Seismic Driven Multistage Reservoir Characterization Process of Thinly Sand-Shale Interbedded Deltaic Reservoirs — A Case Study from the Tapti Daman Sector of Mumbai Offshore Basin, India

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Abstract

Thin sand intercalated shale deposited under tidally influenced sedimentary environment is challenging for reservoir characterization and modelling. Facies variation is controlled by many factors such as river sediment load discharge, seasonality, grains size, paleo morphology and paleo-tectonic controls. In this paper an attempt has been made to not only decipher the sand geometry in a tide dominated clastic deltaic reservoir of Late Oligocene age but also to bring out the hydrocarbon distribution by integrating varied seismic amplitude signature with log and pressure data with meticulous identification of different hydrodynamic compartments. Tapti-daman Sector, part of Mumbai Offshore Basin, represents the transition stage between pure clastic Cambay Basin and near-pure carbonate basin of Mumbai offshore. Late Oligocene sequence of the Daman formation, sandstone reservoirs in the area, are the result of multi-channel activities and deposition of sand in the form of point bar, mouth bar and crevasse splay etc (J.P Pandey, et al 2013). The C-24 prospect was explored during 1987-93 by drilling 8 exploratory wells out of which 4 wells (C24-A, C-24-B and C-24-C & C-24-F) have produced hydrocarbons. Late Oligocene has witnessed overall sea level rise i.e. transgressive whereas sands deposited within are a response of relative fall of sea level and each episode of sand. The Th & K and Th/U & K/U cross plots revealed clay typing and depositional environment i.e. fluvial to marine

transition. The seismic response of Daman Formation in Tapti Daman block varies both in spatially and temporally due sand type and their depositional environment. Therefore, to capture the sand dispersal pattern in C-24 field, a multistage approach was adopted in this study. The connect seismic sand was model with integrating with wells based variogram analysis and posterior probability density function of sand facies with Far Angle Stack seismic amplitude and running number of realization final P10, P50 and P90 case was chosen to achieve the realistic sand dispersal. Porosity model was conditioned to seismic data using krigging since P-impedance shows linear and inverse relationship with effective porosity (PHIE) in sands and biasing with facies. Effective porosity vs. water saturation relation was used to restrict the variability of population in the model. Effective porosity model was used as volume trend for saturation model.

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