AIP Conference Proceedings

pubs.aip.org/aip/acp

Volume 2598

4th International Conference on Earth Science, Mineral and Energy

Sleman, Indonesia • 28 October 2021

Editors • Herry Riswandi, Toshifumi Igarashi, Carlito Tabelin, Timotius Pasang, Omer Faruk Ugurly, Yody Rizkianto and Oktarian Wisnu Lusantono

AIP Publishing

AIP Conference Proceedings

COUNTRY

United States

Universities and research institutions in United States

Media Ranking in United States

SUBJECT AREA AND CATEGORY

Physics and Astronomy
└ Physics and Astronomy (miscellaneous)

PUBLISHER

American Institute of Physics

H-INDEX

80

PUBLICATION TYPE

Conferences and Proceedings

ISSN

0094243X, 15517616

COVERAGE

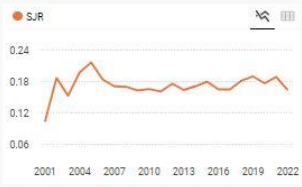
1973-1978, 1983-1984, 1993, 2000-2001, 2003-2022

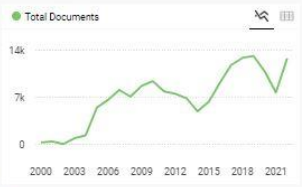
INFORMATION

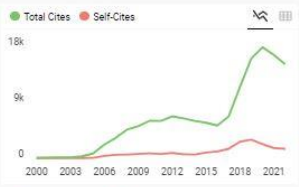
Homepage

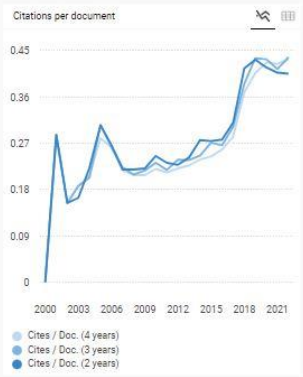
How to publish in this journal

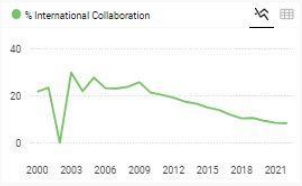
confproc@aip.org

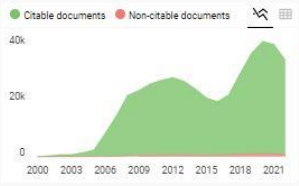


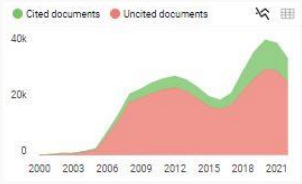












Metrics based on Scopus® data as of April 2023

Journal Development Team

Volume 2598, Issue 1

12 June 2023

4TH INTERNATIONAL CONFERENCE ON EARTH SCIENCE, MINERAL AND ENERGY

28 October 2021

Sleman, Indonesia

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RESEARCH ARTICLE | JUNE 12 2023

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AIP Conference Proceedings 2598, 030022 (2023)
https://doi.org/10.1063/5.0126196

Increasing the Volume of Hydrocarbons in Place (HCIP) by Identifying Hydrocarbon Prospect Zones Based on Log and Core Data in the "RS" Field Limestone Formation.

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Abstract. Formation Evaluation not only plays an important role in oil and gas exploration but also in evaluating reservoirs. When the drilling operation has been completed, a decision is generally made between completing the well or plug and abandon the well. With the logging activity, then the decision can be taken considering the required data has been obtained from the log records. However, the determination of Water Saturation (Sw) cannot be obtained directly from log records, special methods are needed to find it according to the layer under study. In addition, the results of the log calculation will be used. The aim of this work is to obtain a hydrocarbon prospect layer (Net Pay), pore volume of hydrocarbons in the "S8" layer which can be used as a reference for further field development. Besides determining the appropriate method in calculating water saturation can be used as a reference in subsequent calculations in the "RS" field. Henceforth the parameters obtained are used to determine the Initial Oil Reserves using the Volumetric method. In research in Field R, there are 5 wells analyzed for the results of log records, namely Well RS-1, Well RS-5, Well RS-6, Well RS-2 and Well RS-7 the depth is 7098-7300 feet. The layer studied from the five wells has Limestone lithology and is a shally formation, because the shale content (Vshale) for these five wells is more than 10%. Resistivity average around 4-12 Ωm. Therefore, the determination of Sw is carried out using the Indonesian Method. Based on the results of qualitative and quantitative validation, the Sw method chosen after being validated with core data, between Indonesia Formula and Simandoux, was chosen to be applied in the Field RS is Indonesia Formula. The net pay thickness of the five wells was obtained by cutting off Vshale, effective porosity, and Sw. In this paper, effective porosity, Vshale, and Sw cutoffs are used for 8%, 45%, and 70%, respectively. Taking into account the net pay thickness of 56.5 feet, Area Area=8104.56 Acre, and N/G=56.5/302 = 0.183, the Hydrocarbon Pore Volume (HPV) can be obtained, namely HPV = 14.83 MM Bbl.

