Chapter 1

INTRODUCTION

1.1 Background

In Thailand, commercial logging in the forests has been prohibited since 1989. Since then, domestic consumption of timbers in Thailand has turned to other sources. These factors are major driving forces in the development of alternative structural composite timbers from underutilized wood materials available within the country to fulfill the domestic uses. In the South of Thailand, rubberwood is the most important and most abundant softwood and account for nearly 90% of all lumber used in the furniture industry and 10% for hardwood. The demand for and popularity of the rubberwood and its products in traditional timber-importing countries such as Japan, USA and United Kingdom are quite substantial (http://www.thailandrubber.thaigov.net).

Rubberwood is the standard common name for the timber of *Hevea brasiliensis.* The rubber tree reaches its prime in 25 to 30 years, after which it is no longer economical to produce latex but the wood from such trees can be used for other purposes. Wood in the standing tree has high moisture content, usually in excess of 75%. Green wood must be dried before it can be adequately treated with preservation (ITC, 1993).

The drying of green wood decreases warping by removing much of the moisture and reduces transportation costs by reducing the total weight. In addition, strength generally increases as wood is dried from the green condition to moisture contents below the fiber saturation point. But strength can also be negatively affected by the temperatures used in the drying process and lumber drying is one of the most time and energy consuming step in processing wood product. For example, it can take up from 40-70% of the total energy requirement for drying operations (Theppaya, 1998). Drying involves the water removal from wood that is contained in the wood cell. Wood can hold moisture in the cell lumen as free water, or as bound water attached to the cellulose molecules in the cell wall (http://www.uvm.edu/extension/publications/nrem/lumberdrying.pdf**).**

The two most commonly used methods for wood drying are environmental, or air-drying, and kiln, or conventional oven drying, which are time-consuming and inefficient. Hence, the drying of rubberwood requires an optimum drying rate, while reducing power consumption of the process.

Superheated steam drying technique is now becoming more and more common in the USA and in Europe. This is a common trend toward drying wood, which is mainly motivated by shorter processing time and lower energy consumption. But the limitations of this technique are that the high temperature of the product in superheated steam increases problems for temperature-sensitive products and more complex drying systems are needed in comparison with hot air drying.

Many studies have been conducted on superheated steam or high temperature drying, from which it has been found that superheated steam drying significantly shortens the drying time (Li et al.; 1999, Tang and Cenkowski.; 2000, Moreira.; 2001, Thiam, Milota and Leichti.; 2002). However, decreased strength of high temperature dried timber has also been reported (Thiam, Milota and Leichti.; 2002, Bekhta and Niemz.; 2003).

Because of the importance of rubberwood and problems with conventional drying, this research focuses on the effect of superheated steam drying. In the first part, the optimum drying condition that minimizes the drying time and maximizes the physical properties of the rubberwood is determined and the second part, the results are compared with the commercial product. The research reported here is part of a wider study aimed at developing technology for drying rubberwood in our country.

1.2 Research Objectives

1. Determine the optimum drying condition using superheated steam.
2. Determine the strength of the timber dried using the two methods and compare the results with the commercial product.