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Overpressure Petroleum System Analysis Northern Area Field ''X'' East Kalimantan

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ABSTRACT

Analysis method of overpressure was known in dilling operation to obtain drilling strategy information. Mahakam Deltaic as main giant gas producer in Indonesia specially located on northern area was studied to gain information about pressure profile area. Analysis Normal Compaction, Overburden Gradient using Eaton and Bower's method from wireline data is used to define pressure profile. Correlation with drilling event hopefully could established the prediction of pressure profile while drilling without supporting from wireline data. Three pressurre profile area has been detected by combination log data and drilling event which are top lower pressure signature by high gas, transition zone signature by occured gas cut mud due to high gas and hard ovepressure signature by issued well control.

Keywords: pressure profile, normal compaction trend, overburden gradient, overpressure

1. INTRODUCTION

Oil and gas industry is an important industry which supports human living. On previous decade, oil and gas demand was very high compared with supplying. Generally areas in Indonesia consist of reservoir that occured at overpressure area. Analysis for pore pressure on reservoir is important to support succession of drilling strategy.

Identification for new pool of reservoir is more often detect the occurence of pore pressure in benefit area where it formed on petroelum system. Distribution of overpressure area in Indonesia are founded at onshore or offshore area or in sedimentology active area (e.g. shelf and deep water environment), through relax areas (e.g. West Java Basin). Pore pressre is generated by different mechanism [1].

Hydrocarbon accumulation with contained with reservoir in some cases were dealing with high pressure zone called as "Golden Zone" [2].

Determination overpressure using seismic velocity [3] also can obtain infomation about pore pressure pre drill a well.

A. Tectonic Setting

The Lower Kutai Basin lies within the greater South East Asia tectonic system. Indonesia is located on the Eurasia Plate close to a junction between three major plates: the Indian-Australian Plate to the south, the Pacific Plate to the east, and the Eurasia Plate to the north [4]. Development of the Kutai Basin has been very much affected by the interactions between those plates.

Among the interactions are the opening of the South China Sea to the north, at the margin of the Eurasia Plate, the westward motion of Pacific Plate, and the northward motion of the Indian-Australian Plate.

B. Stratigraphy and sedimentation

A generalized stratigraphic column for the Lower Kutai Basin can be found in [1]. The sedimentation regimes can be divided into two: overall transgression during the Paleogene (rift-filled sedimentation and sag), and overall regression during the Neogene (delta progradation and aggradation) [1] [5].

The main process throughout the Paleogene was rift-filled sedimentation. In the northeastern area, the Paleogene sediments vary from alluvial fans and deltaic sediments to deep marine sediments, but are dominantly fluvio-deltaic sediments. In the eastern area, surrounding the present-day Mahakam Delta, the sediments are dominantly deep marine sediments [6].

A schematic structural-stratigraphic section of the Neogene strata in the Lower Kutai Basin was reported by [1]. The lithology of the Neogene section comprise intercalations of sand, mud rock and coal of fluvial–deltaic sediments in the onshore and shelf areas, and dominantly marine mudrock with confined turbiditic sand-mud rock sequences on the deep water area. The evolution of the deltaic system, from delta plain to delta front, can be recognized clearly in that section. In several parts of the onshore area, the Upper Miocene–Pliocene sediments have been eroded, resulting in only Middle Miocene and older sediments remaining.

2. METHODOLOY

Software “Drillwork” is a tool used to analysis pore pressure and geomechanic.

Six wells at northern area of research were used to analysis of overpressure occurence. Log and drilling parameter data are taken and analysis on “Drillwork”.

Gamma ray, Resistivity, Density and Sonic are main log data beside Gas, Mud Weight, Drilling Event as drilling parameter.

Bowen’s and Eaton method are both efficiently to be used to analysis pore pressure on this region.

Sequences to analysis each of well pressure are as follow:

1. defined an overburden gradient by create shale base line from Gamma ray log and complete density log reading from surface by Miller calculation method
2. Generate Normal Compaction Trend by follow Resistivity Semi log and Sonic
3. Determined and analysis pore pressure each well

Structural map and stratigraphy area are used to compare with pressure analysis profile. Precision of pressure profile compare to stratigraphy mapping hopefully will helped to consistency correlation on the field and as guidance to determined pressure zone while drilling on the next well surrounding.

Drilling event compare with drilling parameter were recognized during drilling on each of well-studied such as circulating high gas, drilling break, loss/gain, increase mud weight, and well control [7].

3. RESULT AND DISCUSSION

Pressure profile regime area could be recognized from drilling hazard that obtained while drilling.

The Lower Pressure profiles appear on studi by signature of high gas or circulate out high gas which is characteristic of well drilling. It was common showed up with increasing hydrostatic controlled by mud weight. The Transition Zone profile was signed from circulate out high gas and frequently have gas cut mud where the hydrostatic slightly decrease because the expansion of gas bubble. Hard Overpressure Zone was signed by the increasing of well control issue or mostly founded as well as flowing on research area. One of well research prior end of well have drilling break and started to have well flowing follow by kick.

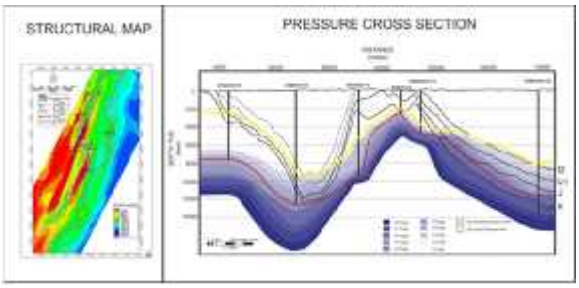

Fig 1. Pressure Cross Section combined with stratigraphy layer.

4. CONCLUSIONS

Pressure profile on research area showed if stratigraphy is not often controlled the pressure. Detection and analysis for pressure profile could be directed directly from drilling event.

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