Keywords: Net pay, Vshale, Effective Porosity, Water saturation, HPV

INTRODUCTION

Oil and gas are non-renewable energy resources in the world. The oil and gas industry in Indonesia has experienced very advanced developments from year to year to meet the increasing domestic demand for fuel [1[. Comparison of domestic demand for crude oil to daily production is greater than domestic demand, to be able to full fill domestic demands is with increasing daily oil and gas production. The size of the daily production target that can full fill the demand must be balanced with increasing hydrocarbon reserves owned [2[. The increase in reserve value can be obtained by conducting explorations in new areas or updating data on existing fields so that re-analysis can be carried out in updating the reserve value supported by the addition of new data[3-5].

To be able to perform a reserve analysis with the addition of new data, it is necessary to analyze the properties of the physical properties of the reservoir rock. One of the methods that can be used to analyze the parameters of the physical characteristics of reservoir rocks is to perform petrophysic analysis using wireline log data. Parameters that affect the size of the reserve value are porosity, water saturation, and thickness of the hydrocarbon prospect formation. The aim of this work is to obtain a hydrocarbon prospect layer (Net Pay), pore volume of hydrocarbons in the "S" layer which can be used as a reference for further field development [6-8]. Besides determining the appropriate method in calculating water saturation can be used as a reference in subsequent calculations in the "R" field. Henceforth the parameters obtained

4th International Conference on Earth Science, Mineral and Energy
AIP Conf. Proc. 2598, 030022-1–030022-6; https://doi.org/10.1063/5.0126196
Published by AIP Publishing. 978-0-7354-4543-7/$30.00

are used to determine the Initial Oil Reserves using the Volumetric method [9 and 10].

The oil and gas sector is the largest foreign exchange earner which is the backbone of national development, therefore it requires concrete efforts to continue to optimize production increase and develop new fields. With hydrocarbons produced, the Water Cut of a field will be even higher. With the higher water content, the smaller the production of hydrocarbons.

METHODOLOGY

The method for determining porosity is the density and neutron log data, the porosity calculation method uses a combination of density and neutron porosity, where the results will be validated with the porosity of the core. The method used to calculate Sw after two methods, namely Indonesia Formula with Simandoux, and after being validated with core data, Indonesia Formula was chosen to calculate Sw in the RS field. The methodology shows the research flow diagram as shown in Fig. 1.

