The Discovery of the Late Oligocene – Early Miocene of Kujung Cycle in JS-Ridge NE Java Basin, Indonesia.

D. Kusuma
Saka Indonesia Pangkah Limited
Jakarta, Kebayoran Baru, Indonesia

F. Dasa
Saka Indonesia Pangkah Limited
Jakarta, Kebayoran Baru, Indonesia

A. Sadat
Saka Indonesia Pangkah Limited
Jakarta, Kebayoran Baru, Indonesia

SUMMARY

The Ujung Pangkah field, in East Java, Indonesia is an oil and gas field which have been producing from Late Oligocene to Early Miocene of Kujung 1 limestone. One of the key factor which support Kujung 1 reservoir performance is reservoir quality. Secondary porosity is one of the key to determine reservoir quality which play significant role for Ujung Pangkah field performance.

Geologically, the Ujung Pangkah field is described as a Late Oligocene to Early Miocene shelf edge carbonate of Kujung 1 associated with NW-SE anticline, sealed by Middle Miocene of Tuban marine shale charged during Middle Miocene by Eocene fluvio-deltaic of Ngimbang source rock. Tectonically, the position of this field is located adjacent to the north of RMKS wrench fault zone which extends from east to west. Structural geology evolution of this field is related to the RMKS fault zone activities through time caused by regional compression at least begun during Early Miocene.

Tectonic product in the Early Neogene in Tuban trough, JS-1 ridge and central deep has formed a NW-SE structural high or ridge which perpendicular to the orientation of Paleogene ridge. Observation through all fields distribution give an impression that there could be a relation between structural configuration generated by regional compression in Early Neogene with reservoir potential distribution of Kujung 1 and CD carbonate which primarily controlled by secondary porosity generation as a product of karsting.

This paper is aimed to identify karsting zone over the Kujung 1 and CD carbonate level with seismic approach using seismic attribute to support geological modeling of Kujung 1 and CD carbonate reservoir in Ujung Pangkah field.

Key words : porosity, source rock, fault, seismic attribute, carbonate.

INTRODUCTION

The offshore Northeast Java Basin is one of the largest basins in Indonesia and one that contains complete hydrocarbon systems from Middle Miocene Tuban formations to Pre Tertiary basement formations. The offshore East Java Basin is located on the southeast margin of Sundaland and is dominated by a series of Northeast trending basement highs and intervening half - grabens that formed during Late Cretaceous to Tertiary times along the Southeast margin of the Sunda Plate (Manur and Barraclough, 1994).

JS-1 ridge, as a part of North East Java Basin, is a highland with NE-SW trending ridge orientation. This area is well known having hydrocarbon bearing accumulation proven in Kujung I and Pre-Kujung I play.

The late Oligocene to Miocene was a period widespread carbonate deposition in SE Asia (Epting, 1980; Fulthorpe and Schlanger, 1989; Ehrlich *et al.*, 1993; Saller *et al.*, 1993; Gucci and Clark, 1993; Sun and Esteban, 1994). Many of these period carbonate in East Java Basin have been the target of hydrocarbon of exploration with numerous oil and gas reservoirs being discovered. Consequently, secondary porosity distribution and development play significant role for exploration on it.

Early Miocene Kujung I play is well known play for East Java Basin. Diagenesis and karstification occur regionally on Kujung I. This is proven by left deflection of density and full diameter core. Early Oligocene CD carbonate is another proven reservoir which is controlled by local paleohigh karstification and fracturation.

Too many carbonates layer as overburden sediment causes complexity to seismic interpretation for Early Oligocene CD formation which results poor seismic imaging and its features.

This paper will reveal how SIPL exploring JS-1 ridge karstification and fracturation on both Kujung I play and CD carbonate Play with seismic approach using seismic attribute to support geological model of Kujung 1 and CD carbonate reservoir in Pangkah PSC.

METHOD AND RESULTS

This study is built by integration of 3D PSTM seismic and log data which is calibrated with sidewall core. The used seismic was reprocessed and merged and covered entire study area.

Some seismic attribute mapes are used to support this study. Coherence is used to delineate the distribution of carbonate build up over Kujung I. This will be integrated with waveform classification. Coherence can also be used to identify fracture related fault orientation on CD carbonate. Model based seismic inversion is used to delineate the distribution of secondary porosity on carbonate. It can also delineate carbonate facies indirectly.

Seismic stratigraphy, core facies, and well log are used to build carbonate model which will support calibrate and seismic based geological model.

