus

By providing lithology-independent porosity, pore-size distribution, continuous permeability, and direct hydrocarbon detection, the proVISION Plus* service delivers a step change in real-time producibility assessment for complex reservoirs.



Applications

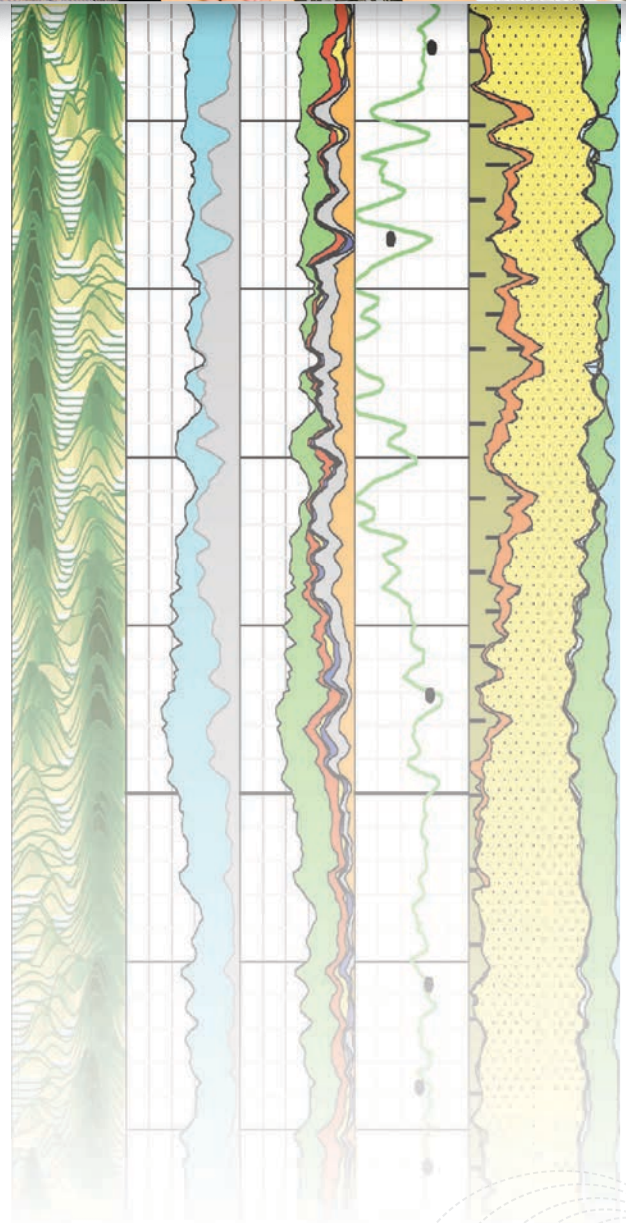
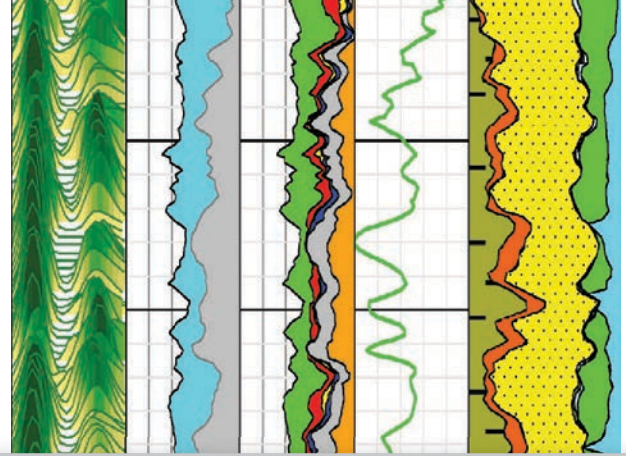
- Continuous, real-time, lithology-independent porosity without chemical sources
- Continuous, real-time permeability evaluation
- Resistivity-independent pay identification
- Thin-bed characterization
- Carbonate facies characterization
- Irreducible water saturation
- Gas-bearing reservoir evaluation
- Heavy oil and tar identification

