UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF A PORTABLE PEANUT SKIN REMOVER MACHINE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Refrigeration and Air Conditioning System) with Honours.

by

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TAJUK: **DESIGN AND DEVELOPMENT OF A PORTABLE PEANUT SKIN REMOVER MACHINE**

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Refrigeration and Air Conditioning System) with Honours. The member of the supervisory is as follow:

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(Pn. Ezzatul Farhain Binti Azmi)

Project Supervisor

ABSTRAK

Pada masa kini, kacang adalah tidak asing dari menu makanan kita semua. Permintaan yang tinggi juga daripada industri pemakanan menyebabkan mesin-mesin pengupas kulit kacang dicipta untuk memudah dan mengurangkan kerja-kerja untuk mengupas kulit kacang. Akan tetapi, mesin kacang yang tersedia ada hanya sesuai untuk digunakan di industri dan tidak dirumah. Ini kerana saiz mesin yang sedia ada adalah tidak sesuai untuk diletakkan di rumah dan kos yang tinggi bagi mesin yang sedia ada juga adalah salah satu satu faktor untuk pengguna untuk menggunakannya dirumah. Oleh sebab itu, sesetengah suri rumah juga masih lagi menggunakan cara tradisional untuk mengupas kulit kacang. Oleh itu, projek ini dilakukan untuk mereka bentuk baru dan memfabrikasikan satu mesin untuk mengpas kulit kacang iaitu "Portable Peanut Skin Remover Machine". Mesin ini hanya menggunakan sumber kuasa 12V DC untuk beroperasi. Mesin ini yang menggunakan "single role with barrier" dapat mengupas 90% daripada jumlah yang dimasukkan berbanding dengan menggunakan cara tradisional hanya dapat mengupas 67.5% daripada jumlah kesluruhan. Konklusinya, mesin ini dapat meningkatkan kecekapan untuk mengupas kulit kacang sebanyak 22.5% daripada kaedah tradisional dan dengan ini ia akan lebih menjimatkan masa dan tenaga kerja oleh pengguna.

ABSTRACT

Nowadays, peanuts are familiar in the menu for all of us. High demand from the industry has resulted in peanut skin removal machines being created to simplify and reduce work on peeling peanut skin. However, existing peanut machines is more suitable for use in the industry and not at home. This is because the size of the existing machine is unsuitable to keep at home and the high cost of the existing machine is also one of the factors. From that, some housewives are still using traditional methods to peel peanuts. Therefore, this project design and develop aims to a machine for peanut skin remover that is "Portable Peanut Skin Remover Machine". This machine only uses 12V DC power to operate. This machine use a “single role with barrier” to remove 90% of the total amount peanut entered compared to traditional methods can only remove 67.5% of the amount peanut entered. In conclusion, this machine improves the efficiency of peeling peanuts by 22.5% from traditional method and it can saves users’ time and their energy.

DEDICATION

I would like to dedicate my final year project to my beloved family, project supervisor and friends. And I would like to express my deepest gratitude to my father Mr. Awang Bin Ibrahim and my mother Mrs. Fatimah Binti Idris for their love, dream and sacrifice throughout my life. Their sacrifice have made to become who I am today. Not to forget my appreciation to my project supervisor Mdm. Ezzatul Farhain Binti Azmi for supporting me throughout of my academic journey especially on this project and for whatever knowledge rendered to me from the beginning till the end of my final year project. Lastly, I would like to send my gratitude to my friends and lecturers for their contribution whether it is directly or indirectly to my final year project.

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First, all praise to Allah the Almighty for giving me the strength, knowledge, healthy body and patience to complete my final year project report successfully in time. I must thank my parents for their love, sacrifice and support throughout my life and made me to become who I am today. I also would like to address my appreciation to my project supervisor Mdm. Ezzatul Farhain Binti Azmi for her support, guidance and encouragement through the time for developing my final year project report. Lastly, my full appreciation for those who are directly or indirectly contribute and support me to finish this final year project report. Thank you.

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V	-	Voltage
DC	-	Direct current
s	-	Time taken (second)
g	-	Gram
L	-	Length
D	-	Diameter
cm	-	Centimeter
mm	-	Milimeter
PVC	-	Polyvinyl chloride
rpm	-	Revolve per minute
BP	-	Product weight
BA	-	Initial weight of the product

CHAPTER 1

INTRODUCTION

1.0 Background

Nuts are food that has enough vegetable protein sources in the population intake menu. Peanut with a scientific name Arachis hypogeae is one of the legumes grown widely in the world. Groundnut is a species in the legume or beans family (Santosh Mangave and Bhagyesh Deshmukh). Peanut plants are the bush plant with a height of about 30 cm. This plant has a small green oval leaf. In addition, the peanut has yellow flowers with hard-shelled fruit with brown and have fibers on the surface. If opened, there will be a young brown seed on the skin of the seed and if the seed skin is peeled, the white nut seeds will be seen.

