CHAPTER I

INTRODUCTION

Thailand relies heavily on energy from imported oil even though some crude oil and natural gas have been found in the kingdom. In 1984, the imported crude oil was about 83 million barrels, or worth about 59,800 million bahts, which was the quantity of about 55 percent of the annual energy demand.(26) Furthermore, the world political crisis, particularly in middle-eastern asia, causes uncertainty to crude oil supply. Regarding these matters, research and development of new technologies for utilizing non-conventional energy resources as displacement of crude oil has been successively performed.

As an alternative, the use of solid fuels to generate electrical power and process steam is becoming a strategy to reduce oil imports and natural gas consumption. Even though oil and natural gas are more satisfactory and solar energy is also better in some case, oil shale and coal are such fuels that should not be ignored. From the fact that crude oil and natural gas will be used up in a few decades, nuclear power carries high environmental risks and provokes strong public opposition, while solar technology is not yet available or economical for certain important applications, particularly those requiring intense heat, increasing utilization of solid fuels, ie. oil shale and lignite, seems to be inevitable.

Presently, Thailand has five producing lignite reserves of which the largest is at Mae Moh district, Lampang province and a large oil shale reserve at Mae Sot district, Tak province. The oil shale is not yet used in any application while major portion of mined lignite has been supplied for generation of electricity using conventional pulverized coal-fired boilers which suffer the problems of low thermal efficiency and pollution control. Fiuidized bed combustion (FBC) system can solve these problems for high thermal efficiency and environmentally acceptable operation at attractive operating cost. Particularly in pollution control aspect, it is possible to eliminate sulfur dioxide, a gas generated during lignite combustion, directly within the boiler by feeding calcium carbonate-containing materials, eg. limestone and dolomite, as adsorbent to capture the said harmful gas along with the lignite. The sulfur in lignite combines chemically with the calcium in the said material, to form solid calcium sulfate. Under suitable conditions and with suitable quantity of limestone, it is in this way possible to trap more than 90 percent of the sulfur, which remains with the solid ash and is discharged with it from the combustor.

Regarding the calcium carbonate-containing materials, analysis shows that Mae Sot oil shale is composed of a significant amount of calcium which is believed to exist substantially in carbonate form. This implies that oil shale may be used as sulfur dioxide adsorbent while combustion can be taken place simultaneously per se.

Consequently, it is an objective of the thesis to investigate the influence of oil shale to lignite ratio and the shale size on sulfur dioxide capture and it is just another objective to study effects of the said oil shale to lignite ratio and the shale size on combustion efficiency. The last objective of this thesis is to provide a conclusion of trends of combustion efficiency affected by air to fuel ratio.

Data and conclusions received from this research may be used in a fundamental assessment of technical and/or economical feasibility of fluidized bed boiler using lignite-oil shale mixture as solid fuel by those who have skills in the art.