Benefits

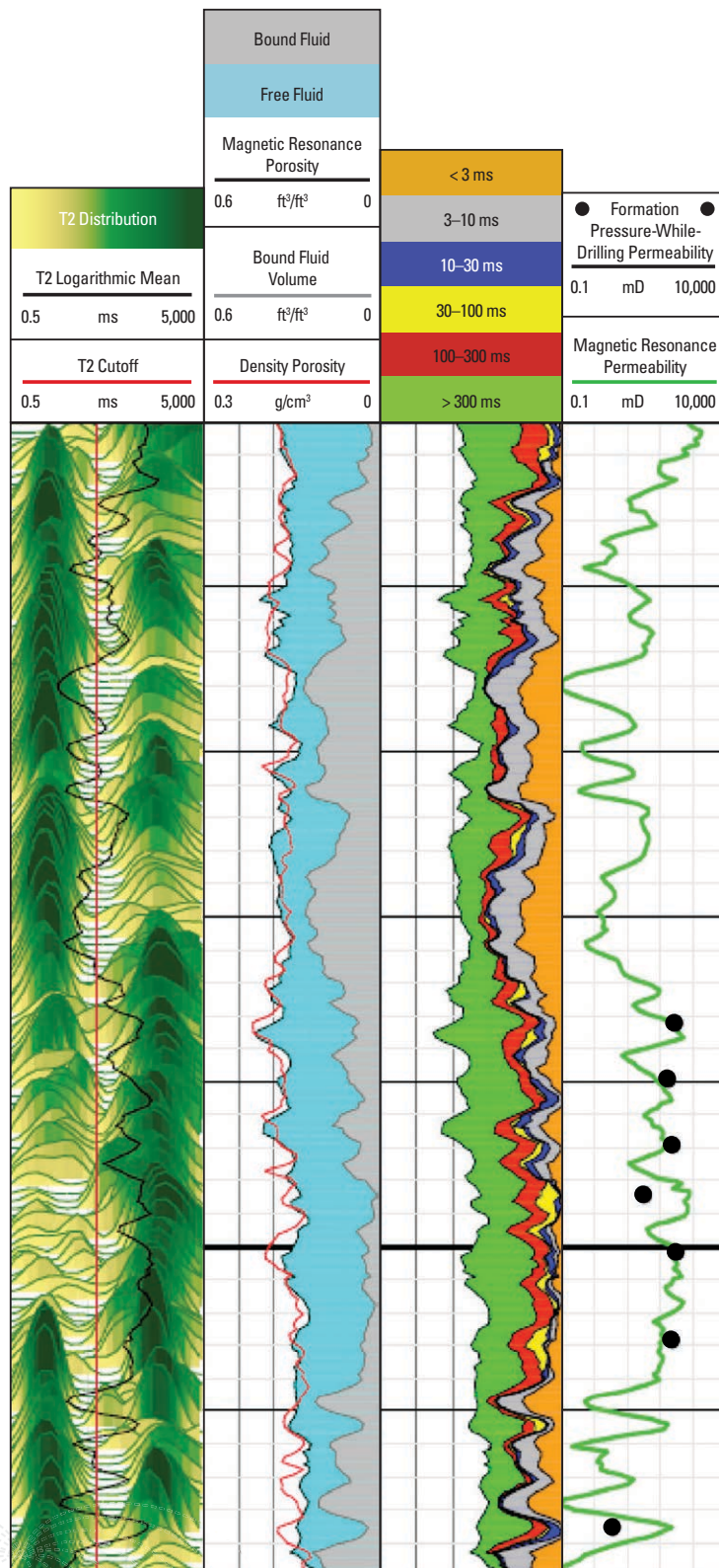
- Optimizes well placement to maximize well productivity
- Enhances perforation and stimulation design
- Provides pore size distribution to assess reservoir storage and flow capacity
- Saves rig time through early formation evaluation
- Prevents plug-and-abandon and sidetrack decisions by avoiding water-cut situations

