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A Multi-disciplinary Approach for Planning a Horizontal Well in an Enhanced Oil Recovery Field, Forest Reserve, Trinidad.

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Abstract

The Upper Morne L'Enfer (UML'E) thermal project is located in the Forest Reserve field and targets production from the A1, A2 and B units of the UMLE unit of the Morne L'Enfer Formation. Primary production from the area began in 1969 and continued up to 2000. In April 2000, a drilling programme commenced and in 2004 a pilot thermal project was implemented with cyclic steam stimulation as the main production mechanism. From 2007 to present the thermal project was expanded to the south-east, to increase productivity of the heavy oil hydrocarbons. Using geological, geophysical and reservoir data, two horizontal wells were proposed in 2014, to further expand the Enhanced Oil Recovery (EOR) area to south. The planned horizontal wells target the A1 sand which is clean, shows a consistent blocky log character and has high resistivity and permeability. The paleo-bathymetry for the UMLE is non-marine to marginal marine. The reservoir sand is interpreted as a distributary channel with tidal influence. The identification of the depositional environment was of great importance in order to delineate areas where the sands are best developed and thus plan EOR patterns with greater accuracy. The reservoir model was built using geological model and rock properties, after which a production history match was done. Following the initial well design, the proposed wells were viewed on the 3D North West District (NWD) seismic dataset. Interpretation of the reservoir showed subtle changes in the dip of the sand which the previous interpretation, using only well logs, was not able to discern. As a result of the 3D interpretation, changes in the well design were made so the horizontal well path remains within the reservoir interval. The chance of success has increased with the integration of the seismic data that allowed better 3D visualization of the Geological Model and more accurate placement of the horizontal well to achieve optimum results.