



**DESIGN DEVELOPMENT OF A MOBILITY MODULAR WATER
FILTRATION SYSTEM FOR FLOOD VICTIMS**



**BACHELOR OF MANUFACTURING ENGINEERING
TECHNOLOGY (PRODUCT DESIGN) WITH HONOURS**

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**Faculty of Mechanical and Manufacturing Engineering
Technology**



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FILTRATION SYSTEM FOR FLOOD VICTIMS**

Nor Shairah Hanis Binti Roslan

Bachelor of Manufacturing Engineering Technology (Product Design) with Honours

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**DESIGN DEVELOPMENT OF A MOBILITY MODULAR WATER FILTRATION
SYSTEM FOR FLOOD VICTIMS**

NOR SHAIRAH HANIS BINTI ROSLAN

**A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Manufacturing Engineering Technology (Product Design) with Honours**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2023

DECLARATION

I declare that this Final Year Project report entitled “ **Design Development Of A Mobility Modular Water Filtration System For Flood Victims**” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

Signature

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Name

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Date

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11th January 2023



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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Product Design) with Honours.

Signature

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Supervisor Name

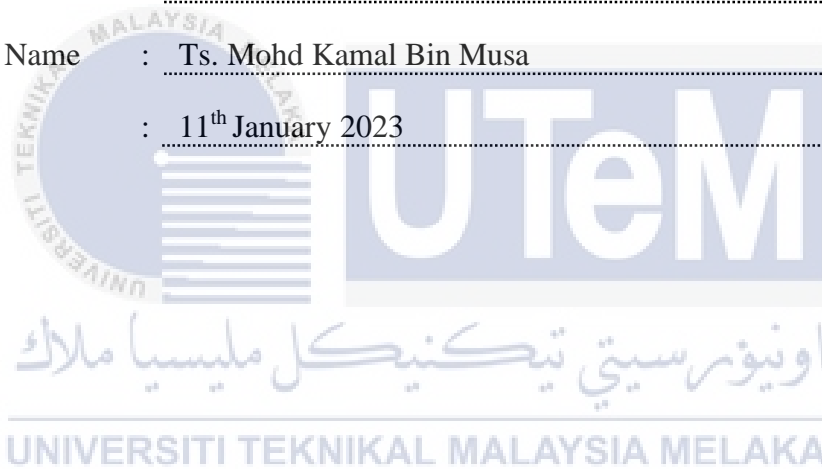
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Ts. Mohd Kamal Bin Musa

Date

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11th January 2023



DEDICATION

This research is dedicated to my beloved parents who have been a source of my inspiration and strength for me during my studies, providing moral, spiritual, emotional and financial support. Also I dedicate this research for my family, lecturers and my fellow friends.



ABSTRACT

Malaysia is one of the countries that often experience floods. The monsoon season usually occurs at the end of the year in various states in Malaysia. The circumstance resulted in flooding in the area due to the area's frequent severe rainfall at the time. This study aims to develop a product of a water filtration system that can be easier to assemble and disassemble by applying the DIY concept. Specifically, it defines the best type of water filtration system which can produce clean water. In this project, the design development of a Mobility Modular Water Filtration System is based on the customer need and the prototype also have been produced. The product testing also have been done 2 times which are for the first testing is using three types of water filter which are Ceramic, UF and PVDF filter. The sample of output from this three types of filter have been sent to the laboratory to observed the quality of water. Since, this three type does not meet the size of the design development product, two types of filters are used in this project which are Carbon Block Filter Cartridge and PP Sediment Cartridge for the double stage filtration system. From the experiment, 4000litres can be produced using this Mobility Modular Water Filtration System that can accommodate approximately as much 80 person per day.



