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DEVELOPMENT OF DRYING RACK
FOR
HOUSEHOLD APPLICATION

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This report is submitted in partial fulfillment

Of

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Faculty of Mechanical Engineering

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“I admit that this report is my own composition
except the summary and extract which each of the source have been explain”

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Writer's Name :

Date :

DEDICATION

To beloved Father and Mother for their encouragement and most importantly for their understanding in the way I am.

ACKNOWLEDGEMENT

Assalamualaikum. Making this assignment would not have been possible without the help and support of my university that is University Technical Malaysia Malacca (UTeM). I am grateful to my supervisor, En Mohamad Firdaus Sukri for his good advised and superb ideas. He also gives me the best guidance and encouragement along accomplishing this project.

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Hopefully, this research report will become a helpful reference to other students in the future. Lastly, thank you Allah.

ABSTRACT

Clothes drying rack is a device where people hung their wet clothes to dry. It is use by each of human in this world. Drying rack is being manufacture with many kind of design according to desire of the customers. In this 21st century, the population of humankind increase rapidly. Many modern countries develop a low cost terrace house due to ensure each human are able to have their own house to stay. This small terrace house has limited space to dry people's clothes. This is where many portable clothes drying rack are being design. Even though, many problem such as cost, occupied many space, damage and other matters always occur which make people keep on changing their drying rack. The only way to ensure none of this problem will occur is a research about the structure and material of the drying rack in the market and develop a brand new design of drying rack. Many calculation of the structural design will be done during the timing project. Material selection also will be the main thing to be considered. Comparisons of each drying rack are being done to see the advantages and disadvantages of the product due to fabricate a new drying rack. SolidWork software is used to sketch the conceptual design and CESEDU Pack to consider the material to be used.

ABSTRAK

Penyidai baju adalah suatu tempat untuk mengeringkan baju. Penyidai baju ini diguna secara meluas oleh seluruh manusia di dunia. Penyidai baju ini di reka cipta dan di buat di kilang-kilang secara meluas. Terdapat pelbagai rekaan dari segi bentuk dan warna mengikut citarasa pengguna. Dalam abad ke 21 ini, bilangan manusia bertambah ramai di muka bumi ini. Kesannya, tempat tinggal adalah terhad kerana muka bumi ini tidak mampu menampung keseluruhan manusia. Rumah teres kos rendah adalah antara faktor kewujudan di kebanyakan negara maju untuk mengurangkan manusia merempat tanpa tempat tinggal. Rumah teres kos rendah ini mempunyai ruang halaman yang terhad dan kecil dimana ia menyusahkan suri rumah menyidai baju. Kadangkala, penyidai baju yang digunakan adalah besar dan susah di gunakan. Terdapat juga masalah seperti dari segi kos, kerosakan dan lain-lain lagi. Masalah seperti ini membuatkan pengguna susah kerana perlu menukar penyidai baju mereka berulang kali. Satu-satunya cara adalah dengan kaedah mengkaji masalah yang di hadapi oleh penyidai baju dari segi bahan digunakan serta rekabentuk. Banyak kajian akan dijalankan demi memastikan mutu dan keunggulan penyidai baju ini terjamin. Selain itu, perbandingan antara penyidai baju di pasaran membantu meningkatkan kajian dalam projek ini. SolidWork akan digunakan untuk melakar reka bentuk manakala CESEDU Pack diguna sebagai penentuan bahan.

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LIST OF SYMBOLS

A = effective surface area (m²)

t = time (s)

V = volume (m³)

ω = specific humidity

p = pressure (kPa)

F = force (N)

M = mass (kg)

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CHAPTER I

INTRODUCTION

1.1 Background

Drying rack is a device where people hang their clothes to dry in air. A clothes drying rack including a free standing frame that supports a plurality of rods from which articles of clothing can be suspended. Specifically, the clothes drying rack includes a purity of rods wherein each rod has corrugated exterior to facilitate passage of air between the clothing and the rod.

There are three types of drying rack. First, is the wire drying rack which uses wire to hold wet clothes. This type usually use at the back yard in huge house such as bungalow houses. Next is the wooden drying rack which is just about the same principle with the wire drying rack. Finally is the metal drying rack which uses aluminum or stainless steel or other materials. The difference is the material that is used. Below is some picture of these three types of drying rack.

