



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART SELF-DRYING WITH ANTI-BACTERIA CLOTHES BLINDS

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

by

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DECLARATION

I hereby, declared this report entitled “Smart self-drying with anti-bacteria clothes blinds” is the results 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 fulfillment 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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(Amir Abdullah Bin Muhamad Damanhuri)

ABSTRAK

Keadaan cuaca di Malaysia tidak dapat dijangka. Purata suhu di negara ini adalah sekitar 27°C dan kadang-kadang boleh mencapai 30°C. Bagi manusia yang ingin mengeringkan pakaian, ia boleh menjadi satu masalah kepada mereka untuk mengeringkan pakaian dan secara tidak langsung, mereka akan mengeringkan pakaian mereka di dalam rumah. Seperti yang manusia tahu, mengeringkan pakaian di dalam rumah adalah satu perkara yang tidak baik dan ia boleh menyebabkan pertumbuhan bakteria yang disebabkan oleh kelembapan yang terdapat pada pakaian. Ia tidak baik untuk pakaian manusia, terutamanya pakaian untuk bayi. Oleh itu, ia telah menjadi satu faktor dalam penciptaan pengering pakaian di dalam rumah ini. Ia dibuat selaras dengan masalah yang dihadapi oleh kebiasaan manusia. Pengering pakaian di rumah ini telah menerapkan konsep yang sama seperti konsep semulajadi di luar, iaitu menggunakan matahari dan angin sebagai medium pengeringan. Ia menggunakan pemanas elektrik sebagai medium pemanasan dan menggunakan kipas untuk menyebarkan udara panas. Bentuk udara panas yang dikeluarkan adalah berbentuk aliran gelora. Cahaya UV digunakan untuk membunuh mikroorganisma seperti virus dan bakteria yang terdapat pada pakaian yang disidai. Tiga jenis pakaian telah digunakan untuk menjalankan eksperimen ini iaitu jenis koshibo, satin dan kapas. Setelah membuat perbandingan masa antara produk ini dan punca semulajadi, masa pengeringan produk ini lebih cepat dan efektif berbanding masa pengeringan menggunakan punca semulajadi.

ABSTRACT

Weather conditions in Malaysia cannot be expected. The average temperature in the country is around 27°C and sometimes can reach 30°C. For those who want to dry clothes, it can be a problem and an obstacle to them for drying clothes and so indirectly, they will dry their clothes in the house. As everyone knows, drying clothes in the house is not a good thing and it can cause bacterial growth caused by moisture in the laundry. It is not good for humans, especially for baby clothes. It has become a factor in the creation of a clothes dryer in the house. It is made in accordance with the problems faced by the common man. Drying clothes in this house has been applying the same concept to the concept of natural outside using the sun and wind as the drying medium. It uses an electric heater as the heating medium and use a fan to distribute the warm air. One form of hot air generated in the form of turbulent flow. Moreover, an additional medium in which heating is the heat lamp. UV light is used to kill microorganisms such as viruses and bacteria found on the clothes hanging. Three types of clothes have been used to conduct experiments koshibo types, satin and cotton. Clothes hung on a wire rope provided and dryers that have the electrical box above. After making comparisons between this product and a natural source, product drying time is faster and more effective than the drying time using natural sources.

DEDICATION

Mother,

Thanks to each of you devote and indeed you never go
My love on you most, your house sure paradise

Brother, Sister

Friends of the world forever

Like the exactly embroidery and fabric you love between us,
And beautiful sheen created gems into the fellowship together forever

Thank you

They - I know who they are and they know who I am.

(Tajul Rosli Samsudin 2016)

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**LIST OF ABBREVIATIONS, SYMBOL
AND NOMENCLATURE**

AHU	Air Handling Unit
Al	Aluminium
AMCA	Air Movement and Control Association
CAD	Computer Added Design
CuNi	Cupronickel
Dc	Direct current
DNA	Deoxyribonucleic Acid
EM	Electromagnetic
FeCrAl	Kanthal wires
FEG	Fan Efficiency Grade
MCB	Miniature Circuit Breaker
PDMC	Permanent Magnet DC
PTC	Positive Thermal Coefficient
UV	Ultra-violet
UVB	Ultra Violet B
UVC	Ultraviolet C
UVGI	Ultraviolet Germicidal Irradiation