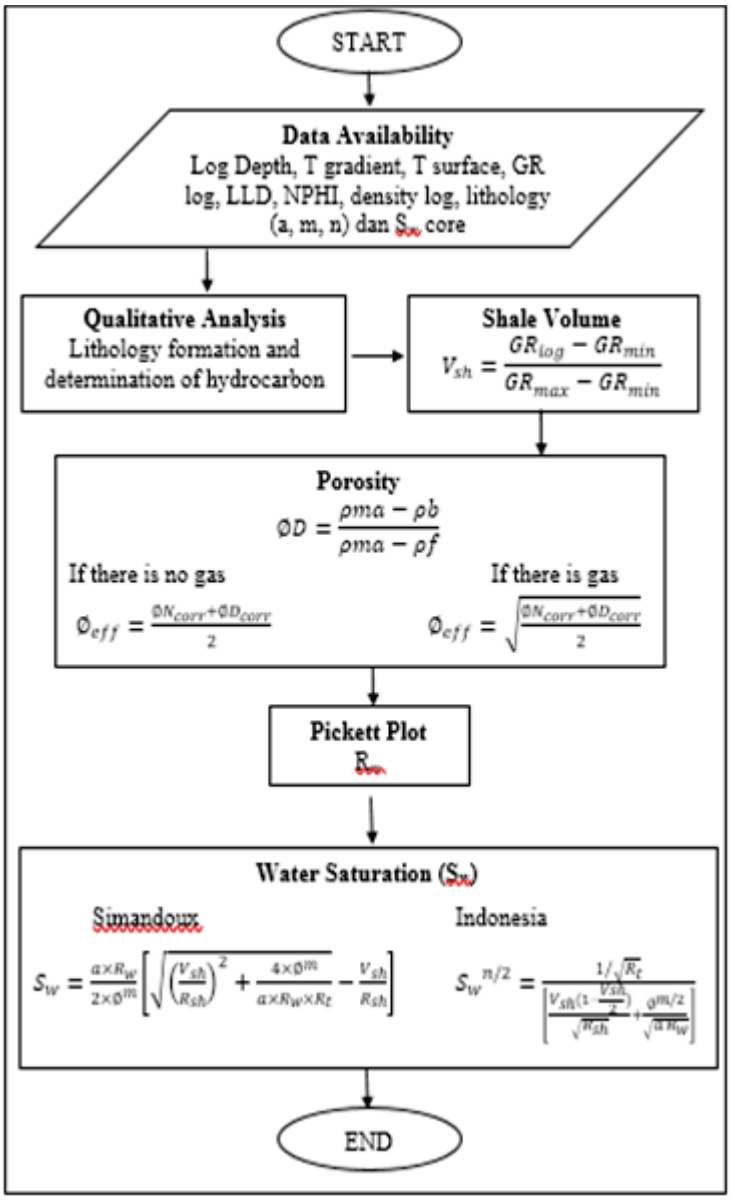

FIGURE 1. Flowchart of Research

RESULTS AND DISCUSSION

Lithology in the hospital field is Limestone. This is one of the log data Well RS-6 in fig. 2 below.

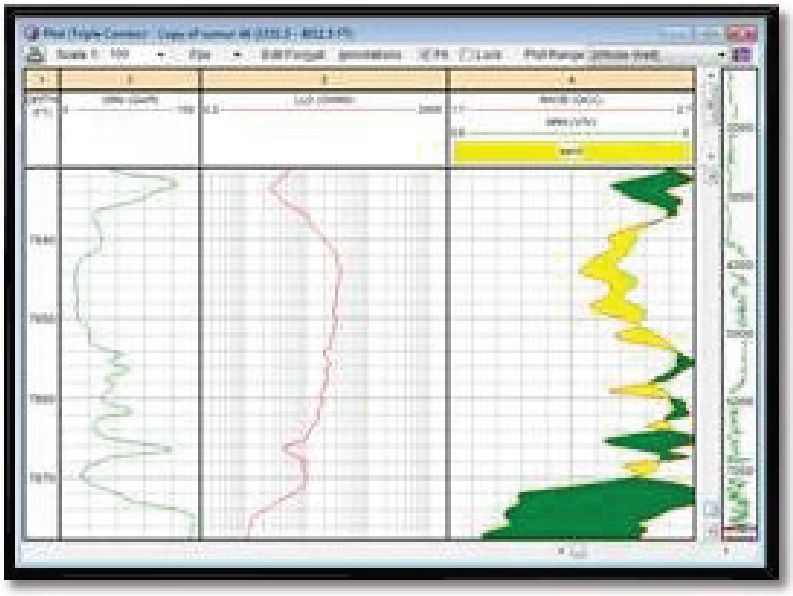

FIGURE 2. Log RS-6/Zona S8

This data was obtained from routine analysis of the R core field which has a matrix density of 2.71 gr / cc. The average shale volume in the S8 Field RS formation is> 10%. With such a large volume of shale, it can be concluded that the formation on the hospital field is a shaly formation. The average shale volume was 14.7%, while the effective Porosity in the S8 field formation in the RS field ranged between 15-23% and the average effective was 18.19%. Whereas the Rw price is done using the Picket Plot method as shown in Fig. 3 below.

