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Estimation Remaining Reserves Amount of Crude Oil and Gas on the Well X by using Volumetric Method

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Abstract. Volumetric is one method of calculating oil and gas reserves in reservoirs that have been used in the oil industry until now. Data sources which become the main requirements in using this method are basic data such as log data, core rocks or side terraces, area estimates, Rf and fluid properties. This method is used to obtain a forecast of the remaining reserves of Well X for future use. Based on the data limitations in Well X there is only Logging (thickness) data whose range is between 650 m and 700 m, the recovery factor is assumed to be 100% and the area of distribution of wells in one block is 13 km2. From the results of calculations using the volumetric method, the remaining reserves in well X are 320,853.63 STB and the remaining natural gas is 1,801,539.11 SCF.

1. Introduction

The Ministry of Energy and Mineral Resources obtained total data of old wells in Indonesia currently reaching 13,824 wells. Of the total old wells in Indonesia, 745 old wells are active and 13,079 old inactive wells. From the available data it can be seen that utilization of old wells has not yet been carried out to the full. Total old wells in Indonesia are spread in southern Sumatra Province as many as 3,623 wells, northern Sumatra 2,392 wells, Central Sumatra 1,633 wells, East Kalimantan 3,143 wells, South Kalimantan 100 wells, Central Java-East Java-Madura 2,496 wells, Papua 208 wells and Seram 229 wells. South Sumatra Province has more old wells compared to other areas, which is 3,623 wells. This means that the South Sumatra Province has a greater opportunity to develop and optimize the use of old wells in Indonesia to help increase national petroleum production. Based on the above problems, it is necessary to study both technically and economically to reactivate old wells in South Sumatra and can be one of the solutions in order to participate in the sustainable development of petroleum production in Indonesia.

Based on the above, the research conducted in the region of Musi Banyuasin district, especially the Bayung Lincir district, precisely on Pertamina UBEP Ramba Blok Tanjung Laban. The research will be needed information to get comprehensive old well information . The information obtained is a basis for the technical feasibility of producing old wells. To determine the feasibility, it is necessary to calculate the remaining reserves by using the volumetric method. The volumetric method is used because it is limited to using well logging data and the area of the Tanjung Laban block. From the calculation of these reserves using the volumetric method, we will get an outcome in the form of an old well production mechanism in the Tanjung Laban block.

2. Method

The study was conducted at Tanjung Laban 01 Field Ramba, PT Pertamina EP Asset 1 located in Babat Supat District, Musi Banyuasin Regency, South Sumatra Province, which can be seen in Figure 3.1 located at coordinates 2o42'23" SL and 104o6'55" EL. The study was conducted on September 20-28, 2018. The trip to the research location can be reached by car with a distance of ± 100 km from Palembang via the highway and ± 10 km through the clay road.

The research method used to solve problems in research is to combine theories, secondary data and primary data obtained in the field. Then the data is processed in order to find a solution to the problems in this study. Research methods carried out include literature review (literature study), field orientation, data collection, data processing, and conclusions and suggestions.

The study continued by searching for the data needed, namely the well log data in the form of gamma ray log data, resistivity log data, density log data and neutron log data. The log data is contained in the form of log curves, so it is necessary to read the log curves to find out the values of the log data. Other supporting data obtained from the literature in the form of calculation constants. Research supporting data can be seen in Figure 1.

