

Chapter 1.

INTRODUCTION



1.1 Background of the Research

Thailand consumed more than 41 billion liters of petroleum products in 1996 and it is expected to rise up at the rate of 5.3% in the next decade. (source : PTT.) Petroleum is the main factor for the country's economy development especially in industrial, transport and agricultural sectors. While petroleum products consumption are scattering in every area of the country, different oil companies employ different modes of transportation to distribute their products to the customers. This depends on area suitability and their costs to each company. In general, there are four transportation modes of the country's oil transport system; ship, pipeline, truck and train. Each mode is described as follows:

1). The oil transportation by ship is a form of sea transport. In which, petroleum product is transported from Sriracha and Rayong oil refineries to the oil terminals in Bangkok and to other oil terminals in the West and the South of Thailand such as Surat Thani and Songkhla Province.

2). The oil transportation by pipeline, transport petroleum through the pipeline at Sriracha-Saraburi of the Thai Petroleum Pipeline Co., Ltd. (Thappline) and from Bangchak-Donmuang-Bangpa-in of the Fuel Pipeline Transportation Co., Ltd. (FPT).

3). The oil transportation by train, transport petroleum from Rayong, Saraburi and Bangpa-in to the oil terminals in the North and Northeast of Thailand.

4). The oil transportation by truck is usually made in a short distance such as from the oil terminal or oil depot to the end users close to that place including the oil transportation from the oil terminal center in Saraburi to those in Northern and Northeastern part of Thailand.

At present, petroleum distribution and marketing in Thailand is dominated by four major firms : PTT, Esso, Shell and Caltex. Together these companies control over 80 percent of the market. The four major oil companies (Esso, PTT, Shell, and Caltex) have 56 oil terminals all together (excluding the oil depots at the airport) which are scattering in every area of the country. The main oil terminals of these

firms are situated in Saraburi, Bangpa-in, Lam Lukka, Sriracha, and Bangkok with the main responsibility of restoration (including legal oil restoration) before transporting to customers.

1.2 Statement of the Problem

As many oil companies have their main oil terminals at Saraburi, so there is a lot of oil transportation in and out from Saraburi Province everyday both by trains and trucks. This caused many problems to the society and the surrounding area such as traffic congestion, air pollution, accidents and road deterioration, especially those transported by trucks. Despite these problems, the oil transportation by truck still plays a major role and tends to increase significantly. As in 1996 the amount of oil transported to the oil terminals amounting to 4,708 million liters was transported by trucks to the Northern part by 3,880 million liters or 310 trips per day (620 round trip) or 44 trips per hour while the oil transported by train was only 992 million liters per year. (Source: a report of overall oil transportation:PTT) Out of 44 trips per hour of oil transported by trucks caused traffic jam on the roads and accidents. Moreover, the air pollution was incurred from the trucks' exhaust pipes.

From the aforesaid problem, the Government initiated an idea to improve the oil transport system so that it would be more effective by transporting the oil and gas through the pipeline in an attempt to reduce the transports cost and the problem of traffic jam. Such idea has been supported by the declaration of energy policy to the parliament on December 11, 1996 in order to develop the oil and gas pipeline transports system to cover many areas in the country (National Energy Policy Office, 1997). Moreover, the National Energy Policy Office has designated its energy plan on the 8th National Economic and Social Development Plan (NESDP) (1997-2001) in order to support scattering oil and gas pipeline transportation system throughout the country with a purpose as follows:

1. To reduce oil transportation cost which would help to close oil prices gap between regions.
2. To ensure confidence to transporting oil and gas to the Northern and Northeastern part.

3. To ease the traffic jam on the main routes and reduce the risk of accidents that caused by tanker trucks.

4. To save the fuel on the transportation system and the state budget used for the road maintenance.

The oil transportation by pipeline can be effectively competitive with that by trucks especially the tanker trucks (30,000 liters-capacity). The transportation by pipeline requires large amount of investment at the initial; however, the operating cost is cheap and even cheaper when there is a large amount of oil to be transported. Therefore, large amount oil to be transported is needed for the pipeline transportation to be competitive with the transportation by tanker trucks.

The cost per unit by the pipeline transportation will be reduced continuously when the quantity of the transports is increasing while the amount of oil transported by the trucks will be limited to only 30,000 liters per truck, so the cost per unit by truck transport is parallel with the horizontal as illustrated in the figure 1.1. If the amount of transports is low, the cost per unit of the oil pipeline transport will be high and higher than by the truck (on the left of the crossing point at A). However, if the petroleum pipeline transportation is high up to a certain point, the transport cost will be cheaper than by the truck (on the right of the crossing point at A).

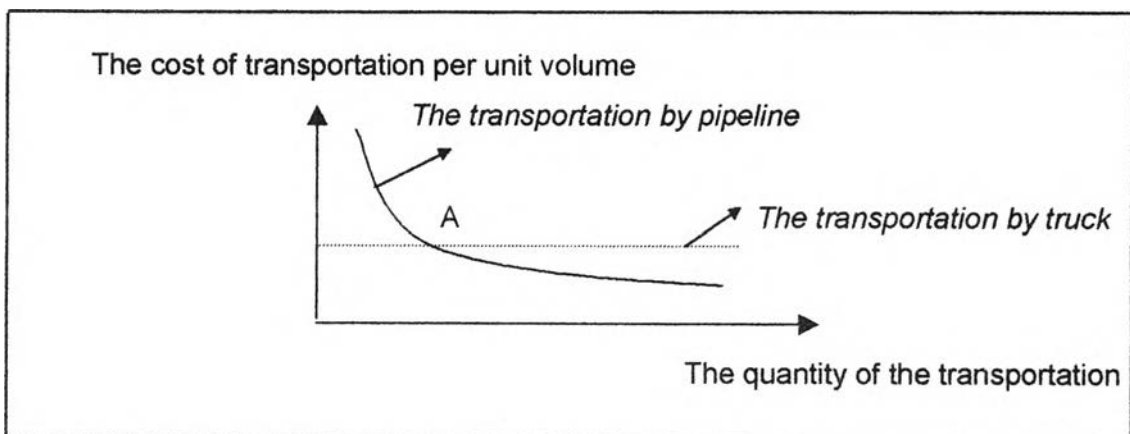


Figure 1.1. Showing the comparison between the cost of oil transportation by pipeline and the cost of transportation by 30,000 liters capacity truck.

