

Shallow Reservoirs, the Neglected Play in the Malay Basin - A Case Study from the A Field

S. H. So* (PETRONAS Carigali Sdn Bhd), S. Shahr (PETRONAS Carigali Sdn Bhd) & N. Ahmad (PETRONAS Carigali Sdn Bhd)

Malay Basin has been one of the prolific hydrocarbon basin in Southeast Asia since 1960's. Being a matured basin now, the hydrocarbon exploration in Malay Basin has become more and more challenging, innovative approaches are required, to identify a new play type for example is becoming more relevant in current scenario. In order to further explore the remaining hydrocarbon potential, mapping and screening have been carried out in the Southern Malay Basin with the main objective to identify the upside potential within the existing fields and inter-fields area. The X Field was one of the chosen field that indicated positive findings. Despite of the recent efforts on identifying deeper play potential, the shallow reservoirs (Group B) in X Field are also showing promising results.

The X Field is located in the Southern flank of Malay Basin, offshore Peninsular Malaysia. The X structure comprises of a heavily faulted Northeast -Southwest trending elongated anticline with a four-way dip closure. The X Field was first discovered in 1975 by Company A through the X-1 exploration well at the crestal part of the anticline. The field encountered non-associated gas in group H, I, J, K and L reservoirs (Upper Oligocene to Early Middle Miocene). Four appraisal wells were drilled from 1992 to 2010 to firm up the accumulation (Figure 1). To-date a Field Development Plan (FDP) is ongoing for the development of group H, I, J, K and L reservoirs within the X proper (near crestal area).

The Group A and Group B, above the Middle-Upper Miocene Unconformity, consist of predominantly marine clays and silts deposited during an overall marine transgression in nearshore to shallow marine environments from Late Miocene to Quaternary (PETRONAS, 1999). Two strong events within

the Group B were interpreted namely Intra B-I (~ 450 m) and Intra B-II (~550 m). The Intra B-II is composed mostly of channel features trending Northeast-Southwest with interpreted seismic facies of sub-parallel, semi- continuous, and wavy high amplitude reflection interpreted as lower coastal plain. The Intra B-I seismic facies of parallel, continuous, high amplitude and high frequency are interpreted as silty marine sheet sand. PCSB has done an Integrated Regional Study of the Malay Basin (IRS) in 2005 using seismic sequence approach where the interpreted SB 2100 marker is equivalent to the Group B from the EPIC, 1994. Findings from the IRS together with wireline logs and mud logs data supported the interpreted Group B depositional environment as lower coastal plain to nearshore marine with sediment provenance from the Northeast direction of the basin.

DHIs such as flats plot and polarity reversal were identified in both Intra B-I and Intra B-II (Figure 2 and 3). The seismic attributes analysis that has been carried out was very convincing to support the shallow potential in Group B as the amplitude anomaly showing possible gas responses (Figure 4). Besides the gas indication from the seismic attributes analysis, the gas chromatograph from the mud logs also showing indication of gas shows, where wells that penetrated the amplitude anomaly indicates higher gas reading, while lower gas readings were observed in the wells located beyond the mapped amplitude (Figure 5). However, no further formation evaluation has been carried out to evaluate the Group B potential.

In conclusion, the upside potential within the X Field is very encouraging using amplitude conformable to the structure spill as indication of gas accumulation which spans over 200 km2. Nevertheless, reservoirs quality (poro-perm) remains as

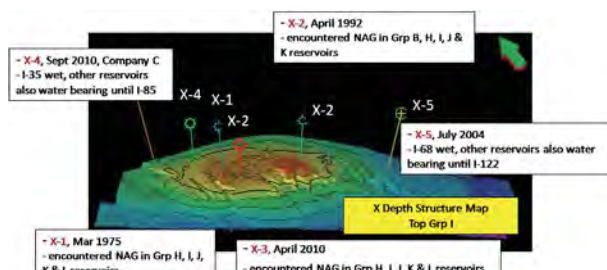


Figure 1: This figure showing the exploration history of the X Field with well location on Top Group I Depth Structure Map.