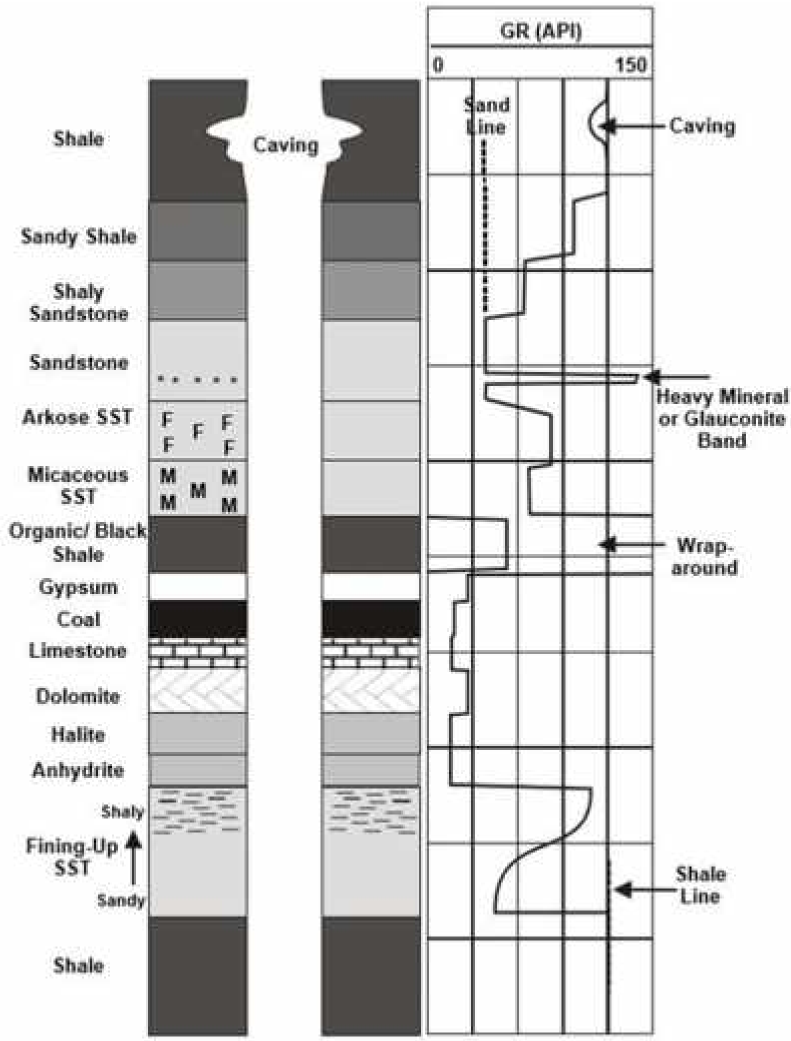

Figure 1. Example of a gamma log analysis of the effects of lithologic differences (Glover, 2007)

3. Results

3.1 Validation of Surface Lithology

Based on the interpretation of each geoelectric and georadar acquisition results, it was found that the surface layer lithology matches the location formation (Figure 2) listed on the superimposed geological map of the well coordinate points.

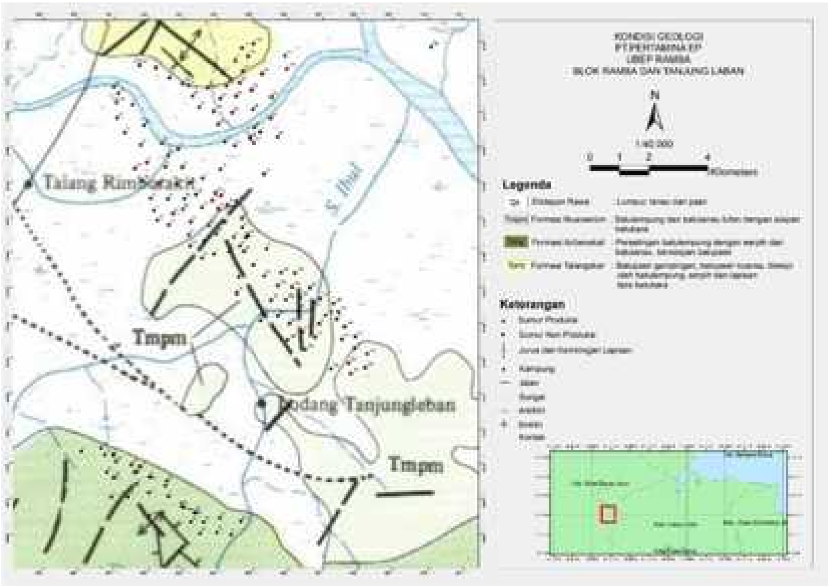

Figure 2. Map of the geological conditions of PT. Pertamina EP UBEP Ramba, Ramba Block and Tanjung Laban

