PeriScope Mapper Guides Well Placement in Mature South China Sea Reservoirs

Bed boundary mapping overcomes subsurface uncertainties, enhancing oil production and improving oil recovery

CHALLENGE
Develop remaining thin oil column reserves in the reservoir attic locations and in thin low-permeability reservoirs of mature offshore fields.

SOLUTION
Use PeriScope* bed boundary mapper, EcoScope* multifunction LWD service†, and adnVISION475* azimuthal density neutron tool to land wells and guide lateral drain placement.

RESULTS
- Achieved oil production 40% higher than target.
- Improved reserves recovery up to 15%.
- Reduced annual field production decline rate 14%.
- Saved 14% of AFE budget.

“...The application of azimuthal LWD bed boundary mapping has improved our confidence in the ability to drill complex reservoir targets, such as thin sands, stratigraphic reservoirs, sections with uncertain water contact positions, and complex extended-reach targets.”

Thanh Binh Tran
Asset Team Coordinator
CACT Operators Group

Drill challenging horizontal wells in mature offshore fields

Before beginning a drilling program in highly mature oil fields offshore southern China, the CACT Operators Group—Chinese National Offshore Oil Corporation (CNOOC), Chevron, and Eni—conducted a reservoir surveillance program. This program revealed that the remaining reserves in high-permeability reservoirs overlaying strong aquifers had accumulated in an attic oil column just 3 to 4 m thick. The program also revealed that the reserves in 1- to 3-m-thick, low-permeability reservoirs interbedded with shale remained unproduced despite years of commingled production with high-quality reservoirs.

Based on survey results, CACT began a horizontal drilling campaign targeting the oil remaining in both the high- and low-permeability reservoirs. Because the reservoir targets were so thin, the standoff between the horizontal laterals and the oil/water contact (OWC) was crucial for good well performance and reserve recovery.

Achieve precise landing and lateral placement

Because precise landing and lateral placement were critical to the success of the program, rotary steerable systems were used in conjunction with PeriScope bed boundary mapping, EcoScope real-time images, and an adnVISION475 azimuthal density neutron tool.

The PeriScope mapper was used to delineate multiple boundaries simultaneously and avoid drilling into upper reservoir hard streaks, and the horizontal lateral sections were placed accurately within the thin pay zones despite structural uncertainties. EcoScope service provided density images for real-time formation evaluation and structural dip interpretation, and the adnVISION475 tool provided azimuthal measurements of rock and fluid properties for formation evaluation.

Typically, mature reservoirs are challenging to produce due to thin oil columns, high structural uncertainties, and uncertain OWC levels.
CASE STUDY: Bed boundary mapping enhances oil production and improving oil recovery

In this well, the trajectory was successfully maintained within 0.5 m below the top of the pay zone throughout the section despite the high contrast between the actual structural profile found and the original predrill model. The presence of shale break and multiple lobe sands were clearly mapped along the horizontal section, helping the team to place the trajectory precisely within the expected target zones.

**Optimize trajectories and minimize drilling risk**

PeriScope, EcoScope, and adnVISION425 technologies helped CACT optimize well trajectories and minimize drilling risk by improving understanding of reservoir characteristics for real-time decision making.

Oil production from the first eight sidetrack and extended-reach wells that were drilled and completed averaged 40% higher than the production target. Reserves recovery improved up to 15%, and the annual field production decline rate was reduced 14%. In addition, there was a 14% AFE budget savings. These results have increased CACT's confidence in the ability to land and place wells in thin sands, stratigraphic reservoirs, sections with uncertain water contact positions, and complex extended-reach targets.

Contact your local Schlumberger representative to learn more.