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# Determination of the Maxx Prospect Zone Petrophical Parameters in MA06 Well MA Field with Log Data Analysis

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**ABSTRACT:** The well logging method is one of the methods used in petrophysical analysis to assess the formations used in obtaining information and shadows related to a reservoir. In addition, in an effort to determine success in the oil and gas field, this method is also included for calculating petrophysical values such as permeability, water saturation, and porosity. Then this value will be used in finding the initial oil reserves (OOIP) and initial gas reserves (GIIP) in the MA field. This will be very helpful in developing further oil and gas fields because materials are available as a basis for reference. This study analyzes the MA field precisely at the MA-06 Well by utilizing the qualitative and quantitative petrophysical analysis method by only referring to log data because there is no availability of core data. To find out the depth of the prospect zone and what fluid is in the formation, the authors analyze it in a qualitative way, namely by determining the permeable zone, then looking at the resistivity value, then determining the type of fluid on track 3. While in obtaining petrophysical values such as shale volume, porosity, water saturation and rock permeability the authors chose to use quantitative methods to analyze them. So that the results of the analysis carried out, it was found that the MAXX well has a net sand thickness of 36 feet and a net pay of 36 feet with an average value of shale volume, porosity, water saturation and permeability in that zone respectively 34.8%. , 18.03%, 35.3%, and 38.31 mD

**KEYWORDS:** Logging Analysis, Netpay, Prospects, Permeability, Zone Porosity.

## I. INTRODUCTION

In everyday human life, energy is the main source of human needs. Almost all aspects of life require energy. Energy is divided into two types, namely renewable and non-renewable. One form of energy that is the main source of human needs is petroleum. Log data is generated through exploration activities. Formation assessment is an important part of oil exploration and exploitation activities. Formation assessment is one way to determine the character of the formation in the well. Through this formation assessment we can know which zones can be exploited. In the formation assessment, there is an attempt to interpret the log data. This effort is carried out by lowering the equipment into the wellbore so that rock characteristics and conditions around the well can be recorded. Later this will provide convenience in determining saturation, large oil reserves, porosity, and lithology.

## II. METHOD

In this study, a method that focuses on petrophysical analysis will be used, this research is interpreted both qualitatively and quantitatively. Interactive petrophysics software is used to support efficiency in converting LAS data into triple combos and to process quantitative data using Microsoft Excel. First, from the MA field log data, an analysis was carried out by interpreting the log data on the triple combo based on the criteria. The steps in this study are:

**I. *Qualitative Interpretation***

A. Track 1 Low GR log values indicate a permeable zone.
B. Track 2 A high Rt value indicates an indication of hydrocarbon content.
C. Track 3 The type of fluid contained can be known when there is a separation between the density log and neutron log values.

**II. *Quantitative Interpretation***

A. Calculation of volumeshale is calculated from the GR log:

$$\text{GRindex} = \frac{\text{GRlog} - \text{GRmin}}{\text{GRmax} - \text{GRmin}}$$

B. Resistivity of formation water using the Picket Plot Method
C. The porosity of the density log obtained by the equation below and the neutron porosity obtained from the NPHI readings:

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Density logs:

$$\varnothing\ D\ \log = \frac{pmatrix - pdensitas}{pmatrix - pformasi\ fluida}$$

Effective porosity:

$$\varnothing\ Eff = \frac{(\varnothing D) \quad + (\varnothing N)}{2}$$

D. Water saturation by Simandoux method:

$$Sw\ simandoux = \frac{c \times Rw}{\varnothing eff^{m}}\left[\sqrt{\left(\frac{Vsh}{Rsh}\right)^{2} + \frac{5 \times \varnothing eff^{2}}{Rw \times Rt}} - \frac{Vsh}{Rsh}\right]$$

E. Determination of permeability using the wyllie and rose method:

$$K = \left(\frac{250\ X\ \varnothing eff^{3}}{Swirr}\right)^{2}$$

F. Cut off with parameters such as shale volume 0.5, porosity 0.08, Sw 0.65, and permeability 5mD.
More complete stages related to this petrophysical analysis research can be seen in Figure 1.