Features

- Real-time, continuous measurement of T2 distribution
- Calculation from T2 distribution of continuous permeability, lithology-independent porosity, producible and irreducible fluid volumes, and pore size distribution
- Turbine power to eliminate trips to replace batteries
- Single-sleeve stabilizer that minimizes motion without affecting tendency
- Ability to be placed anywhere in BHA



Providing a complete petrophysical answer



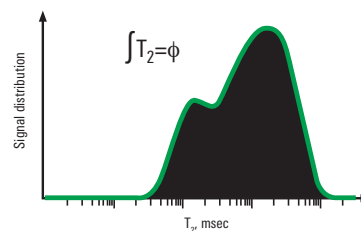
RESERVOIR QUALITY

The proVISION Plus service measures magnetic resonance and complements other LWD data to provide advanced petrophysical evaluation of complex reservoirs in real time. By fully evaluating rock and fluid properties with the proVISION Plus service, you can reveal bypassed pay zones and determine permeability.

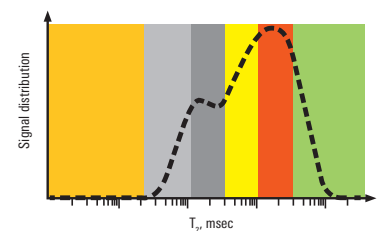
Using T2 distribution, the proVISION Plus service calculates continuous permeability, lithology-independent porosity, producible and irreducible fluid volumes, and pore size distribution. These capabilities make it possible to identify pay zones in shaly sands that would otherwise be bypassed and accurately determine permeability in heterogeneous carbonates. This evaluation method provides the final piece for a complete petrophysical answer.

