

‘Saya/Kami\* akui bahawa telah membaca  
karya ini dan pada pandangan saya/kami\* karya ini  
adalah memadai dari segi skop dan kualiti untuk tujuan penganugerahan  
Ijazah Sarjana Muda Kejuruteraan Mekanikal (Rekabentuk)’

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**DESIGN AND TESTING OF LIFTING OR HARVESTING MECHANISM  
FOR NATA DE COCO MANUFACTURING INDUSTRIES**

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**This report is submitted as partial requirement for the completion of the  
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## PENGAKUAN

“Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya saya telah jelaskan sumbernya”

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## DECLARATION

“I hereby, declare this thesis is result of my own research except as cited in the references”

Signature : .....

Author Name : Teoh Chun Keat

Date : .....

**DEDICATION**

**To  
My Beloved Family  
Parents  
Cavern  
Kevin  
Adeline**

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## ABSTRAK

Fokus PSM ini adalah reka bentuk mekanisme pengangkatan untuk mengganti tenaga manusia. Sebelum nata de coco tersebut boleh dimakan, ia akan melalui kaedah fermentasi, kaedah potong, kaedah penapisan dan akhirnya kaedah pemasakan. Kaedah penapisan adalah kaedah yang netralkan pH 3.0 ke 6.0-7.0. Reka bentuk mesin ini akan diintegrasikan dengan tangki penapisan yang sedia ada. Konsep pengangkatan perlu merujuk kepada beban yang perlu diangkat, iaitu 500kg. Oleh yang demikian, penggunaan motor adalah perlu. Bagi mendapatkan hasil rekabentuk yang efektif, penjaanaan rekaan konsepsi adalah penting. Pemilihan reka bentuk terbaik dilakukan berdasarkan ciri-ciri tertentu. Setelah itu, reka bentuk konfigurasi ditentukan bagi memastikan prestasi mesin dapat berfungsi seperti yang dijangkakan. Pemilihan bahan, fungsi, mesin komponen dan mekanisme pengangkatan adalah penting untuk hasilkan mesin ini di peringkat paramatrix. Tambahan pula, semua lukisan kejuruteraan, analisis kekuatan dihasilkan pada peringkat ini. Reka bentuk penghalusan akan menentukan nama komponen dan komponen nombor untuk EBOM, dan juga jadual kos.

## ABSTRACT

This project focuses on the lifting mechanism for nata de coco to take place manpower. Before the nata de coco is ready to eat, it will undergo fermentation process, scraping process, cutting process, leaching process and finally cooking process. Leaching process will neutralizing the pH about 3.0 to 6.0-7.0 and then cleans the nata de coco in water. By design this lifting machine, some Engineering Design Specification is given and must be integrate with the existing leaching tank. Lifting concept must base on that amount of load need to lift up, which is around 500kg. Therefore the motor is needed. Next, generate conceptual designs and choose the best from the design. Follow by determine the configuration design. Selection of material, feature, standard parts and mechanism to lift the load are importance to fabricate the machine in parametric stage. In addition, all CAD drawing, stress analysis and manual calculation will be done in this stage too. Detail design stage will identify the part name and part number for EBOM, and also for costing schedule.



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## LIST OF SYMBOLS

$n$	=	Velocity Proportion (No units)
$r$	=	Radius of Sheave, m
$\omega$	=	Rotational Velocity, rad/s
$d$	=	Diameter of Sheave, m
$N$	=	Speed of Sheave, m/s
$d_1$	=	Diameter of The Driver Pulley, m
$d_2$	=	Diameter of The Driven Pulley or Follower, m
$N_1$	=	Speed of The Driver Pulley, r.p.m.
$N_2$	=	Speed of The Driven Pulley or Follower, r.p.m.
$N_2/N_1$	=	Velocity Ratio of Rotating Pulleys
$t$	=	Thickness of Belt, m
$E$	=	Young Modulus
$M$	=	Bending Moment, Nm
$\theta$	=	Slope Angle, °
$P$	=	Load, N
$F$	=	Force, N
$x$	=	Length, m
$\sigma$	=	Bending Stress, $\text{Nm}^{-2}$
$I$	=	Moment of Inertia, $\text{m}^4$