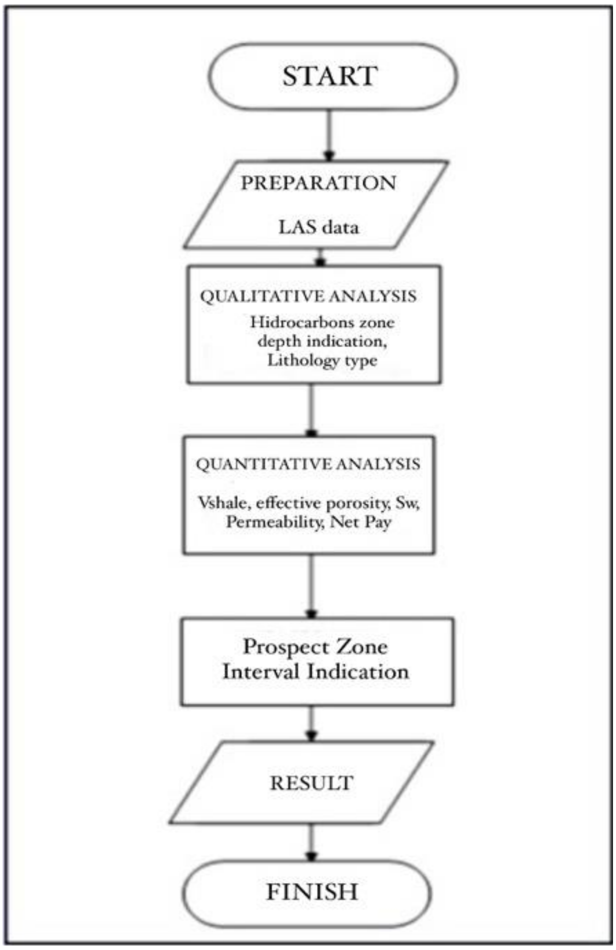


**Figure 1**: Flowchart

## III. RESULTS AND DISCUSSION

After a qualitative analysis was carried out on the MA-06 MAXX well, it was found that the intervals of the hydrocarbon prospect zone were found which can be seen in the following triple combo display from the LAS data as shown in Figure 2.

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**Figure 2**: *Triplecombo* well MA06

Based on the information from the data above, we can get the depth interval of the prospect zone. The prospect zone interval obtained from the triplecombo containing criteria such as a permeable zone to a relatively high resistivity value, then added with the deviation of the NPHI log graph and the RHOB log that experienced a crossover. Then the MAXX prospect zone is determined, which is at a depth of 3045-3084 feet as shown in Figure 3

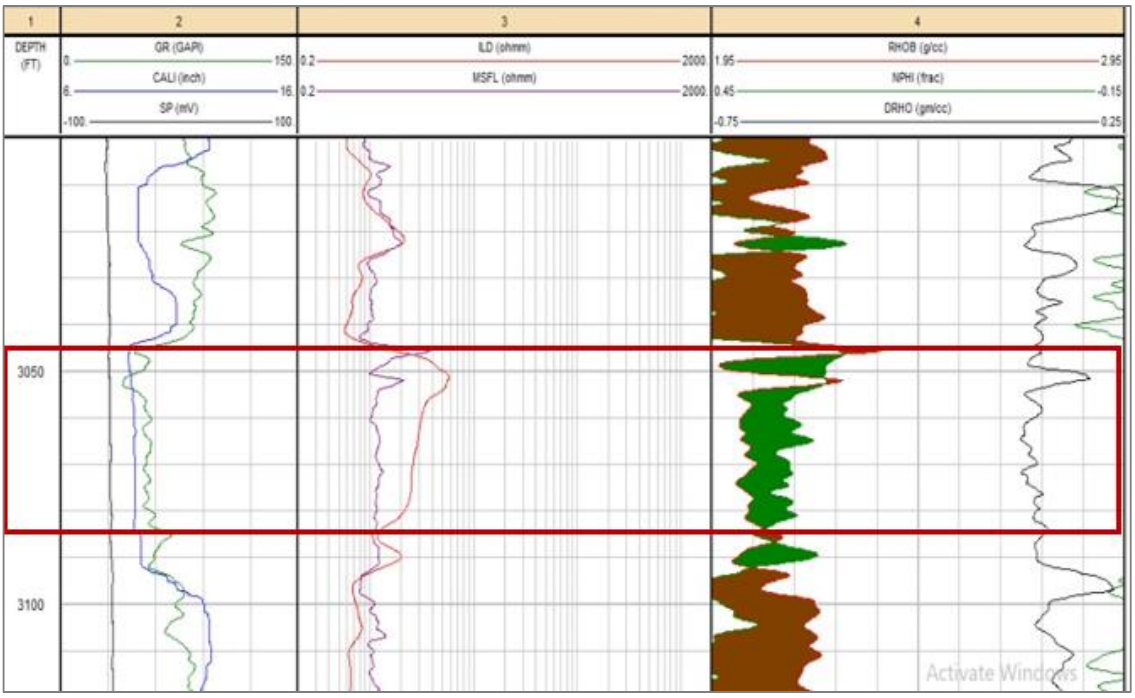


**Figure 3**: MAXX Prospect zone well MA06

As for the determination of the type of lithology in the MAXX zone, the crossplot reading of the NPHI log and the RHOB log is carried out so that the results of the MA-06 MAXX well crossplot can be seen in Figure 4 Cross Plot MA-06 MAXX Zone.

