



## INTRODUCTION

Thailand is one of many countries in the world whose socio-economic conditions are being seriously threatened by energy shortage and spiralling fuel prices. To study the use of oil shale has been intensified lately in many countries which seek for another source of energy. Discovery of a vast oil shale deposit throughout the northern part, particularly at Mae Sot basin, is very interesting. Since 1974, Mae Sot basin was surveyed by the team from Department of Mineral Resources and was estimated to be 18.67 billion metric tons. On the production of shale oil, the remaining solid wastes called spent shale were considerably left about 60-80% by weight. The spent shale is usually disposed of.

Cement industry is one of the few industries which is capable of utilizing large quantities of byproduct wastes (spent shale). From the physico-chemical characteristics of spent shale, it is well suited for making good quality cement. It is also composed of four major oxides,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{CaO}$  which is the same major oxides in Portland cement. The spent shale is higher in  $\text{SiO}_2$  and lower in  $\text{CaO}$  content. This can be compensated by limestone. The residual carbon, after oil shale is pyrolyzed, generally remains.

Thus, producing million tons of cement from spent shale will lower fuel consumption because of its inextractive combustible materials. Besides, spent shale which is easy to grind causes a decrease in cost of grinding raw material. Hence, spent shale should be an important and profitable ingredient in the manufacture of cement.

Cement industry is the principal industry in developing country. It plays an important role in economical development. In the foreseeable future, Portland cement concrete will still remain the most widely used constructing material in the world. Developments of a modern industrial society would not be possible without cement. This statement is particularly true and enhanced by its present building and construction boom with vast and urgent requirements for cement supply. By 1985, the yearly cement production in Thailand is expected to rise to 15 million tons. This will cause a corresponding increase in demand on energy and raw materials. Although natural raw materials for Portland cement manufacture are plentiful, it appears that the cement industry happens to offer the possibility for optimum utilization of industrial wastes. The energy saving in cement making can then be achieved, if the utilization of spent shale could be possibly used.

#### 1.1 The objectives of this study

To study the technical feasibility for production of cement from spent shale.

## 1.2 The scope of this study

1.2.1 To investigate the application of spent shale in raw material substitution of cement process and choose limestone, spent shale and clay as the raw mixture

1.2.2 To estimate the amount of spent shale used

1.2.3 To investigate the chemical properties of cement from spent shale

1.2.4 To investigate some physical properties of cement from spent shale

1.2.5 To compare between cement from spent shale and Elephant brand cement

## 1.3 The advantages of this study

1.3.1 On the production of shale oil, a considerable amount of solid waste material called spent shale was left. If this spent shale can be used to produce cement. It is more valuable to make use of spent shale instead of treat it as a waste.

1.3.2 Producing cement from spent shale increases oil shale retorting more profitable.

1.3.3 It will enhance the construction material in the engineering field.

1.3.4 It support the utilization of oil shale which has been economically important to the country.