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P.O. Box 3524, La Romaine, Trinidad and Tobago, W.I. or UTT Building, Esperanza Road, Brechin Castle, Couva, Trinidad W.I. Website: www.the gstt.org Email: thegstt@gmail.com

Subsurface Modeling to predict the performance of a horizontal well

Southern Basin, Trinidad

Author: 1Trisha Lalla, Dwarak Uthayashankar, Danais Ragoonanan, Carissa Toolsie, Jillian George, Felicia Skelly-Mitchell

[1] TLalla@trinioil.com & Dwarak Uthayashankar - presenters, Trinity Exploration and Production, Trinidad and Tobago

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In the prolific Southern Basin, Trinidad, there are stranded reserves in fault blocks which represent appreciable oil volumes. Traditionally, these reserves have been targeted using vertical development wells. Oilbelt Services Limited, through their upcoming drilling campaign will seek to drill their first horizontal well in an effort to change the paradigm of optimally drilling and producing reserves.

A static 3D geological model was constructed, using Baker Hughes' Jewelsuite software, to predict the potential production inflow rates for various horizontal well lengths and reservoir permeability values. Geological data sets such as well survey/trajectories, formation markers, seismic interpretation and petrophysical well logs, provided essential inputs for the model. This data was used to populate a model grid with integrated reservoir properties such of Vshale, Sw and porosity.

Data from an analogue field in the Southern Basin was used to establish the relationship between permeability and Vshale to supplement the porosity and permeability data in the area of interest. The grid provided the platform to run reservoir simulation iterations using input oil parameters, such as solution GOR, oil gravity and gas specific gravity. The model was history matched for validity based on the current production rate and performance of a nearby offset well to the proposed horizontal well location.

Permeability modeling sensitivities applied showed production performance increased significantly with an increase in reservoir permeability. Production rates were also increased by two to three times that of a vertical well by increasing horizontal completion length. The model was based on a maximum horizontal well length of 500 ft that could be achieved based on the size of the fault block of interest.

Horizontal wells can be the solution for maximizing initial well inflow by increasing sand face exposure thus enabling production returns to be realized sooner than traditional vertical wells.