

Evaluation of Critical Rate in Mature Oil Field with Dynamic Oil Rim Fluid Contacts in the Niger Delta

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Abstract : Most reservoir in mature oil fields are vulnerable to challenges of water and/or gas coning as the size of their oil column reduces due to long period of oil production. These often result to low oil production and excessive water and/or gas production. Since over 50 years of oil production in the Niger delta, it is apparent that most of the oil fields in the region have reached their mature stages, thereby susceptible to coning tendencies. As a result of these, a good number of wells have been shut-in and abandoned, with significant amount of oil left unproduced. Analysis of the movement of fluid contacts in the reservoir is a significant aspect of reservoir studies and can assist in the management of coning tendencies and production performance of reservoirs in a mature field. This study, therefore, seeks to evaluate the occurrence of coning through the movement of fluid contacts (GOC and OWC) and determine the critical rate for controlling coning tendencies in mature oil field. This study applies the principle of Nodal analysis to calibrate the thin oil column of a reservoir of a mature field, and was graphically evaluated using the Joshi's equation of critical rate for gas-oil system and oil-water system respectively. A representative Proxy equation was developed and sensitivity analysis carried out to determine the trend of critical rate as the oil column is been depleted. The result shows the trend in the movement of the GOC and OWC, and the critical rate, beyond which will result in excessive water and gas production, resulting to decreasing oil production from the reservoir. This result of this study can be used as a first pass assessment in the development of mature oil field reservoirs anticipated to experience water and/or gas coning during production.

Keywords : coning, fluid contact movement, mature oil field, oil production

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