CHAPTER I

INTRODUCTION

1.1 Significance of the Study

More than one-fourth of the people in the worldeat rice as a major staple food. In Thailand, more than 80 % of the population deal with agriculture. Rice production rate each year is about 20 million tons. A portion of the produce are exported worldwide. A method of hygienic treatment of rice was found in India a long time ago. This method is today not only used for improving the quality of rice after milling but also for cleaning the rice. Another method also celled rice parboiling involves steaming and heating process before milling. Parboiled-rice is very well-known and has been produced in industrial scale in the U.S. and Italy since 1940. Nowadays one-fourth of rice production is passed through parboiling process for pre-milling treatment to give a good quality, especially in Thailand. There are many methods for parboiling rice ranging from simple solar drying to heating by hot water flowing in pipe. The processes may be either batch or continuous. At present, industrial technology advanced rapidly, and one technology that is well-known in industry is the fluidized-bed process. This technique can be achieved and applied to drying step of the parboiling process using electric energy as heat source to produce hot air. The operating cost of this unit is very high because it consumes a large quantity of electric energy. The operating cost can be reduced by substituting

electric energy with energy from agricultural waste especially rice hull. In Thailand, rice hull has a very high potential as a fuel to produce hot air because, each year, Thailand has produces about 5 million tons of rice hull as by-product of rice plantation. The heating value of rice hull is about 3,410 kcal/kg dry basis. Therefore energy that can be produced from rice hull is about 1.7×10^{13} kcal which is equivalent to 400 MW of electric energy. This amount of energy is more than sufficient to use in the local parboiling process. Some rice hull is being used now as a fuel in simple inefficient combustion systems. In this case, a fluidized-bed technique can be applied to increase combustion efficiency. Thus, there is a high posibility to produce hot air in rice hull fluidized-bed combustor to use in fluidized-bed dryer for parboiled-rice production.

1.2 Objectives

The objectives of this study were:

1. to control quality of parboiled-rice using a fluidized-bed technique.
2. to generate hot air using rice hull as fuel in a fluidized-bed combustor.
3. to develop a combine system for parboiled-rice drying involving a fluidized-bed dryer rice hull fluidized-bed combustor.

1.3 Scope

This study involve the application of theoretical study to improve the quality of parboiled-rice and to use the energy from waste materials. The tasks to be undertaken in this research are as follows.

1. to combine a rice hull fluidized-bed combustion system and a parboiled-rice fluidized-bed dryer system.
2. to improve the distribution system in a fluidized-bed combustor.
3. to study performances of the individual systems and the combined system.
4. to calculate material and energy balances of the combined system.