CHAPTER 1
INTRODUCRTION

Fang Oil Field is located in the Fang District, Chiang Mai Province and is the first to have been developed in Thailand Figure 1.1. This field is managed and operated by the Defence Energy Department. In the past, the primary production rate of this field was 1,200 barrels per day. The production rate has declined to as much as 700 barrels per day. Thus, it is necessary to find the method for increasing the production rate. One of the methods is to plan for additional production wells in existing oil fields and exploration wells in new areas.

Previously, seismic data were interpreted and intended to delineate geological structures. There are stratigraphic studies based on only well data. The concepts of seismic stratigraphy have not been applied to their efficient use in seismic interpretation. Therefore, existing geological information at the Fang Oil Field cannot be used to accurately locate reservoir rocks, especially in the present-day where more attention has been brought to small structures with petroleum potential.

1.1 Aims of Study.

The aims of this project are to understand the seismic stratigraphy based on both seismic data and well data. Structural maps, isochron maps and seismic amplitude maps will be integrated to provide a three-dimensional picture of the Tertiary depositional systems. The resultant depositional model will contribute to the prediction of geometry and distribution of reservoirs and ultimately to the estimation of reservoir potential and the hydrocarbon prospect.

1.2 Literature Review

Buravas (1973) and Sethakul (1984) classified sediments and rocks in the Fang basin into two units, the Mae Sod and Mae Fang formations. The Mae Sod Formation (Late Eocene - Pliocene) can be separated into three parts based on well

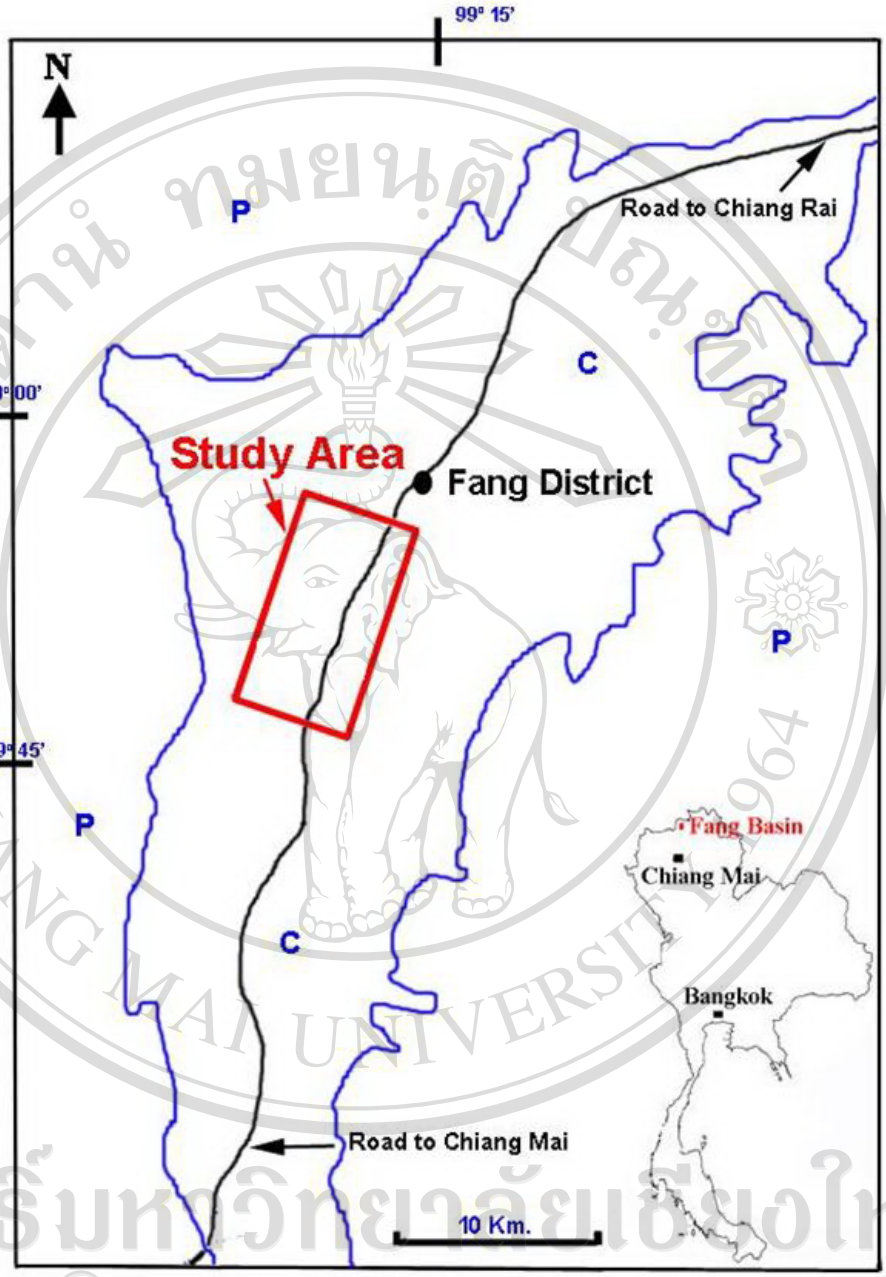

Figure 1.1 Map showing location of the study area. C = Cenozoic rocks; P = Pre-Cenozoic rocks.

