



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**INVESTIGATION ON THERMAL RESISTANCE PROPERTY
OF NATURAL HYBRIDIZATION FIBERS (OIL PALM &
COCONUT) THROUGH CONDUCTION CONCEPT ANALYSIS.**

This report submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelors of Manufacturing Engineering
Technology (Process and Technology) with Honour.

By

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DECLARATION

I hereby, declared this report entitled Investigation on Thermal Resistance property of Natural Hybridization Fiber (Coconut & Oil Palm) through conduction concept analysis is the result of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honors. The member of supervisory is as follow:

.....
(MR. MOHD RAZALI BIN MD YUNOS)

ABSTRAK

Kelapa (*Cocos nucifera*) juga dikenali sebagai Kelapa atau Nyior di Malaysia adalah tumbuhan di bawah Keluarga FABACEAE (atau Palmae) dan dipercayai berasal dari Wilayah Lautan Pasifik. Di negara kita, kita dapat melihat terdapat banyak ladang kelapa sawit dan telah digunakan sejak lebih 50 tahun yang lalu dan merupakan sumbangan besar perdana menteri kedua kita kepada masyarakat kita. Kedua-dua gentian kelapa sawit dan serat kelapa boleh digunakan dalam pelbagai aplikasi di bawah teknologi hijau. Projek ini bertujuan untuk menghasilkan penebat haba dengan menggunakan hibridisasi serat kelapa sawit dan serat kelapa. Sebanyak 11 komposit dari kedua-dua gentian komposisi yang berbeza telah diuji dengan analisis ujian haba. Hasil daripada kajian menunjukkan pembuatan hibridisasi dengan mencampurkan kedua-dua serat kelapa sawit dan serat kelapa cenderung untuk mengurangkan pemindahan haba sehingga menjadikannya sesuai untuk aplikasi penebat haba.

ABSTRACT

Coconut (*Cocos nucifera*) also called Kelapa or Nyior in Malaysia was a plant under Family FABACEAE (or Palmae) and believed to be originated from Pacific Ocean Region. In our country, we can see there's a lot of oil palm plantation and have been utilized since more than 50 years ago and it is a major contribution of our second prime minister to our society. Both of the oil palm fiber and coconut fiber can be used in various application under green technology. This project aims to produce heat insulator by using the hybridization of oil palm fiber and coconut fiber. A total of 11 composite from both fibers of different compositions were tested with heat test analysis. The results of the hybridization by mixing both oil palm fiber and coconut fiber tends to reduce the heat transfer thus make it suitable for heat application.

DEDICATION

This report is dedicated to my parent, Mr. Mohd. Ali bin Aman and Robiah binti Rahmat for the knowledge and wisdom that have been taught to me for embrace myself to be better. This dedication is dedicated to my supervisor, Mr. Mohd Razali bin Md Yunos for without his encouragement and mentorship, none of this would have happened. This dedication also dedicated to all my beloved friends that never stop supporting with a positive attitude until the report is done.

Thanks for everything.

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Bismillahirrahmanirrahim,

Peace upon you, in the name of ALLAH, The Most Compassionate, The Most Merciful. Salawat and Salaam to our beloved Prophet, Nabi Muhammad S.A.W. With the completion of this thesis report, praise to Allah, by Him who given the chances and wisdoms.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

OPF	Oil Palm fiber
CF	Coconut fiber
LNF	Long Natural fiber
k	Thermal Conductivity
R	Thermal Resistivity
Δx	thickness of composite
A	Cross section area of the composite
W	Watts; indicates the heat energy that flows through the composite
m	meter; indicates the unit of length that heat will be transfer
\dot{Q}	Heat Transfer through the composite
C	Composite
K	Kelvin; indicates the temperature that flows through the composites
$^{\circ}\text{C}$	degree Celsius
CO^2	Carbon Dioxide
EFB	Empty Fruit Brunches
FFB	Fresh Fruit Brunches
ASTM	American Society for Testing Material
IPCC	The Intergovernmental Panel on Climate Change
NASA	National Aeronautics and Space Administration
GISS	Goddard Institute for Space Studies

