CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

This study is about the analysis of heat conductive in nanowood composite boards. In Malaysia, wood composite industry is one of the biggest industrial sectors as well as around the world. Many new products have been developed since the 1960's, such as medium density fiber board (MDF), wafer board, oriented strand board (OSB) and some cement bonded boards. The pressing operation is one of the most important and expensive in the manufacture of these products. A quantitative understanding of it is important if we are to improve the performance of existing products, to reduce pressing times, and to design processes for the manufacture of new products with specified properties (Humphrey, 1989).

The modeling of hot-pressing relies on a rigorous understanding of many interactive physical processes, one of which is conductive heat transfer. The slow heat transfer due to low thermal conductivity of wood particles is one of the major concerns. Because of that, many different ways were developed such as steam injection and high platen temperature are being tried to increase the heat transfer. One more innovative method is to use nanoparticles such as aluminum oxide, copper oxide and ferrous oxide in small percentage mixed with the thermosetting resin and added in the wood particles.
In nanotechnology, a particle is defined as a small object that behaves as a whole unit in terms of its transport and properties. Particles are further classified according to size in terms of diameter; coarse particles cover a range between 10,000 and 2,500 nanometers. Fine particles are sized between 2,500 and 100 nanometers. Ultrafine particles or nanoparticles are sized between 100 and 1 nanometers. In this study, the rule of mixtures will be employed to predict the properties of the nanowood composite material. The thermal conductivity of nanowood composite boards having different particle concentrations will be experimentally evaluated.

During composite manufacture, heat energy is transferred from hot platens to the composite both by conduction and by convection of water vapor (following phase change). At high temperature and in the presence of moisture, wood materials become soft and are easily compacted by pressing pressure to form high density board. In the meantime, the adhesive is cured to achieve strong internal bond strength.

1.2 PROBLEM STATEMENT

From this study, the problem of heat conduction in a solid slab will be numerically solved and compared with solutions obtained from software for wood fibre boards and nanowood composite boards. Comparison is made between the experimental results and computational predictions. Later, reasons for any deviations will be analysed.

1.3 PROJECT OBJECTIVES

i. To determine the thermal conductivity of nanowood composite boards having different particle concentrations.

ii. To investigate heat conduction problem of wood composites.
1.4 SCOPES

The scopes of this project are:

i. Learning the use of software available in the Faculty/Department.

ii. Formulating a mathematical model for the problem through software and analytically.

iii. Experimental determination of thermal conductivity of nanowood composites.

iv. Comparison of numerical values with experimental results.

1.5 OVERVIEW OF REPORT

Chapter 1 mainly briefs about the background of the project which involves the introduction, problem statements, objectives and scopes of the report. Chapter 2 basically describes more about the studies on heat conduction process of wood composites and wood-based composites which has been done earlier by other scientists. Whereas Chapter 3 introduces the experimental procedures and other methods of this project. Chapter 4 is discussed about result of the whole project and Chapter 5 is about the conclusion that can be made and also the future recommendations in this heat transfer matters.