



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DESIGN AND DEVELOPMENT OF SMART DRYING FOR  
CLOTHES – ENHANCEMENT ON OVERALL DESIGN**

This report submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Process) with Honours.

by

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I hereby, declared this report entitled “Design and Development of Smart Drying for Clothes – Enhancement on Overall Design” 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 fulfilment of the requirements for the degree of Bachelor of Engineering Technology manufacturing with honour (Process and Technology). The member of the supervisory is as follow:

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(En.Syahrul Azwan bin Sundi@Suandi)

## ABSTRACT

This project was to study the design smart drying system for clothes dryer system by using heat waste. There are many cabinet dryer is widely used today as an alternative to natural clothes drying, especially for those who are busy working from morning until evening, having limited time and for the residents in urban areas. It is a routine for one to wash and dry their denim and clothes throughout the year. Unfortunately, nature will never be the same all the way. It is always sometimes raining and various seasons. Thus, a smart drying system is proposed to encounter these problems. To implement the development of this prototype, many steps have to perform. Starts with project planning, information searching and then further with prototype construction, there are been manage well until the recent progression that lead the way to produce a final functional prototype of Smart drying System. By analyze and study about the previous researches, its help more to understand the concept and the application to be used for this prototype. In addition to have a good result of this project, the information about drying mechanism is also gathered from the published books, articles and journals as guidelines. The idea of design concept is contributed from the current product that available in the market place. Some new idea also had been generate by the good example of the current used products. Furthermore, the conceptual design presented for design development is selected by according to the screening concept. The expected results that system will be solve a major problem while drying clothes is unexpected weather changing. New evolution of invention has to be made for solving these problems

## ABSTRAK

Projek ini adalah untuk mengkaji reka bentuk sistem pengeringan yang sempurna untuk memastikan sistem pengering pakaian dengan menggunakan sisa haba. Terdapat banyak pengering kabinet digunakan secara meluas pada hari ini sebagai alternatif kepada pakaian untuk pengeringan, terutama bagi mereka yang sibuk bekerja dari pagi sampai petang, mempunyai masa yang terhad dan untuk penduduk di kawasan bandar. Ia adalah satu rutin bagi seseorang untuk mencuci dan mengeringkan denim dan pakaian mereka sepanjang tahun. Malangnya, peralihan musim tidak akan sama sepanjang tahun. Oleh itu, sistem pengeringan pintar ini dicadangkan untuk menghadapi masalah ini. Bagi melaksanakan prototaip ini, terdapat banyak langkah-langkah perlu untuk dilaksanakan terlebih dahulu. Bermula dengan perancangan projek, pencarian maklumat dan kemudian terus dengan pembinaan prototaip, setelah menguruskan dengan baik sehingga perkembangan ini barulah pergi untuk yang menghasilkan prototaip akhir yang berfungsi sebagai sistem pengeringan Pintar. Dengan menganalisis dan mengkaji tentang kajian sebelum ini, ia dapat membantuan lebih untuk memahami konsep dan aplikasi yang akan digunakan untuk prototaip ini. Selain mempunyai hasil projek yang baik, maklumat mengenai mekanisme pengeringan turut dikumpul daripada penerbitan buku-buku, artikel dan jurnal sebagai garis panduan. Konsep idea reka bentuk yang terdapat di pasaran banyak menyumbangkan idea untuk projek ini. Idea-idea baru juga telah banyak menjana teladan yang baik melalui produk untuk digunakan pada masa kini. Tambahan pula, reka bentuk konsep yang dikemukakan untuk pembangunan reka bentuk dipilih dengan mengikut konsep pemeriksaan.. Keputusan yang dijangkakan bahawa sistem akan menyelesaikan masalah utama iaitu cuaca yang berubah-ubah tidak dijangka semasa pengeringan pakaian. Evolusi baru ciptaan perlu dibuat untuk menyelesaikan masalah-masalah ini.

## **DEDICATIONS**

I would like to dedicate this PSM project to my beloved family especially my mother and father with their confidence in me to overcome the entire obstacle in my journey to success. This dedication also goes to my lovely friends and classmate whom persistently gives me precious support and motivation throughout the year.

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## **LIST OF ABBREVIATIONS, SPECIALIZED NOMENCLATURE**

SDS	-	Smart Drying System
SDM	-	Smart Drying Machine
3D	-	Three Dimensional
CAD	-	Computer Aided Design

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

The technology of the efficient clothes dryer nowadays is rarely used in Malaysia. People prefer to use traditional technology, such as normal drying technique where they hang or put their clothes outside of their houses and in the open public spaces such gardens and backyard, some people even think they can just hang their clothes in close space and it will dry. Some of the reasons why they choose to use the traditional method of drying clothes because it is cheap and it did not need some power efforts. Some say that the technology and design is too complicated, some even say that the range of the price is not quite affordable.

