Extending Kencanaloka Field Production by Developing a Hidden Potential of Eocene Carbonate Gas Reservoir, A Case Study of K-85 Zone in Kencanaloka Field, Offshore North West Java*

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Abstract

Kencanaloka Field is located approximately 59 miles northeast of Jakarta and has been developed since 1986 by three platforms: K-A, K-B, and K-C. Current production of the Kencanaloka Field is 4500 bopd and 25 mmcfd mostly coming from Miocene Reservoir: Parigi, Main, Massive, Baturaja, and Talang Akar Formation. It is located next to the mature South Ardjuna Sub Basin (Noble et al., 1997). It consists of fluvio-deltaic sandstone reservoir, shallow marine deposit sandstone and limestone with matrix porosity supported. As production declined, several G&G studies have been performed to seek new opportunity in other reservoirs. The concept was then tested to add reserves and maintain the production.

A new play from the deeper Pre Talang Akar Formation named K-85 zone has been developed to maintain and increase gas production. Based on stratigraphy, K-85 carbonate is deposited just above the basement. Old interpretation of K-85 was marked as basement. Age dating has been performed and its age ranges from Early Oligocene to Late Eocene. Petrography analysis has found no visible porosity due to the high effect of compaction. However, most penetrating wells have experienced total loss. What does this mean? The reservoir could be highly fractured. It is supported by conventional core analogue and petrography data.

K-85 is an Eocene carbonate reservoir and described as brecciated and recrystalline limestone which is associated with fractures (Figure 1A and Figure 1B) (Sadiarta et al., 2014). The Kencanaloka-1 exploratory well, located in Kencanaloka East block and drilled in 1998, tested 545 BCPD and 8.5 MMSCFD from this zone. Kencanaloka-15 well was drilled to develop the zone in 2011. It has 18 MMSCFD as initial rate and 9 MMSCFD as current rate, 15 BCF as cumulative production with no water and steady reservoir pressure. However, only limited log data could be acquired during drilling those wells due to total losses.

Adjacent to the producing block, K-85 opportunity has been identified in Kencanaloka West block. It has six existing wells that shown similar hydrocarbon indication from total loss experience and high gas reading. Those wells were targeting well-known reservoirs in the above formations. Thus, it penetrated K-85 as rat-hole only. Likewise, it is challenging to determine the petrophysical properties and hydrocarbon in-place. The MBAL data and back-calculation approach from the producing block was then being used as analogue data. Seismic attributes analysis has been performed to identify fractures in the K-85 reservoir. It was then combined with the mud log and wireline log data. Discontinuity features in seismic has high correlation with the depth of total loss circulation in the offset wells. It raises the prediction accuracy of fracture distribution in K-85 reservoir (Figure 2A and Figure 2B).

Proposed depletion plan targeting K-85 zone in Kencanaloka West block has been designed to prove hydrocarbon in-place and to add reserves. An advanced well log acquisition has been planned as it would be essential to get accurate petrophysical parameters. Image and sonic log would be the preferred logs for fracture characterization. Rotary side wall core would be utilized as additional data for fracture identification. As concerns to total loss and high possibility of dealing with naturally fractured reservoir, the wells are designed to set casing on top of the zone and drill the zone using an MPD tool along with specific drilling mud. Risk mitigation plan and decision tree have been developed to drill the K-85 zone including acidizing program if there is no flow when performing well-test. Those programs are offered to extend KL field production by developing the K-85 zone. If successful, the new play would be applied to surrounding fields. There are several promising closures in the northern part of Kencanaloka Field that have never been explored.