ABSTRAK

Malaysia merupakan antara negara yang sering mengalami banjir. Musim tengkujuh biasanya berlaku pada penghujung tahun di pelbagai negeri di Malaysia. Keadaan itu mengakibatkan kawasan itu dilanda banjir berikutan hujan lebat yang kerap berlaku di kawasan itu ketika itu. Kajian ini bertujuan untuk membangunkan produk sistem penapisan air yang lebih mudah dipasang dan dibuka dengan mengaplikasikan konsep DIY. Secara khusus, ia mentakrifkan jenis sistem penapisan air terbaik yang boleh menghasilkan air bersih. Dalam projek ini, pembangunan reka bentuk Sistem Penapisan Air Modular Mobiliti adalah berdasarkan keperluan pelanggan dan prototaip juga telah dihasilkan. Pengujian produk juga telah dilakukan sebanyak 2 kali iaitu untuk ujian pertama menggunakan tiga jenis penapis air iaitu penapis seramik, UF dan PVDF. Sampel keluaran daripada tiga jenis penapis ini telah dihantar ke makmal untuk memerhatikan kualiti air. Memandangkan, ketiga-tiga jenis ini tidak memenuhi saiz produk pembangunan reka bentuk, dua jenis penapis digunakan dalam projek ini iaitu Kartrij Penapis Blok Karbon dan Kartrij Sedimen PP untuk sistem penapisan dua peringkat. Daripada eksperimen tersebut, 4000liter boleh dihasilkan menggunakan Sistem Penapisan Air Modular Mobiliti ini yang boleh memuatkan lebih kurang 80 orang sehari.



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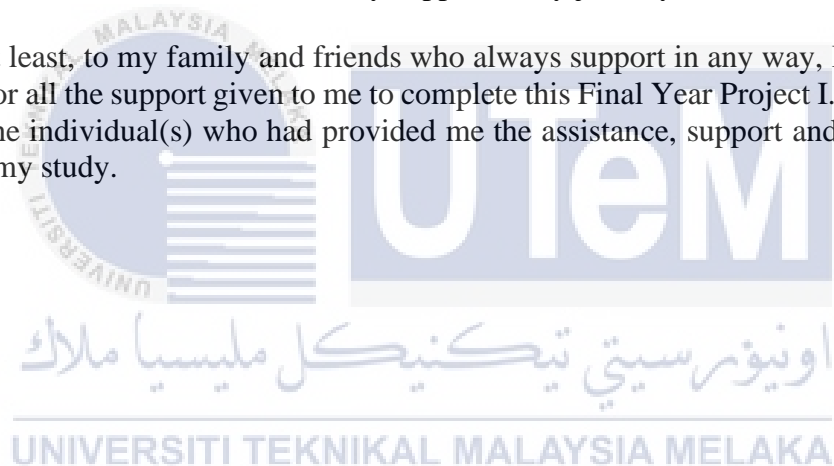


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CHAPTER 1

INTRODUCTION

1.1 Background

Floods are one of the natural disasters that often hit our country, especially in the East Coast states, Peninsular Malaysia. Typically, these states will experience a monsoon season at the end of each year. Due to the frequent heavy rains at that time, the situation has caused floods in the area. Following the passage of a tropical depression (official name Tropical Depression 29W) from the South China Sea, the flood was caused by continuous heavy rains in most regions of Peninsular Malaysia. Floods began to develop in various states, particularly in the Klang Valley and the East Coast, especially in the monsoon season and high tide events (Wikipedia,2022). Floods often occur in low-lying areas such as areas near rivers and drainage. Many properties were destroyed as well as livestock and crops died. Those involved such as farmers will suffer huge losses. Floods can also be life-threatening. In addition, murky flood water can carry various dangerous objects such as sharp iron, ropes and so on. Flood water is also contaminated with various impurities from sewage water, animal carcasses and many more where this condition can spread infectious diseases.