Domestic market demand is still large enough for peanut needs. Increasing this, it should be closely linked to the development of the food and food industry. Until now, peanut products are sold in two forms that are both peeled and unpeeled. In peeling peanut process, most farmers are peeled manually so output productivity is very low and takes some time. Other than that, it takes a lot of money now and to finding a workforce is also increasingly difficult.

Peeled skin is intended to remove the skin attached to the seeds. Peanut peeler can be done traditionally by hand. The traditional methods, especially manually peeling are very boring, slow and requiring high labour input and high processing loss when involved on a large scale (Agbonkhese A. Kingsley, Afoegba S.Clement, 2018).

There is an existing peanut skin remover machine in the market and the machine use the mechanical system to operate. Peanut skin remover machine in the market designed with the bigger size to process more peanut in one time, but the designed size of the machine is not suitable for use at home because the size will take more space for keeping it at home. Furthermore, there is still no development of peanut skin remover machine in the market with small size for use at home.

In this project, a portable peanut skin remover machine is developed with a small size to make suitable uses at home. So, the machine will not take large space to keep this machine at home and the user no need to peel the peanut by hand. So it will save their as they can time to do another work while in the kitchen.

1.1 Problem Statement

The peanut should be peeled before they are eaten or put into a culinary material to get the real taste of the peanut. If the peanut is not peeled, it will disturb the taste of peanut. Most housewives still use the old way to peel skin peel when want to cook it. Therefore, it will take time to peel and separate peanuts with it skin. This will waste the time to peel the peanut whereas we can do more work if the peanut is peeled by machine. From the previous peanut skin remover machine, it was designed with the bigger size to process more peanut in one time. However, the size is the problem to keep it at home because it will take more space in the kitchen to place it.

Furthermore, the amount uses of peanuts at home is not like in industries. Therefore, the existing peanut skin remover machine is not suitable for the use at home and more suitable for the use at industries or shop. The cost to buy the existing peanut skin remover machine also one of the reason why the community still use the old way to peeling the peanut at home.

1.2 Objective

Based on the problem statement, the objectives for this project are focused on the portable peanut peeling machine are stated as below:

1. To design a new portable peanut skin remover machine.
2. To fabricate a portable peanut skin remover machine with low cost, easy to operate and with ideal size to keep it at home.
3. To measure the effectiveness of the portable peanut skin remover machine.

1.3 Work Scope

Based on the objectives above, the work scope for this project are stated as below:

1. To design a portable peanut skin remover machine suitable for the use at home.
2. To fabricate the portable peanut skin remover machine with ideal size.
3. Test and evaluate the portable peanut skin remover machine.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Nuts are the sixth most important oilseed in the world. It contains 48-50% oil and 26-28 protein, and is a rich source of fibber, minerals and vitamins (Adwal Ravindra, 2017). Nuts in Latin are called Arachis hypogaea contains an important source of protein for diet. Especially, these foodstuffs are used for industrial use and raw materials. Groundnut is a species in the legume or beans family (Santosh Mangave and Bhagyesh Deshmukh). In the industry, nuts are used as raw materials for the manufacture of cheese, butter, oil, sweets and snacks. One of the processes that determine the quality of peanuts available for use is peanut peeling process. Peanut skin peels the last operation processed from nuts before extraction.

Peeled skin is intended to remove the skin attached to the peanuts. Peanut peeler can be done traditionally by hand. The traditional methods, especially manually peeling are very boring, slow and requiring high labor input and high processing loss when involved on a large scale. Recently, manual peeling only produced 4.2 kg per hour per person, causing fatigue and causing partially divided seeds by 35%. The Peanut Mechanism process accelerates to the greatest technical challenges because granules vary in size and shape, texture, color, and strength of peanuts; physical and mechanical properties of bean seeds.

Initially, nuts are separated from the skin by the workers. They simply combine nuts with their hands and nuts separately from their shells. The production obtained from this method is very low and does not meet market demand because the process is very time-consuming. It's also a boring job for the worker. Traditional methods for

separating the skin from nuts by putting nuts in a cloth bag and rolling them with rolling pins. The technique managed to break the shells (removing painful fingers), but we still have to take the beans because they did not come. This is not a reliable method for peeling peas because it breaks nuts and beans mixed with shells. The introduction gives knowledge that traditional methods are not enough methods for separating peanuts. Because of this manual process, identify some major issues & to solve this problem some ideas or concepts are generated. Based on the idea generated, the project objective is determined. Small entrepreneurs and entrepreneurs face the following major problems (Agbonkhese A. Kingsley & Afoegba S.Clement, 2018).

