ADDRESSING WELLBORE POSITION CHALLENGES IN ULTRA-EXTENDED-REACH DRILLING IN RUSSIA'S FAR EAST

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Drilling in Russia's Far East has always been associated with industry-defining ultra-extended-reach drilling. With the emergence of more powerful drilling rigs and advances in measurement- and logging-while-drilling (MWD and LWD) tools, these wellbores can be designed to reach farther. Therefore, accurately penetrating and exploiting distant reservoirs have resulted in critical dependence on high-accuracy surveying techniques.

Successful target penetration and meeting anticollision requirements without the need for shutting production in nearby wells are key proponents for a geomagnetic referencing service (GRS). Geomagnetic referencing is the technique to minimize the lateral position uncertainties when using MWD. This is particularly important for wellbores that extend the boundary of the drilling envelope with stepouts greater than 13 km. The wellbore azimuth accuracy is highly dependent on the quality of the magnetic data used to produce the geomagnetic reference model. This model characterizes the absolute magnitude and vector direction of the natural magnetic field for every point along the wellbore. Representation of the local crustal magnetic contribution is key to the process since it constitutes a significant error in the lateral wellbore position.

Since 2011, a new, highly accurate geomagnetic referencing methodology has been used in Russia’s Far East. Global contributions are accounted for by a high-definition geomagnetic model (HDGM). In addition, the local crustal magnetic anomaly is represented by 3D ellipsoidal harmonic functions tracking the shape and depth of the Earth, thereby providing seamless integration with HDGM and avoiding distortions faced by conventional plane-Earth approximations. A comparison with the previous industry standard shows improvements of 0.5° in azimuth determination. This high-degree geomagnetic technique will serve well for a number of upcoming developments in Russia’s Far East, continuing to push the drilling envelope and providing essential, accurate wellbore positioning, while offering significant time and cost savings.