log data. The lower part consists mainly of reddish brown sandstone, siltstone, conglomerate and coal. The middle part is at least 700 m thick and dominated by claystone, mudstone and sandstone with fossil gastropods, leaves and fish fragments. The upper part is black grey siltstone and grey sandstone. The Mae Fang Formation (Pleistocene to Recent) unconformably overlies the Mae Sod Formation and consists of arkosic sandstone, clay and red mudstone (Figure 1.2).

Bruan and Hahn (1976) showed that the Fang basin was filled with rocks of Tertiary and Quaternary age. These Cenozoic rocks and sediments consist of shale, sandstone, conglomerate, sand and gravel.

Settakul (1985) classified the reservoir rocks of the Fang oil field into five units using well log data of the well FA-MS-26-39 drilled on the Mae Soon structure. These units are, from top to bottom, the D-Sand, E-Sand, F-Sand, G-Sand and H-Sand (Figure 1.2).

Srihiran (1986) studied on the Mae Soon Oil Field, the results show low apparent resistivity values or anomalously conductive areas with high apparent resistivity values on off field or the background line. The combination with the interpretation of exploration wells and seismic investigation shows a possible boundary of oil – water contact in the western part of the Mae Soon Oil Field.

Khantaprab and Kaewsang (1987) recognized a distinct basin wide unconformity at the base of the Upper Miocene sequence in the Fang Basin. The unconformity divides the fluvio-lacustrine facies sequence below from the high energy fluviatile facies sequence above. This unconformity is regionally widespread and probably is associated with either or both tectonic activities and the fall of water level in the basin.

Kaewsang (1987) described Cenozoic sedimentary sequence of the Fang basin as of exclusively non-marine origins. It thickens westward toward the major basin-bounding faults. The overall sedimentary facies of the Fang basin are generally of fluvial and lacustrine environments. They show high degree of facies variation both vertically and laterally. The regional and local tectonics are believed to be the major controlling factor of the variation in the depositional environment and hence sedimentary facies.Settakul and Pimsarn (1991) studied oil origin in the Fang Basin