Line 1 which direction is at azimuth 290° at coordinates 02°42'22.6"S 104°06'49.7"E - 02°42'26.6"S 104°06'56.2"E has a trajectory which is mainly rubber and swamp forest then also has a diverse topographic slope. In line 1 that uses 5 meters of electrode spacing and 240 meters in track length. Line 2 which direction is at 200° azimuth at coordinates 02° 42'25.8"S 104°06'57.1"E - 02°42'18.4"S 104°06'56.3"E has a trajectory which is generally a dry clay field and a slight entry into the rubber forest area then also has a diverse topographic slope. In line 2 that uses 5 meters of electrode spacing and 240 meters in track length. The 3-way course at the 200° azimuth at coordinates 02°42'26.4"S 104° 06'56.6"E - 02°42'18.8"S 104°06'57.1"E has a trajectory which is generally a dry clay field and a little into the rubber forest area then also has a diverse topographic slope. In line 3 that uses 5 meters of electrode spacing and 240 meters in track length. The 4-way course at azimuth 190° at coordinates 02°42'25.5"S 104°06'57.5"E - 02°42'20.6"S 104° 06'51.5"E has a trajectory which is generally a dry clay field and a little into the rubber forest area. On line 4 it also passes through electrical substations and oil and gas pipelines. Then also has a diverse topographic slope. On track 4 that uses 5 meters of electrode spacing and 240 meters in track length. (Figure 3)

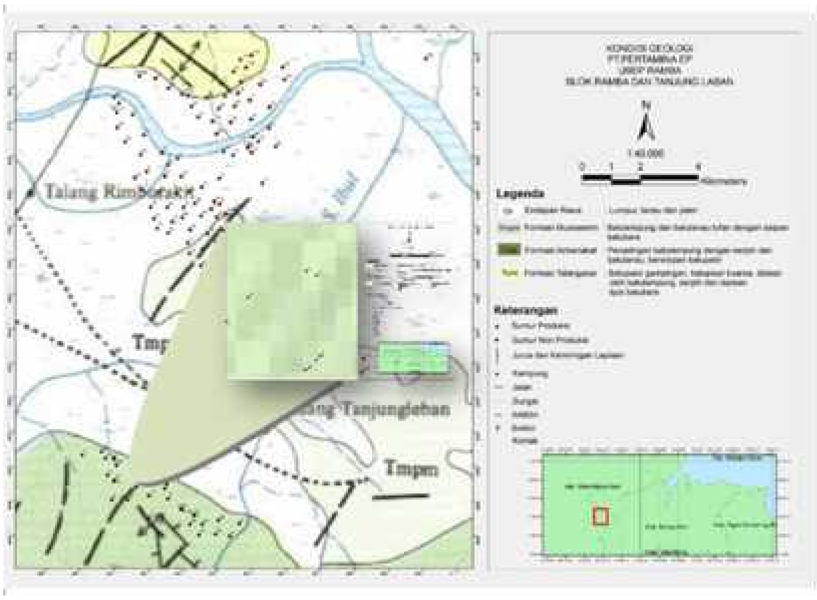

Figure 3. Map of superimposed geological conditions and geophysical acquisition path.

From each geological acquisition results, it is found that local subsurface lithology is dominant in each trajectory, that is, the study area is included in the formation of sediment consisting of silt (clay), mud, sand and gravel (limestone sand). Based on the research results obtained, the study area including into areas with rare or undetected groundwater using geoelectric measurements of resistivity (resistivity) because they only reach penetration depths of less than 100 meters. The study area is classified as an alluvial and swamp sedimentary category. This category is composed of fine-grained to coarse-grained materials (gravel, sand, silt, lumps, and mud). Permeability of layers or levels of water to moderate discharge to high. But at the time of making up the precipitate is silt and clay level of small breakthrough. However, surface water that comes from rainwater is relatively high. This is shown by the small resistivity value of the layer using the Wenner Alpha, Wenner Beta, and Wenner Schlumberger configuration methods on each path.

This is directly proportional to the information presented from the geological map, that the Tanjung Laban Block as a whole is located in the Airbenakat Formation which consists of interlocking slabs with shales and silt stones, sandstone inlay. Therefore, the results of geophysical measurements are considered to be in accordance with the meticulous location and can be used as a foundation for sub-surface lithology. The limited depth of the geophysical method makes the need for deeper lithological verification using well logging data.