CHAPTER 1

INTRODUCTION

1.0 Introduction of climate in Malaysia

Both peninsular and separate Malaysia lie in the same tropical scopes and are influenced by comparable airstreams. They have high temperatures and humidity, substantial precipitation, and a climatic year designed around the upper east and southwest rainstorm. The four seasons of the climatic year in Malaysia is from November or December until March, the primary monsoon period is from March to April or May, the southwest storm is from May or June to September or early October and the second monsoon period is from October to November. The data from the meteorological department of Malaysia report the average temperature in Malaysia is typically 27°C, but in the latest report, temperatures have soared to the 30°C. In average, the temperatures are always high and a lot of rain (rainy season) falls in the months: August, September, October, November, and December. In average, the warmest month is April and the coolest month is September. April month is the wettest month, where June is the driest month. So, from this data, the people know the weather condition in Malaysia is unpredictable. Therefore, it is because the people that want dry their clothes had to dry them in the house. Besides that, the clothes blinds are common expose several contaminants. It is also due to the unpredictable weather condition. It will also cause skin diseases, itching, and other skin diseases. Thus, an idea was formed to solve the problem with the design of a product concept attach with UV light system, dryers such as the heater, fan blower, and another concept. This prevents us from being contaminated clothes and also solves the problem of users who do not have enough time to dry their clothes. This study involves CAD software for the design phase.

1.1 PROBLEM STATEMENT

There are two problem statement that are found and cause the people dry their clothes in the house. The main problem is the weather conditions in Malaysia unpredictable and it will cause consumer clothes hanging in the house (Carbon, Initiative, & Islands, n.d.). Sometimes the weather is hot during the day and sometimes it rains. It causes people to take precautions with drying clothes in the house. The second problem is normally, the consumer busy work and it also will hang clothes in the house. In Malaysia usually employees will work for 8 hours and it causes people do not have time to dry their clothes outside the house and then dry them in the house. Therefore, according to (Kassiri, Akbarzadeh, & Ghaderi, 2012), it can cause the clothes exposed to the bacteria when dry the clothes in the house.

1.2 OBJECTIVE

There are three objectives of this project in which this objective used to get the result and data. There are three objectives such as:

1. To design using CAD (Solid Works) Anti-bacteria and self-drying clothes blinds.
2. To fabricate model/prototype of Anti-bacteria and self-drying clothes blinds.
3. To compare the effectiveness of the clothes dry using natural sources and self-drying clothes. .

1.3 SCOPE

The scope of this study are separated by three such as:

1. Using Solid Works software to design the phase.
2. Turbulent pattern hot air with UV light.
3. Climate in Malaysia.

The parameter of this project follow the objective that this project aim. This project about the clothes drying that using a multiple sources such as natural sources and this smart self-drying. The parameter to study in this project is separated by four matter such as:

- i Air flow rate of fan.
- ii Air velocity.
- iii Temperature.
- iv Relative Humidity.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

The clothes dryer in the house was a concern and received encouraging response from the public, especially to those who have problems with dry cloth during the day. This caused the clothes dryer in the house are very demanded by the public. It is possible to make the clothes dryer in the house something that should be owned by everyone. Users easy to find clothes dryer in the house and have a lot of options with different drying concept. Therefore, on this section will be described the theories and theoretical framework. According to Wallace and Wray the meaning of literature review is not just about a series of book and journal article reviews but its more to describing and summarizing what each is about. In this section, the researcher will elaborate the research strategy. Literature review consist the type of clothes dryer, some example and story of part of this self-drying clothes and also the theoretical framework and the summary that comprise step to complete this research.

2.1 The type of clothes dryer

There are many type of clothes dryer and also many concept that used to dry the clothes. In Malaysia, there are many product of clothes dryer in the house with different concept. Most of the concepts put forward focused on how to dry clothes and have different designs.

For example, there are some clothes dryer uses heat transfer method in which a fire was lit under the plate and then scar heat can dry clothes and so on. However, what is certain, most of the clothes dryer in the house prefer to use the electric heater to dry clothes in the house. The electric heater is also a device that is capable of drying clothes in the house. There are many types of electric heater which can be used in the process of drying clothes (Enhancement & Initiative, 2013).

(Clothes & Rack, 2010) Stated it must refers to the design and capacity of the garment to be dried. Hot air blown from the heater with a fan that has a certain speed or rpm speed parallel to the fan motor. Some of the clothes dryer to dry clothes but just do not kill or prevent bacteria present on the shirt. By installing ultra violet light, the bacteria can be prevented from sticking to clothes. The ultra violet light we often see in hospitals where they are used to treat babies with jaundice. Figure 2.1 and 2.2 shows the existing clothes dryer.



Figure 2.1 The bag clothes dryer



Figure 2.2 The wardrobe of clothes dryer

Other than that, there are many types of clothes dryer that have different concept. For example, the clothes dryer by using waste heat from split unit. It using waste heat as a drying medium to dry the clothes. The waste heat from the outdoor unit produce hot air and that air use for drying the clothes. (Suntivarakorn, Satmarong, Benjapiyaporn, & Theerakulpisut, 2009). The factor that effected the energy performances of dryer is heater power, fan speed, weight, and initial moisture content of the clothes (Ashraf M. Bassily & Gerald M. Colver, 2003)

2.2 Heater

As indicated by (Natural Resources Canada, 2012), a heating component changes over power into heat through the procedure of resistive or Joule heating. Electric current going through the component encounters resistance, bringing about heating of the component. Not at all like the peltier effect, is this procedure free of the heading of current stream.