ONE MEASUREMENT, FOUR ANSWERS

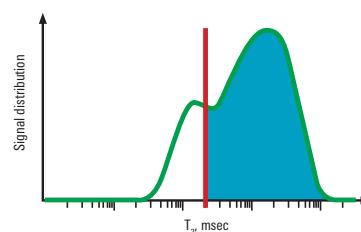
Mineralogy-Independent Porosity



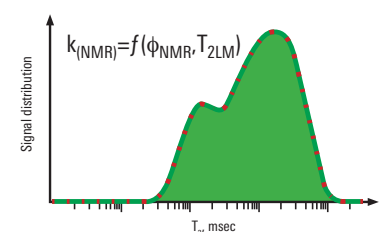
Facies Analysis Pore Size Distribution



Irreducible Water and Free-Fluid



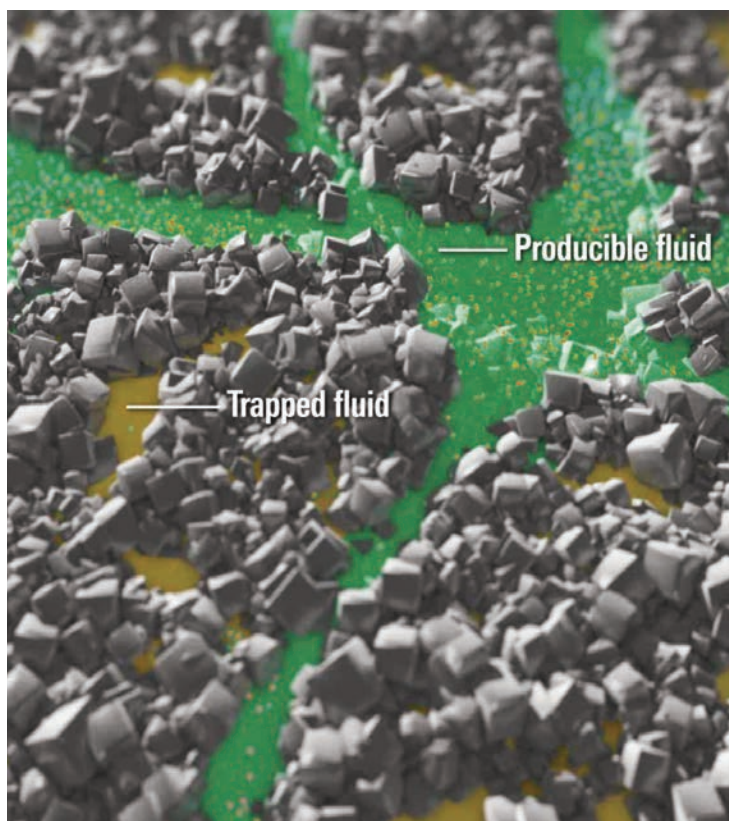
Continuous Permeability



COMPLETION QUALITY

By identifying bypassed pay zones and areas of high permeability, the proVISION Plus service provides information critical to optimizing your completion design. This service provides insight that can improve the effectiveness of your entire completion strategy and creates opportunities to increase production and decrease completion cost.

The service identifies areas of low permeability, helping you make better decisions about where and how to produce. When additional pay zones are discovered, you can use the data to create a targeted completion design.



Using pore size distribution, the proVISION Plus service helps you assess reservoir storage and flow capacity.



