Shallow Hydrocarbons in the Pattani Trough, Gulf of Thailand

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Abstract

It has been recognized from the early stages of exploration in the 1980s that gas-bearing reservoirs with condensates were located at depths of approximately 4,000 to 5,000 feet in parts of the Pattani Trough, Gulf of Thailand. However, even though the entire pay window is evaluated for each prospect area, no regional study on the shallow hydrocarbons has been made due to the majority of hydrocarbons residing in deeper zones. In the Gulf of Thailand, there are two major Cenozoic sedimentary basins, the Pattani Trough and the Malay Basin. In the Pattani Trough, commercial production started at the Erawan gas field in 1981 and subsequently more than 20 oil and gas fields have been discovered and have continued producing hydrocarbons at the current date.

The Pattani Trough is a rift type-sedimentary basin and the maximum thickness of sediments is more than 10 km. The geological column is divided into five sedimentary units from Sequence 1 to 5 in ascending order. Two major unconformities are identified: one is called the Middle Cenozoic Unconformity (MCU) and the Middle Miocene Unconformity (MMU). The latter unconformity is located between Sequence 4 and Sequence 5. Oil and gas are mainly trapped in fluvial to deltaic sandstones of Sequence 3 and Sequence 4 located between 5,000 to 9,000 feet. Structure is characterized by many normal faults.

Based on the more than 800 wells and 3D seismic data, detailed studies on well correlation, dip-meter, micropaleontology, regional isopachs and sand-shale ratio were made and it was concluded that the these shallow hydrocarbons are closely related to the incised valley-fill sediments located in the lower part of Sequence 5 immediately above the MMU. Hydrocarbons generated in the deeper levels have migrated upward through faults and moved into and are possibly trapped in the incised shallow reservoirs. Previous wells were drilled in the highly faulted areas where most of the oil and gas is trapped and there are no wells drilled in the monocline areas. Although the detailed areal distribution of the incised valleys is not clearly identified, hydrocarbons are expected in monocline areas if conditions are favorable.

Since the MMU is widely developed in the South East Asia, this type of exploration concept focusing shallow hydrocarbons can be applied not only for the undrilled area of the Pattani Trough but also for the mature sedimentary basins such as the Malay and Nam Con Son basins.