Early Oligocene to Miocene Carbonate Sequence

Generally, Early Oligocene CD carbonate in the JS-1 Ridge was firstly developed as ramp platform and tectonically turned into rimmed shelf carbonate sitting on the horst by Paleogene tectonic. This can seismically be reconstructed as shown Figure.1. Early Miocene Kujung I was deposited widespread as reef carbonate in North East Java Basin area, the orientation and geometry is well mapped by seismic attribute Coherence (Figure.2).

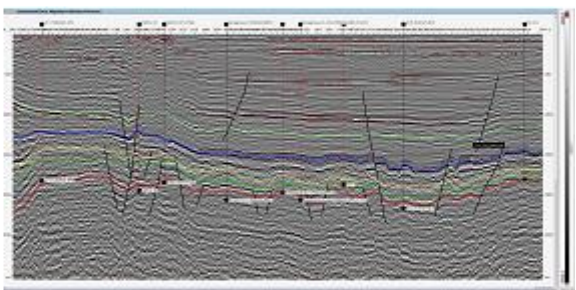

Figure 1. a.) Time Seismic Arbitrary Line N-S along JS-1 Ridge

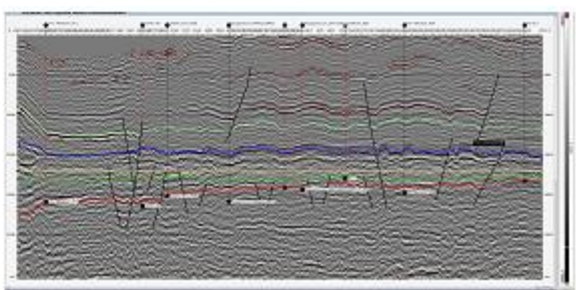

Figure 1. b.) Time Seismic Arbitrary Line N-S along JS-1 Ridge Flattening on 26 Ma (Maximum Flooding Surface)

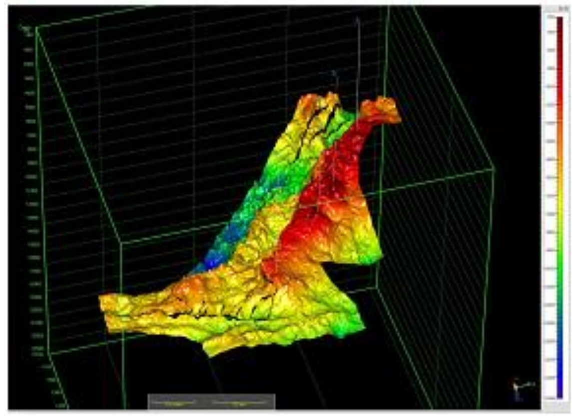

Figure 1. c.) Basement Depth Structure Map (ft)

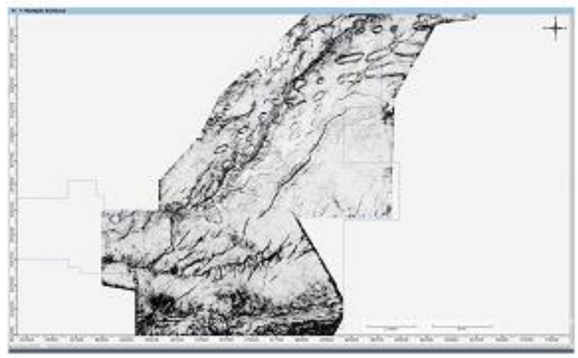

Figure 2. Seismic mapping coherence attribute on Kujung I, level shows reefal carbonate geometry and orientation.

Carbonate Lithofacies and Depositional Environment

Identification of CD Carbonate depositional environment based on integrated seismic attribute (Acoustic Impedance) and well data (sidewall core). In general, three boards depositional environment can be identified as 1). Shelf margin 2). Back Reef of shelf margin 3). Lagoon (Figure 3). Based on Waveform classification, Kujung I depositional Environment can be classified into 1). Shelf margin and 2). Lagoonal with patch reef complex (Figure 4).

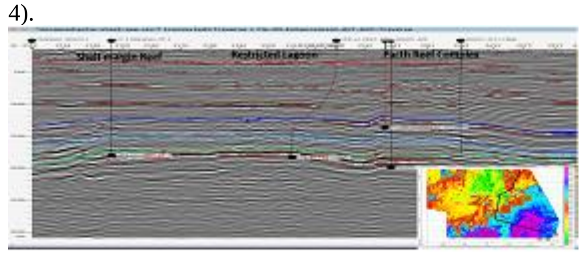

Figure 3. a.) Time Seismic Section shows geometry and boundary shelf margin carbonate to Platform Interior (Lagoonal)

CONCLUSIONS

Based on detailed analysis seismic attribute, three depositional settings and where the best location to find good reservoir property (karst zone distribution) have been well identified.

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