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Referring to the crossplot graph between the neutron porosity and density log, we can conclude that the MA-06 well is cemented with sandstone type, so the values of a, m and n are based on the table, namely the a value or turtuosity factor is 1, the m value or cementation factor is 2, the value of n or the saturation factor is 2, and the value of C is 0.4 because sandstone is a type of clastic rock.

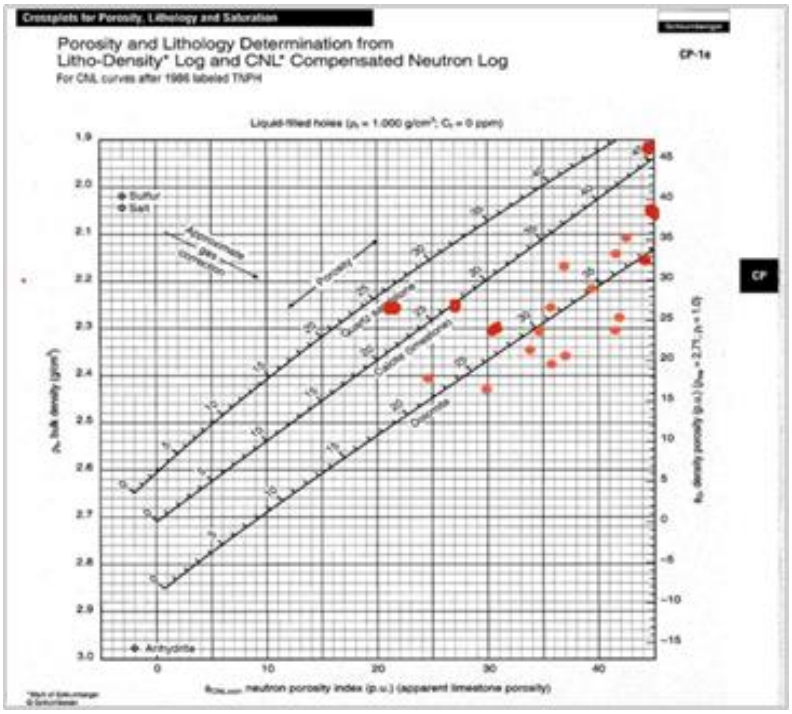


**Figure 4:** *crossplot* MAXX Prospect zone well MA06

The calculation of the shale volume and the average formation temperature in the MA-06 well MAXX zone has been done manually as shown in table I.

**Table I.** Shale Volume of MAXX Zone Well MA06

| Depth (ft) | Shale Volume (frac) |
|---|---|
| **3045** | 0,284 |
| **3048** | 0,347 |
| **3051** | 0,210 |
| **3054** | 0,326 |
| **3057** | 0,347 |
| **3060** | 0,378 |
| **3063** | 0,357 |
| **3069** | 0,357 |
| **3072** | 0,378 |
| **3075** | 0,357 |
| **3078** | 0,336 |
| **3081** | 0,389 |
| **3084** | 0,526 |

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Neutron logs and density logs are read out in determining the porosity, then the value obtained will be corrected by the volume of shale that inhibits the productivity level of the rocks.

From the various calculations above, we get the value of the effective porosity of the MA-06 well MAXX zone as shown in table II.

**Table II.** Effective Porosity of MAXX Zone Well MA06

| Depth | Por Effektif |
|---|---|
| **3045** | 0,129 |
| **3048** | 0,161 |
| **3051** | 0,143 |
| **3054** | 0,180 |
| **3057** | 0,185 |
| **3060** | 0,178 |
| **3063** | 0,173 |
| **3066** | 0,193 |
| **3069** | 0,182 |
| **3072** | 0,190 |
| **3075** | 0,198 |
| **3078** | 0,184 |
| **3081** | 0,191 |
| **3084** | 0,212 |

Before determining water saturation, we need the value of the resistivity of the water which we can find using the Picket Plot method.

