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DESIGN OF RIGID BOARD MATERIAL FROM
BANANA TREE TRUNK FIBER

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This report was adduced as
fulfilling a part of requirement for award of
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“I declare that this report is my own work except for summary and quotation that I had described the source for each one of them”

Signature ;

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Date ;

“To family and friends”

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Assalamualaikum and Salam Sejahtera. Thankful for Allah S.W.T with full grateful. With helping and blessing from god and with good effort from my family, Umami and dad especially, I had executed my Projek Sarjana Muda. With lots of appreciation to my supervisor PM. Ir. Abdul Talib Bin Din for his guidance and support along my way to complete this Project. Also thank to my second supervisor Mr. Imran Shakir bin Mohamad.

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ABSTRAK

Laporan ini menghuraikan tentang proses merekabentuk bahan papan tegar dari serat batang pokok pisang dengan bahan komposit polyester. Penggunaan sumber semula jadi telah meningkat di abad untuk mengekalkan kehijauan bumi. Oleh itu, penggunaan serat semula jadi adalah sangat digalakkan untuk tujuan industri. Fokus utama projek ini adalah untuk mendapatkan nisbah terbaik serat batang pisang kepada polyester yang boleh memberikan kekuatan tertinggi kepada produk bahan papan tegar. Repot ini menyoroti kajian literatur dan dokumen lampau berkaitan dengan bahan komposit. Terdapat juga kajian teori yang meninjau beberapa teori yang berguna berkenaan dengan kekuatan bahan yang boleh dikaitkan kepada bahan komposit. Beberapa kaedah digunakan oleh penulis untuk mencapai matlamat kajian seperti menemuramah pakar di dalam bidang serat semula jadi. Penulis juga menerangkan cara-cara untuk memperoleh serat batang pisang di dalam bab kaedah kajian. Serat mentah tersebut digabungkan dengan polyester untuk dijadikan sebagai spesimen ujian. Spesimen-spesimen tersebut diuji kekuatannya melalui ujian mekanikal. Sifat-sifat mekanikal yang diperolehi daripada ujian mekanikal dianalisis dan dibincangkan. Hasil daripada kajian ini, didapati jumlah optimum serat batang pisang didalam polyester resin adalah antara 4% hingga 6%.

ABSTRACT

This report describes the design of rigid board material from banana tree trunk fiber reinforced polyester composite. The use of natural source is increases in this century for the green environmental protection. Hence, the use of natural fiber is highly recommended for industrial purpose. The main focus of this project is to obtain the best ratio of banana tree trunk fiber to polyester composite that can gives the highest strength of the rigid board product. This paper is first review some literatures and past documents regarding to the nature of the composite. There are theoretical studies that revised some useful theory about strength of material that can be related to the composites materials. Several approaches were applied by the author to achieve the goal such as interviewing the expertise in the natural composite fields. The author described the method to extract the banana tree trunk fiber in the methodology chapter. The raw fiber is then reinforced into polyester in the fabricating process for of test specimen. The specimens subjected to mechanical testing to measure their strength properties. The results are then analyzed and discussed. From this study, the optimum amount of banana tree trunk fiber in polyester resin is between 4%and 6%.

CONTENTS

CHAPTER	ITEMS	PAGES
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	<i>ABSTRAK</i>	v
	ABSTRACT	vi
	CONTENTS	vii
	LIST OF TABLES	xii
	LIST OF FIGURES	xiv
	LIST OF SYMBOLS	xxiii
	LIST OF APPENDICES	xxiv
 CHAPTER 1	 INTRODUCTION	 1
	1.1 Project Background	1
	1.2 Objective	2
	1.3 Scope	2
	1.4 Problem Statements	3

