Chapter 2

Lignite

2.1 Coal and Lignite

Generally coal was formed in areas where forests once grew, but in some instances coal resulted from the accumulation of vegetation which drifted and accumulated in deltas. When such organic material were deposited in water, decay was incomplete as layers were deposited on other layers. The movements of the earth surface submerged the land at intervals, and under pressure and heat for millions of years deposits of coal were formed.

Lignite is one of the major coal groups. According to the ASTM (American Society for Testing Materials) definition lignite is classified as a coal with a heating value lower than 4,612 calories /gm or 8,300 BTU/lb (moist basis). Lignite which is brown in colour is also called brown coal.[1,2]

2.2 Lignite in Thailand

Lignite deposits are found in widely scattered areas in Thailand (see the map in Fig. 2.1). These deposits occur in Tertiary sediments of continental or brackish-water marine origins.

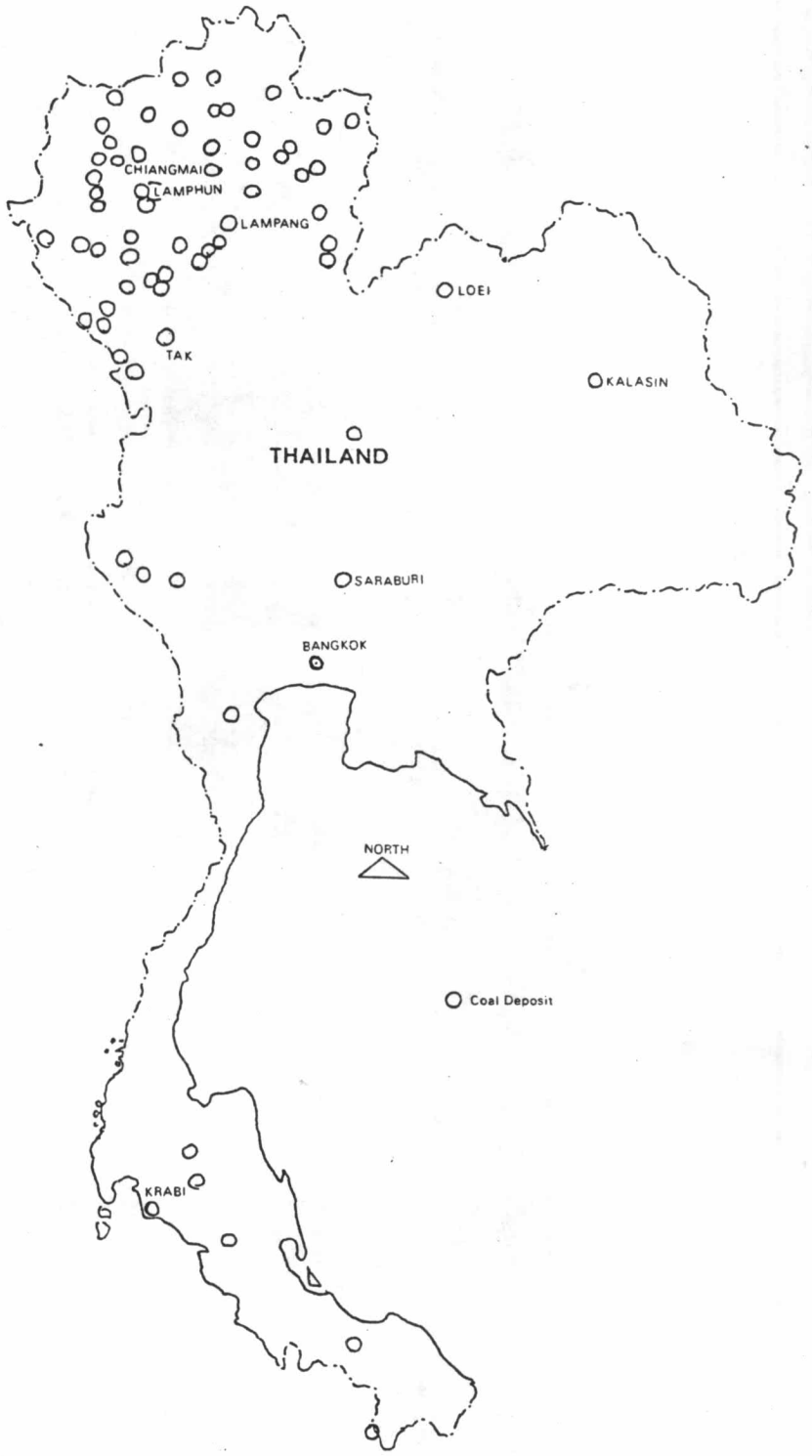

Fig. 2.1 Coal Deposits in Thailand[5]