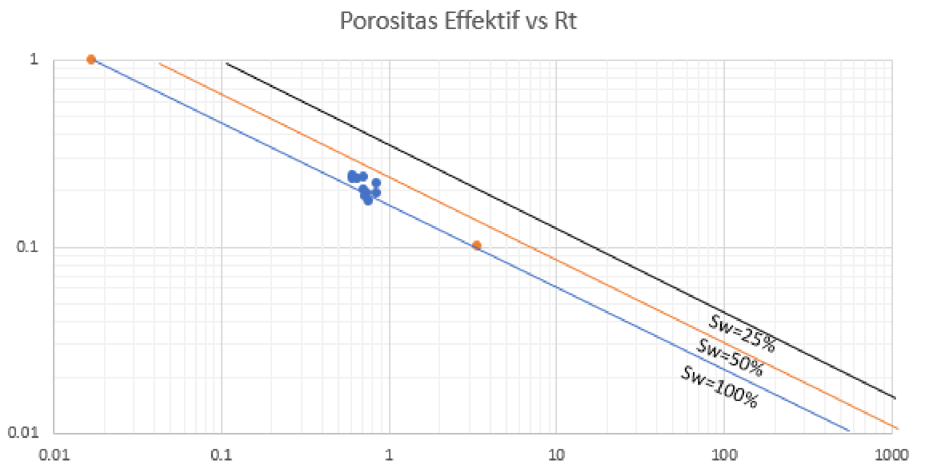


**Figure 5**: Picket Plot Well MA06

Figure 5 shows a picket plot graph from the MA-06 well where the resistivity assessment is obtained when porosity 1 is around 0.017 ohmm and when porosity is 0.1, the value is 3.4 ohmm, so that the Rw value is 0.0209 ohmm.

With this calculation, another value is obtained in the MA-06 well zone, namely water saturation which is carried out using the simandoux method as shown in table III.

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**Table III.** Water Saturation of MAXX Zone Well MA06

| Depth | $S_{w\ (frac)}$ |
|---|---|
| **3045** | 0,579 |
| **3048** | 0,309 |
| **3051** | 0,319 |
| **3054** | 0,288 |
| **3057** | 0,322 |
| **3060** | 0,343 |
| **3063** | 0,365 |
| **3066** | 0,339 |
| **3069** | 0,372 |
| **3072** | 0,364 |
| **3075** | 0,353 |
| **3078** | 0,400 |
| **3081** | 0,442 |
| **3084** | 0,482 |

In measuring the ability of rocks to flow fluids in the MA-06 well zone, the author has analyzed the permeability using the Wyllie and Rose method, while the permeability value of the MAXX zone is presented in table IV.

**Table IV.** Permeability of MAXX Zone Well MA06

| Depth | K (mD) |
|---|---|
| **3045** | 2,99 |
| **3048** | 28,53 |
| **3051** | 15,58 |
| **3054** | 54,26 |
| **3057** | 48,70 |
| **3060** | 36,59 |
| **3063** | 28,52 |
| **3066** | 54,09 |
| **3069** | 34,13 |
| **3072** | 42,96 |
| **3075** | 55,76 |
| **3078** | 30,86 |
| **3081** | 29,76 |
| **3084** | 40,39 |

Furthermore, the petrophysical value is used as a reference in making cut offs, or the removal of some layers that are considered useless. The parameters are shale volume 0.5, porosity 0.08, Sw 0.65, and permeability 5mD. The values after the cut of obtained are, net sand value 36 and net pay 36, average shale volume 34.8%, average effective porosity 18.03%, average water saturation 35.5% and average permeability 38.31mD.

**IV. CONCLUSION**

From this paper we can draw the conclusion that:

1. The MAXX zone MA06 well is cemented with sandstone type, so the values of a, m and n are based on the table, namely the a value or turtuosity factor is 1, the m value or cementation factor is 2, the value of n or the saturation factor is 2, and the value of C is 0.4 because sandstone is a type of clastic rock.
2. Hydrocarbon prospect zone, namely MA-06 Well MAXX Zone at a depth of 3045-3084
3. In MA-06 Well, the Shale Volume, Porosity Value, Water Saturation, and Permeability were found at 34.8%, 18.03%, 35.5% and 38.31mD, respectively.
4. In MA-06 Well, it is known that the thickness of the net sand layer is 36 feet and the thickness of the hydrocarbon layer or net pay in the well is 36 feet.

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