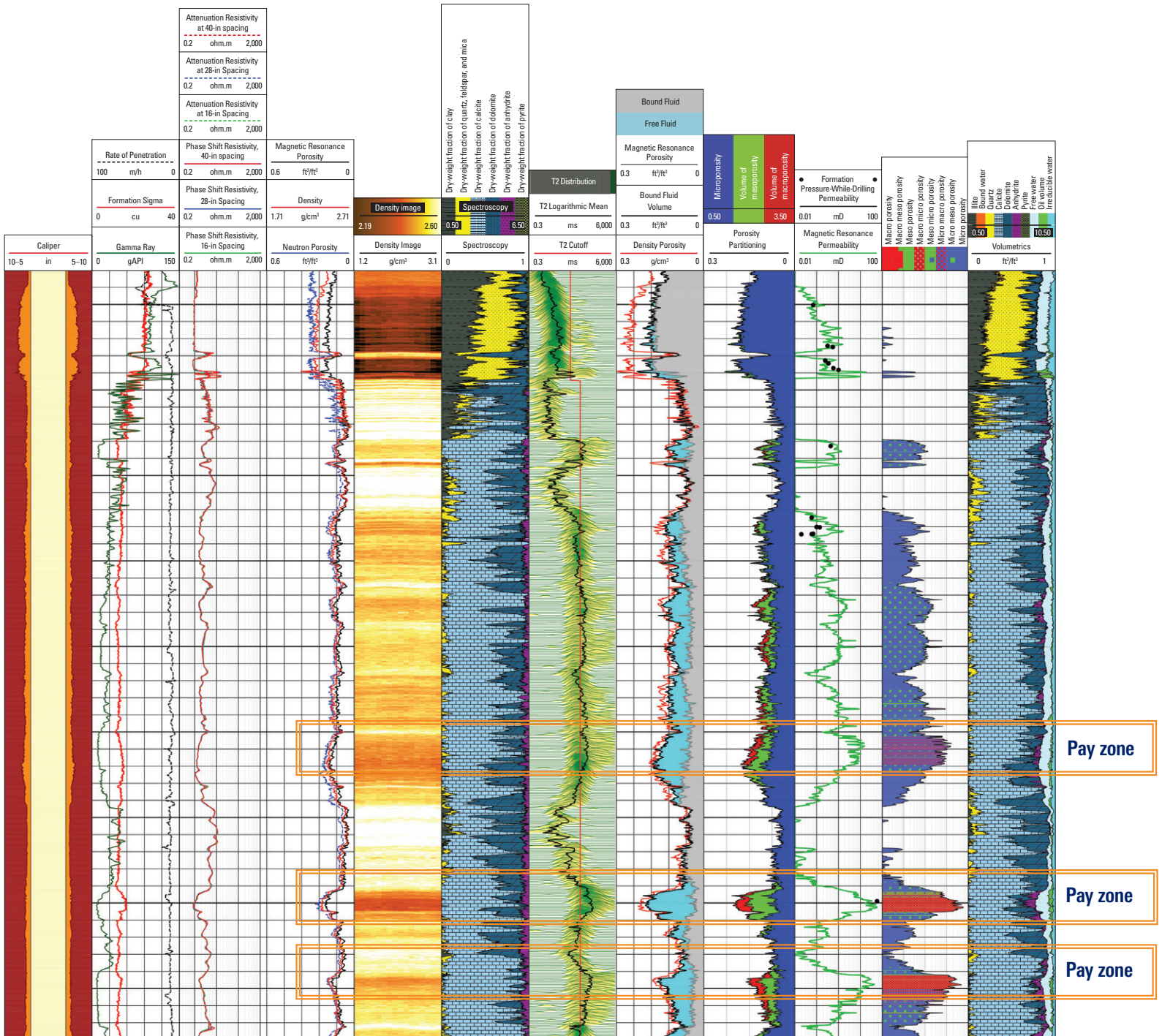
CASE STUDY

Describing heterogeneous carbonates

While drilling a well with a challenging trajectory to target a complex carbonate reservoir offshore Brazil, an operator required an LWD analysis to identify producible zones.

Schlumberger recommended the proVISION Plus service to evaluate rock and fluid properties and obtain accurate lithology-independent porosity and continuous permeability. In combination with the EcoScope* multifunction-while-drilling service, logs from the proVISION Plus service would enable the operator to determine if the reservoir required testing, perforation, or acid stimulation.

The high-quality, real-time magnetic resonance data from the proVISION Plus service provided a comprehensive description of the carbonate reservoir rocks, including permeability, to optimize placement of the wellbore. The advanced petrophysical evaluation improved testing and completion design and calculated reservoir producibility for this offshore well.



The proVISION Plus service provided continuous permeability in real time across the entire interval. As a result of data from the proVISION Plus, EcoScope*, and StethoScope* formation pressure-while-drilling services, the operator was able to accurately calculate the producibility of the reservoir.

