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Formation sensitivity assessment of Gbaran field, Niger Delta

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The prolific Niger Delta basin is a mature petroleum province. Therefore, further prospectivity in the basin lies within deeper plays which are high pressure and high temperature (HPHT) targets. One of the main characteristics of the Niger Delta is its unique diachronous tripartite stratigraphy. Its gross onshore and shallow offshore lithostratigraphy consists of the deep-seated Akata Formation and is virtually exclusively shale, the petroliferous paralic Agbada Formation in which sand/shale proportion systematically increases upward and at the top, the Benin Formation composed almost exclusively of sand. This stratigraphic pattern is not exactly replicated in the deep offshore part of the delta. The downward increasing shale percentage in the older and deeper parts of the basin poses a great problem to drilling. Increasing shaliness usually leads to wellbore instability and such other problems as pack-offs and stuck pipe. These hazards are the main causes of non-productive time in expensive deep-water or high temperature and high pressure (HPHT) drilling operations. Moreover clay mineral diagenesis generates mixed layer clays at higher temperatures and this tends to cause overpressures that may lead to disastrous kicks, losses and even blowouts. Predicting and managing drilling in such over-pressured or problem sections will form a major part of the evaluation for exploration and development in these parts of the delta. A formation sensitivity test consisting of the detailed study of the influence of various ions on the degree of formation damage of one of the main producing fields in the eastern Niger Delta has been studied. Analytical results of clay mineral composition obtained using X-ray diffraction (XRD) methodology were successfully applied to predict the various types of clay minerals present and hence intervals problem of shales. Further experimental formulations derived using Capillary Suction Time (CST) tests found that addition of 7% KCl to the original water based drilling fluid made drilling through the problem sequences easier leading to very good cost savings and compliance with the Nigerian environmental regulations. The operator has planned deeper drilling and further development of the field.

Biography

Bertram Maduka Ozumba is currently on early retirement after rising to the position of Head of Geological Services in Shell Petroleum Development Company of Nigeria Ltd., Nigeria. He is a well-known Philanthropist and a seasoned Manager and Geoscientist with strong technical background, broad experience and leadership roles in exploration geology. He has extensive expose and experience to a broad range of multicultural working environments for which he has positively adapted. He is a Member of several professional bodies including the American Association of Petroleum Geologist (AAPG), Nigerian Association of Petroleum Explorationist (NAPE) where he is a Fellow of the Society, Nigerian Mining and Geosciences Society (NMGS), Council of Registered Miners and Geoscientists of Nigeria (COMEG), Society of Petroleum Engineers (SPE) and a Certified Petroleum Geologist (CPG) of the United States of America. He has published and continues to publish several scholarly papers in international and local journals and has served either as Editor or Reviewer in journals.

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