CHAPTER 1

INTRODUCTION

1.0 Research Background

Our life had become more comfortable as the technologies in our life increases with the time. Thanks to development that had been done by our races that put our society in terms of better condition. As a human, the needed of benefit in each aspect is a demand. The development in every single process in our life had given us lot of benefits. But, as the development that had been done increases, the world also experience decreases. Means that there are pros and cons come after the development of our world. According to the (Adams, 2009), monetary development is viewed as important to diminish human destitution, and industrialization and urbanization are conservatively taken to be an essential of financial development. That is the way the world's by and by industrialized (and affluent) centre nations got where they are, and duplicating them is the one major thought of the create mentalist worldview. But does the argument that only economic growth can allow escape from the descending spiral of poverty and environmental degradation (Broad 1994) take account of the increased environmental hazards of industrialization?



Figure 1.1: Cement factory, Nigeria. Cement is critical to building projects in the developing world, and often has to be imported. Yet, like so many other products, its manufacture can bring significant environmental problems, generating large amounts of CO₂ as well as particulate matter, nitrogen and sulphur oxides, volatile organic compounds and heavy metals.

(Adapted from (Adams, 2009))

Industrialization had increased the chances of work for people and helps a lot in production. The growth of many factory and industry had affected our environment. According to the (Barman, 1989), the industrial and technological progress however, has been escorted by a developing negative impact on the environment in terms of its pollution and degradation. Industrialisation brings with it the seeds of environmental damage, assisted and aided by both needs and greed of man. Activities such as manufacturing, processing, transportation and consumption not only diminish the stock of natural resources but also add pressure to the environmental system by accumulating the stock of wastes. The proficiency of the industries, however, depends on the supply and quality of natural and environmental resources. While water, soil, air, forest and fishery resources are productive assets, the pollution of water, air, atmosphere and noise are the by-products of economic development, predominantly industrialisation and urbanisation. ‘Greenhouse effects’,

'global warming' and 'acid precipitation' are circumstances in point. Pollution is an 'external cost' (sometimes called a 'spill-over cost' or a 'neighbourhood cost'). Untreated or inappropriately treated waste becomes pollution, increasing not only private costs but also social costs. Environmental degradation often tends to become irreversible and enforces damaging costs on the economy resulting in output and human losses, loss of labour productivity from ill- health and loss of crop output. The ecological and social costs of such unrestrained pollution and degradation have put a big question mark on the superficial conception of industrialisation as a way of economic development.

The circumstances of occur that damaging our environment effect by the industrialization are greenhouse effect, global warming and acid precipitation. In our research, the global warming will be the focused of the impact that actually gave uncomfortableness to the human. According to the (Wolff et al., 2014), both hypothesis and direct perceptions have affirmed that an Earth-wide temperature boost is going with more noteworthy warming over land than seas, saturating of the climate, moves in territorial precipitation examples and ascends in extraordinary climate occasions, sea fermentation, softening icy masses, and rising ocean levels (which expands the danger of seaside immersion and tempest surge). Presently, record high temperatures are by and large essentially outpacing record low temperatures, wet territories are getting to be plainly wetter as dry zones are getting to be plainly drier, substantial rainstorms have turned out to be heavier, and snowpack (a vital wellspring of freshwater for some, locales) are declining. These impacts are relied upon to increment with more prominent warming and will undermine nourishment creation, freshwater supplies, beach front framework, and particularly the welfare of the immense populace by and by living in low-lying regions. Despite the fact that specific areas may see some neighbourhood advantage from the warming, the long haul results by and large will be troublesome.

