Characterizing Wolfcamp Benches in the Delaware Basin: Do You Know Where Your Laterals Are?

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Abstract

Targeting specific benches within the Wolfcamp Formation in the Delaware Basin has become an important objective for Permian Basin operators. It is critical to optimize infill wells because the spatial offset relationship to the parent well is a key driver in targeting reservoir facies and the reduction in offset well communication. This study utilizes facies modeling through Heterogeneous Rock Analysis (HRA) coupled with seismic to high grade the rock fabric in between previously drilled pilot wells, with advanced logging suites in vertical well bores serving as the petrophysical anchors for the derived model. Understanding the depositional environments and linking mechanical drivers, such as Young's Modulus, Poisson's Ratio, and pore pressure are fed into the model. Once the facies typing has been established, this high graded workflow can then be reincorporated back into the full geomodel, only then can the seismic dataset and HRA be used to highlight the desired facie signatures for the optimization of drilling infill child wells. This modeling application has a small error bar because of the representative sampling and distribution of modeled grid cells, the incorporation of mudlog sample cuttings into the model, the variability of some stratigraphic tops, and the complexities of interpreted seismic horizons across the interval of interest, yet still delivers a limited target drilling window of roughly twenty feet.To geosteer these lateral wells targeting a desired facies, specific waypoints are designated to drill the best reservoir rock possible throughout the entire lateral using this high graded HRA model. However, as drilling rates reach their mechanical optimization throughout the lateral, bit bounce from encountering dense, interfingered facies can change the trajectory of the wellbore away from the targeted waypoints. Minimizing porpoising and dog leg severity

issues is dependent on the predictability of what types of facies lie ahead the bit. Revealing structural complexities across the geomodel is one such trend which helps to drive completion metrics for wellbore longevity and increased productivity. Understanding these data within a derived geomodel assists in revealing trends and assigns metrics so operators can meet these modeled optimizations. Without the initiation of a geomodel to understand these targeted intervals within a multi bench development program, optimization can not be reached because of the variability of rock fabrics and structural controls in between the distant offset pilot wells. The application and evolution of the HRA model is one such method to link complex geology for the optimization of targeted facies.