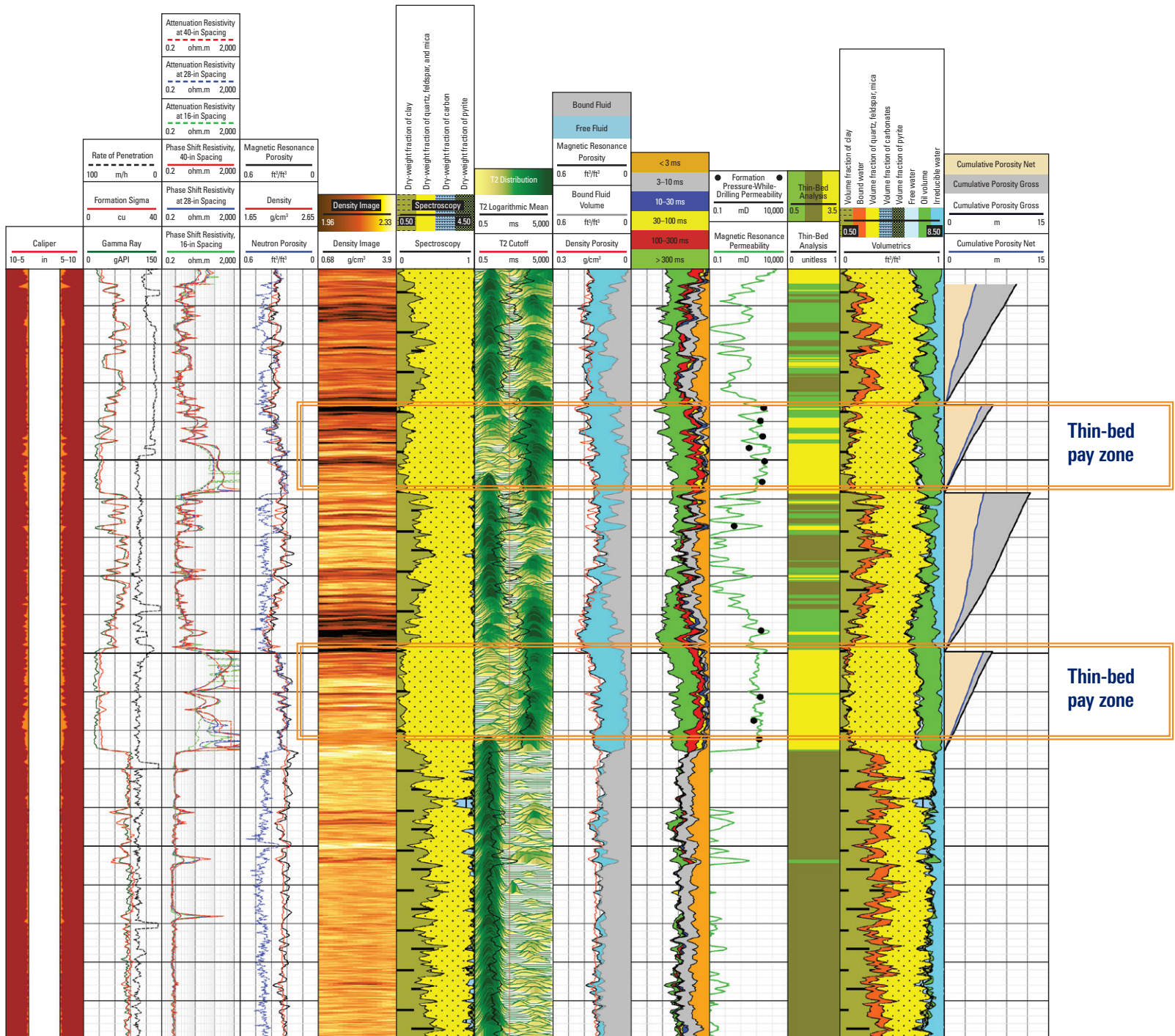
CASE STUDY

Predicting production rates in sandstone

An operator drilling a deepwater well offshore Africa needed to evaluate potential pay zones in a thinly bedded sandstone reservoir. Because of good vertical connectivity, thinly bedded sandstone reservoirs can contribute to increased well production. However, evaluating potential pay zones within individual sandstone layers is challenging in such complex reservoirs.

Using the proVISION Plus service, a thin-bed analysis was performed to interpret the porosity as it related to well performance. This analysis would help in evaluating the well's reservoir volumes and capturing the contribution of each pore system.

The thin-bed analysis provided advanced interpretation of the deepwater reservoir's porosity. The T2 distribution relaxation times enabled the operator to characterize the two laminated sand-shale sequences in real time, resulting in a 60% increase in calculated reserves. Net-to-gross and continuous permeability were also estimated for perforation interval selection and completion design optimization.



The EcoScope service clearly identified two distinct thin bed pay zones. When the logs from the EcoScope service were combined with logs from the proVISION Plus service, two additional laminated sand-shale sequences were revealed, leading to a 60% increase of reserves in place.