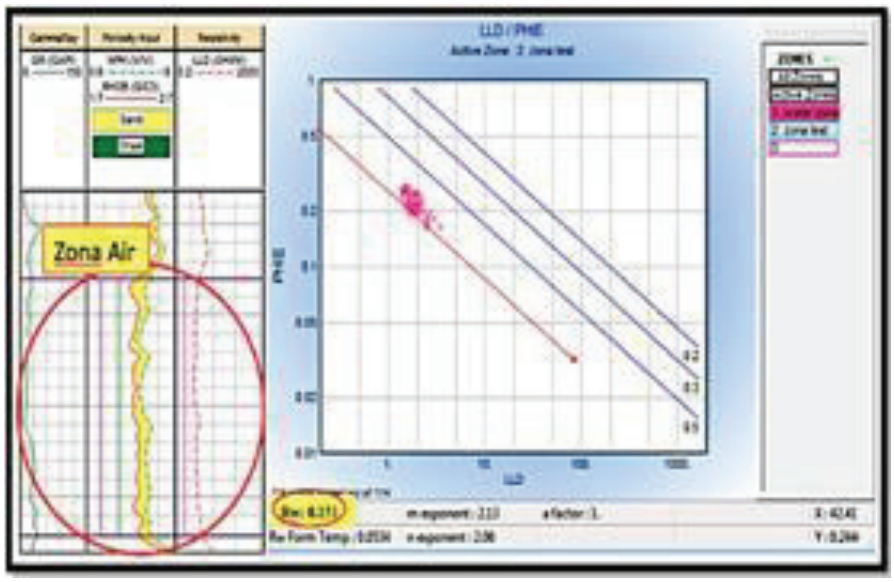

FIGURE 3. Determining of Rw using Picket Plot
RS Field

Determination of Rw using Pickett Plot in the water zone in the Field RS. Rw was obtained in the water zone using a Pickett Plot, by plotting between resistivity vs. porosity, where a Rw = 0.151m was obtained at 77 °F. For calculation of Rw per depth a temperature gradient is required. This is because temperature affects the price of Rw. Sw calculation is done by two methods, namely Indonesia and Simandoux.

the water saturation value that has been obtained through calculations using the simandoux method and the Indonesian formula, still requires validation of the water saturation value obtained from the results of laboratory analysis of reservoir rocks. validation that is carried out using the results of core data analysis needs to be done to be able to find out the approach to the results of the water saturation analysis using this method to the real conditions below the surface. validation results can be seen in Fig. 4.

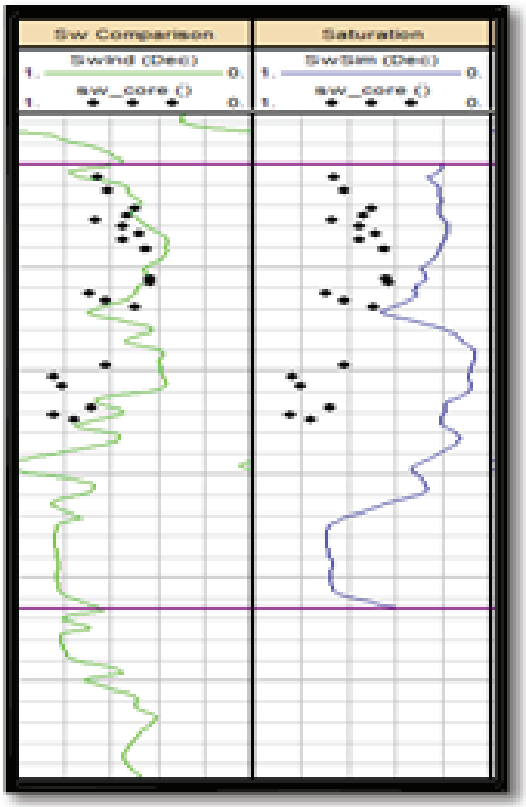

FIGURE 4. Sw Log Validated Using Core Data

However, after validation using core data, the results that are closer to the core are Indonesian Equations. This can be seen in Fig. 4, where the core data is overlaid in the log recording the Sw curve of two methods, namely Indonesia Formula with Simandoux.

