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The influence of depositional and structural attributes on oil rate and basic sediment & water

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epositional and structural elements confer significant impact on hydrocarbon flow behaviour. These geologic elements were evaluated to understand possible causes of rapid production decline. The oilfield where this study is carried out is located within the shallow offshore area of the Niger Delta, Nigeria. The field experiences high decline in oil rate and sharp increase in water-cut two years after commencement of production. This research provides a predictive insight into coning behaviour and also serves as a blueprint for post-breakthrough performance analysis. Key objectives considered include: To identify subsurface structure capable of hydrocarbon entrapment; determine depositional characteristics of facies/depositional environment of key reservoirs; and to determine possible causes of rapid production decline in the field. The methods adopted include; well log correlation and sequence stratigraphic technique to establish the continuity of key horizons; electrofacies/seismic characterization of the gross depositional setting of key reservoirs and 3D seismic volume attribute analysis for stratigraphic and structural characterization. The 3D seismic volume attribute procedure for generating attributes follows a defined Petrel workflow that uses established algorithms to output anticipated results. The results showed that eight continuous sand horizons occurred within six depositional sequences of 7000 ft thick paralic Agbada Formation. A depth structure map generated over the N5.2 sand revealed a structural saddle; an elongate fourway dip closure with two structural culminations. Further analysis using 3D seismic attributes on time slice 0 to 4000 milliseconds showed four facies distribution patterns. They include: Dispersed facies; linear/parallel facies; isolated pattern, and meandering configuration. Depositional attributes inferred include: Beach-barrier-shoreface deposits; deep sea channel, chaotic turbidite sands, and stratigraphic pinchouts. Areas with high seismic root-mean-square amplitude represent sand-prone facies; low amplitude areas may be interpreted as pelagic or hemipelagic sedimentation, or water-bearing facies. The N5.2 producing sand has excellent reservoir quality and natural fractures. Inappropriate choke management, water injection, excellent reservoir quality and vertical fractures are factors that aggravated significant fluid flow and early water breakthrough, resulting in rapid production decline. The 3D seismic horizon slices is suitable for amplitude display, gross rock bodies identification, selection of possible drilling locations and for stratistructural modeling.

Biography

Prince Suka Momta holds a BSc degree in Geology from the University of Calabar, MSc in Petroleum Geology and PhD in Geology (Sedimentology & Reservoir Geology) from the University of Port Harcourt, Nigeria. He has a strong technical background and experience in oilfield operations involving drilling and formation evaluation, wellsite operations, well completion and casing for the past six years with OANDO Energy Services, Lonestar Drilling and CISCON Nigeria Limited. He has lectured with Uptonville Oil and Gas Institute (Petroleum Geoscience Institute) for six years and supervised 20 undergraduate and postgraduate diploma students of Petroleum Geoscience; published over 15 papers in reputable international journals and presented 4 conference papers; served as PhD Research Assistant to the OB Lulu Briggs Chair in Petroleum Geosciences at the Institute of Petroleum Studies, University of Port Harcourt between 2013 and 2016. He is a seasoned subsurface exploration consultant/Head of technical team with Petro-Drill Global Concept Limited/Radiant Exploration (USA) and Geo Exploration Technologies (Germany), promoting a state-of-the-art 4D satellite/airborne hydrocarbon and solid mineral exploration technology. She was a member of Oil Spill Rapid Response Team on Lonestar Drilling rig for all the operations in the Nembe Creek, Bayelsa State, and also an Environmental Consultant to Eyaa Community, Onne, Rivers State between 2014 and 2015, handling a major spill that occurred in the area. He reviews research articles for the American Journal of Geosciences (Science Publication), and Editorial Advisory Board Member on Petroleum Geology to the Elixir International Journal and Pelagia Research Library.

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