2.2.1 Metal heating elements

According to (Natural Resources Canada, 2012), most heating components use Ni chrome 80/20 (80% nickel, 20% chromium) wire, lace, or strip. Ni chrome 80/20 is a perfect material, since it has moderately high resistance and structures a discipline layer of chromium oxide when it is warmed interestingly. Material underneath this layer won't oxidize, keeping the wire from breaking or wearing out. Resistance wire: Metallic resistance heating components might be wire or strip, straight or snaked. They are utilized as a part of basic heating gadgets like toasters and hair dryers, heaters for modern heating, floor heating, rooftop heating, and pathway heating to liquefy snow, dryers, and so on. The most widely recognized classes of materials utilized include:

- Kant Hal (FeCrAl) wires
- Ni chrome 80/20 wire and strip
- Cupronickel (CuNi)

2.2.2 Ceramic heating elements

According to (Incropera, DeWitt, Bergman, & Lavine, 2007), molybdenum silicide: Molybdenum silicide (MoSi_2) an intermetallic compound, a silicide of molybdenum, is a refractory ceramic primarily used in heating elements. It has moderate density, melting point $2030\text{ }^\circ\text{C}$, and is electrically conductive. At high temperatures it forms a passivation layer of silicon dioxide, protecting it from further oxidation. The application area includes glass industry, ceramic sintering, heat treatment furnaces and semiconductor diffusion furnaces. PTC Ceramic

elements: PTC ceramic material stand for its positive thermal coefficient of resistance (i.e., resistance increases upon heating). Most ceramics have a negative coefficient, whereas most metals have positive values. While metals do become slightly more resistant at higher temperatures, this class of ceramics (often barium titanate and lead titanate composites) has a highly nonlinear thermal response, so that it becomes extremely resistive above a composition-dependent threshold temperature. This behaviour causes the material to act as its own thermostat, since current passes when it is cool, and does not when it is hot.

2.3 Fan

Generally, the definition of fan, selection of fan are presented. Fan is the important component in some device like AHU. The fan in AHU is consumes huge amount of energy to create high pressure to move and distribute the air. The function of the fan is to produce air movement and distribute that air to conditioned space. A metric called Fan Efficiency Grade (FEG) are published by Air Movement and Control Association (AMCA). The fan size is become a factor of the fans efficiency. Therefore, to reach high efficiency, the small fan are not suitable compare the larger fan. (Sunon, 2012)

2.3.1 Fan selection

The selection of fan is most important to any device like AHU. Commonly, the centrifugal fans are frequently used because that fan can move large volumes of air. Centrifugal fan are available with a number of blade designs such as backward curved, forward curved and air foil. The air flow of fan also becomes a factor of energy performance. For example, in regular household dryer, it process 240 cubic feet per minute (cfm) of flow rate. The air flow rate suitable for that place. (J., 2010)

2.4 Material

Based on this project, the material that suitable to use to make an electric box is composite aluminium. There are many advantages of this material for use to make electric box.

2.4.1 Aluminium

According to (Ion, 2011), the meaning of aluminium is the element that used for making aircraft parts and cooking equipment. The element have a light and silver coloured metal.

2.4.1.1 The Aluminium Advantages

With its special properties and abundant supply, aluminium has revolutionized modern construction. Aluminium's unique combination of strength and rigidity, ease of fabrication, and versatility of design makes it an ideal building material for architectural products. Our architectural product group can meet your needs on any project; from small and simple to large and complex.

2.4.1.2 Strong

Aluminium is low in weight, yet high in strength an uncommon combination of two advantageous properties in a structural metal.

Aluminium alloys can exhibit the same strength as many structural steels, but at a third of the weight. As a lightweight material, aluminium reduces transportation costs, installation labour costs and reduces the risk of injury.

2.4.1.3 Durable

The unique combination of a stable material with an exceptionally durable finish means long-term quality that requires little to no maintenance. To maintain attractive appearance, minor cleaning of surface dirt is all that is necessary. Aluminium is a durable material with consistent and predictable properties. It does not absorb moisture and is saltwater-resistant, so it will not rust, rot, swell, warp, twist, split or crack.

2.4.2 Composite aluminium

The meaning of composite aluminium is the mixture two or more of material such as aluminium material mix with the other material. The generally, composite material consists of two or more mechanically and physically separable of material. They are made by mixing the separated material (Materials, 2012). The advantages of the composite aluminium is this material have an economical option, easily and quickly processed, long lasting durability, excellent weather resistance, outstanding thermal comfort, protecting the environment (Ion, 2011).