2.1 Uses of Ground Nut

Murali T. variath and etc(2017) said, peanut are essential oils, food, and world food crops. Grains rich in fat and protein, and 100 g of the kernel provides 567 kcal energy and fibre food 8.5 g. Nuts are a source of minerals, vitamins and antioxidants and health enhance bioactive compounds such as resveratrol, tocopherol, arginine and so on Food Use of nuts can reduce the risk of inflammation, diabetes, cancer, Alzheimer's disease and gallstones. Nuts are planted in more than 100 with more than 95% of the area planted in Asia and Africa. Aflatoxin and allergens are the main health precursors in nuts and research efforts are needed to develop peanut allergens and aflatoxin-free allergens.

Peanut are used for baking or marinating and for preparing peanut butter. Peanuts are a very nutritious food. One pound of beans produces 2,700 calories. Filtered processed oil is used for cooking and making margarine. Peanut oil is an important food oil. Oil cakes are used as animal feed. Protein in nuts is used in making synthetic fibre. Vegetable Ghee made from peanut oil after hydrogenation. Some commercial products are peanut milk, peanut ice cream and peanut massage oil for infantile paralysis. The stomach is used as a filler for fertilizers, or crushed into flour for insulation blocks, floor sweeping compounds, cages, etc. Peanut oil has also found several uses as lubricants, and a mixture with mineral oil has been developed.

2.2 Method for Peel Skin Peanut

Nuts, such as peanuts, almonds, chestnuts and the like have astringent skin that covers the albumen and need to remove the skin before it is used for food. However, the removal of the skin is faced with extreme difficulties, and although various methods for this purpose have been made to date none of them can be said to be satisfactory (Yoshiichi Takeuchi, 1970). So, there are two methods to peel skin peanut;

2.2.1 The wet skinning method

In a skin exfoliation method known to be wet, swollen peanuts in hot water are removed from it and cooled quickly to make an albumen contract. Then, after breaking the skin by cutting the loose part with a sharp knife, the skin is separated from the albumen using a skin roller. However, this method, which involves complicated operations, is not only unsuitable for mass production, but can also leave some nuts with the skin because it is caused by deviations in size and shape, and beans found still in the skin in the selection process are rarely used, which is very uneconomical.

2.2.2 The dry skinning method

The peanut is heated quickly by radiant heat so that the skin is only roasted, and the skin is removed by making it brittle and ready to release. However, very fine controls are needed because it is very difficult to maintain the roasting level in the best conditions. In other words, the condition called white roast must be maintained very carefully. This method, although suitable for obtaining products in the mass production system, has defects in terms of product quality which is greatly reduced due to the loss of a lot of water during the roasting process.

2.3 Physical Properties of Groundnut

Vinay M.Nirmale,(2017) reported commonly used peanuts in the market there is the number of peanut types available in the market coming from different areas of the world. Out of that, there are two main types which are widely used for domestic as well as industrial applications and products. There are java type peanut in **Figure 2.1** and bold nut type in **Figure 2.2**.

1. Round Type called as Java Type peanuts

Figure 2.1 Java Type peanuts

2. Long Type called as Bold Type peanuts

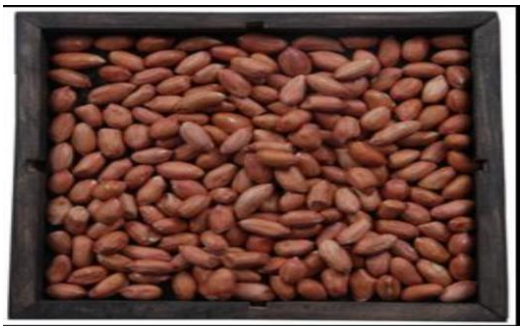

Figure 2.2 Bold Type peanuts

2.3.1 Size Variation

The diameter and length of both java type and bold type peanut is measured by the vernier calliper and the average values of diameter and height are calculated and tabulated in the table. They are given in the following **Table 2.1**.

Table 2.1: Size Variation

Size variation of peanuts no.	java type (Sample-1)		Bold type (Sample-2)	
	Diameter (d) in mm	Height (L) in mm	Diameter (d) in mm	Height (L) in mm
1	9.02	15	10	18.2
2	10	14.18	8.6	15
3	8.56	15.1	8	17
4	8.64	13.62	10.6	18.4
5	9.16	12.5	9	15
6	9.4	16.68	8.2	16
7	10.4	12.7	10	16
8	9.3	14.4	8.5	16
9	9	11.38	9.6	15.02
10	7.6	12.1	9	15.5
11	9.1	14.5	8.6	15.3
12	8.8	14.5	8.4	14
13	7.9	12.5	8.7	15.6
14	9.7	14.9	8.8	16.28
15	9.38	12.55	9.2	14.7
Mean	9.07	13.77	9.2	15.86

From **Table 2.1,** the diameter of peanuts for Sample 1 ranges from minimum 7.6 mm to maximum 10.4 mm and diameter of peanuts for sample 2 ranges from minimum 8 mm to maximum 10.6 mm. The diameter of peanuts for sample 1 is lower than the diameter of peanuts for sample 2. The height of peanuts in sample 1 generally ranges from minimum 12.1 mm to maximum