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GEOPHYSICS PAPER 9

LOW RELIEF STRUCTURE, A FAVORABLE HC ACCUMULATION TRAP IN MALAY BASIN

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ABSTRACT

Malay Basin had undergone three major vertical structure movements: extension, thermal subsidence and basin inversion. The important result of the inversion is the compressional anticline, include the low relief structure. Exploration activities in recent years demonstrate that low relief structure is a favorable HC accumulation trap.

The discovered low relief structure HC accumulations have the following characters:

- 4 way dip structures (associated with deep seated faults)
- Low HC column (50 to 100 m)
- Large area (up to 60 km2), and HC filled near to spill point
- Very thick total net pay (over 200 meters)
- Multi layers with different contact systems.
- Low CO2 content comparing to high relief trap.

Coastal plain and deltaic environment deposits match with the low relief structures make them excellent hydrocarbon accumulation traps in Malay Basin.
The possible low relief traps lies between high relief structures or beneath the major gas fields which may be overlooked because they are not obvious in time domain or affected by gas sagging. Hence the comprehensive seismic analysis is needed, especially the 3D seismic velocity model.

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CONVENTIONAL APPROACH SEEMS TO BE THE BEST!

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ABSTRACT

Lateral and vertical velocity variations are among the key concerns for time to depth conversion especially in carbonate regime. A reliable velocity model should take account of these issues.

The K prospect area is well known of its geophysical and geological complexity. The targeted and proven reservoirs are believed to be a type of platform carbonate. Furthermore, the existence of channel filled by shale throughout the whole K block, in the shallower horizon, i.e. at W level had caused pull down effects until the basement level. The poor seismic data quality and the unavailability of stacking velocities have developed more challenges to the study.

There were three methods had been identified in order to produce a reliable velocity model meant for time to depth conversion purposes. The three methods are; average velocity model, 3D velocity model and conventional layer cake model.

The first model is an application of well average velocity with main focus on the targeted reservoirs. The 3D velocity model had used a 3D grid as a platform to incorporate all TWT surfaces, well and DMO velocities. A statistical concept of modeling had been applied to populate the well (primary trend) and DMO velocities (secondary trend) in a single 3D model. Then, an anisotropy function (well velocity / DMO velocities) X DMO velocities had been generated as to integrate the anisotropy factor into this model.

The third model is a conventional method which was generated based on observed velocity changes in sonic data vertically. Whilst, the TWT surfaces had been used as to control for lateral variations. Later, both well velocities and TWT surfaces had been incorporated with utilizing the Vo-K method as the basis of generating this model.

Based on the statistical report of residual errors, the third model turns up to provide the least amount of erroneous.

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