It is common practice to dry clothes by exposing the recently washed clothes to the atmosphere preferably outdoors. Clothes lines of various types have been proposed from which the garments are suspended, usually by use of clothes pegs. There have also been proposals for portable racks from which the clothes can be suspended. Racks have the

advantage that they take up less room than a clothes line and can be used in an indoor environment.

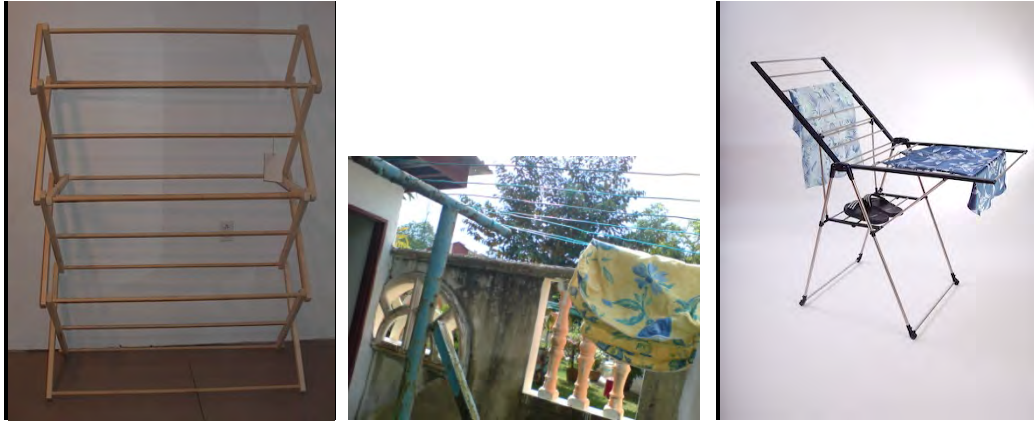


Figure 1.1: Basic types of Drying Rack
(Source: IKEA Malaysia Petaling Jaya, 2008)

In this modern century, rich people uses clothes dryer. A clothes dryer or tumble dryer is a household appliance that is used to remove the moisture from a load of clothing and other textiles, generally shortly after they are cleaned in a washing machine (http://en.wikipedia.org/wiki/Clothes_dryer).



Figure 1.2: Clothes dryer

(Source: http://en.wikipedia.org/wiki/Clothes_dryer)

Clothes dryer is small and easy to use at a small area of house even at a flat house. But, it is so expensive and moreover it can increase the electricity bill. Besides, there are many limitations using this device where not all clothes can be used to dry because it can damage it. The only solution to this matter is a portable drying rack which uses the nature source that is the sun.

1.2 Objective of study

The objectives of this project are to develop a compact drying rack with huge capacity to dry clothes in limited space area. Before starting this project, several targets and goals have been set to achieve excellent structure of a dry rack. The goals for this project is to find the suitable material to fabricate, so that the drying rack would have long life time and not ease to fragile. Besides, low cost fabrication which is in range of RM400-RM500. To design a portable drying rack which would not occupied space in a limited house space area.

It is considered that there is a need to improve the versatility of a clothing rack by means of increasing its maneuverability, rending the rack easy to assemble and disassemble and ensuring good drying efficiency. The rack should be easy to use and durable, capable of resisting damage due to moisture and exposure to sunlight.

1.3 Problem Statement

According to National House Buyers Association, it says in their website (<http://www.hba.org.my>) that majority people in Malaysia buy low cost terrace house. This low cost terrace houses have limited spaces. Normally a huge capacity of drying rack needs bigger space. This could cause problem to dry many clothes in a time because of the limited space area. Although there are many portable drying rack in the market, but it stills occupied the space. Besides, it cannot hold enough weight of 8-14kg clothes. This amount of clothes is based on an average washing machine capacity.

Poor architectural design, such as material and structural design that is use are not strong enough to hold a huge amount of weight. We often hear people change their drying racks often. This is because many drying rack in the market are so easily broke into pieces. The installation of drying rack such as screwing part or weld part is being done so granted. The material which is used is ease to corrosion, crooked and fragile.

Cost is a major factor to most of people when buying a brand new drying rack. Nowadays, portable drying rack which is good to use are so expensive. This is because we are paying to its brand.