In some cases, Malaysia has two weather seasons, the wet season and the dry season. The traditional method of drying clothes had some disadvantages, people can only use this method efficiently in the dry seasons, you can use the method in the wet seasons but the clothes will dry in a long time. The north-eastern coasts of Malaysia experience very wet weather conditions during the northeast monsoon season as they are exposed to the north-easterly winds. Temperatures do not differ much from month to month, and there is no large daily range of temperature. Night-time temperatures can be oppressive due to high humidity.

Formerly, where limited sunlight (cloudy days) and restricted air flow for house types such as high rise condominiums and apartments, natural drying is prohibited in some housing areas for aesthetic reasons and conventional domestic electric dryers are too expensive and inefficient (Mahlia, T. S. 2011)

This kind of situation describes that the need of clothes drying machine production is needed. The reason why design this product is because, day by day the need of the product is increase, the housing complex in Kuala Lumpur is very rare of the open space that is available. Nowadays, The room for the need to hang, or tie the clothes in the rope in order to dry the clothes is decreased. Other reason is the time, some people is too busy and they need quick dry clothes for example, some of the customer needs some clothes to be dried quickly and both husband and wife's commonly working do not have time in organizing their housework's.

Nowadays people still depends on the nature in drying clothes. It is a routine for one to wash and dry their denim and clothes throughout the year. As a conventional method sun energy is using as a major source to dry clothes. Unfortunately, nature will never be the same all the way. It is always sometimes raining and various seasons. Besides, human now are really busy with their job and most of the family are now working parent. Thus, a smart drying system is proposed to encounter these problems. We cannot change the way of nature to solve the problem but the way or the method of drying can be thought and applied.

The design of this project is generally supporting the needs of quick dry clothes to be acquired in short time period , and people can do it more effectively and simple to do at the same time. Hopefully this idea can be fulfilled, and the design can fulfil the customers need and the specification can also satisfy the customer's needs. People can now dry their clothes efficiently, faster, and without any fear of rain that were become a problem of delaying the clothes to be dried. People who do not have enough room can also be assured of their clothes to be dried at the knick of time.

## 1.2 Problem Statements

Clothing is one of the basic needs for human. Clothing protects the vulnerable nude human body from the extremes of weather, other features of our environment, and for safety reasons. The practical function of clothing is to protect the human body from dangers in the environment: weather like strong sunlight, extreme heat or cold, and precipitation, for example like insects, noxious chemicals, weapons, and contact with abrasive substances, and other hazards. Each time the clothes are used, it needs to be cleaned before it can be used again. This to make sure the clothes to be hygienic and free from dangerous bacteria.

However, nowadays people still depends on the nature in drying clothes. It is a routine for one to wash and dry their denim and clothes throughout the year. As a conventional method sun energy is using as a major source to dry clothes. Unfortunately, nature will never be the same all the way. It is always sometimes raining and various seasons. Besides, human now are really busy with their job and most of the family are now working parent. Thus, a smart drying system is proposed to encounter these problems. Project cannot change the way of nature to solve the problem but the way or the method of drying can be thought and applied.

Otherwise this projects also use of heat waste from aircond as one alternative to another for drying clothes that have been washed. The heat waste means free heat is just being wasted without any benefit. There is badness in releasing heat to the environment that will cause of global warming. This problem can overcome by manipulating the heat waste to flow into a smart drying system and remove the moisture from cloths. The heat will be cost zero, which mean no energy efficient and less power consumption.

### **1.3 Objectives**

To make sure that this project meets the goals and requirement, the objectives of this project are defines below according to the points. The objectives of this project are defines as below:

1. To design and describe a prototype smart drying focusing on residential uses.
2. To investigate the suitability of attaching an air ductility to which beat graph by split unit air condition.
3. To select the prototype development on durability, realibility and accuracy air condition.
4. To design and analyse cloth drying machine by utilizing heat waste.

### **1.4 Scope of study**

Scope:

- 1 Detail design of a smart storage residential used.
- 2 Focus on overall structural design element of durability, realibility, and ergonomic will be mainly studied.

### **1.5 Conclusion**

As a conclusion main problem while drying clothes is unexpected weather changing. New evolution of invention has to be made for solving these problems. In reviewing the needs of the project that been specified, this project will give the opportunity to student to show their abilities and gaining variety of engineering skill especially in conducting a potential benefit products.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter provides background cloth dryer machine research previously done, it wills mainly discussing about the general operation, principles and mechanisms that related to the Smart Drying System studies. Some of previous research and studies were included into this chapter to support the development of ideas for Smart Drying System concept and design. Furthermore, the chapter presents theoretical frameworks that built the conceptual foundation for the study and guide the research design and methodology.

#### **2.2 Product review**

There are two general classes of rotating dryers: electric and gas. Both of these refer to the method used to raise the temperature of the air flowing through the tumbler, since the tumbling action is usually electrically powered. The electric dryer generally uses a coiled wire that is heated with electric current. The amount of electric current is varied to adjust the air temperature. The gas dryer employs a gas burner that burns natural gas, propane, or butane to form a jet of hot gases that are directed into a venturi chamber, which uses Bernoulli's principle to pull in ambient air and raise its temperature.