The petroleum products especially automobile fuels are very important to the country's economic system. This is so far the Northern part of Thailand where

automobile fuels are transported by tanker truck most frequently. In addition, the automobile fuels demand of Northern market is projected to grow at a slightly fast rate. (Source: PTT.)⁴ Moreover, from the purposes that mentioned previously by the government and the 8th NESDP (1997-2001) also pay attention to the studies of the feasibility of the Northern refined products pipelines project. And also, some oil terminal depots are readily existed in the North, such as at Nakhon Sawan, Pittsanulok and Lampang. The Northern refined petroleum products pipeline route is, therefore, choose to be studied in this project.

This project is a study of pre-feasibility of the Northern refined petroleum products routing pipeline on both technical and economic aspects as mentioned above. This pipeline with intermediate take off terminals, originates from the Saraburi terminal to the North region market of the country. Moreover, this project tried to find the appropriate pipeline route and suitable intermediate oil terminals subject to the lowest expenditure. This pipeline is a single pipeline to transport the petroleum products that consist of Unleaded Gasoline (ULG), Unleaded Regular (ULR) and High Speed Diesel (HSD) into the Multi-Products Pipeline for providing service to the customers in the Northern part.

Refined product distribution to the North and NorthEast has taken place exclusively in the past by tanker truck and rail. Rail has limited capacity due to track constraints and existing traffic. Therefore, tanker trucks have been the primary source of petroleum distribution. Tanker trucks currently travel from refinery or regional distribution terminals to retailers or major customers. The characteristics of the distribution system serving a particular location are designed subject to efficiency and resource availability.

This new pipeline would compete with the existing main modes of transportation which are rail and tanker truck. The pipeline would also be positioned as the lowest cost transportation services and should capture the majority of the market.

The technical feature of this project is to describe the preliminary design and the cost estimation has been prepared based on this preliminary engineering design. The pipeline and associated facilities will be designed to achieve the projected

maximum throughput flow rate. Moreover, the estimated appropriate oil terminals and pipeline routing will be based on a more important factor that is the lowest expenditure. So, **Transportation Problem** technique is suitably applied in this project in order to find the least cost method of automobile fuels transportation from oil terminal at Saraburi to customers in Northern region.

The Depot and tank sizes are estimated by Batch size of automobile fuel products. While, pipe sizes and associated facilities such as pumps, valves, loading bay and safety system are calculated by using the computer program of Petroleum Authority of Thailand. As a fundamental principal of the design, this program will meet the performance objectives of safety, efficiency and economy. The progression of the design program effort through to the detail design phase will establish refinements, which should result in life-cycle cost and pipe size optimization.

1.3 Objectives of the Research

To study the pre-feasibility of a refined products pipeline project to serve the Northern provinces in terms of marketing, engineering and economic.

1.4 Scope of the Research

The researcher has designated the scope of this study as following:

1). To study the pre-feasibility of the Northern refined products pipelines project by routing the oil pipeline from the connection point at Sriracha-Saraburi of Thai Petroleum Pipeline Co., Ltd. (Thappline). By routing the single pipeline in an attempt to transporting the Automobile fuels that consist of Unleaded Gasoline (ULG), the Unleaded Regular (ULR) and the High Speed Diesel (HSD) into the Multi-Products Pipeline for providing service to the customers in the Northern part.

2). To designate the suitable pipeline routing of the project in order to achieve maximum safety for pipeline, minimum disturbance of the affected landowners, and especially, to prevent the problem expected to take place from the dissatisfaction of the people.

3). To study the suitable places in an attempt to establish the oil terminals by using the lowest expenditure. From the report of Northern petroleum products

consumption demand, the expected Northern line location terminates in Lampang with intermediate terminals at Nakhon Sawan and Phitsanulok.

4). The economic analysis is aimed to see whether the project is suitable for investment or not by the criteria for the analysis and decision that are price per unit and revenue of pipeline project. Price is the important direct impact of project decision-making. In this project, petroleum products price of transporting (or Tariff rate) by pipeline will be compare with price of transporting by truck that is the effective mode at present. The revenue of this project is Throughput Tariff. Throughputs depend on Demand and capture rate.

1.5 Research Procedures

1. Study marketing, demands and supplies of petroleum products in the Northern market of the country at present and forecasting 10 years in the future.
2. Study and analyze in technical term in order to estimate the appropriate pipeline routing and oil terminals by using the Transportation problem analysis (the least cost method and the minimal column value).
3. Analyze and calculate the cost and size of pipeline and oil terminals by using the forecasting demand.
4. Conduct economic analysis by considering comparison between petroleum products price per unit of transporting by pipeline and by the effective existing main mode that is tanker truck. Estimate the revenue of this pipeline that is throughput tariff rate.
5. Analyze and summarize research
6. Review and write up thesis
7. Final examination

1.6 Expected Results

1). The result of this project would provide an information and suggestion for optimal decision making whether the project should be run or not.

2). It will be a suggestion to find the suitable route to prevent the problem expected to take place from the dissatisfaction of the people.

3). It will be mitigate the risk of accidents caused by the oil trucks and lessen the traffic jam on the main routes.