In 1981, the Department of Mineral Resources of Thailand collected data and summarized that fifty lignite deposits had been discovered, and the total reserve is estimated to be 1,200 million tons. This total reserve is equivalent to 66 million barrels of crude oil. Among these deposits, only three deposits are commercially important, namely, Mae Moh, Li and Krabi[5]

2.2.1 Mae Moh

The Mae Moh lignite deposit is in Lampang province in the northern part of the country. It is Thailand's major reserve of lignite with an estimated reserve of about 650 million tons. The quantity that can be mined is estimated at 450 million tons.

2.2.1 Li

The Li deposit is another important lignite area in the north, and preliminary studies indicated that the lignite from this deposit is superior in fuel quality to other deposits. It is higher in heating value and lower in sulphur content (see Table 2.1). The estimated reserve is about 50 million tons.[6]

2.2.3 Krabi

The Ban Pu dum lignite area in Krabi province is located close to the Andaman sea on the western coast of southern Thailand. The lignite there has a fixed carbon value which is comparable to other lignites but has comparatively high sulphur contents. The reserve of this deposit has been estimated at 30 million tons.

The reserves of these three deposits are illustrated in Fig. 2.1.

2.3 Properties of Lignite

Table 2.1 shows the properties of Lignite from the above mentioned deposits. These properties however may not be regarded as fully representing the complete average lignite properties from the entire reserves of each deposit.

Table 2.1 Analysis of Lignites [4]

Deposit	Mae Moh		Li		Krabi	
Analyser / Properties	R.S	P.P	R.S	P.P	R.S	P.P
Moisture %	35.9	12.4	28.0	11.4*	30.3	13.8*
Ash %	12.4	7.6	3.7	4.9	8.5	13.4
Dry basis %						
Volatile matter	50.8	50.3	47.7	48.4	50.8	51.5
Fixed carbon	49.2	49.7	52.3	51.6	49.2	48.5
Carbon	72.1	-	75.2	-	70.7	-
Hydrogen	4.5	-	5.0	-	4.5	-
Nitrogen	2.6	2.6	0.7	1.4	1.7	2.2
Sulphur	2.0	2.3	0.6	2.0	4.1	5.6
Oxygen	18.8	-	18.6	-	19.0	-
Calorific value						
Btu/lb	12,040	10,250	12,810	10,060	11,850	10,060

Proximate and ultimate analysis

R.S. = Rachadawong S.

P.p = Poovatananuwong P.

*Samples of P.P were dried before being analysed.

From Table 2.1 the ash and sulphur content from the Li deposit is comparatively low, whereas the sulphur content from the Krabi deposit is comparatively high.

2.4 Lignite Utilization in Thailand

The Electricity Generating Authority of Thailand (EGAT) has built five 75 MW electric generating plants utilizing lignite at a rate of one million ton/year at Mae Moh. Furthermore EGAT will have 10 plants installed by 1992 to generate 1,725 MW, and 12 million tons of lignite per year from the Mae Moh reserve will be exploited.[40] Lignite from the Mae Moh deposit was also once utilized for producing chemical fertilizers. When the fertilizer plant was in operation it utilized 250-300 tons of lignite per day to produce 84.5 tons per day of Urea fertilizer and 192.8 tons per day of Ammonium sulphate.[7]

In 1980, 385,000 tons of lignite from the Krabi deposit was utilized to generate 60,000 KW of electricity.[6]

Because of the low contents of sulphur and ash in the Li lignite, it may be contemplated as a raw material for making high-grade industrial fuels such as metallurgical coke and domestic fuel that could be absorbed entirely by local requirements.

2.5 Fluidized Bed Combustion of Lignite

In order to utilize lignite more efficiently it is suilable for Thailand to study and develop technology for combusting lignite. At present fluidized bed combustion is recognized to be able to offer greater efficiency of energy utilization than pulverized-coal combustion and contributes to solving the problems of environmental deterioration due to SO_2 and NO_x emissions.