After the water saturation value has been obtained and validated against the core data, the parameter we need to obtain at the next analysis stage is the net thickness value or commonly referred to as net pay. Netpay is obtained after three parameters are cut off, Vsh, Ø, and Sw. How to determine the cutoff by making a graph Ø vs Volume shale, which will get the cut-off price Ø and cut-off Vsh. To determine the cut-off Sw, a graph is made between Ø vs Sw.

The data used to create a cut-off graph are clay volume values, porosity, and water saturation data obtained from logging analysis results or parameter values obtained from reservoir rock laboratory analysis. In addition to these data, production test data will also be used which will prove whether with the existing rock properties, the rock can still flow reservoir fluids.

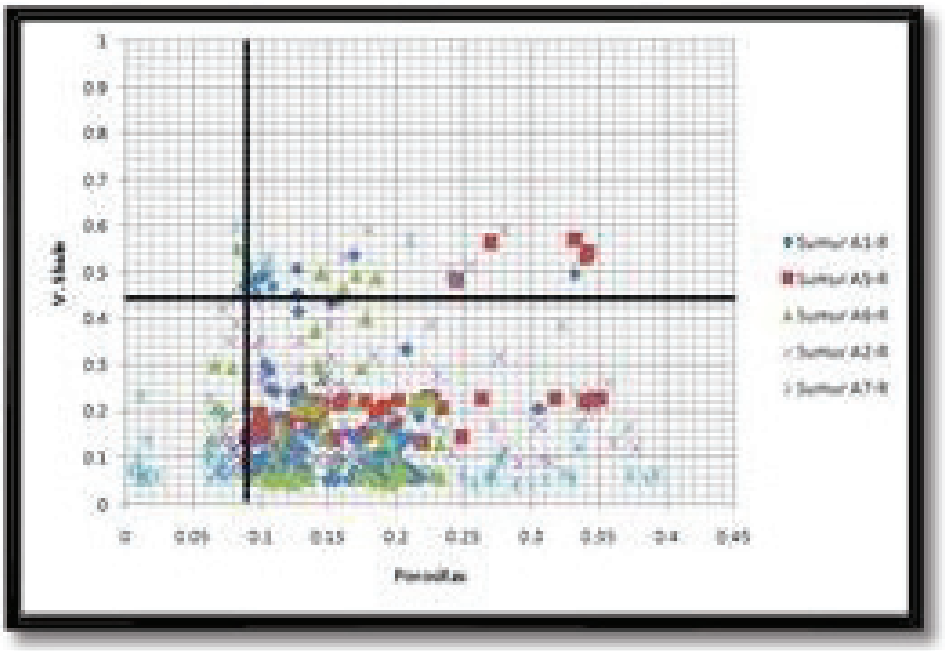

FIGURE 5. Cut off Vsh vs Ø RS Field

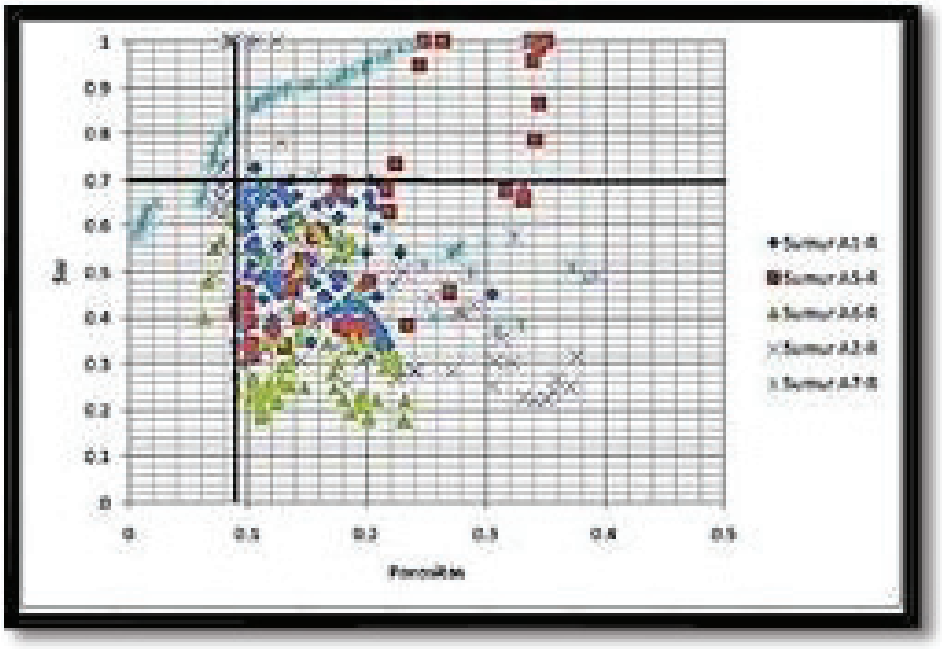

FIGURE 6. Cut off Ø vs Sw RS Field

From the two graphs added with the result of swabbing or DST, we get Cut off Vsh = 45%, Cutt off Ø = 8%, and Cutt off Sw = 70%. As shown in Fig. 5 and fig. 6, namely 45%, 8%, and 70%, the Netpay Field totally price is 56.5 feet. The average thickness is 11.3 feet.

CONCLUSION

Based on the results and analysis, as well as discussion, the conclusions of the study are as follows: Lithology in the R field is Limestone. This data was obtained from routine analysis of the R core field which has a matrix density of 2.71 gr / cc. The average shale volume in the RS Field S8 formation is> 10%. With such a large volume of shale, it can be concluded that the formation on the R field is a shaly formation. The average shale volume is 14.7%, while the Effective Porosity in the RS field S8 formation ranges from 15-23% and the average effective is 18.19%. The results