CHAPTER	ITEMS	PAGES
CHAPTER II	LITERATURE REVIEW	4
	2.1 Banana Tree	4
	2.2 Banana Tree Trunk	7
	2.3 Cellulose	8
	2.4 Banana Tree Leaf	9
	2.5 Rigid Board	11
	2.6 Composite Materials	12
	2.6.1 Fibers for reinforced-plastic composite Materials	13
	2.6.2 Matrix materials for fiber-reinforced-plastic Composite materials	14
	2.6.3 Epoxy resins	15
	2.6.4 Method for producing fiber-reinforced Composites	17
	2.6.4.1 Open mould processes for fiber reinforced composite materials	17
	2.6.4.2 Closed-mold processes for fiber reinforced composite materials	22
	2.6.5 Applications of fiber-reinforced composite Materials	24
	2.7 Banana Tree Trunk Fiber	24
	2.7.1 Banana tree trunk fiber preparation method	26
	2.7.1.1 Banana tree fiber extraction using biological method (degumming process)	27
	2.7.2 Banana tree trunk fiber properties	29
	2.7.3 Banana tree fiber applications	30
	2.8 Theoretical Studies	31
	2.8.1 Stress-strain curve for fiber composite	31
	2.8.2 Isostrain condition	33
	2.8.3 Isostress condition	35

CHAPTER	ITEMS	PAGES
CHAPTER III	METHODOLOGY	38
	3.1 Objective Review & Expected Problems	38
	3.2 Data Collection	41
	3.2.1 Past document review	41
	3.2.2 Face-to-face Interview	42
	3.2.3 Direct observation	44
	3.3 Banana Tree Trunk Fiber Rigid Board Fabrication	45
	3.3.1 Banana trunk fiber extraction	46
	3.3.2 Banana tree trunk fiber composite specimen Fabrication	49
	3.4 Hardness Test (Durometer Hardness)	56
	3.5 Flexural Test	58
	3.6 Tensile Test	61
CHAPTER IV	RESULTS	64
	4.1 Extraction and Fabrication of Banana Tree Trunk Fiber Rigid Board Material	64
	4.2 Hardness Test Results	67
	4.3 Flexural Test Result	70
	4.3.1 Flexural stress-strain diagram for banana tree Trunk fiber composite with 8% fiber	70
	4.3.2 Flexural stress-strain diagram for banana tree Trunk fibers composite with 6% fiber	71
	4.3.3 Flexural stress-strain diagram for banana tree Trunk fibers composite with 4% fiber	72
	4.3.4 Flexural stress-strain diagram for banana tree Trunk fibers composite with 0% fiber	73
	4.3.5 Flexural stress-strain diagram for plywood	74
	4.3.6 Flexural Properties	75

CHAPTER	ITEMS	PAGES
	4.3.7 Graph of flexural strength	76
	4.3.8 Histogram of flexural modulus	77
	4.3.9 Graph of maximum load	78
	4.4 Tensile Test Results	79
	4.4.1 Tensile stress-strain diagram for banana tree Trunk fibers composite with 8% fiber	79
	4.4.2 Tensile stress-strain diagram for banana tree Trunk fibers composite with 6% fiber	80
	4.4.3 Tensile stress-strain diagram for banana tree Trunk fibers composite with 4% fiber	81
	4.4.4 Tensile stress-strain diagram for banana tree Trunk fibers composite with 0% fiber	82
	4.4.5 Tensile stress-strain diagram for plywood	83
	4.4.6 Tensile properties	84
	4.4.7 Graph of tensile strength	85
	4.4.8 Histogram of modulus of elasticity	86
	4.4.9 Graph of maximum load	87
	4.4.10 Ductility	88
 CHAPTER V	 DISCUSSION	 89
	5.1 Extraction of Banana Tree Trunk Fiber	89
	5.2 Fabrication of Banana Tree Trunk Fiber Composite	90
	5.3 Hardness	91
	5.4 Flexural Stress-strain Diagram	92
	5.5 Flexural Strength	93
	5.6 Flexural Modulus	94
	5.7 Tensile Stress-strain Diagram	96
	5.8 Tensile Strength	98
	5.9 Modulus of Elasticity	99
	5.10 Comparison	100

CHAPTER	ITEMS	PAGES
CHAPTER VI	CONCLUSION	104
	6.1 Conclusion	104
	6.2 Recommendation	106
	REFERENCES	107
	APPENDICES	112

LIST OF TABLES

NO.	TITLE	PAGE
2.1	Some properties of unfilled cast polyester and epoxy resin	16
2.2	Minimum properties applied to resin products consisting polyester resin	17
2.3	Botanical composition of studied pseudostem fibers	25
2.4	Comparison of properties of banana fiber	29
2.5	Mechanical properties of pseudo-stem banana reinforced epoxy composite	30
4.1	Theoretical fiber wt% versus actual fiber w%	66
4.2	Hardness test results	67
4.3	Hardness test results summary	68
4.4	Flexural properties	75
4.5	Tensile properties	84

