

**THERMAL PROPERTIES OF CEMENT BONDED  
PARTICLEBOARD FROM PETAI BELALANG  
(Leucaenaleucocephala) WITH DIFFERENT  
PERCENTAGE OF WASTE PAPER SLUGE ASH  
(WPSA)**

**SITI NASUHA BT MOHD RAFIEN**

**BACHELOR OF SCIENCE (Hons.) PHYSICS  
FACULTY OF APPLIED SCIENCES  
UNIVERSITI TEKNOLOGI MARA**

**JULY 2013**

## ACKNOWLEDGMENT

First of all I would like to thank Allah, the Lord Almighty for giving me this wonderful opportunity to enhance my knowledge and thinking ability through pursuing this degree. This thesis would not have been written without the help, advice, guidance and information given so willingly by very many people. Their names are endless. Here, I wish to express my sincere gratitude to my honorable supervisor, En Nazree b. Ahmad, for introducing me to the field of research and guiding me throughout this work. I learn a lot from him about thermal conductivity that make me interest in this field. I would like to express my sincere thanks to DrMarzuki b. Ab.Rahman who help with supplying material and give more information about the material.

I would also like to express my real appreciation and thanks to the followings for their help with technical problems En MuhamadSukri b. Muda, En MohdFaidzal b. Mohamed and En Khalid b. Abd. Rahman from Physic laboratory staff, En Rudaini b. Ahmad Nawawi and En Rosli b. Jaafar from Wood Industry Department (WID).

SitiNasuhabtMohdRafien.

## TABLE OF CONTENTS

	Page
<b>ACKNOWLEDGMENT</b>	<b>iii</b>
<b>TABLE OF CONTENTS</b>	<b>iv</b>
<b>LIST OF TABLES</b>	<b>vi</b>
<b>LIST OF FIGURES</b>	<b>vii</b>
<b>LIST OF ABBREVIATIONS</b>	<b>viii</b>
<b>ABSTRACT</b>	<b>ix</b>
<b>ABSTRAK</b>	<b>x</b>
 <b>CHAPTER 1: INTRODUCTION</b>	
1.1 Background	1
1.2 Problem Statements	3
1.3 Significant of study	5
1.4 Objectives	5
 <b>CHATER 2: LITERATURE REVIEW</b>	
2.1 Introduction	6
2.2 Theory of thermal conductivity	7
2.3 Other related studies	13
 <b>CHAPTER 3: METHODOLOGY</b>	
3.1 Introduction	15
3.2 Sampling of material	16
3.3 Types method and testing device	16
3.3.1 Testing using KD-2 Pro Thermal Properties Analyzer	17
3.3.2 Testing using Thermal conductivity apparatus	19
3.4 Statistical Analysis	21
 <b>CHAPTER 4: RESULTS AND DISCUSSION</b>	
4.1 Introduction	22
4.2 Thermal conductivity of CBP	23
4.2.1 Thermal conductivity of the CBP testing using Thermal conductivity apparatus	23
4.2.2 Thermal conductivity of the CBP testing using KD2 Pro Thermal Properties Analyzer	27

4.3	Comparison of thermal conductivity value using thermal conductivity apparatus andKD2 Pro thermal properties analyzer	29
4.4	Discussion	30
<b>CHAPTER 5: CONCLUSION AND RECOMMENDATIONS</b>		
5.1	Introduction	32
5.2	Conclusion	33
5.3	Recommendation	33
<b>CITED REFERENCES</b>		34
<b>APPENDICES</b>		36
<b>CURRICULUM VITAE</b>		39

## ABSTRACT

### **THERMAL PROPERTIES OF CEMENT BONDED PARTICLEBOARD FROM PETAI BELALANG(*Leucaenaleucocephala*) WITH DIFFERENT PERCENTAGE OF WASTE PAPER SLUDGE ASH (WPSA)**

A standard procedure has been used in this study in measuring the thermal conductivity of Cement Bonded Particleboard (CBP) from *Leucaenaleucocephala* or locally known as PetaiBelalang as wood particle and incinerator Waste Paper Sludge Ash (WPSA) from paper industry as a cement replacement in CBP manufacturing. Three different percentages of WPSA (10%, 20% and 30%) were used for the CBP mixtures. The measured thermal conductivity of CBP is significantly affected by the percentage of WPSA. The result showed that, the higher percentage of WPSA can reduce the thermal conductivity of CBP. The effects of using different percentages of WPSA on the thermal properties of the resulted CBP boards were investigated.

**Keywords:** Cement Bonded Particleboard, *Leucaenaleucocephala*