

Investigation of Geothermal Gradient of the Niger Delta from Recent Studies

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Abstract : In this paper, subsurface temperature measured from continuous temperature logs were used to determine the geothermal gradient of NigerDelta sedimentary basin. The measured temperatures were corrected to the true subsurface temperatures by applying the American Association of Petroleum Resources (AAPG) correction factor, borehole temperature correction factor with La Max's correction factor and Zeta Utilities borehole correction factor. Geothermal gradient in this basin ranges from 1.20C to 7.560C/100m. Six geothermal anomalies centres were observed at depth in the southern parts of the Abakaliki anticlinorium around Onitsha, Ihiala, Umuaha area and named A1 to A6 while two more centre appeared at depth of 3500m and 4000m named A7 and A8 respectively. Anomaly A1 describes the southern end of the Abakaliki anticlinorium and extends southwards, anomaly A2 to A5 were found associated with a NW-SE structural alignment of the Calabar hinge line with structures describing the edge of the Niger Delta basin with the basement block of the Oban massif. Anomaly A6 locates in the south-eastern part of the basin offshore while A7 and A8 are located in the south western part of the basin offshore. At the average exploratory depth of 3500m, the geothermal gradient values for these anomalies A1, A2, A3, A4, A5, A6, A7, and A8 are 6.50C/100m, 1.750C/100m, 7.50C/100m, 1.250C/100m, 6.50C/100m, 5.50C/100m, 60C/100m, and 2.250C/100m respectively. Anomaly A8 area may yield higher thermal value at greater depth than 3500m. These results show that anomalies areas of A1, A3, A5, A6 and A7 are potentially prospective and explorable for geothermal energy using abandoned oil wells in the study area. Anomalies A1, A3, A5, A6 occur at areas where drilled boreholes were not exploitable for oil and gas but for the remaining areas where wells are so exploitable there appears no geothermal anomaly. Geothermal energy is environmentally friendly, clean and reversible.

Keywords : temperature logs, geothermal gradient anomalies, alternative energy, Niger delta basin

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