

CHAPTER 1

Project Description

1.1 INTRODUCTION

Wood is widely used as a material for many structures, furniture, tools, decorative objects, and composites. The continual utilization of the virgin forests has reduced the available supply of large clear logs for lumber and veneer. In order to satisfy the demand, many species are grown in plantations. As a result of the fast growth, a higher percentage of low density wood with inadequate mechanical properties is produced.

Low density wood can be modified by heat, moisture, and pressure to wood elements (laminae or strands) with structural characteristics equal to, or greater than, the highest grades of softwood species. Pioneering research done prior to 1950 (to develop a product called STAYPAK) had shown that compression of wood while heating can considerably improve stability, strength, and stiffness. This research, however, failed to identify the physical and chemical mechanisms allowing the optimization of the process.

The goal of the present study was to investigate the effect of applied compressive strain, in a high-pressure steam environment, on the strength and stiffness of compressed wood. Samples compressed at specific moisture content, temperature, and pressure were tested in tension parallel to grain. SEM microscopy was employed for observing changes in cellular structure. Chemical composition of wood samples before and after desorption experiments was determined by acid hydrolysis followed by high performance liquid chromatography (HPLC).

1.2 TECHNICAL OBJECTIVES

The objectives of this research were:

- 1) To investigate the effect of densification on ultimate tensile strength and stiffness of two wood species.
- 2) To determine the effect of densification on the changes in wood structure.
- 3) To determine the effect of densification on the chemical changes of wood.

1.3 RATIONALE AND SIGNIFICANCE

In a short-term the results of this research will provide information for better understanding of modifications that occur during wood compression. This will help to optimize

existing hot-press manufacturing processes. In a long-term outlook the modification of wood with inadequate mechanical properties can have a significant effect on the wood products industry. Low density and juvenile wood can be used in new high performance composite materials instead of old-growth timber.