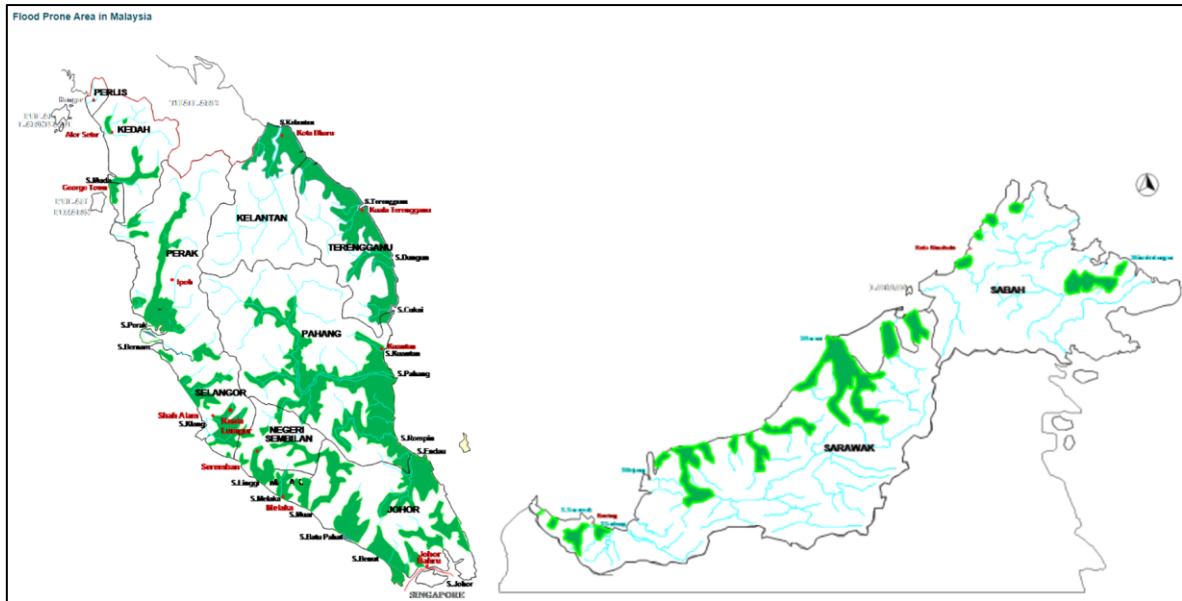


Figure 1.1 Flood Prone Area in Malaysia (Department of Irrigation and Drainage, 2017)

Based on the data in Figure 1.1 from the Department of Irrigation and Drainage, the green areas in every state in Malaysia are areas where floods occur. Not only in Malaysia but there are also several other countries that face flood situations such as Indonesia, India, Bangladesh, the Philippines and many other countries that are prone to floods. (Ika Lestari, 2021).

When this disaster occurs, all sources of electricity and water will be cut off for the safety of all victims. Because water is a basic human necessity, acquiring and managing it has become a critical concern. Various solutions are always begun by all involved parties for providing clean water, especially for regions that had possible flood disasters during the rainy season, such as government mitigation programs, CSR programs from some firms or agency, and survival efforts by people in the vicinity of these unfortunate places. Each of these actions had its own set of benefits and drawbacks, as well as its own set of strengths and limitations. For example, one option is simple to use but lacks sufficient capacity, whilst the other offers excellent performance but may be more expensive. Therefore, do not take flood water to drink without filter or even cooked because it will affect health as it is a serious concern to all people.

1.2 Problem Statement

Unexpected floods cause problems for some Malaysians living in flooded areas. During floods, water and electricity supplies will be temporarily cut off to prevent unwanted things from happening. Flood victims will be placed in flood evacuation areas provided to ensure protection and safety to the victims when the situation is still unstable. Taking the news from Malaysia Kini on 25th Dec 2021, with the main topic, “Flood: Issue from Mentakab Area still don’t have electric supply and clean water supply”. From the news, the head of the Adun Mentakab area, Woo Chee Wan told that he went to a Malay village and found the residents using mud water to wash dishes as shown from the figure. He also stated that Water levels have begun to drop, but the lack of water and power supplies has caused a lot of inconvenience to residents who need to clean their homes. The electricity supply has also not been fully restored and there is a shortage of generators. Then, bathing is also an issue, and if they are Muslims, water is very important where for them to take ablution for prayers. (Low Choon Chuan, 2021). As a result of the water supply cut off, clean water resources are very limited for the affected residents and make it difficult for them to carry out cleaning activities either self-cleaning or cleaning in areas that have receded. Because most of the water sources have been polluted by floodwater and are unfit for household use, particularly drinking, lack of access to clean water is a serious concern.



Figure 1.2 News about a flood in Mentakab area by Malaysiakini

Not only Malaysia, but neighboring countries such as Indonesia are also experiencing a lack of clean water supply due to floods. Based on an article from Kompas.com, flood victims in Periuk Kota Tangerang lack clean water. In this article, one of the flood victims in Kampung Gebang Raya, Periuk Kota Tangerang, Ian Petter, he had to line up with other residents to fill gallons to collect clean water. When found at the Garden City Residence flood control post, Ian took turns being the water supply officer. Ian said that clean water had been hard to come by since Saturday night (2020, February 1) because the electric-powered water pump could not function. (Singgih, 2020).