The rises of temperature cause by the global warming effect had been felt by the human races and lead to the uncomfortableness feeling. The possible way to deal with it is by dealing with the heat transfer around us either we can increases the flow temperature or otherwise decrease it. According to the (Conference et al., 2000), one

of the coolest and best vitality effective advances accessible today is insulation. General helps from insulation are various, including thermal performance, individual solace, sound control, build-up control, fire security and work force insurance. The thermal insulation properties of protection materials convey essential vitality and ecological advantages. Produced using a changeability of substances including fiber glass, mineral wool, foam and different materials, insulation items are essentially intended to decrease the exchange of warmth through building structures in lodging, business and mechanical applications. By their exceptionally nature, insulation items enable shoppers to decrease more vitality utilize and more discharge of toxins every year than it takes to fabricate them. This imprint in an exceptionally positive entire vitality and natural adjust for thermal insulation.

The wall insulation acts as a component to reduce the heat transfer. The material used to build wall insulation is one of the aspect need to be focus on as it will effect on the thermal performance. The development of finding the better material for wall insulation is continuous. According to the (Robert L. Fehr, 2009), it can be puzzling to try to characterize insulation because many materials come in a variety of forms. The insulation industry continues to develop new products to meet the increasing request for specialized products. This research will try to implement sustainability development. The meaning of sustainability is the investigation of how common frameworks work, stay various and create all that it requirements for the nature to stay in balance. It additionally recognizes that human development takes assets to manage our current lifestyle. Sustainability and sustainability development concentrates on adjusting that scarce difference between competing needs - our need to push ahead innovatively and financially, and the necessities to ensure the conditions in which we and others live.

Thus, the selection of material to produce the composite is from the natural fiber. Coconut fiber and oil palm fiber were selected to be the main ingredient to produce the composite. Coconut fibre is found between the hard, internal shell and the outer shell of coconut. The individual fibre cells are narrow and hollow, with thick walls made of cellulose. They are pale when immature, but later become hardened and yellowed as a layer of lignin is deposited on their walls. There are two

varieties of coconut fibre which are brown and white. Brown coconut fibre collected from fully ripened coconut is thick, strong and has high abrasion resistance. White coconut fibres collected from coconuts before they are ripe are white or light brown in colour and are smoother and finer, but also weaker. They are generally spun to make yarn used in mats or rope. Oil palm fibre is produced from oil palm's vascular bundles in the Empty Fruit Branch (EFB). EFB is considered as waste products after the Fresh Fruit Branch (FFB) have been processed. Oil palm fibre itself is 100% natural, non-hazardous, biodegradable and environmental friendly. Oil palm fibre is a superior substitute to coconut fibre due to its strong bond that is commonly used in making composite material production.

1.1 Problem Statement

Global warming is the term used to portray a gradual increase in the usual temperature of the Earth's atmosphere and its oceans, a change that is believed to be permanently changing the Earth's climate. There is great debate between many people, and sometimes in the news, on whether global warming is real (some call it a hoax). But climate scientists looking at the data and facts approve that the planet is warming. While many opinion the effects of global warming to be more substantial and more rapidly occurring than others do, the scientific compromise on climatic changes related to global warming is that the average temperature of the Earth has risen between 0.4 and 0.8 °C over the past 100 years. The increased volumes of carbon dioxide and other greenhouse gases released by the burning of fossil fuels, land clearing, agriculture, and other human activities, are understood to be the primary sources of the global warming that has happened over the past 50 years. Scientists from the Intergovernmental Panel on Climate carrying out global warming research have lately predicted that average global temperatures could increase between 1.4 and 5.8 °C by the year 2100. Alterations resulting from global warming may include rising sea levels due to the melting of the polar ice caps, as well as an increase in occurrence and severity of storms and other severe weather events.

