Overpressure Occurence and Mechanism in Blora-Tuban Region, East Java Basin, Indonesia

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The East Java Basin is well known as an overpressured basin in Indonesia (Kamaluddin *et al*., 2011). The manifestation of the overpressure, i.e. mud volcano is ubiquitous in this basin (Satyana & Asnidar, 2008). This paper discusses results from the western part of the East Java Basin, from Blora and Tuban regions (Fig. 1.). The methods used in this study are drilling parameter and wireline log analyses with additional data from scanning electron microscopy (SEM).

The mudweight used while drilling in a typical well in the area is shown on Fig. 2. The mudweight starts to increase significantly at the depth around 1100 m, corresponding to the deflection in d'exponent (Fig. 2., right). Based on this observation, it is implied that the top of the overpressure is located at the depth ~1220 m. Lithologic column (Fig. 2., left) shows that starting from the depth ~1000 m, sand content starts to decrease significantly. In this well, sloughing shale is associated with connection gas, thus drilling pipe stuck at depths 1100 – 3000 m. This is caused by the presence of high overpressure as indicated by significant increase in mud weight. Density, sonic and resistivity data in the shale section reverse toward the low density and resistivity and high neutron porosity and sonic velocity, at depth ~1250 m (Fig. 3.). This depth corresponds to the increase in mudweight and deflection in d'exponent (Fig. 2.). Therefore, overpressure in this well is responded fairly well by neutron porosity, density, sonic and resistivity logs.

In order to analyse the cause of overpressure, a cross-plot between density and sonic data is constructed. Starting from the surface, down to the depth of 1250 m, the shale points are located in a smectitic line. Starting from the depth of 1250 m (top of overpressure), down to the depth of 2100 m, the data are located in the transition between smectitic and illitic line. These circumstances indicate that there is strong relationship between the presence of overpressure and smectite to illite transformation. From the depth of 2100 m to 3000 m (TD), the data are located in the illitic line, corresponding to the presence of higher overpressure (Fig. 4.).

The presence of authigenic clay minerals, i. e. smectite-illite, illite, kaolinite and chlorite detected from SEM analysis (Lemigas, 1989) confirms that diagenetic clay mineral occurs at the depth of 1100–3000 m (TD). Based on the above analysis, it can be concluded that in the study area, overpressure could be observed from drilling parameters and wireline logs. Furthermore, the analyses of wireline logs and clay mineralogy show that the smectite to illite transformation may contribute to the observed overpressure in the studied area.

Kamaluddin, M. K., Adiwiarta, A. M., Bahuguna, S., Wahyu, C. S. S. (2011): Proc 35th Ann Conv Indon Petrol Assoc: IPA11-E-071

Lemigas Co. (1989): The result of petrographic analyses of BNG-1 well. Unpublished manuscript.

Pertamina E. P. Co. (1989): Final well report of exploration well. Unpublished manuscript.

Satyana, A. H., Asnidar (2008): Proc 31th Ann Conv Indon Petrol Assoc: IPA08-G-139

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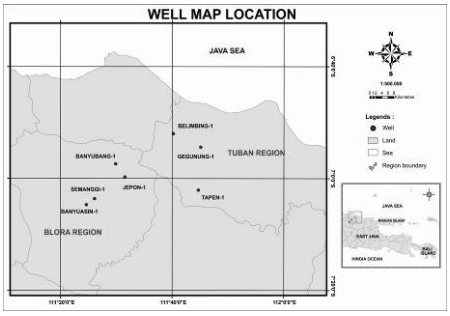

Fig. 1.: Map of research area

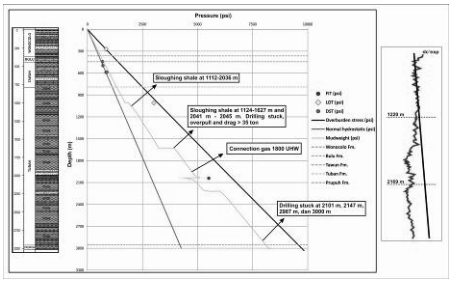

Fig. 2.: Dc'exponential in a typical well (Banyubang) shows defection from normal trend at 1220 m (Pertamina, 1989) and drilling parameters also show indication off overpressure

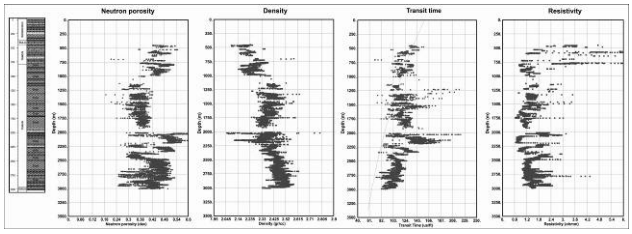

Fig. 3.: Wireline logs response in shale lithology (left to right: neutron porosity, density, sonic and resistivity logs) in a typical well (Banyubang) show deflection from normal trend in 1250 m that indicate an overpressure

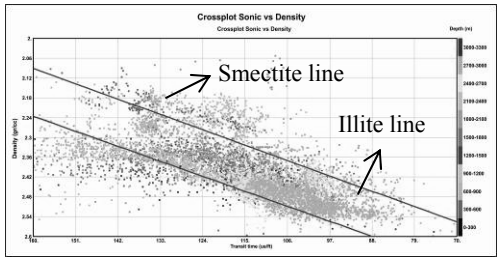

Fig. 4.: Crossplot density (Y) vs. sonic log (X) in shale lithology at a typical well (Banyubang) show movement of data from smectite line to the illite line starting at 1250 m.