proVISION Plus

Measurement Specifications	proVISION Plus 675	proVISION Plus 825
Hole size	8.375 to 10.625 in [21.273 to 26.988 cm]	10.25 to 12.625 in [26.035 to 32.068 cm]
Range of measurement		
Uncorrected porosity	0 to 100%	0 to 100%
Min. echo spacing	600 us	600 us
T2 distribution	0.5 to 5,000 ms	0.5 to 5,000 ms
Vertical resolution		
Static [†]	4 in [10.16 cm]	4 in [10.16 cm]
Dynamic [‡]	10 in at 50 ft/h [25.4 cm at 15 m/h] 20 in at 100 ft/h [50.8 cm at 30 m/h]	10 in at 50 ft/h [25.4 cm at 15 m/h] 20 in at 100 ft/h [50.8 cm at 30 m/h]
Precision [§]	±1%	±1%
Depth of investigation ^{††}	14 in [38.1 cm]	17 in [43.2 cm]
Min. mud resistivity ^{††}	0.02 ohm.m	0.02 ohm.m
Others		
Data capacity	420 operating h	420 operating h
Power supply	Turbine	Turbine
Combinability	Fully compatible with all Schlumberger LWD tools	Fully compatible with all Schlumberger LWD tools
Mechanical Specifications		
Nominal collar OD	6.75-in [17.15 cm] API tolerance	8.25-in [20.955 cm] Nominal API
Min. ID	2.00 in [5.1 cm]	2.5 in [6.35 cm]
Length	37.31 ft [11.37 m]	38.47 ft [11.73 m]
Weight ^{§§}	3,900 lbm [1,769 kg]	5,800 lbm [2,630 kg]
Thread connections	5½ FH Box API	6½ FH Box API
Joint yield torque	46,000 ft.lbf [62,367.628 N.m]	91,000 ft.lbf [123,400 N.m]
Max. operating temperature	300 degF [150 degC]	300 degF [150 degC]
Max. operating pressure	20,000 psi [137.9 MPa]	20,000 psi [137.9 MPa]
Max. flow range ^{†††}	800 galUS/min [3 m³/min]	1,200 galUS/min [4.5 m³/min]
Pressure drop constant ^{†††}	30,000 psi	82,000 psi
Stabilizer ^{§§§}		
Downhole distance	2.5 ft [0.76 m]	3 ft [0.91 m]
OD range	8.25 to 10.375 in [20.96 to 26.35 cm]	10 to 12.125 in [25.40 to 30.79 cm]
Total flow area (TFA) ^{††††}	14%	14%
Max. dogleg severity		
Sliding	16°/100 ft [16°/30 m]	14°/100 ft [14°/30 ft]
Rotating	8°/100 ft [8°/30 m]	7°/100 ft [7°/30 ft]
Max. system shock level	30 min at Shock Level 5 (50-g _n threshold or accumulated 200,000 shocks above 50 g _n)	30 min at Shock Level 3 (50-g _n threshold or accumulated 200,000 shocks above 50 g _n)

[†] From radio-frequency antenna aperture.

[‡] With three-level averaging and 1% precision for sandstone configuration.

[§] At 25 degC [77 degF] and with three-level averaging.

^{††} Diameter of cylindrical measurement volume.

^{†††} Providing 90-in [228.6-cm] vertical resolution at 50 ft/h [15.24 m/h] logging speed.

^{§§} Including upper crossover.

^{†††} Minimum and maximum depend on turbine setup.

^{††††} Pressure drop, psi = [(mud weight, lbm/galUS) × ((flow, galUS/min)²)]/(Pressure drop constant, psi).

^{§§§} Stabilizer sleeves available in several sizes.

^{††††} TFA in in² is more than 14% of annular flow section (equivalent collar).



proVISION Plus

The **real-time solution** for advanced petrophysical evaluation of complex reservoirs.



Find out more about proVISION Plus at slb.com/proVISIONPlus

* Mark of Schlumberger
Other company, product, and service names are the properties of their respective owners.

[†] Japan Oil, Gas and Metals National Corporation (JOGMEC), formerly Japan National Oil Corporation (JNOC), and Schlumberger collaborated on a research project to develop LWD technology that reduces the need for traditional chemical sources. Designed around the pulsed neutron generator (PNG), EcoScope service uses technology that resulted from this collaboration. The PNG and the comprehensive suite of measurements in a single collar are key components of the EcoScope service that deliver game-changing LWD technology.

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