TECH BRIEF

HIGH-DENSITY CONTINUOUS GYROSCOPIC SURVEYING

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INDUSTRY CHALLENGE + OBJECTIVE

Traditional surveys are not always able to capture the most accurate wellbore data. When engineers receive inaccurate data, they are unable to determine correct wellbore positioning or well conditions, such as tortuosity. Tortuosity can significantly impact drilling processes and efficiency and be crucial for the life of downhole production equipment. Also, without accurate surveys, collision risks significantly increase.

Survey tools enhanced with digital electronics, modern processors and high-accuracy sensors produce higher quality data and provide solutions that can impact wellbore position. This paper explains how high-density surveys are proving to be an effective way to collect accurate borehole data.

TECHNOLOGY + SERVICE SOLUTION

- High-density survey tools are able to collect data that can be used to analyze wellbore tortuosity and position throughout the entire well. These surveys can be taken while drilling or tripping out of the hole and subsequently used to update the wellbore tortuosity and position.
- Continuous inclination and azimuth provides knowledge of the borehole turns in real time, without having to wait for the stationary surveys. This data allows the directional driller to optimize the sliding time required to turn the well when a mud motor is used and drill a smoother horizontal lateral.
- Continuous survey data collected in casing can show if the casing was set in compression or tension. It can also identify the best location for electrical submersible pumps and more accurately calculate sucker rod side forces.

RESULT + VALUE DELIVERED

- In one case study, the tortuosity parameters calculated from a high-density continuous gyroscopic (HDCG) survey showed more details about the trajectory of the wellbore than a measurement-while-drilling (MWD) survey. The HDGC survey identified high doglegs that revealed the maximum through bore diameter over a 30-meter interval dropped to zero at 2,900 meters. MWD intervals at each stand (30 meters) did not show the true dogleg in this section of the wellbore resulting in complications with running casing and failure of artificial lift equipment. The inadequate information also resulted in lost production with significant extra costs to the operator (estimated to be more than 7 million USD).
- Because of the HDCG survey data, the client decided to place the production pumps 150 meters higher than they were initially planning to avoid future rework.
- High-density survey data can be used to provide a better understanding of the shape and tortuosity of the borehole in open hole, casing and tubing. This data allows the construction of smoother well paths and reduces torque and drag, allowing the lateral portion of the well to be extended. It also reduces lateral and true vertical depth uncertainty, which can be used to improve reservoir maps.
- Overall, high-density survey data collected during drilling operations can be used throughout the life of a well. It can have a significant impact on repair costs and downtime during the production life of the well.

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