OTC-29168-MS

Continuous Improvement in Wellbore Position Accuracy: Ultra-Extended-Reach Drilling in Far Eastern Russia

Benny Poedjono; Stefan Maus; Sheldon Rawlins; Nicholas Zachman; Adam Paul Row; Xiong Li

Abstract

Drilling ultra-extended-reach (ultra-ERD) wellbores has redefined industry standards. Operators and service companies must fully assess the accompanying risks to maximize the overall productivity of an asset. New drilling technologies, such as improved drilling fluid design and geomechanics analyses, allow wellbores to be drilled to the lateral displacement of greater than 13 km. This requires improved absolute wellbore positioning, in conjunction with reduced uncertainties. When developing these drilling technologies, the economics must be considered so as not to exponentially increase the cost per barrel of oil. The increase in infill drilling of nearby offset wellbores requires developing improved methods that reduce wellbore position uncertainty when placing the wellbore in the reservoir, in addition to avoiding collisions.

The proposed geomagnetic referencing technique is suitable for the application to the Sakhalin-1 project in eastern Russia. Here there is a predominance of ultra-ERD wellbores coupled with considerable knowledge of the varying depth of the basement rock structure. This paper presents a process used for creating a geomagnetic crustal field model that can be updated to the actual survey location with the date and time for real-time application. This process can also be used in the reprocessing of legacy measurement-while-drilling (MWD) data. The application of this process significantly improves wellbore position accuracy. The ability to have a greater understanding of the overall geomagnetic field, along with enhanced techniques in multistation algorithm processing, removes the effects of drillstring and the cross-axial interference due to mud shielding effects. Additional benefits of this application include reduced wellbore tortuosity for planned wells, improved anticollision separation factors, and improved torque and drag profiles.

This new geomagnetic model, updated to the actual survey location, date, and time and incorporating realistic uncertainty determinations based on basement rock depth analysis, has resulted in a 50% improvement in the overall ellipse of uncertainty (EOU) when compared with previous definitive surveys, in addition to an accurate bottomhole location. Incorporating these advanced techniques reduces position uncertainty that improves overall 3D wellbore positioning. Other studies, such as a disturbance field study, evaluate the effects of the magnetospheric ring current, auroral electrojets, and secondary induced fields, and was conducted by analyzing the magnetic observatory data from the same magnetic latitude to quantify the maximum and minimum declination variations during a magnetic storm.

2018. Offshore Technology Conference