It can observe many issues regarding increase of temperature around the world. According to the (Wong, 2006), giving to a report by the Japan

Meteorological Agency² on the climate in 1999, the temperature had expanded by 0.6°C worldwide and 1°C in Japan amid the previous 100 years. Such marvel was principally ascribed to the enhanced emanation of carbon dioxide and other nursery gasses because of vitality utilization by human. From (Hanouz, 2017), every day we emit 110 million tons of heat-trapping global warming pollution into our atmosphere. The collected amount of all that manmade global warming pollution is trapping as much extra heat energy as would be released by 400,000 Hiroshima-class atomic bombs exploding every single day. Information from (Culshaw, 2007), in statistical terms, a 1 percent increase in temperature leads to a 4.5 percent increase in civil war in the same year and a 0.9 percent increase in the next year. By year 2030, based on averaged data from 18 climate models, this amounts to a 54 percent increase in armed conflict occurrence in the region. Fourteen of the sixteen warmest years on record have happened since 2000, with 2015 confirmed as the warmest year globally on record. 2015 was more than 1°C higher than pre-industrial temperatures and 0.2°C above 2014 which was the earlier warmest year (Kathryn Humphrey et al., 2017). We catch that individual record years and the observed runs of record-setting temperatures were extremely unlikely to have happened in the absence of human-caused climate change (Mann et al., 2016).

The growth of population also contributes to the increase of temperature. The reason is when the region is increasing with the development; many people will migrate to that particular region. Thus, the region will be more packed and make the temperature rise. So, the demand of air-conditioning will increase. Besides, the industrial building will emit a gas to the air and causes the pollution. That will lead to the occurrences of urban heat island. According to the (Roth, 2013), for millions of people living in cities, increased temperatures are a growing fact and concern. The urban heat island (UHI) is a phenomenon whereby urban regions experience warmer temperatures than their rural, undeveloped surroundings. The UHI is the most obvious atmospheric modification attributable to urbanization, the most studied of climate effects of cities and an iconic phenomenon of urban climate. It can be found in settlements of all sizes in all climatic regions and arises from the introduction of artificial surfaces characteristic of those of a city that radically alters the aerodynamic, radiative, thermal, and moisture proper- ties in the urban region

compared to the natural surroundings. The heat island is defined on the basis of temperature differences between urban and rural stations, and the isotherm patterns of near-surface air temperatures resemble the contours of an island.

The global warming and urban heat island both gave same effect. The connection of both phenomena will regarding to rises of temperature. According to the (Epa, 2008), the effects from urban warmth islands and worldwide environmental change (or an Earth-wide temperature boost) are frequently comparative. For instance, a few groups may encounter longer developing seasons due to either or the two marvels. Urban heat islands and worldwide environmental change can both likewise increment vitality request, especially summer time and air conditioning request, and related air contamination and ozone harming substance emanations, contingent upon the electric framework control fuel blend.

Thus, the rises of temperature regarding the issue of global warming had marked uncomfortableness to the human. As a human being, usually there will be a matter that will manipulate the satisfaction. Regarding of this problem, there are few matter that discovered to be the causes of uncomfortableness of human. One of it is increasing of room temperature in the building sector. The concrete wall exposed to the sun without insulator will absorb heat. Due to heat capacity, the wall remains warm during night causes inside building become uncomfortably. Besides that, the phenomena of urban heat island. It defined the cities are usually hotter than rural areas. It happen cause of modification of lands. The uses of air-conditioning also causes of heat problem. Usually, people use the air-conditioning to stabilize the room temperature but in the same time, it release the chlorofluorocarbon (CFC) gas thus causes increase of greenhouse effect. It also will contribute to the thinning of ozone layer.

1.2 Research Objective

The project proposal objective contains three objectives.

- i. To study the Coconut and Oil Palm fiber properties that affect heat transfer.
- ii. To produce the composite specimen made up of natural hybridization fiber (Coconut & Oil Palm).
- iii. To investigate on thermal performance of composite made up of Oil Palm with the Coconut fiber loading.

1.3 Scope

The limitation and the scope for this research have been discussed. The area of the research will be more focused on the thermal performance and the fiber loading in the composite specimen. The thermal performance that will be study is the thermal conductivity of the composite specimen during the heat source being flashed towards it.

