Paper 3

Tarakan Basin, NE Kalimantan, Indonesia: a century of exploration and future hydrocarbon potential

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Nearly a century of exploration in the Tarakan Basin of NE Kalimantan, Indonesia, has yielded four major oilfields, with a total cumulative production to end-1986 of 312 MMBO, plus one large gas field and five minor oil accumulations. Reserves reside mainly in stacked, predominantly fluviatile, thick sandstone reservoirs of Pliocene and Pleistocene ages. Multiple reservoirs (up to 90 zones) also occur within shallow marine sandstones of Upper Miocene to Pliocene age Traps are primarily downthrown, independently-closed, roughly north-trending anticlines, ranging between 960 and 2600 acres. Most major accumulations are located on Tarakan and Bunyu islands, with only one on the mainland but as yet none offshore.

Over 86% of produced reserves had been discovered prior to 1923 (Pamusian, 1901 and Bunyu, 1923). Both structures were easily identified by their surface expressions and oil seeps. Recent exploration (post 1970), with over 30 exploration wells drilled onshore and 16 offshore, added the medium-sized Sembakung oil field and the large Bunyu Tapa gasfield. The lack of success offshore is largely attributable to the rarity of sufficiently large, independently-closed structures at shallow depths, within the Plio-Pleistocene sand-prone levels so productive in the largest onshore fields.

Migration timing is partly constrained, at least on Bunyu Island, by the presence of Pleistocene reservoirs, indicating extremely late migration, into structures which are either early Pleistocene or possibly re-activated Pliocene or earlier features. Bunyu and Tarakan Islands were depocenters during the late Miocene and Pliocene and were only inverted in late Pleistocene times. Precise dating of tectonic phases is rendered difficult by a lack of age-diagnostic fossils and by laterally discontinuous seismic events which do not correlate laterally with wells nor onshore outcrops.

Technical problems have been partially solved by high-quality seismic data, new wells and isotope age dating. Untested plays include closures at older stratigraphic horizons, growth-fault plays in the deep-water area and stratigraphic traps. This review presents a summary of the Tarakan Basin stratigraphy and structure in relation to the exploration history and an assessment of the currently perceived hydrocarbon potential. The combination of high technology and understanding of basin dynamics will hopefully be the key to success, before the close of a century of exploration.

Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 18, No. 6, November-December 1992