

CHAPTER I

INTRODUCTION

Thailand has experienced development in several areas and had satisfactory economic growth. To sustain this condition, it is necessary that sufficient energy sources are provided. At present, the most important energy source is petroleum (oil and gas). In 1991, Thailand consumed total petroleum of about 525,000 barrels of crude oil equivalent per day and there is an increasing tendency for petroleum consumption.

Petroleum used in Thailand are both imported and produced locally. At present, local petroleum production supplies more than thirty per cent of total petroleum consumption. Petroleum exploration in Thailand first started in 1925 leading to a discovery of Fang Oilfield in Chiangmai province. After discovery of Fang Oilfield, petroleum exploration activities in Thailand had not been active and stayed idle most of the time. Only during the past twenty years that petroleum

exploration activities have been very active and several oil and gas fields have been discovered. Now natural gas is produced locally from fields both offshore and onshore (mostly offshore) at total volume of 729 million cubic feet or 13,602 barrels of crude oil equivalent per day. Condensate obtained from gas production from gas fields in the Gulf of Thailand is also produced at rate of 22,600 barrels per day. Sirikit Oilfield which is the largest oilfield in Thailand provide the majority of oil produced locally at rate of 23,500 barrels per day. In addition, natural gas liquid (NGL) is obtained from natural gas separation plant at rate of 2,500 barrels per day.

The majority of oil consumed in Thailand is imported from many countries. In 1991, 217,000 barrels of crude oil and 177,000 barrels of gasoline were imported daily (Petroleum Authority of Thailand, 1991).

Due to the importance of petroleum as a source of energy, Thai government has promoted exploration for and production of petroleum within the country. Most of exploration and production activities are undertaken by foreign oil and gas companies. In the process of exploration for and production of petroleum, estimation of the amount of oil or gas to be recovered, known as "reserve", is one of the important steps. By knowing the reserve, the operator or oil company can make

decision on development of the oil or gas field which was discovered by using the reserve value for technical and economical evaluation of the field. In addition to usefulness to oil and gas companies, reserve is also valuable information for a government in planning and making decision on provision of petroleum as an energy source. Right planning and decision are important to both an oil company and a government. Wrong planning and decision may cause an oil company to obtain less or lose profit or even have financial problems. Similarly, wrong planning and decision may lead a government to encounter with social and economical problems caused by under- or over-supply of petroleum. Therefore, it can be seen that obtaining the right value of reserve is very important.

Unfortunately, it is difficult to obtain the right value of reserve. There are many methods that can be used to calculate reserve. All these methods need assumptions and input variables. The right values of input variables are also difficult or impossible to obtain. This fact, in couple with assumptions required, makes it impossible to obtain the right value of reserve. Realizing this, no more effort is made to obtain the right value of reserve. Effort is now made to evaluate both the approximate value and the uncertainty of the estimated reserve.

In this study, volumetric method will be used to calculate reserve. Monte Carlo simulation will be used as a tool to evaluate uncertainty of the calculated reserve. The most simple case of reserve calculation using Monte Carlo simulation is to treat reservoir as a single block. A more complicated case is to divide a reservoir into several blocks. A number of blocks will be dictated by many factors such as availability of data, nature of the reserve. This case may be subdivided into three cases. First, when there are no statistical relationship among input variables and no statistical relationship in space of input variables. Second, when there is statistical relationship among input variables (at least between two input variables). Third, when there is statistical relationship in space of one or more input variables.

The main purpose of this study is to develop a computer program for oil reserve calculation using Monte Carlo simulation taking into account all cases mentioned above. In addition, the effect of statistical relationship between two input variables and the effect of statistical relationship in space of an input variable on the calculated reserve will be investigated. Finally, an example of using the developed computer program using data from an oilfield in Thailand will be illustrated.