of the calculation of water saturation (Sw) in this field use the Indonesia Formula method. The average Sw value in the R field, Sw is 38.35%. Netpay after having cut off three parameters namely Vsh, Ø, and Sw which are 40%, 8%, and 70%, the Netpay Field R price is 56.5 feet. The average thickness is 11.3 feet. After the calculation result parameters are obtained, then the Original Oil In Place (Hydrocarbon Pore Volume (HPV) field R can be calculated by Volumetric Method. With an Area of Area = 8104.56 Acres, then HPV = 14.834 MM Bbl.

REFERENCES

[1] Amyx, J.W., Bass Jr., D.M., and Whiting, R.L.: Petroleum Reservoir Engineering – Physical Properties, McGraw-Hill, Inc., NY, NY, (1960).Amin, M. M., 2013. Mud and Drilling Mud Hydraulics. 152.

[2] Craft, B.C., Hawkins, M.: Applied Petroleum Reservoir Engineering, Revised by Terry, R.E., Prentice Hall, Englewood Cliffs, NJ, 1991.

[3] Crain, E. R. Petrophysical Handbook. Rocky Mountain House, AB : Spectrum 2000 Mindware, 2010.

[4] Dake, L.P.: The Practice of Reservoir Engineering, Elsevier Science B.V., Amsterdam, the Netherlands, 1994.

[5] Essley, P.L. Jr.: "What is Reservoir Engineering,"Journal of Petroleum Technology, Jan. 1965.

[6] Gerding, M. (Editor): Fundamentals of Petroleum, 3 Ed., Petroleum Extension Service– Division of Continuing Education, The University of Texas at Austin, Austin, TX, 1086.

[7] Mamora, D.D. and Wu, C.H.: PETE 420 Reservoir Engineering I, Class Notes for 1993 Fall Semester, Texas A&M University, 1993.

[8] McCain, W.D. Jr.: The Properties of Petroleum Fluids, 2 Ed., PennWell Publishing Co. [21] Pirson, S.J.: Oil Reservoir Engineering, McGraw-Hill Book Co., Inc., NY, NY, 1958.

[9] Tiab, Djebbar, and Donaldson, E.C : "Petrophysics", 2004.

[10] Whitson, C.H. and Golan, M. : Well Performance, 2 Ed., Prentice Hall, Englewood Cliffs, N.J., 1991.