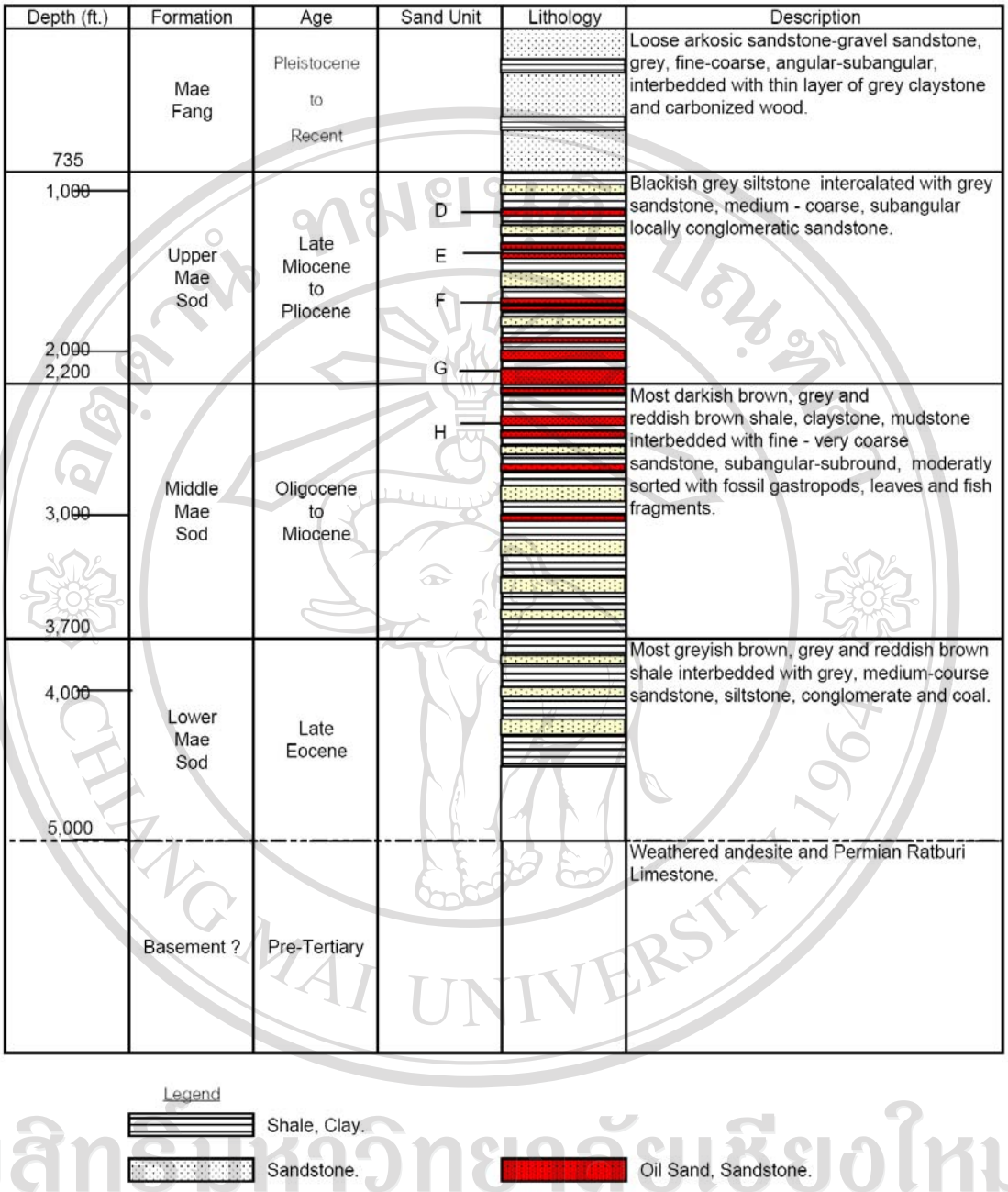

Figure 1.2 Stratigraphy of the Fang Basin (modified from Buravas (1973); Sethakul (1984); Settakul (1985)).

and indicated that the oil source is bituminous and carbonaceous shale interbedded with coal beds in the Lower and Middle Mae Sod Formation. This oil migrated into fine to coarse grained, moderately to poorly sorted sandstone reservoirs. These reservoir rocks have one to 20 percent porosity and permeability of 10 to 20 millidarcies. The sandstone reservoirs are overlain by siltstone and shale of the Upper Mae Sod Formation.Zollner and Moller (1996) interpreted seismic stratigraphy of the Fang basin. Seven horizons and six sequences were picked based on sequence stratigraphic methods. All picks represent unconformities marked by reflection terminations and separating different seismic packages with specific internal reflection configurations. Horizons A-E (Sequences 1-4) were deposited during the development of the half-graben. In general they can be characterized as layers of low, medium to strong amplitudes with only minor internal reflections. Seismic configurations include toplaps, downlaps, onlap, concordant, parallel, sigmoid to oblique clinoforms, pinches out and erosional truncations. Horizons E-F (Sequence 5) include reservoir rocks. The lower boundary onlaps both sides of the basin, and the upper sequence boundary is characterised by erosional truncations in the east and toplaps in the west. The internal reflection configuration is parallel. In the east and west strong reflections occur and become less prominent towards the center of the basin. Sequence 5 represents an infill unit. Horizons F-G (Sequence 6) has similar seismic characteristics as that of Horizons A-E (Sequence 1-4).

Rodjanapo (1998) interpreted that the Mae Sod Formation was deposited in a temperate climate and an environment involved with lakes to floodplains and channels. It is also rich in organic matters. Lamaginite and alginate A (Botryococcus sp.) are the dominant organic matter types. Both are good oil sources.

Boonyarat (2001) interpreted that the formation water in the Fang Basin is of a meteoric origin. Flowing formation water can carry petroleum to traps. Flushing of traps by meteoric water has caused dilution of formation water and has displaced oil to downstream direction. On the Mae Soon structure, the production wells in the western limb have higher water cuts than that in the eastern limb. Oil displacement has clearly occurred on the Mae Soon structure while conclusion can not be made in other structures.

1.3 Usefulness of the Research (Theoretical and/or Applied)

The results could be applied in planning oil production in existing oil fields and exploration in new areas in the Fang Basin.

1.4 Research Plan and Scope

1.4.1 Scope: This thesis intends to study stratigraphy, depositional environment and structure of reservoir rocks in the Fang Basin based on 3D seismic and well data.

1.4.2 Research Plan

1.4.2.1 Literature review.

1.4.2.2 Data collection.

1.4.2.3 Data Interpretation.

1.4.2.4 Paper Submission.

1.4.2.5 Thesis writing.

1.5 Research Location

1.5.1 3D – Seismic survey (1996) area, 75 square kilometers, located in the Fang Basin, Fang District, Chiang Mai Province, Northern Thailand between Lat. 19° 56’ to 19° 46’ N and Long. 99° 06’ to 99° 16’ E (Figure 1.1).

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