## LIST OF ABBREVIATIONS

PSM	= Projek Sarjana Muda
CAD	= Computer Aided Design
FEA	= Finite Element Analysis
CAE	= Computer Aided Engineering
SOP	= Standard Operating Procedures
EBOM	= Engineering Bill of Material
BOM	= Bill of Material
DC	= Direct Current
AC	= Alternating Current
CNC	= Computer Numerical Controlled
AWS	= American Welding Society
CFD	= Computational Fluid Dynamic
WI	= Work Instruction

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## CHAPTER I

### INTRODUCTION

This chapter discuss about the intro to the importance of this Final Year Project. There are some discussion included too, such as background, problem statement, objectives, and scopes of the project.

#### 1.1 Background

Nata de coco is an indigenous dessert in Philippines. It is a popular dessert and a trendy dessert nowadays. Nata de coco is a chewy, translucent, jelly-like food product produced by the bacterial fermentation of coconut water. Nata de coco is regarded for its high dietary fiber, and it is zero fat and cholesterol content. The nutritional values of the coconut are varied according to the different stages of development.

The manufacture of nata de coco involves several steps. First, the ingredients like water, dissolving sugar and extracting coconut milk are prepared and mixed. Then filling the mixture into basin and fermenting nata de coco. After that, clean the nata de coco by scrapping the fungus until white layer is appeared. Then follow by cutting process and leaching the nata de coco by keeping immerse in water. Next, the nata de coco is lifted up from drain. Nata de coco is checked so that it is totally neutral before lift up, and then

cooked. The next step is to mix a sugar with flavor and fill in container before soaking of nata de coco in water for remove sugar water surplus. After setting aside overnight, the nata de coco is finally produced and ready for packing.

The process that involved in the production of nata de coco is leaching process. Leaching process in nata de coco can be defined in general as using water to leach contaminant from the nata de coco. Through this process, the bacteria will be removed and sterilized. In addition, nata de coco will be neutralized at pH of 7.0. After soaking process cleans nata de coco in water, harvesting process is done by using lifting method. By focusing on the lifting method of nata de coco, some procedures will need to discuss and work over.

## **1.2 Problem Statement**

In the era of technology, machines play vital part to solve human's problem. Nowadays, there are many types of machines or even robots are used in the industry field. Machines can help to increase the production and also save human resources cost.

In certain industry, the entire lifting or harvesting process of nata de coco is still done conventionally. Manpower is needed to lift the nata de coco just after the process of leached and soaked cleans. This conventional method takes in excess of time and low efficiency.

To overcome these problems, some design requirements and conditions have to consider. The design requirement is ready with a tank and a bucket with dimension of 0.9m x 0.9m x 0.6m. Lifting concept must base on that amount of load need to lift up, which is around 500kg. While designing the lifting mechanism, many conditions have to take note, such as the selection of motor, selection of lifting concept, selection of materials and etc. After selection of conception design, the actual parts of machine have

to fabricate and testing is done on that lifting machine. Any knowledge that have been study before which is suitable to design the lifting mechanism are encourage to apply too.

### **1.3 Objectives**

The objective of this Final Year Project is to design, fabricate and testing the mechanism that able to lift a leached nata de coco in order to proceed the other process.

### **1.4 Scope**

Few necessary elements must be considered to guarantee the objectives of the project achieved. The scopes for this project are as follows:

- i. The investigation base on literature study from many sources
- ii. Design few conceptual designs that fulfill the engineering design specification.
- iii. Conduct a simulation on stress analysis.
- iv. The lifting machine must be fabricated.