

doi: <http://dx.doi.org/10.19240/njpas.2017.C01>**SHALY SAND ANALYSIS FROM WELL LOGS: CASE STUDY OF A NIGER-DELTA FIELD, NIGERIA.****T.O. Adeoye<sup>1</sup>, O. Ologe<sup>2</sup>, L.M. Johnson<sup>3</sup>, M.O. Ofomola<sup>4</sup>**<sup>1</sup>Department of Geophysics, University of Ilorin, Ilorin, Kwara State.<sup>2</sup>Department of Applied Geophysics, Federal University, Birnin Kebbi, Kebbi State.<sup>3</sup>Department of Geology, University of Ilorin, Ilorin, Kwara State.<sup>4</sup>Department of Physics, Delta State University, Abraka, Delta State.

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**Abstract**

Accurate prediction of hydrocarbon potential in any field in terms of porosity and water saturation needs to be carefully done. This paper analyses hydrocarbon potential from well logs but incorporates the effects of shale in the estimation of water saturation and porosity. The overlay of the induction resistivity logs helped to differentiate the hydrocarbon zones from water saturated zones. Neutron and density logs overlay were used to differentiate gas and oil in the hydrocarbon zones. The pickett plot was used to predict the water saturation in the hydrocarbon zones. Estimation of porosity within these intervals was prepared from the bulk density log, and compared with the porosity obtained from shaly sand analysis. Also, the water saturation obtained from the pickett plot was compared with those obtained from the shaly sand analysis. Results show that hydrocarbon reservoirs are present in the field. The presence of shale minerals in the reservoirs led to the over estimation of porosity and water saturation. Porosity estimates corrected for shale effect reveals an average value of 0.25 while hydrocarbon saturation obtained from shale corrected water saturation is averaged at 0.63. Shale corrected porosity and saturation can enhance the accurate prediction of volume of hydrocarbon in place when the reservoir area is known.

**Keywords:** Volume of shale, porosity, water saturation, shaly sand, hydrocarbon potential.**INTRODUCTION**

Generally, petrophysical analysis helps to convert the raw log data into estimated quantities of oil and gas in a formation, if they are present in the wellbore (Asquith & Krygowski, 2004). This is done by interpreting lithology logs, resistivity logs and porosity logs. However, accurate determination of petrophysical quantities in a shaly reservoir is not a straightforward task.

The Niger Delta is composed of an overall sequence of sand alternated with shale (Ajakaiye, 2002). In the distal parts of the depobelts, significant volumes of hydrocarbon may be trapped in the Agbada Formation where shale intercalations are more frequent. The interpretation of shaly-sand log data is a

challenge. This is because the presence of shale within the reservoirs may or may not, affect the accuracy of petrophysical results that are predicted from the logs (Asquith and Krygowski, 2004). The Archie's water saturation equation used by most Geologists and Geophysicists, presupposes that the rock framework is not electrically conductive. In other words, it is a perfect insulator. In reality, the general pervasive presence of clay minerals in sandstones adds a conductive element that causes Archie's equation to overestimate water saturation (Cannon, 2016). In such situations, the presence of shale or clay minerals in a reservoir can cause erroneous overestimation of porosity derived from logs (Alao et al 2013).

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