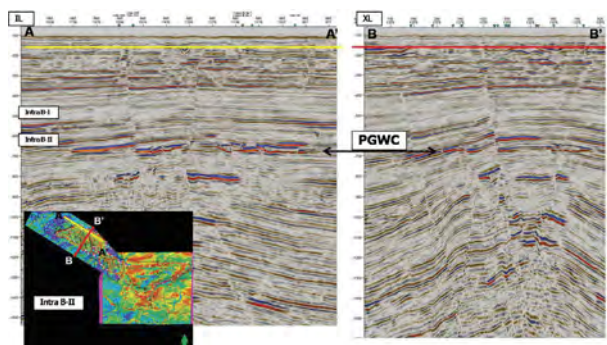


Figure 2: The flatspot or possible gas water contact (PGWC) identified from the Intra B-II horizon.

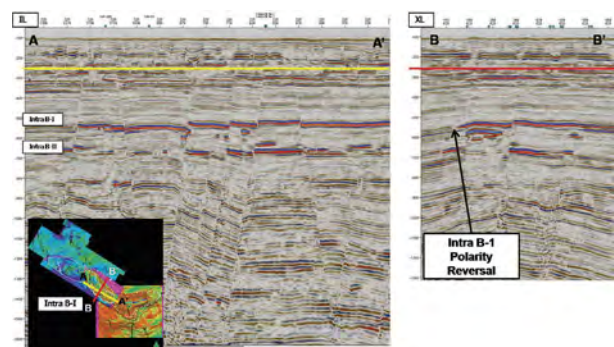


Figure 3: Polarity reversal observed from the Intra B-I horizon.

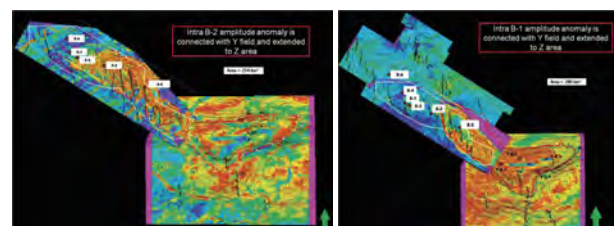


Figure 4: a) Intra B-II RMS amplitude anomaly conformable to the structure. b) Intra B-I RMS amplitude anomaly conformable to the structure.

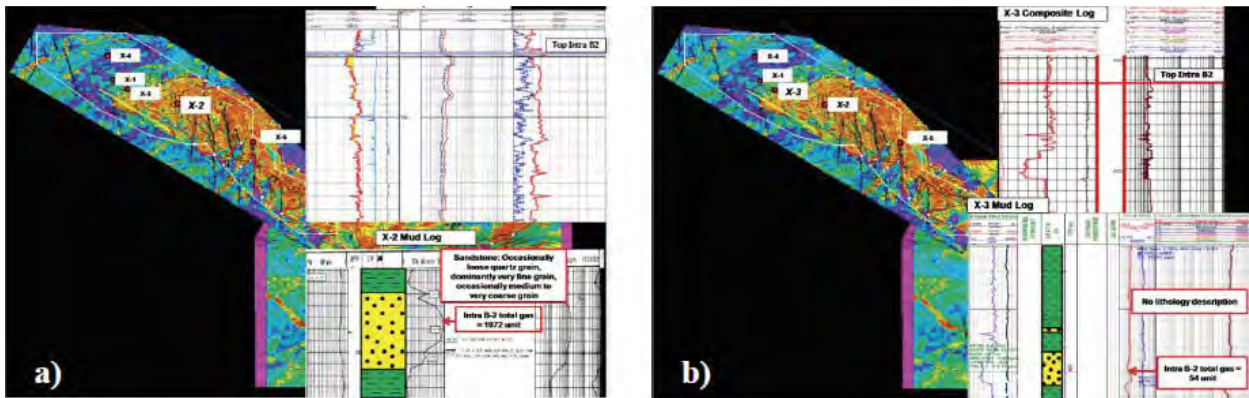


Figure 5: a) X-2 well located on the amplitude anomaly observed significant amount of gas shows in the Intra B-II. b) X-3 well located outside the amplitude anomaly, no gas shows observed in the Intra B-II.

the primary uncertainty for the Group B reservoirs as expected in silty sandstone environment. Draw-down pressure for the shallow reservoir during production is still under study where proper production testing and further formation evaluation is mandatory to conclude the true commerciality of this play.

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