

IPTC 12167

Sequence Stratigraphy Approach To Identify New Play and Evaluation of Petroleum System in Blocks 102 & 106, Song Hong Basin, Vietnam

Hamzah Harun, SPE, Petronas Carigali Sdn. Bhd. Othman Ali Mahmud, SPE, Petronas Carigali Sdn. Bhd. and Jaafar Unir, SPE, Petronas Carigali Sdn. Bhd.

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This paper was prepared for presentation at the International Petroleum Technology Conference held in Kuala Lumpur, Malaysia, 3–5 December 2008.

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Abstract

Blocks 102 & 106 are located in the Song Hong Basin, offshore, Northern Vietnam in water depth of 25 to 30 meters (Figure 1). Petronas Carigali Overseas (V) Sdn. Bhd. (PCOSB) is the operator of the blocks with a 50% working interest. To date, PCOSB has acquired about 1054km² of 3D data and drilled three exploration wells. The first well was drilled in 2004 with minor oil and gas discovery in the Middle Miocene shallow marine sand. The subsequent well was drilled in the middle of 2006, which turned out to be a dry well. The third exploration well was drilled at the end of 2006 and encountered about 70m of net gas sand in the Middle to Late Miocene interval (Figure 2). Based on the two discoveries in Blocks 102 & 106 and significant oil discovery in the onshore well B10-STB-1X drilled by other operator outside the blocks, a working petroleum system is believed to be present in the Song Hong Basin.

In order to further explore the hydrocarbon potential in Blocks 102 & 106, a regional study with sequence stratigraphic approach were carried out in 2007. The study utilized the available 2D, 3D and the latest well data in the blocks.

Plate tectonic reconstruction and geodynamic evolution shows that the Song Hong basin is a rift basin that formed in the late Eocene/ Oligocene time (Figure 3). The basin formation and evolution is closely related to the strike slip movements of the Red River Fault Zone following the impact of collision between Indian plate and Eurasia plate in the Oligocene time. The basin has undergone a series of extensional and compressional events that provides the main structural framework for hydrocarbon trapping mechanism in the area (Othman & Jaafar, 2006). The relationship between tectonic events and structural formation can be summarized as follows: -

- i. Eocene to Oligocene
Block faulting creates horst and graben structures during the rifting phase.
- ii. Late Oligocene
NW-SE opening of South China Sea caused compression or tectonic inversion to some part of the Song Hong Basin.
- iii. Middle Miocene
The change of displacement direction caused formation of distinct unconformity, which in places shows deep channel incision and possible deposition of basin floor fans to the south of blocks 102 & 106.
- iv. Late Miocene
The continuous strike slip activity, which culminated in the Late Miocene, caused reversal of faults and the formation of inversion structures.

Several key seismic lines have been selected to identify sequence boundaries and major bounding surfaces (Figure 4). The identified surfaces were later validated with the available well data and mapped in full scale using Landmark Workstation. The study has identified six sequence boundaries that separated the depositional package into seven sequences. Interpretation on seismic data and paleogeographic mapping suggest that the first package in the early Oligocene sequence were deposited in the lacustrine setting. The formation of lakes during the early stage of the rifting provides conducive environment for the deposition of good potential source rocks in the area. The reservoir potential in the lake setting should come from fluvials and