CHAPTER VI

CONCLUSION

From the detailed analysis of the regional geology of Northern Thailand coupled with the detailed investigation on the surface/subsurface geological and geophysical conditions of the Fang basin, it is concluded that the Fang basin began to form in the Oligocene time(?) by relative movement of the Chiang Saen Fault Zone and the Mae Tha Fault Zone respectively to the order of the time. This is basically due to the fact that the Tertiary Period marked the resume instability of block and strike slip faulting. The collision of the India and the Eurasia plates during the Himalayan Orogeny in Eocene to early Miocene is regarded to be responsible for the formation of graben or tilted fault-blocks in the northern part of Thailand which are expressed geomorphologically as intermontane basin.

The near-triangular geometry of the Fang intermontane basin is considered to be an intracratonic basin where sedimentary sequence in this basin records of initial isostatic subsidence followed by a thick sedimentary infill history.

The ground geophysical survey data of the Fang basin reveal that there are at least three separate sub-

basin or depression elongated in the longitudinal basinal axis of the Fang basin, notably, Huai Pa Sang, Huai Ngu, and Pa Ngew from north to south, respectively.

Many lines of evidence indicate that the oldest sediments in the basin is of Oligo-Miocene age, and the Cenozoic sedimentary sequence in the basin is non-marine clastic with total thickness of approximately 2.5 kilometres in the deepest part of the basin. This Cenozoic sequence can generally be subdivided into three main successions. The lowermost succession is represented by alluvial fan and mainly meandering fluviatile facies overlying unconformably the pre-Cenozoic basement rocks. Lithologically, the succession is characterized by the association of coarse- and medium-grained clastic deposits thickening westwardly. The middle succession lies conformably on the lowermost succession with an abrupt change in lithological characteristics to mainly fine-grained clastic sediment and some coal as well as medium-grained clastic of fluvio-lacustrine facies thickening westwardly. The uppermost succession is characterized by the medium- to coarse-grained clastic sediments of high energy fluviatile facies of braided system and alluvial fan and associated with ephimeral lacustrine facies. Generally, the succession also shows the westward thickening characteristics similar to the other two underlying successions.

Early depositional episode in the Fang basin, the lowermost succession was restricted within the tilted fault-block depression after the basin was initiated during Paleogene time. Between early to middle Miocene time, there was the widespread paleo-lake development in the Fang basin. This development is believed to be associated with the increases structural activities, especialy the reactivation of existing major faults which culminated a depression of limic condition. The deposition during this time was represented by the middle succession. In the late Miocene, there was the major change in tectonic setting in the Fang basin which caused the abrupt disappearance of the paleolake followed by the basinwide unconformity and sedimentation of the uppermost succession. Throughout the late Miocene to presumably Holocene, numerous intrabasinal faultings have been intermittenly reactivated penecontemparaneously with the deposition of the uppermost succession.

It is important to note that the Cenozoic sedimentary sequence in the Fang basin, in almost all cases show the westward thickening of the bedding architecture. This suggests that the major basinal bound faults, namely, the Chiang Saen Fault Zone, and the Mae Tha Fault Zone as well as associated intrabasinal faults have been intermittenly reactivated throughout the depositional episode of the Cenozoic sedimentary sequence in the Fang basin.

With respect to the cumulative petroleum recovery from the Chaiprakarn, Mae Soon, and Pong Nok areas during 1959 to 1984, the total production of 1,764,271 barrels have been recorded. At present, the petroleum production rate in the basin is approximately 35,000 barrels per annum. It has been long-known that the crude produced from the Chaiprakarn, Mae Soon, and Pong Nok areas are different. The Chaiprakarn and upper pay zone of the Pong Nok are of asphatic base crude, whereas the Mae Soon and lower pay zone of the Pong Nok are of paraffinic base crude. The difference in the crude characteristics is probably due to bio-chemically and physico-chemically degradation during the secondary migration. This conclusion is drawn from the crude oil characterization using the oil compound, sulphur content, and wax content to determine the field of occurrence. The Chaiprakarn crude indicates that it is of aromatic-asphaltic (heavy degraded oil type), whereas the Mae Soon crude is of paraffinic type. It is, therefore, regraded that the Mae Soon crude represents the characteristics of probably original crude derived from the non-marine origin matter in the Fang basin.

On the integration of sedimentary facies analysis the petroleum generation potential, it is concluded that the lower part of the middle sequence of Huai Ngu, Pa Ngew, and Huai Pa Sang sub-basins are faverable to be the petroleum generating zones, kitchen areas, in decreasing

order, respectively. Using the Lopatin's method, the oil window of the Fang basin with geothermal gradient approximately 95° C/1000 metres will be below the depth 1,100 to 1,400 metres under the ground surface. Therefore, the possibility to discover the petroleum from greater depth not penetrated by any existing drill-hole above the kitchen areas is very high particularly in the either stratigraphic and/or structural traps.