Introduction

TLJB structure is located South Sumatra Province (Figure1). TLJB Field was a separate structure from the existing TLJ with a separator in the form of the Lembak fault. In terms of hydrocarbon content the structure of the TLJB is different from the existing TLJ, where the TLJB is more dominant in the gas while the existing TLJ is more dominant in oil even though it is structurally higher. So it can be concluded that the initial wells that penetrated the TLJ B structure were the TLJ-157 well drilled in 1952 with production from the R7 layer in the TAF GRM formation, in 2012 the TLJ-237ST well was drilled which was also produced from the TAF GRM formation (layer R8) but the layer This cannot produce for long from the R8 layer due to the channeling of water behind the casing, this well has also been produced from layers R7, R11, and R12. In 2016 the TLJ-244 well was drilled which was proven to produce gas in TAF-TRM and TAF-GRM. In general the hydrocarbon prospect layers of the TLJB Field are: MEF, GUF, A, B, C2, D, E, F, H, I, K1, K2, L2, M1, M2, N, O, R1, R5, R7, R8, R9, R11, R12, V1, & PB_Series (PMB equivalent). In the TLJ-240 well drilling towards the top of the structure, it blows out due to abnormal pressure in the MEF formation's sandstone layer at a depth of 300 m, this needs to be watched out during drilling. Regionally, the depositional environment in the target zone is around fluvial-deltaic and the target layer is a sandstone reservoir. Stratigraphically the upper TAF that develops in the TLJB Field can be correlated with the layers in the existing TLJ structure, but in the lower TAF (TAF-GRM) there is a thickening in the TLJB Field, so that the TLJB Field is more similar to the structure of the TLJ Existing PMB Field.

Figure 1: The working area of PT Pertamina EP

Data and Method

The TLJ-247 well drilling is to increase the absorption point in the TLJB Field which is proven to produce oil and gas in wells TLJ-157, TLJ-154, TLJ-237ST, TLJ-243, TLJ-244, TLJ-245 and TLJ-246. The TLJ-247 well is a directed well that is targeted at the subsurface to the west of the TLJB Field. Limited seismic data due to close settlement, then began to look interesting after the TLJ-PMB Passive Seismic in 2012 after the TLJ-245 well drill showed a good correlation between net pay and passive seismic amplitude. (Figure 2).

Figure 2: Top Structure A Overlay Passive Seismic Amplitude
TLJB Field was further developed through TLJ-237 drilling, obtained 900 bopd qoi from R8 layer, but the WC quickly rose, in 2013 TLJ-240 (25INF) drilling occurred, blowout repair of TLJ-157 suspend well with open MEF layer to cope with blowout & finally become a source of gas. In 2014 TLJ-243 drill found prospect of layer A around 250 bopd, it was found that there was a break in this well, MEF layer was logged and from the drilling side an additional casing route was added to overcome the MEF zone overpressure.

In 2016, the TLJ-244 drill began using a wireline formation tester (XPT), then there was something strange about the results of the gas in layer A which further strengthened the indication of the difference between TLJ & TLJB (sealing fault separated by Lembat Fault), evaluation of TLJ PBU data which strengthens the sealing fault.

In 2017, TLJ-245 drill to penetrate the PB-series layer to prove the deep target equivalent to PMB. Obtained oil was obtained when unloading the PB25C layer well, and showing indications of Hydrocarbons from the PB23D, PB25D, PB25E_a, and PB25F_a layers with an initial production of 206 bopd at layer A.

In 2018, TLJ-246 drill:
- LFA results obtained by the prospect of new gas in the GUF zone
- Completion of layer F: gas yield with PBU results showing high skin value
- Completion of K1 layer: the results of gas with heavy oil, an indication of drill to flange oil rim will be obtained
- Because there is no gas production facility, the layer is targeted for oil.
- Core A-B layer TLJ-246 analysis and cutting GUF and TAF-TRM layers were analyzed. Low resistivity & low permeability due to the influence of bioturbation, clay smectite, calcareous cemented & siderite
- Fracturing Campaign at layer A-B

Oil Rim Hunting was carried out after the successful production of layer A by fracturing in TLJ-245, fracturing of TLJ-244 and TLJ-246 in layer B which gave quite good results. After drilling TLJ-246 well K1 layer that gets gas and heavy oil, there is potential for down flange direction.