LIST OF FIGURES

NO.	TITLE	PAGE
2.1	Banana tree illustration	5
2.2	Banana tree after gave their fruit; abundant agricultural waste product	7
2.3	Banana tree trunk cross section	8
2.4	Structure of cellulose	9
2.5	Banana leaf	10
2.6	Banana leaf as a culture and a stylish way in serving foods	10
2.7	Rigid board made from MDF	11
2.9	Fiber strands (Internet source; www.bluebird-electric.net)	13
2.10	Glass fiber	14
2.11	Carbon fiber	14
2.12	Fiberglass mat is manually placed on the mould	18

NO.	TITLE	PAGE
2.13	Rollers used to compact the layers and remove trapped air	18
2.14	Spray up gun illustration	19
2.15	Spray up process	19
2.16	Some basic vacuum bagging kits; (a)peel ply; (b)release film; (c)breather; (d)vacuum bag; (e)bag sealant tape; (f)vacuum pump.	21
2.17	A bulkhead of carbon fiber boat is in curing process under vacuum bag method	21
2.18	SMC process illustration	22
2.19	Continuous-Pultrusion process illustration	23
2.20	Dried pseudostem	26
2.21	Banana yarn	27
2.22	Products from banana fibers	30
2.23	Stress-strain curve for a metal	31
2.24	Stress-strain curve for composite	32
2.25	Composite structure consisting of layers of fiber and matrix under isostrain conditions of loading (Volume of composite $V_c = area A_c \times length l_c$)	34

NO.	TITLE	PAGE
2.26	Composite structure consisting of layers of fiber and matrix under isostress conditions of loading (Volume of composite $V_c = area A_c \times length l_c$)	36
3.1	Methodology flow chart	40
3.2	Fabricating a part of carbon fiber composite boat	45
3.3	Banana tree trunk	46
3.4	Banana trunk was peeled layer-wise	47
3.5	Fiber location	47
3.6	Scraping method	48
3.7	Raw fibers after air dried	48
3.8	Open mould	50
3.9	Partall Coverall Film	51
3.10	Banana tree trunk fiber laminates	52
3.11	0% fiber (100% resin) laminate	52
3.12	Released test specimen panel	53
3.13	Test specimen panels after excess resin removed	53
3.14	ASTM D638 tensile test specimen dimension (mm)	54

NO.	TITLE	PAGE
3.15	ASTM D790 flexural test specimen dimension (mm)	54
3.16	Tensile test specimens	55
3.17	Flexural test specimens	55
3.18	Hand-held Shore Durometer Hardness Test type D	56
3.19	Shore Durometer Hardness type D indenter	57
3.20	Durometer was hold in a vertical position	57
3.21	Indenter touches the specimen	58
3.22	Instron Universal Testing Machine	59
3.23	Banana fiber composite test specimen under flexural test	60
3.24	100% resin specimen under flexural test	60
3.25	Plywood specimen under flexural test	60
3.26	Specimen samples that breaks	61
3.27	Banana tree trunk fiber composite specimen under tensile test	62
3.28	100% resin specimen under tensile test	62
3.29	Plywood specimen under tensile test	63
3.30	Specimens samples that breaks after testing	63

NO.	TITLE	PAGE
4.1	Surface contacted with mould (left) is smoother than surface opened to air (right)	65
4.2	Graph of hardness versus Fiber wt% and plywood	69
4.3	Flexural stress strain diagram of specimen with banana tree trunk fiber percentage of 8%	70
4.4	Flexural stress strain diagram of specimen with banana tree trunk fiber percentage of 6%	71
4.5	Flexural stress strain diagram of specimen with banana tree trunk fiber percentage of 4%	72
4.6	Flexural stress strain diagram of specimen with banana tree trunk fiber percentage of 0% (100% resin)	73
4.7	Flexural stress strain diagram of plywood specimens	74
4.8	Graph of flexural strength	76
4.9	Histogram of flexural modulus	77
4.10	Graph of maximum load	78
4.11	Tensile stress-strain diagram of specimen with banana tree trunk fiber percentage of 8%	79
4.12	Tensile stress-strain diagram of specimen with banana tree trunk fiber percentage of 6%	80

