Advanced Horizontal Well Correlation Method for the Dynamic Update of Subsurface Layers While Geosteering

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Abstract

A new automated approach to well correlation is presented that utilizes real-time Logging-While-Drilling (LWD) data and predicted well curves to dynamically update subsurface layers during geosteering operations. Historically, well correlations that were based on a simplified assumption of vertical well trajectories ignored the effect of horizontal sections along the borehole path in the calculation of reservoir thickness. In addition, well correlations were also typically performed using 2D cross sections, which did not account for apparent dip in reservoir thickness calculations. A new advanced methodology introduced in this study involves the creation of a dynamic structural framework model, from which horizontal well correlation is performed using real-time well logs and predicted logs that are generated from adjacent wells. The predicted logs are correlated to the LWD logs using anchor points and an interactive stretching and squeezing process that honors true stratigraphic thickness. Each new anchor point results in the creation of an additional control point that is used to build a more precise structural framework model. This new approach enables more rapid well log interpretation, increased accuracy and the ability to dynamically update the subsurface model during drilling. It also enables more efficient steering of the wellbore into the most productive zones of the reservoir. This study demonstrates how wells with over 10,000 feet of horizontal reservoir contact can be correlated in a real-time geosteering environment in a dynamic, efficient and accurate manner. The proposed process dramatically helps reduce the cost of drilling and the time it takes to dynamically regenerate accurate updated maps of the

subsurface. It represents a major improvement in the understanding and modeling of complex, heterogeneous reservoirs by fostering a multi-disciplinary environment of cross-domain experts that are able to collaborate seamlessly as asset-teams. Both accuracy and efficiency gains have been realized by incorporating this methodology in the characterization of multi-stacked reservoirs.