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## **Prospect Analysis and Hydrocarbon Reservoir Volume Estimation in an Exploration Field, Shallow Offshore Depobelt, Western Niger Delta, Nigeria**

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Abstract

The daunting challenge in the exploration and production of oil and gas in the face of continual rise in the world's energy consumption has long been how to economically recover bypassed reserves within existing assets. This research is focused on the analysis of prospects and volumetric estimation of the hydrocarbon reservoirs delineated within an exploratory field using 3D seismic data and suites of wireline logs. The prospectivity of the delineated reservoir was carried out using seismo-structural interpretation and formation evaluation towards the assessment of the prolific hydrocarbon occurrence within the field. The reservoirs have porosity (0.29–0.32) for H1, (0.20–0.31) for H2 and (0.30–0.40) for H3 and the average computed hydrocarbon saturation of (0.31–0.62) for H1, (0.16–0.52) for H2 and (0.64–0.73) for H3, hydrocarbon pore volume (HCPV) of 28,706.95, 33,081.2 and 45,731.49 barrels for H1, H2 and H3, respectively, while the estimated stock tank oil initially-in-place (STOIP) range (136.8–140.73) MMSTB for H1, (36.77–489.64) MMSTB for H2 and (166.62–308.14) MMSTB for H3. The observed porosity and hydrocarbon saturation for the delineated reservoirs as well as the estimated hydrocarbon pore volume and storage total oil in place indicate that the reservoirs are highly prolific. The study has therefore contributed to the understanding of hydrocarbon resource potential within the study area.

Keywords

Hydrocarbon resource evaluation Play analysis Reservoir characterization Formation evaluation Prospect mapping Niger Delta

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Notes

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## References

Akaegbobi, I. M., Nwachukwu, J. I., & Schmitt, M. (2000). Aromatic hydrocarbon distribution and calculation of oil and gas volumes in Post-Santonian Shale and Coal, Anambra Basin, Nigeria. In M. R. Bello & B. J. Katz (Eds.), *Petroleum systems of South Atlantic Margins* (Vol. 73, pp. 233–245). American Association of Petroleum Geologists Memoir.

Google Scholar

Allen, J. R. L. (1965). Late Quaternary Niger Delta and adjacent areas: Sedimentary environments and lithofacies. *American Association of Petroleum Geologists Bulletin*, 49, 547–600.

Google Scholar

Anomneze, D. O., Okoro, A. U., Ajaegwu, N. E., Akpunonu, E. O., Ahaneku, C. V., Ede, T. A. D., et al. (2015). Application of seismic stratigraphy and structural analysis in the determination of petroleum plays within the eastern Niger Delta Basin, Nigeria. *Journal of Petroleum Exploration and Production Technology*, 5, 113–122. <https://doi.org/10.1007/s13202-015-0161-2>.

CrossRefGoogle Scholar

Archie, G. E. (1942). The electrical resistivity as an aid in determining some reservoir characteristics. *Journal of Petroleum Technology*, 5, 54–62.

Google Scholar

Asquith, G. (2004). Basic well log analysis. *American Association of Petroleum Geologists Methods in Exploration Series*, 16, 12–135.

Google Scholar

Avbovbo, A. A. (1978). Tertiary lithostratigraphy of Niger delta. *American Association of Petroleum Geologists Memoir Bulletin*, 62, 295–306.

Google Scholar

Chapin, M., Swinburn, P., Weiden, R. V., Skaloud, D., Adesanya, S., Stevens, D., et al. (2002). Integrated seismic and subsurface characterization of Bonga field, offshore Nigeria. *The Leading Edge*, 21(11), 1125–1131.

CrossRefGoogle Scholar

Damuth, J. E. (1994). Neogene gravity tectonics and depositional processes on the deep Niger Delta continental margin. *Marine and Petroleum Geology*, 11, 320–346.

CrossRefGoogle Scholar

Deptuck, M. E., Sylvester, Z., Pirmez, C., & O'Byrne, C. (2007). Migration-aggradation history and 3-D seismic geomorphology of submarine channels in the Pleistocene Benin-major Canyon, western Niger Delta slope. In: R. B. Wynn, & B. T. Cronin (Eds.), *Sinuuous deep-water channels; Genesis, geometry and architecture*, *Marine and Petroleum Geology* (Vol. 24(6–9)), pp. 406–433. Elsevier.

Google Scholar

Doust, H., & Omatsola, M. E. (1990). Niger Delta. In J. D. Edwards & P. A. Santogrossi (Eds.), *Divergent/passive margin basins* (Vol. 48, pp. 239–248). American Association of Petroleum Geologists Memoir Bulletin.

Google Scholar

Ejedawe, J. E. (1981). Patterns of incidence of oil reserves in Niger Delta Basin. *American Association of Petroleum Geologists Bulletin*, 65, 1574–1585.

Google Scholar

Ejedawe, J. E., Coker, S. J. L., Lambert-Aikhionbare, D. O., Alofe, K. B., & Adoh, F. O. (1984). Evolution of oil-generative window and oil and gas occurrence in Tertiary Niger Delta Basin. *American Association of Petroleum Geologists Bulletin*, 68, 1744–1751.

Google Scholar

Larionov, V. V. (1969). *Borehole radiometry*. Moscow: S.R. Nedra.

Google Scholar

Lawrence, S. R., Munday, S., & Bray, R. (2002). Regional geology and geophysics of the eastern Gulf of Guinea (Niger Delta to Rio Muni). *The Leading Edge*, 21, 1112–1117.

CrossRefGoogle Scholar

Nigerian Oil and Gas Sector Report. (2014). *The long journey*. CSL Report, 50 p.

Google Scholar

Oyeyemi, K. D., & Aizebeokai, A. P. (2015). Hydrocarbon trapping mechanism and petrophysical analysis of Afam field, offshore Nigeria. *International Journal of Physical Sciences*, 10(7), 222–238.

CrossRefGoogle Scholar

Oyeyemi, K. D., Olowokere, M. T., & Aizebeokhai, A. P. (2017a). Hydrocarbon resource evaluation using combined petrophysical analysis and seismically derived reservoir characterization, offshore Niger Delta. *Journal of Petroleum Exploration and Production Technology*.

<https://doi.org/10.1007/s13202-017-0391-6>.

Google Scholar

Oyeyemi, K. D., Olowokere, M. T., & Aizebeokhai, A. P. (2017b). Evaluation of optimal reservoir prospectivity using acoustic-impedance model inversion: A case study of an offshore field, western Niger Delta, Nigeria. *NRIAG Journal of Astronomy and geophysics*, 6(2), 300–310.

CrossRefGoogle Scholar

Reijers, T. J. A. (2011). Stratigraphy and sedimentology of the Niger Delta. *Geologos*, 17(3), 133–162.

CrossRefGoogle Scholar

Sanuade, O. A., Akanji, A. O., Olajojo, A. A., & Oyeyemi, K. D. (2017). Seismic interpretation and petrophysical evaluation of SH field, Niger Delta. *Journal of Petroleum Exploration and Production Technology*. <https://doi.org/10.1007/s13202-017-0363-x>.

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