![Figure 3: Data from the TLJ well drilling & Correlation of layer K](image)

Based on data from drilling results and the correlation of TLJB Field well, the discovery of Gas-Oil Contact K1 layer TLJ-246 well, thereby increasing confidence in the proposed TLJ-247 drilling down dip from the TLJB Field structure, and the results found the K2 oil layer which was previously penetrated by the wells which are at the top of the structure are gas layers.

**Geological Hazard**

To anticipate the existence of geological hazards in the TLJ-247 drilling, a description of each formation to be penetrated is presented, as follows:

1. Kasai / Alluvium Formation, consisting of gravel, tuffan sand and volcanic concretion clays, acid tidal rock. This formation is a land sediment, lake. Hazards that often appear are: Gumbo due to swelling clay.
2. The Muara Enim Formation (MEF) at the top develops coal-claystone intertwining, while at the bottom it contains siltstone. The Muara Enim Formation is more of a swamp deposit as the final phase of the regression. Hazards that may arise are:
   a. High gas from coal
   b. Shallow Gas reservoir MEF layer at a depth of about 242 mTVDSS / 290 mMD as a source of blow out in TLJ-240 / 25INF and the upper MEF layer above it at a depth of 115.5 mTVDSS / 176.4 mMD
   c. Gumbo due to swelling clay
3. Gumai Formation (GUF), Hazards that may arise are: Shale shale / sloughing shale due to shale thickness that is quite thick.
4. Baturaja Formation (BRF), consisting of limestone. In the TLJ structure, the developed Baturaja limestone is a type of platform that is usually tight or has no porosity so it is not dangerous.
5. Talang Akar Formation (TAF), consisting of fluvial to delta (gritsand member / GRM) sediments and shallow seas (transition member / TRM). The Talang Akar Formation is the main reservoir layer in South Sumatra. In the TAF GRM section develops coal inserts which are sometimes quite thick. Hazards that may arise are:
   a. High gas from coal
   b. Shale loss

The methods and solutions applied include:
1. Evaluate subsurface in an integrated manner with geological modeling
2. Drilling operation improvement:
   ▪ Adding casing routes to cover the MEF zone and using RBOP to prevent blow out, decrease fluid loss control to reduce damage
   ▪ Use SG mud with a gradual increase to reduce damage while still maintaining hole stability
   ▪ Optimization of casing setting depths up to the BRF top overpressure zone so that SG mud can be minimized while in the TAF zone
Optimization of KOP on TLJ-247 well so that inclination is not too high & trajectory becomes more optimum

Result and Discussion
1. Operationally it runs smoothly and there is no hazard or blowout

![Figure 4: Operational Drilling Wells TLJ-247 & Prognosis VS Actual Drilling Wells TLJ-247](image)

2. Performance of K-layer oil production TLJ-247 well, 503 bopd, KA= 0%, natural flow.
3. The production structure of TLJB Field managed to record oil production figures from 150 Bopd in 2016 to 690 Bopd in 2019.
Conclusions

1. TLJ from the beginning as an area of danger became an interesting structure to be developed.
2. TLJ-247 (TLJ-B31) well drilling succeeded in exceeding targets both in oil and operational targets.
3. The key to successful TLJ-247 drilling (B31) is the discovery of Gas-Oil Contact K1 layer TLJ-246 well, thereby increasing confidence in the proposed TLJ-247 drilling (B31) towards down dip of the West TLJ structure, and the result is found K2 oil layer which previously penetrated by wells which are at the top of the structure is a layer of gas.
4. To improve recovery and pressure maintenance, it is necessary to optimize the position of the drilling and injection wells in the main oil reservoir in layers A, B and K2.
5. The search for potential step outs needs to be done for the oil field enlargement, especially in the flank zone which currently needs to be confirmed to increase confident levels in field development.
6. Further Development: Development of integrated gas production & development facilities with the Tundan structure

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