NO.	TITLE	PAGE
4.13	Tensile stress-strain diagram of specimen with banana tree trunk fiber percentage of 4%	81
4.14	Tensile stress-strain diagram of specimen with banana tree trunk fiber percentage of 0%	82
4.15	Tensile stress-strain diagram of plywood	83
4.16	Graph of tensile strength	85
4.17	Histogram of modulus of elasticity	86
4.18	Graph of maximum load	87
4.19	Graph of percent elongation	88
5.1	Graph of combination of flexural stress-strain	92
5.2	Graph of tensile strength	93
5.3	Load-deflection curve obtained from flexural test	94
5.4	Histogram of flexural modulus	95
5.5	Graph of combination of tensile stress-strain	96
5.6	Micro-cracking	97
5.7	Graph of tensile strength	98
5.8	Histogram of modulus of elasticity	99

NO.	TITLE	PAGE
5.9	Schematic representation of the tensile elastic modulus as a function of the volume fraction of fiber in a reinforced-fiber-plastic matrix composite laminate loaded under isostrain and isostress condition	101
5.10	Tensile strength comparison	102
5.11	Modulus of elasticity comparison	102
5.12	Flexural strength comparison	103

LIST OF SYMBOLS

E	=	longitudinal modulus of elasticity, GPa
E_m	=	modulus of elasticity of the matrix, GPa
V_m	=	volume fraction of the matrix
E_f	=	modulus of elasticity of the fibers, GPa
V_f	=	volume fraction of the fibers.
V_c	=	volume fraction of the composite.
P_c	=	load on the composite, N
P_f	=	load on the fiber layer. N
P_m	=	load on the matrix layer, N
σ_c	=	stress of composite, Pa
σ_f	=	stress of fiber, Pa
σ_m	=	stress of matrix, Pa
A_c	=	fractional area of composite, m ²
A_f	=	fractional area of fiber, m ²
A_m	=	fractional area of matrix, m ²
ε_c	=	strain of composite
ε_f	=	strain of fiber
ε_m	=	strain of matrix
l_c	=	length of composite, m
S_T	=	tensile strength of the composite, MPa
S_{Tf}	=	tensile strength of the fibers, MPa
S_{Tm}	=	tensile strength of the matrix, MPa
E_b	=	modulus of elasticity in flexural, MPa
L	=	support span, mm
m	=	slope of the tangent to the initial straight line portion of the load deflection curve, N/mm

b = width of the beam, mm

d = depth of the beam, mm

LIST OF APPENDIXES

NO.	TITLE	PAGE
A	PSM GANTT CHART	112
B	FLEXURAL TEST DATA SAMPLE	113
C	TENSILE TEST DATA SAMPLE	135
D	FLEXURAL TEST LOAD-DEFLECTION GRAPH	150
E	TENSILE TEST LOAD-DEFLECTION GRAPH	152

CHAPTER I

INTRODUCTION

Project Sarjana Muda (PSM) or Final Year Project is an academic and scientific research that related with programs at Faculty and compulsory for every final year students as to fulfil the requirements before being awarded the degree. This project will cover certain scopes in every student's field study. The title of this project is Design of Rigid Board Material from Banana Tree Trunk Fiber. This project is categorized into biocomposite field study because the product that will be developed is characterized by the fact that the synthetic fibers are replaced by the natural fiber, which is a banana tree trunk fiber.

1.1 Project Background

Banana tree grows from underground rhizomes, forming a pseudo-trunk, with large, showy leaves that shred naturally in the wind, giving the plant its exotic looks. In the past decades, many research works has been carried out on the natural fiber reinforced composite materials in many applications. Banana tree are available in abundance in nature and can be used to reinforce polymers to obtain light and strong materials. Banana fiber, also known as banana stem fiber is a new type of natural plant fibers, but the information of the usage of banana fibers in reinforcing polymers is limited in the literature. Hence, the aim of this project is on the investigation of the banana tree trunk fiber rigid board material.