1.4 Scopes of project

Based in the objective of this project, several scopes have been decided to achieve all this objectives. The scopes of this project are:-

- I. It can hold a capacity of 9-14kg of clothes.
- II. Wall Mounted Design.
- III. Install at limited area of 5ft x 10ft.
- IV. Structural Analysis of Drying Rack

1.5 Benefit of study

The author and readers can improves skill and gain knowledge by studying the structural, material and design of the drying rack. Besides, this Project Sarjana Muda (PSM) cannot be done in this university. There are none journal that can be use to as a reference to accompany my path to do this project. This means that, after the author completes this project successfully, this paper can be use as a reference to everyone.

Next, the terrace house holder shall not worry of their crowded space at their area because of its ease to use. The author design will make sure all the objective will be covered for the good of the users. They could also save huge amount money to buy drying rack because the new portable drying rack is outstanding from bottom to the top. Users will not fear to dry their clothes anytime because it is portable and easy to install anywhere in the area of their house.

CHAPTER II

LITRITURE REVIEW

2.1 Introduction

Traditionally in most places, clothes are dried on a clothesline. This practice uses readily free, renewable energy sources wind and sunshine.

Care should be taken with colored clothes, as they may fade in the sun. They should either be left in the sun for a short time only, or dried in a shady position. Wealthier people may choose to use clothes dryers they are seen as convenient and reliable, not dependent on weather. However, they are very wasteful of energy.

Some council codes actually require developers to install clothes dryers. This is very wasteful of energy, and so sustainable alternatives are desirable. Where drying clothes in public view is not allowed, in order to maintain a tidy appearance, there are designs which can satisfy both sustainability and aesthetics. One approach is to have drying rooms (perhaps a small section of a balcony) with louvers to allow airflow. Another is to have the balcony railing designed in such a way that drying racks below a certain height are not visible from outside the building (http://www.appropedia.org/Washing_and_drying_clothes).

2.2 Review design of drying rack in the market

There are many design and material of drying rack. Each of the design has the advantages and disadvantages. The drying rack is created according to the desire of users. The designs have being survey by the author at IKEA Malaysia which is located at Petaling Jaya. IKEA MALAYSIA is well known as one of the famous and largest furniture in Malaysia. There are many kinds of design and most importantly it is affordable. The author also browses to the internet to survey a few popular designs.

2.2.1 Wall Mounted Expandable Clothes Drying Rack



Figure 2.1.1: Wall Mounted Expandable Clothes Drying Rack

(Source: <http://www.skyburst.com/dryingracks>)

Figure 2.1.1 is a closed dimension with 12inches tall x 6inches wide x 27inches long. The top shelf is 5.5 inches wide. It can expands to 22 inches and fold flat to a compact 6 inches when not in use. The pull out rack provides 18 feet of drying spaces. The drying rack is strong enough to hold wet jeans or jackets. It makes a great addition to any mudroom or laundry room or uses it to dry flowers and herbs. Constructed from white pine, with dowels and pegs of birch, available finished in honey pine oil or unfinished. Finally, it is easy to mount, with two pre drilled holes, includes screws and birch button caps for mounting.

2.2.2 Butterfly Clothes Drying Rack



Figure 2.1.2: Butterfly Clothes Drying Rack

(Source: IKEA Malaysia Petaling Jaya, 2008)

Figure 2.1.2 is the Butterfly drying rack is made from lightweight stainless steel and heavy gage ABS plastic. The wings of the clothes drying rack are adjustable up and down to several height positions, allowing hanging and drying just about anything. The Butterfly clothes drying rack makes a perfect sweater drying rack. Sturdy construction and quality materials set our clothes drying racks apart from the others. There is no need to fumble with poorly built thin wooden clothes drying racks, that wobble and fall down, or low quality chrome plated designs that rust quickly. The design provides stability and superior weight bearing capacity and promises years of service. It is fully extended the top offers nearly 10 square feet of drying space. Shirts, pants, and towels are hung easily underneath the rack from the cross bars. Plastic caps on the legs prevent the floors from scratching. The Butterfly folds flat when not in use, and can be set up in seconds. Dimensions of it is top flat is 38inches high, 52inches long and 23inches wide. The weight is 11.6 lbs.