



SEAPEX Exploration Conference 2003
Orchard Hotel, Singapore
9th – 11th April 2003

ABSTRACT

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BLOCK B8/32, GULF OF THAILAND: PETROLEUM SYSTEM AND IMPLEMENTATION OF TECHNOLOGY IN FIELD DEVELOPMENT.

Block B8/32 is approximately 2,891 sq km in size and lies on the north-western edge of the Pattani Basin, with production from fluvial sands of Miocene and Oligocene age. Block B8/32 is subdivided into four Production license areas, Benchamas, North Jarmjuree, Maliwan and Tantawan. Oil and gas production is from two main fields: Tantawan and Benchamas.

Technological advances from the drilling of exploration and development wells to seismic imaging techniques have made this area economically attractive.

Exploration started in the Block in 1971 with the drilling of the 238-1X well by Gulf Oil Corp. Initial drilling was focused on the Ko Kra Ridge on the western edge of the concession. The focus of exploration was oil reserves but the results indicated a predominance of gas which subdued interest in the area. Later exploration moved off the Ko Kra Ridge towards the center of the basin utilizing straight holes to define graben system potential. These wells often found hydrocarbons but in non-commercial quantities. Again interest in the area waned. With the introduction of 3D seismic and the use of directional drilling to follow the high side of the fault block close to the bounding fault, a string of commercially successful tests were made throughout the current extent of block B8/32.

The Gulf of Thailand Basin is characterized by a series of elongate, narrow, north south or northwest-southeast trending Tertiary basins and collapse grabens. The Tertiary basins formed as a result of extensional tectonics believed to have been initiated during an Eocene oblique slip extension structural event. Continued deposition associated with extension has continued through today, resulting in linear collapse graben trends. Many faults in the collapse graben trends are



active today and are present to the surface, while other faults remain “buried” deep in the section. The stratigraphic section in the B8/32 concession area thickens from west to east, towards the center of the basin.

Two different petroleum systems are identified in the B8/32 area. Upper Oligocene lacustrine intervals in the B8/32 area represent the primary source for liquid hydrocarbons. Basal Miocene coaly and shallow lacustrine sediments containing Type II/III kerogen, which can generate light oil and gas/condensate, represent a secondary source system. In certain areas, marine shales may provide a subordinate contribution of liquid hydrocarbons. The use of oil base mud and the distribution of drilling limits source rock evaluation in the B8/32 area. The definition of predictive source rock models is continuing with additional stratigraphic and biomarker data.

The reservoir section is an alternating sequence of sand and shale with a few local coals. Most of the reservoir section was deposited in a fluvial/costal plain environment, with linear, discontinuous sands through laterally extensive amalgamated sand sequences. Hydrocarbon accumulations are generally associated with three-way dip closures formed along normal faults. Stratigraphic closure in the strike direction, at the depositional edge of fluvial sand, is also common. Wells are usually directionally drilled parallel to the trapping fault and encounter multiple stacked pay sands. The individual sands are generally thin, averaging about 30 feet; some sands are as thick as 90 to 150 feet.

The Tantanwan Field is located in north central part of the Gulf of Thailand Basin, on the east side of the B8/32 concession. The field occurs in a well developed graben structure located over a hinge at the eastern edge of the Pattani Trough. Tantanwan field is not a single contiguous accumulation as a field is generally defined. The field is composed of numerous individual fault and stratigraphic traps with most reservoirs drained by one or two wells.

The Benchamas Field can be subdivided into two geologic areas. East Benchamas is associated with three distinct accumulations but is considerably less faulted than Tantanwan. Since the East Benchamas fault blocks are fairly large, as many as 25 wells have been drilled to develop multiple pays in a single fault block. The second area, more similar to Tantanwan field in structural style, is known as the Benchamas Hinge area.

The B8/32 area is unique in the Gulf of Thailand in terms of its oil production. Other fields to the south have produced condensate in association with gas. In



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contrast, Benchamas Field has significant crude oil reserves. Twenty-five horizontal wells, including the world's first ever zero-drill completion horizontal well, have been drilled in oil reservoirs with water injection – 23 as producers, and 2 as horizontal injectors. Current oil production from the horizontal wells ranges from 1,000 to 4,500 BOPD per well.

Seismic inversion has been applied to a variety of field development problems within Block B8/32: well-to-well sand correlation, landing and steering horizontal wells, optimizing well trajectories and well planning, reservoir characterization, and estimating sand connectivity.