Transgressive Successions of the Mahakam Delta Province, Indonesia

Lambiase, Joseph [1]; Remus, David [2]; Husein, Salahuddin [3] (1) Department of Geology, Chulalongkorn University, Bangkok, Thailand. (2) Remus Energy Consultants Pte. Ltd., Singapore, Singapore. (3) Gadjah Mada University,, Indonesia, Indonesia.

Integration of regional seismic mapping with well log and core data, plus concepts derived from modern sedimentary processes, indicates that mid-Miocene and younger transgressive successions have considerable reservoir potential in the Mahakam Delta province. Regional seismic mapping identified seven sequences that comprise progradational clastic successions at the axis of sedimentation and aggradational clastic successions deposited during transgressive events. The progradational areas often exhibit clinoform packages, but adjacent areas are marked by parallel reflections indicating aggradational stratigraphic architecture. These can be up to several hundred meters thick, or nearly as thick as the progradational successions.

The mid-Miocene and younger succession is shale-dominated with thin interbedded sandstones that are most common in progradational successions, with most sandstones interpreted as distributary channel or mouth bar deposits regardless of their stratigraphic context. However, an assessment of the quantitative sediment dynamics of the modern Mahakam Delta indicates that it presently is in a transgressive phase that is generating an aggradational, transgressive succession that is an exact analogue for the subsurface successions. Fluvially-derived sand is being stored as aggradational distributary sands and transgressive shoreline sands are being deposited by wave re-working of inter-distributary shorelines.

Transgressive distributary sands are up to several times as thick as their progradational counterparts, they have sharp upper boundaries rather than fining upward into a transitional contact with an overlying mudstone, and exhibit moderate tidal influence near their tops. The greater thickness and absence of a fining-upward transition causes the reservoir potential of transgressive distributary sands to be better than that of progradational distributary sands. In core, transgressive shoreline sands are wave-dominated, although they exhibit significant tidal influence. High-resolution biostratigraphic analysis indicates they develop during relatively short-lived, local transgressive events; without the high-resolution stratigraphic context, they could be mistaken for progradational mouth bar deposits when they occur within larger-scale progradational units. This has significant reservoir implications as shoreline sands in the Mahakam Delta system have irregular shapes that are mostly inherited from the pre-existing delta morphology.