3.2. Inner Layer Verification

Inner layer verification is carried out to address the limitations of the ability of geoelectric and georadar devices that can only penetrate the subsurface layer with a maximum depth of 12-50 meters. Inner layer verification is also used to help find out some of the main variables that become input data in the actual reserve calculation. The well logging data used are only Tanjung Laban-01 well due to limited data access from PT. Pertamina UBEP Ramba. The data contains the thickness of each formation layer and the presence of oil and gas. (Figure 4)

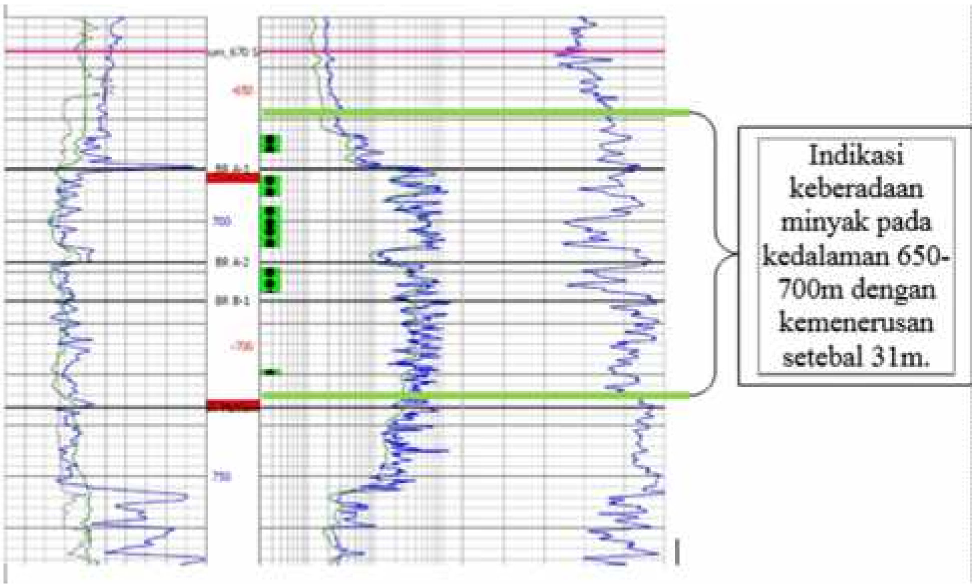

Figure 4. Well logging data with an indication of the presence of oil at a depth of 650-700m.

3.3. Actual Reserve Calculation

From the help of well logging data and the Tanjung Laban well distribution map as an assumption of the reservoir area in the Block, it was found that the actual reserves as of the date of acquisition of the well logging data, as follows:

Known:	A	= 5,4 km^2
	h	= 31 m
	Ø	= 0,6
	Sw	= 0,3
	Boi	= 1,7

Volumetric Calculation of Tanjung Laban Block Oil:

$$N = \frac{7 \quad x\, A\, x\, h\, x\, \emptyset\, x\, (1-S\quad)}{B}$$

$$= \frac{7 \quad x\, 5{,}4\, x\, 3 \quad x\, 0{,}6\, x\, (1-0.3)}{1{,}7}$$

= 320.852,63 STB

Volumetric Calculation of Tanjung Laban Gas Block:

$$G = \frac{4 \quad x\, A\, x\, h\, x\, \emptyset\, x\, (1-S\quad)}{B}$$

$$= \frac{4 \quad x\, 5{,}4\, x\, 3 \quad x\, 0.6\, x\, (1-0.3)}{1{,}7}$$

= 1.801.539,11 SCF

So, with the assumptions and helped by the distribution map of the location of the well above it was found that the oil and gas reserves in the Tanjung Laban Block were 320,852.63 STB and 1,801,539.11 SCF.

4. Conclusion

Based on the description, the following conclusions are obtained:

1. Based on the geological map that has been supervised by impose with geoelectric and georadar acquisition trajectories, it is found that the whole Tanjung Laban block lies in the

formation of benak water which consists of interlocking clay stone with flakes and silt stone, sandstone inserted. This is reinforced by the results of interpretation of well logging data that are suitable for geological and lithological maps of subsurface results from geoelectric and georadar acquisition. It was also found that oil and gas availability was indicated at depths of 650 to 700 meters.

2. Based on the results of calculations with the help of well logging data, distribution maps, and data on oil well production in X field, it was found that oil reserves in the distribution of Tanjung Laban block around 320,853.63 STB and the remaining natural gas is 1,801,539.11 SCF.

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