

SEDIMENTOLOGY OF CARBONATE BUILDUP IN CENTRAL LUCONIA, SARAWAK, MALAYSIA

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Carbonate rocks are usually complex and difficult to understand, because of the heterogeneity of fabric and depositional setup. Even though the carbonate platforms in the Luconia province contain numerous gas reservoirs; little is published about their geological evolution, lithofacies, depofacies, depositional environment and stratigraphy (Gartner, 2000; Epting, 1980, 1989; Vahrenkamp, 1996, 1998). Alpha and Beta field that are located in Luconia Province are appraisals cum development fields that need a geological study as an input data for the 3D static model. Hence, Alpha and Beta field were proposed by PETRONAS Carigali Sdn Bhd for detailed sedimentological and stratigraphic study based on conventional cores and wireline data.

Three major stratigraphic intervals were defined from the core to well log correlation that was done on the conventional core taken from Alpha and Beta field, which are Lower Transgressive Unit, Middle Aggradational Unit and Upper Drowning Unit. Four lithofacies were identified in well Alpha which are coral floatstone, skeletal packstone, skeletal foraminiferal rudstone and argillaceous limestone; while five main lithofacies were determined in well Beta, which are coral floatstone, skeletal packstone, skeletal rhodolith packstone, skeletal grainstone and skeletal foraminiferal packstone.

From the seismic profile, Alpha and Beta fusiform-shaped isolated carbonate platform shows similar backstepping stratal geometries pattern to other isolated carbonate platform in Central Luconia Province which developed on fault bounded structural

highs. The main factor controlling the distribution of stratal geometries within the carbonate across the Central Luconia Province was the sea-level fluctuation and local and regional variations in subsidence.

Based on the observation on both wells Alpha and Beta cores, petrographic analysis and routine core analysis (RCA) results for well Alpha, reservoir quality for both fields are assumed to be primarily shaped by the movement of freshwater in phreatic and vadose environments. Microporosity which is not restricted to any facies occurs through the entire cored section. The distribution of macroporosity however is confined to the carbonate sands, generally packstone and coral floatstone. RCA results in well Alpha indicate skeletal packstone and coral

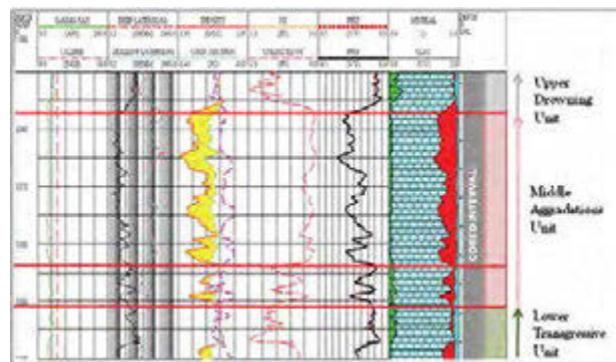


Figure 1. Well Alpha log to core correlation.

floatstone to have a good reservoir quality while well log in well Beta indicate good reservoir quality in skeletal packstone, coral floatstone and skeletal rhodolith packstone.

Based on facies association in core, well Alpha is interpreted to be situated in quiet water inner lagoon environment while well Beta is interpreted to be situated in high energy storm influenced outer lagoon environment. An excellent Holocene analogue is Chinchorro bank off the Yucatan peninsula of Mexico.

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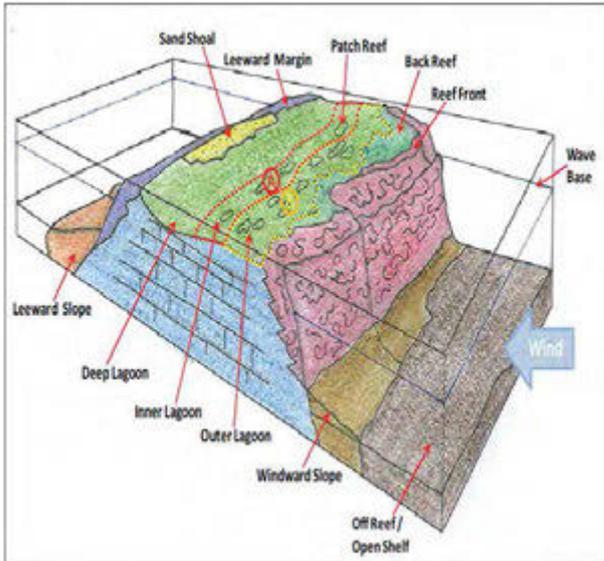


Figure 2. Schematic model of an isolated carbonate platform showing possible depositional environment for well alpha and beta.



Figure 3. Recent analogues for alpha and beta isolated platforms and possible depositional environments for well alpha and beta. Modified after Bray (2009).