The standard method used to detect the thermal conductivity is by referring ASTM C518. This experiment method covers the measurement of steady state thermal transmission through flat slab specimens using a heat flow meter apparatus. Unfortunately, the limitation occurs to use this standard method because of the apparatus and equipment not usable. An alternative method used to determine the thermal conductivity probably by traditional method. A heat source will be flash to the composite specimen for a half an hour, then the temperature indicator will be used to read the temperature. The data that have been collected will be tabulated and show in the graph. The R-value for each composite specimen also will be calculated.

The selections of material also have been discussed. The materials used to make the composite specimen are come from the natural hybridization fiber (Coconut and Oil Palm). Moreover, the selections for both fibers are because it's thermal property which is better to insulate the heat. The coconut fiber will be taken

from the source that available in the lab. The oil palm fiber will be request from the oil palm mills in Pasoh. The fibers will be taken are shredded fiber and dried long fiber. The resin for the composite binder will be taken also from the source at the lab.

1.4 Significant of Project

Over this study, we develop alternative material in the production of heat insulator by using natural fibre and waste of empty fruit brunches in order to determine the performance of heat insulator of the new product. Besides, it is a phase to reduce the heat problems that occur in our country. This study essentially will help to widen the perspective of the other to fully utilize the waste that from green product.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

The global warming and urban heat island are the serious issues that occur in our Earth. With the rises of temperature, human cannot gain a comfortable life during their lifetime. The scientists have been predicted that rising temperature can cause a big impact to the human and the surrounding. According to the (Riebeek, 2010), the gauges are being utilized to anticipate how rising temperatures will influence the two individuals and regular biological communities. The seriousness of natural change will rely upon how much the Earth's surface warms throughout the following century.

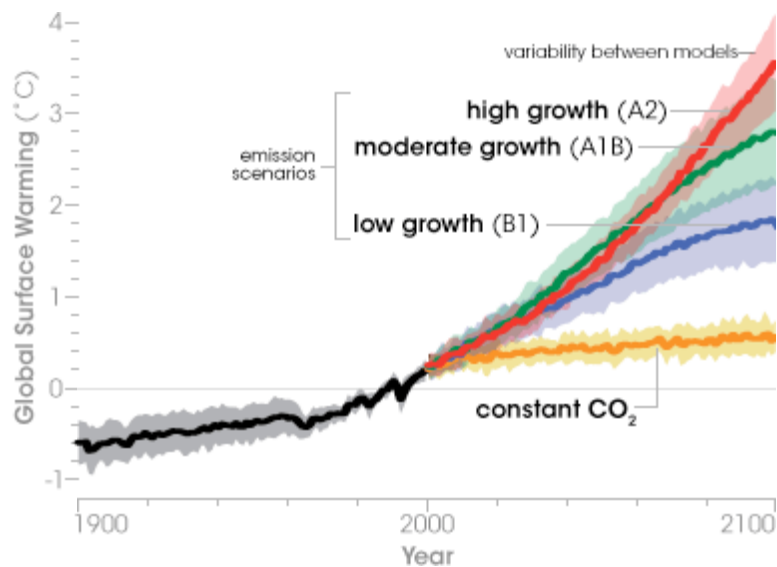


Figure 2.1: The Intergovernmental Panel on Climate Change estimates that Earth will warm between two and six degrees Celsius over the next century. The range in estimate comes from running different emission scenarios through several different global climate models. Scenarios that assume that people will burn more and more fossil fuel provide the estimates in the top end of the temperature range, while scenarios that assume that greenhouse gas emissions will grow slowly give lower temperature predictions. The orange line provides an estimate of what global temperatures would have been if greenhouse gases had stayed at year 2000 levels.

(Adapted from (Riebeek, 2010))

The observation from the Intergovernmental Panel on Climate Change (IPCC) likewise predicts that temperature increments will be most voiced towards the finish of the century, with the northern side of the equator the most uncovered.