Optimizing Landing and Geosteering Operations in Heterogeneous, Thin Sand Bodies in Clastic Reservoirs

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Abstract

Objectives/Scope: Optimal well planning is essential for the field development and placing horizontal well within thin and discontinuous sand bodies in clastic reservoirs. Major challenges, commonly encountered in clastic, heterogeneous reservoirs is the development of thin sand bodies (less than 5-8 ft thickness) that are unpredictable in terms of lateral and vertical connectivity that affecting the final sand net to gross ratio (N/G). Sudden sand pinch-outs at different stratigraphic levels are frequent with uncertain orientation.

Methods, Procedures, Process: Structural uncertainty can pose extra challenges in operational activities in such heterogeneous reservoirs. In this abstract, we propose a workflow which help to gain maximum reservoir contact. Several correlation panels are generated to evaluate areal extent and stratigraphic position of the sand bodies and to pick sand-rich bodies using final formation analysis (FAL) logs. Conventional cut offs of our target are: 1) less than 30 gamma-ray API counts; and, 2) density values of 2.3 gram/cc.

Results, Observations, Conclusions: Top and base of these thin sand bodies are picked and mapped across the area of interest (AOI), where sand thickness maps of sand lobes are generated to aid in the identification of sand thicknesses at well level. The sand thickness maps, including the orientation and potential pinch-outs of these sands are evaluated. At a last stage, fluid contacts and zones with low N/G ratios based on the mentioned cut-offs are used to identify high uncertainty area. Finally, during landing phase, the landing angle is between 88 to 89 and ROP will be low around 50 ft /hr increasing the possibility of landing success within these thin heterogenous sand units. Also, sand thickness maps and offset wells correlation help the geosteering process and increases reservoir predictability.

Novel/Additive Information: The proposed workflow has been tested to land highly heterogenous wells without using the deep azimuthal resistivity image, which optimized cost saving. Applying this new approach, can reduce not only uncertainty in landing and geosteering in thin reservoirs; but more importantly can be used in future drillings targets with good results in cost optimization.