



WS D2 07

Reservoir Analog Characterization Based on Outcrops and Darcy's Methods

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Summary

Nowadays, research paradigm which occurs in the objectivity of academics and industrial landscape lead to a gap of judgment upon geological evolution, especially on outcrops analog on hydrocarbon exploration study and both perspectives can be combined in this study. The study is located on Walat Fm., Sukabumi. West Java. The data were collected from field mapping, measured section, and direct sampling. Processing data is done by using Darcy's method and thin section analysis to define porosity and permeability and also qualitative interpretation to analyze the geometry of the reservoir itself. The stratigraphic column and the measured section of the area shows that Walat Fm. is considered as a good reservoir as the formation is laterally distributed around 5-6 km and vertically thickens to 150 ft. Also, the porosity and permeability of the sandstone qualified as the oil reservoir rocks. The geological section provides the information of petroleum elements such as traps, migration, and seal. Source rock geochemically tested and classified as moderate – good source rock. As a result of all the studies, Walat Fm. is concluded as a potentially good reservoir analog to be further analyzed to determine the hydrocarbon contain and prospect.

Introduction

Based on regional physiographical map, study area located in Zona Bogor (Van Bemmelen, 1949). The Oligocene Walat Formation which is also referred as the equivalent of Bayah Formation (Martodjodjo, 2004) consist of interbedded sandstone, conglomerates and claystone with a few coal. The lithology were deposited in fluvial environment or river system. Nowadays, fluvial sediments are deliberated as some of productive petroleum basins in Indonesia deposited in fluvial environment. Therefore, analog study is very important as the application in determining reservoir sediments, supported by physical characteristic from darcy methods in this study. The objective of this study is to evaluate the reservoir potential in study area based on porosity and permeability as a fluvial deposits analog which already produced.

Method and/or Theory

Field geological mapping is conducted to collect the outcrop data from field observation. The boundaries between bodies and geological structures are systematically measured and recorded. The Walat Mountain was picked as the main traverse due to the representativeness of all lithology and sedimentary structures to identify the depositional environment, geometry or thickness of the section and the distribution of the lithology. Six rocks were sampled to be analyzed by Darcy methods using constant head mechanism where the height of water in observation is on constant point to define porosity and permeability supported by thin section analysis.

Examples (Optional)

Walat Fm. has a lateral distribution up to 6 km. This expanse intervals came from the field geological mapping conducted on the study area. From the measured section methods result, the thickness of the formation is as much as 150 ft and with a detailed lithological mapping have shown that Walat Fm. consist of various lithology. This formation is extensively dominated by sandstone interbedded with a very few of claystone and coal occurred. Sample experiment using Darcy methods determine the permeability of the rock which ranged from 1 – 1000 milidarcy and classified as semi-pervious permeability for the lithology of fresh sandstone and oil reservoir rock (Bear, 1972). Previous study have done to point out that Walat Fm. can potentially be a good reservoir supported by four other petroleum system. The source rock could be derived from Batuasih Fm. which conformably overlies the Walat Fm. (in several areas is adjacent to Walat Fm. due to the normal faults resulting in anticlines) and consist of clay grain sized sediments. Total organic carbon (TOC) varies from 0.49% - 1.14% with oil prone Type I and II kerogen (Parptisih, etc, 2009). Primary migration can occur along the structural trap formed in Miocene – Oligocene tectonic period. Claystone from Rajamandala Fm. can be considered as a good seal rock for the petroleum play.

Conclusions

Walat Formation has a potential to be a good reservoir. This good reservoir supported by other potential petroleum component such as the source rock that could be derived from Batuasih Fm. which conformably overlies the Walat Fm. with TOC varies from 0.49% - 1.14% with oil prone Type I and II kerogen (Parptisih, etc, 2009). Primary migration can occur along the structural trap formed in Miocene – Oligocene tectonic period. And the seal rock is the claystone of Rajamandala Formation. Yet, the hypothesis needs to be further analyzed until the study area can be strongly argued to be prospectively good to the petroleum industry.

Acknowledgements (Optional)

The authors wish to thank Mr. Abdurrokhim, S.T., Ph.D as the Head of Department of Faculty of Geological Engineering, Padjadjaran University as well as the Laboratory of Sedimentology and Quaternary Geology Padjadjaran University. And also to Mr. Gilang Anugerah, Mr. M. Robby



Saputra, S.T., and Mr. M. Nashir, S.T. for their support and consultation throughout the process of writing this paper.

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