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A new play type in the Western Malay Basin: the West Malay Basin/J-L/stratigraphic play

DAVID W. ABRAHAMSON

Amerada Hess (Malaysia - PM304) Limited
Suite 9.02, Level 9, Menara Tan & Tan
207, Jalan Tun Razak
50400 Kuala Lumpur

The oil industry and PETRONAS have recognised for some time that stratigraphic plays may exist on the flanks of the Malay Basin. Although the Malay Basin taken in its entirety may be considered a mature area, the western flank of the Basin has seen little drilling activity (Fig. 1). In fact, by the end of 2001 out of a total c. 360 wildcat and appraisal wells in the whole Malay Basin only one or two wildcats have been drilled in the Western Malay Basin J-L play area. This is not particularly surprising as historically the Malay basin has been a structural play.

The first exploration well was drilled in the Malay Basin in 1969. The first significant oil in the basin was discovered two years later in 1971 at both the Seligi and Bekok anticlines. During the 1970s and 80s exploration efforts were targeted at finding the more obvious structural traps, that is, the compressional anticlines. The exploration emphasis in the Malay Basin gradually shifted towards stratigraphic and combination traps. This was especially true on the northeastern flank, or ramp margin, of the basin. This shift in exploration emphasis was highly aided by improving exploration technology and better geologic understanding of the basin.

But what about today now that all the large obvious structures, i.e. the compression anticlines, have been drilled and many of the northeastern basin flank plays have been tested?

In 1997 PETRONAS introduced a new profitability-based PSC fiscal regime to revitalise Malaysian exploration activities. In 1998 the Malaysian government further stimulated the upstream petroleum industry by lowering the export duty on oil from 20% to 10% and the Petroleum Income Tax (PITA) from 40% to 38%. These combined actions by PETRONAS and the Malaysian government were successful in attracting new upstream players to Malaysia. These new entrants to the Malaysian upstream brought new and innovative ideas to exploration. Most of the blocks covered by the R/C PSCs include petroleum discoveries that had not been previously developed. Malaysian exploration activity has significantly increased since the new PSCs were implemented. The increase in exploration activity is already benefiting Malaysia in the short term and is expected to yield long term benefits.

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Amerada Hess in early 1998 signed a PSC on Block PM304. During the evaluation of this block it was recognised that a significant portion of the western part of the block lies west of a major hinge line that forms a significant structural feature along a large portion of the western margin of the Malay Basin. The Tertiary units thin rapidly across the hinge line onto the western flank of the basin.

A relatively sparse grid of 2D seismic data existed on the western part of Block PM304 prior to the PSC being signed by Amerada Hess in 1998. Amerada Hess acquired additional 2D seismic data in mid 1998 across PM304, much of it on the western part of the block. It was quickly recognised that an area of 'bright spots' was showing up on several of the 2D lines in the hinge line area. These 'bright spots' appeared to be stratigraphically rather than structurally controlled. Amerada Hess decided to acquire a 3D seismic survey in the hinge line area to cover this, as well as other leads identified on the 2D data. The 3D data was acquired in mid 2000. Mapping of the 'bright spot' anomaly on the 3D data verified that the anomaly was a stratigraphic trap and not structural in nature (Fig. 2).

One possible geologic interpretation of the anomaly is that it is some type of near shore or shoreline lacustrine sand body complex that was deposited against an incised erosional escarpment (Fig. 3). Interpretations of the sand body ranged from it being a palaeo-shoreline beach or barrier bar, an alluvial fan delta, or fluvial sand. The 'bright spot' anomaly may conform to an embayment in the erosional scarp. It was thought that the anomaly could be charged by hydrocarbons migrating updip out of the more central part of the Malay Basin towards its western margin (Fig. 4).

Based on the results of the 3D survey, this particular 'bright spot' anomaly was upgraded to prospect status and a wildcat well was approved to test the prospect. Amerada Hess drilled a test well on the prospect, in June and July of 2001. The initial results of the wildcat well are encouraging with both oil and gas encountered on test.

Are there other stratigraphic traps of this nature on the western flank of the Malay basin, possibly more subtle than the one recently drilled by Amerada Hess? What new technologies, analyses or ideas will be needed to pursue or define these prospects? These questions can only be answered by more exploration endeavours.