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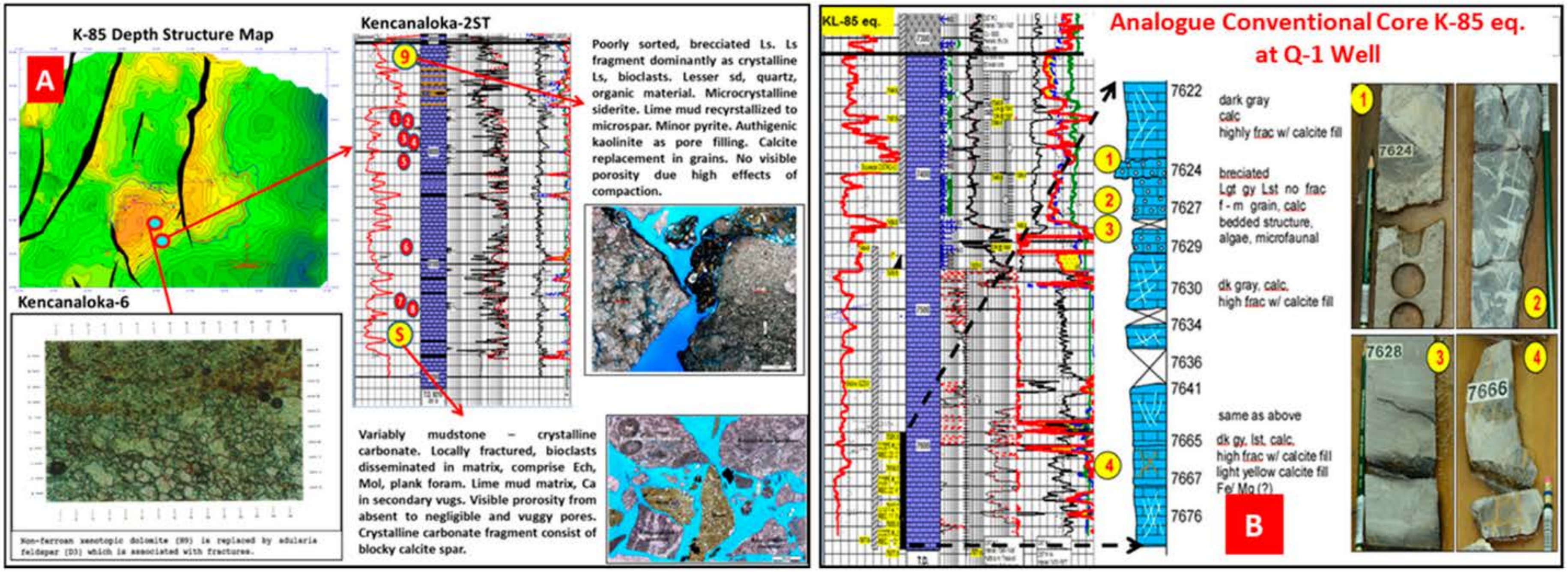

Figure 1. A) Petrography analysis of K-85 shows crystalline and brecciated limestone which is associated with fracture. B) Analogue conventional core K-85 equivalent at Q-1 well shows intensive fracture.

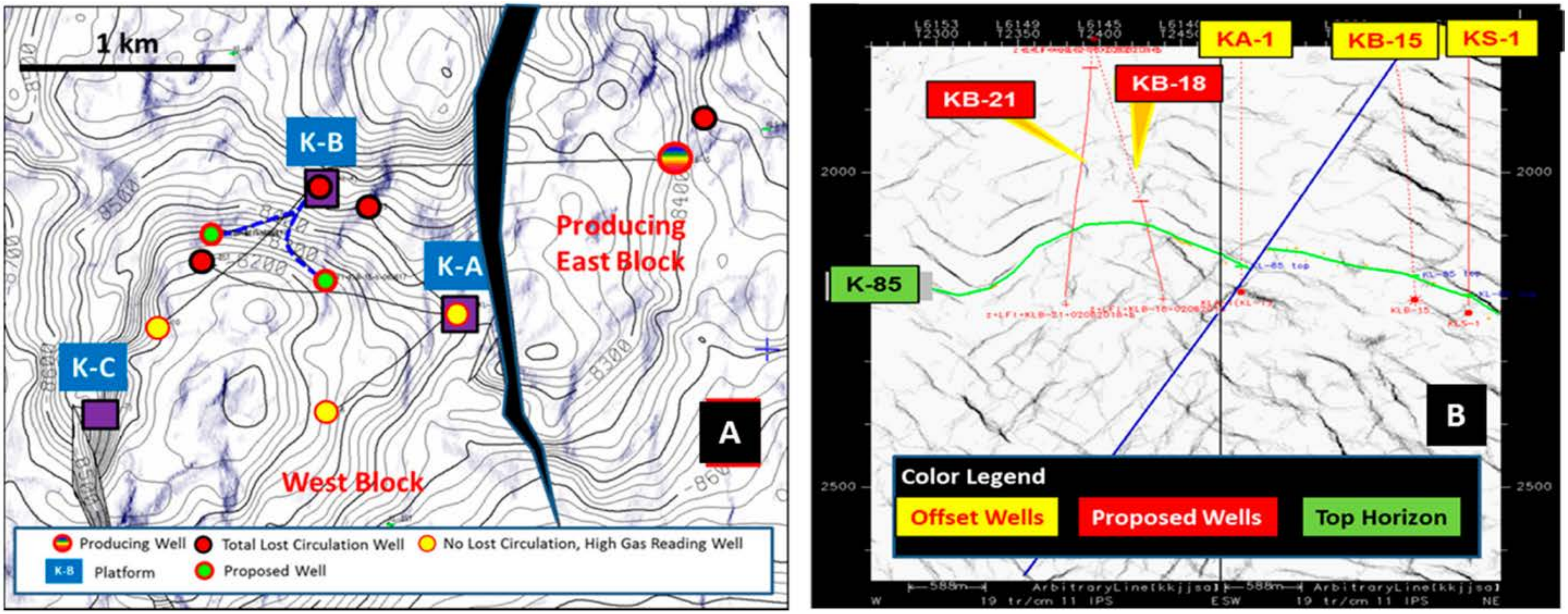

Figure 2. A) K-85 depth structure map overlays with seismic attribute shows discontinuity identified as fractured. B) Discontinuity feature in seismic shows high correlation with the depth of total lost circulation in offset wells.