DISTRIBUTION OF CARBONATE BUILD-UPS IN STANVAC'S SOUTH SUMATRA AREA

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Two Mesozoic deformation phases account for the configuration of the pre-Tertiary basement in South Sumatra. The first, occurring during the middle Mesozoic, created a system of major northwest-southeast trending right-lateral stike-slip faults. The second phase, during the Upper Cretaceous, brought about a fault system which was of similar type, but north-south in trend. Interference of the two systems together with associated differential uplift resulted in an asymmetric, broken up, Tertiary basin in the east and a platform in the west. The basin itself consisted of several asymmetric sub-basins bounded by the above fault systems.

A micritic-detrital carbonate overlying a Tertiary clastic wedge was deposited on the basin flank during a period of marine quiescence at the end of the early Miocene. Several carbonate reefal build-ups were able to grow on the flank of the basin. These reefal build-ups occurred particularly in the shallower marine environments. Towards the basin deep, the micritic-detrital carbonates grade laterally into monotonous shales of the lower member of the Telisa sequence.

A detrital-micritic carbonate onlaps the Pre-Tertiary basement in the Platform area. Some low relief carbonate reefal build-ups developed on this onlapping carbonate.

The eastern edge of the platform is sharp, being cut off from the depocentre of the basin (the Benakat Gulley) by a distinct north-south Upper Cretaceous fault. On its northern side, the platform slopes gradually towards the Pigi Trough. The carbonates, here overlying the lower Tertiary clastic wedge, are similar in development to those in the eastern basin.

The reefal build-ups on the platform slope and on basement highs are highly prospective in Stanvac's concession area. Six reefs located on the basin slope have been drilled. Five resulted in gas and oil discoveries and one was dry but had oil shows. Four reefs developed on basement highs were drilled, two found gas and two were dry.

THE BATURAJA FORMATION OF THE SUNDA SUB-BASIN AREA

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The Sunda sub-basinal area lies immediately west of the Seribu platform, within the present day Java Sea. Within this region the Baturaja Formation consists of a Lower Miocene transgressive sequence of limestones, secondary dolomites, claystones and shales conformably overlying the Oligocene Talang Akar Formation.

Three distinct facies, namely, shelf, basinal and reef are discernable within the Baturaja Formation.

The basinal facies is the deepest and thickest facies and is characterized by low-energy, clay-rich carbonates, both grain and mud supported. The granular fabric was derived from faunal debris and silt to fine grained detrital material, principally glauconite and terrigenous quartz. The faunal elements are dominated by open water planktonic and calcareous benthonic foraminifera along with fragmented pelecypods and echinoderms. Porosity is of the intergranular type and is relatively low. The basinal facies grades up-dip into the stable shelf facies and, locally, into the reef facies.

The shelf facies is characterized by grain supported carbonate, the granular texture having been derived from glauconite and detrital quartz along with various faunal elements. The fine to locally coarse grained biomicrites of the shelf facies range in faunal content from 20% to 50%, echinoderm and pelecypod fragments as well as open water planktonics and the larger forams being the dominant constituents. Carbonates of the shelf facies are of shallow water, inner-sublittoral origin, deposited under low to moderate energy regimes. The bulk of the shelf carbonates are rather argillaceous in nature, the clay content having greatly reduced the porosity of the primary matrix. Occasionally, where the shelf areas were exposed to effects of periodic sub-aerial erosion, meteoric induced solution-vugular porosity was developed, creating a potentially productive reservoir rock.

Where basement controlled platform areas were present, lying favorably within the unrestricted path of current flow, isolated patch/platform type reef growth occurred. These Baturaja bioherms are elongate; possibly due to a prevailing current direction, and sub-circular in plan (average width to length; 1:4). Reefward, the carbonates of the shelf facies increase in both faunal and floral grain content and size. As the inferred depositional energy increases, isolated occurrences of foraminiferal shoals, as well as energy-induced biosparites, are encountered. Coral debris biomicrites formed by reef talus, tightly apron the bioherms and grade inward into the in-situ coralline biomicrites which define the leading edge of active coralline reef growth. Faunal contents range from 50% to 80%, with compound corals being the dominant constituents, and to a lesser degree echinoderm and pelecypod fragments, and minor amounts of gastropod and bryozoan debris. Red algae are the dominant floral component. Coral debris biomicrites also fringe the inner edge of the reef top, with faunal content, grain size and depositional energy generally decreasing inwardly. Owing to the highly granular nature and the general absence of interstitial clays, these reefal carbonates demonstrate moderate to high, primary intergranular porosities. The preferential solution effect of ground water within the porous reefal framework has caused dissolution of the aragonite skeletons, creating solution-mouldic porosities as high as 40%. Where extensive leaching of the coralline framework is in evidence, the underlying carbonate is often found to be affected by sparry calcite cementation within the available pore space. This cementation is thought to be the result of precipitation from the supersaturated fluids derived from the leached coral framework. The reef carbonates are also prone to neomorphic recrystallization of the micrite matrix to microspar and pseudospar, which also serves to destroy any pre-existing porosity. This recrystallized carbonate is often

quite dense (interval velocities of 12,850 ft./sec. at 3600 ft.) and also fracture-prone. Where fracture systems are developed, this rock type has the potential for being, initially, a highly productive reservoir rock.

Seismic Expression of Carbonate Build-ups, Northwest Java Basin

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Four distinct episodes of carbonate deposition can be recognised in the Tertiary of the Northwest Java Basin. The two most widespread of these occurred during the interval from Oligocene to Lower Miocene and during Late Middle Miocene time. Two minor episodes resulting in more localized deposition, occurred in Lower to Middle Miocene time.

Carbonate build-ups were developed during each of these periods. These build-ups can be recognized and mapped in detail from the excellent seismic data obtained from the area.

The size, shape and disposition of all build-ups, except those developed during the late Middle Miocene, are shown to be related to the tectonic framework, depositional history and local structural features of the basin. The late Middle Miocene build-ups appear to be unrelated to paleo — structural features, indicating deposition on a base-levelled surface at a time of structural maturity and quiescence.

The available seismic data can be used to detect variation in porosity and to provide direct and indirect indications of hydrocarbons within the build-ups.

It is demonstrated how the presence of a large volume of gas within a late Middle Miocene carbonate build-up can be interpreted directly from the seismic data.

Early Miocene Carbonate Depositional Environments, East Java Sea[*]

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In Lower Miocene time, a prolonged period of gentle epeirogenic subsidence and transgression resulted in the deposition of a widespread, thick, limestone and shale unit (the 'Kujung Unit I') in the region of the present day Eastern Java

[*] The complete text of this paper occurs in the Proceedings of the Sixth Annual Convention, 1977, Indonesian Petroleum Association.