Figure 1.3 Flood victims in Periuk Kota Tangerang lack of clean water
Source: Kompas.com, 2020

1.3 Research Objectives

The main aim of this research is to provide a clean water for external used for the flood victims.

Specifically, the objectives are as follows:

- a) To find the best type of filtration system in producing clean water.
- b) To determine the quantity of water usage needed by the flood victim.
- c) To develop a product of water filtration which can be easier to assemble and disassemble by applying the DIY concept.

1.4 Scope of Research

The scope of this research is as follows:

- Focus on producing clean water from the water filter for the flood victims.
- Obtain data on how much clean water can be produced in a day based on the flow rate of the water filter made.
- The design development of product are easier to install



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A safe and convenient water supply is extremely important for human health and the well-being of any society. Due to the frequent floods that hit Malaysia, every community should be concerned about the things that will be faced. The problem of lack of clean water supply in some affected areas must be taken into action and always be prepared in the face of impending disasters. This chapter focuses more on the research section to give ideas to produce a quality water filter that can benefit many people. Products such as portable water filters to some extent can help those in need when disaster strikes. The features that need to be focused on in the construction of this water filter should be easy to assemble and disassemble so that it is easy to store and carry anywhere, especially during flood conditions. With the availability of facilities in supplying clean water such as the use of water filters, it can facilitate some residents who need clean water supply such as during floods. Moreover, this research has also been conducted by previous projects and it can help in facilitating and developing this project to become more efficient.

2.2 Water Quality

Water is a very important natural resource not only to humans but also to animals and plants that need water to survive. In this project, the quality of water produced through water filters is very important to ensure the cleanliness and safety of people who use it. When there is a flood and the water supply is cut off that will be very worrying situation for the victims. Water is also used by humans not only internally (for drinking), but water is also used externally as

well as for bathing or for Muslims who want to perform prayers (ablution). So, with clean and quality water, people can avoid getting any water-borne diseases that can be harmful.

2.2.1 What is Water Quality?

Water quality is defined as the biological, physical, and chemical qualities of water, as well as its suitability for the intended use. These three types of quality are the three primary methods of water treatment.

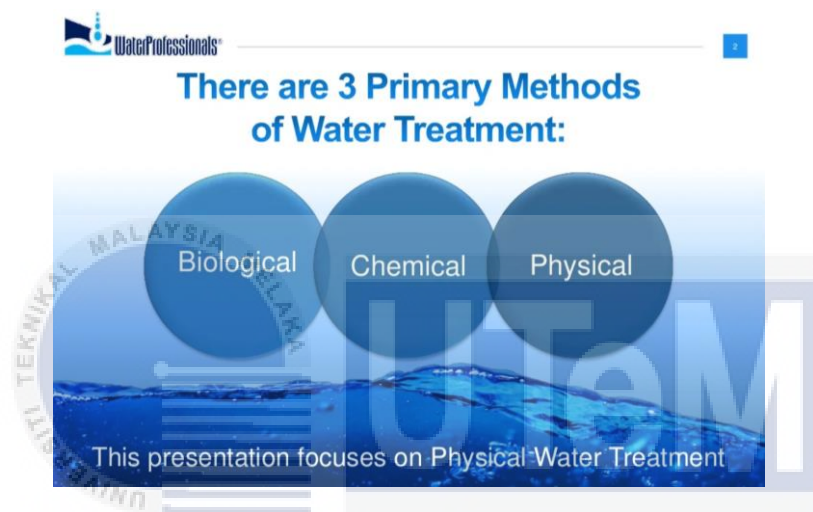


Figure 2.1 Three Methods of Water Treatment

Water quality standards are established after years of research to assure the acceptability of efficient water use for a certain purpose. Water quality analysis is the process of measuring the needed properties of water using standard procedures and comparing them to the standard. (Ritabrata, 2018). Water quality testing is mostly used for monitoring purposes. The following are some of the important parts of such an assessment:

1. Determine whether the water quality meets the required requirements, and hence whether it is suitable for the intended usage.
2. To keep count of a system's efficiency while working to maintain water quality.
3. Determine whether an existing system needs to be upgraded or changed, as well as what changes should be made.
4. To check for conformance with rules and regulations regarding water quality.