Enhancing Well Placement and ROP With High-Density Data

PULSESTAR™ INTELLIGENT HIGH-SPEED TELEMETRY SERVICE IMPROVES DRILLING PERFORMANCE

OFFSHORE UAE

CHALLENGES

Provide high-density data for accurate well placement with ultra-deep resistivity inversions at high ROP:

- Gather high-density, real-time LWD downhole data
- Drill long horizontal section (> 5,000 ft) in a single run

SOLUTION

Deploy the PulseStar™ intelligent high-speed telemetry service to deliver high-resolution, real-time LWD data at extended depths:

- Deliver high-speed data rate across the reservoir section
- Maximize downhole time for extended periods

RESULTS

- Provided consistent well delivery and increased reliability with tandem telemetry in the same BHA
- Supplied high-density image logs produced by high physical data rate
- Delivered accurate well placement and optimized completion design by enhancing real-time multilayer mapping and identifying non-uniform water boundaries
- Increased the ROP by 80% and contributed to 20% reduction in AFE days

OVERVIEW

The operator of an oil-producing lateral in an offshore mature field in the UAE required high-density data from several solutions without compromising the rate of penetration (ROP) while drilling long laterals. This included real-time, ultra-deep resistivity 3D inversions and borehole imaging for accurate well placement. The operator selected the PulseStar™ intelligent high-speed telemetry service to transmit high physical data rates and deliver the required logging data from multiple logging while drilling (LWD) services.

CHALLENGES

Developing a mature carbonate reservoir requires drilling dual laterals with long-duration runs. And real-time reservoir monitoring requires multiple LWD services with high-density data for improved reservoir insight.

SOLUTION

The PulseStar™ intelligent high-speed telemetry service delivers high-resolution, real-time drilling, and logging data to help ensure efficient and consistent well delivery. For this mature carbonate maximum reservoir contact (MRC) well, the PulseStar service offered consistently high data rates acquiring high-density logs across the reservoir, in combination with the extended battery life to drill the long horizontal section in a single run.

RESULTS

The operator reached planned TD, delivering 5,152 ft in a single run and reducing well days by 20%. High-density data was obtained in real-time, including ultra-deep resistivity 1D inversions equivalent to recorded data quality, 3D real-time inversions, 360° borehole images, bulk density, neutron porosity, directional measurements, gamma ray, and downhole drilling dynamics. This data helped achieve precise well placement and enhanced reservoir insight. It also contributed to an optimized completion design after identifying the water boundaries based on the high-quality real-time reservoir mapping image. The advanced telemetry proved its capabilities by providing multiple data types in a harsh environment, allowing seamless execution while achieving a 100% MWD signal detection rate and significantly improving the ROP.

Figures 1 and 2 below illustrate two drains, one drilled using standard telemetry and the other using the PulseStar intelligent high-speed telemetry service.

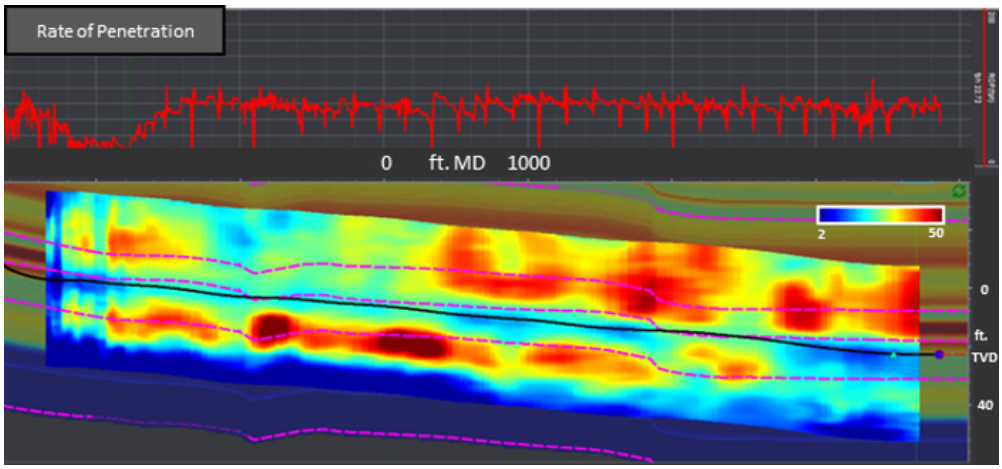

Figure-1: Multilayer mapping using standard telemetry

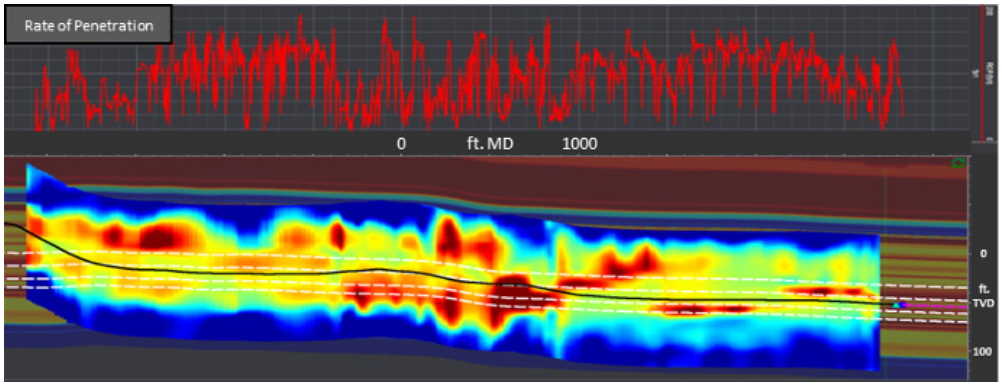

Figure-2: High-resolution and enhanced multilayer mapping and non-uniform water boundary using the PulseStar™ service

Compared to the image in Figure 1, the curtain plot on Figure 2 shows enhanced overall quality of the reservoir mapping image throughout the long lateral. This resulted in accurately placing the well to avoid the water drain (blue area in the curtain plot.) Also, the real-time LWD measurements, as well as the dense drilling dynamics information in Figure 2 were delivered at a significantly higher ROP compared to the first drain.

The PulseStar service enhances reservoir insight with high-resolution formation evaluation data, and it improves drilling performance in complex BHAs running multiple sensors. This maximizes on bottom time and delivers integrated solutions as a complete suite for optimum well placement.

HALLIBURTON