



**DEVELOPMENT OF MOBILE CLEAN WATER SUPPLY UNIT FOR FLOOD
DISASTER VICTIMS**



**BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY(AUTOMOTIVE
TECHNOLOGY) WITH HONOURS**

2022



Faculty of Mechanical and Manufacturing Engineering Technology



Muhammad Amir Danial Bin Nazari

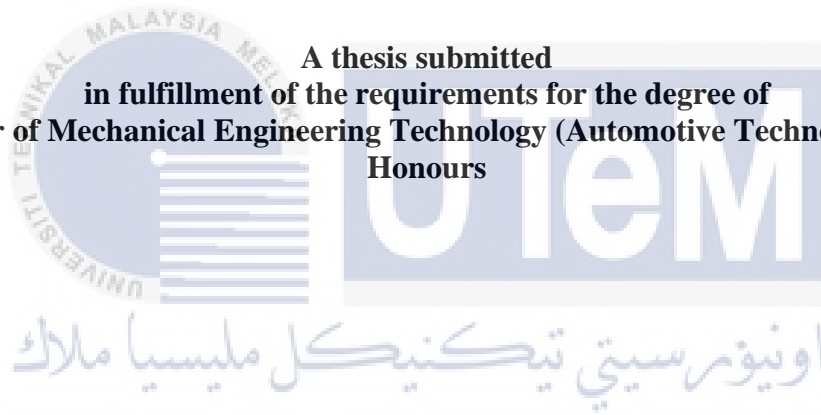
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**DEVELOPMENT OF MOBILE CLEAN WATER SUPPLY UNIT FOR
FLOODDISASTER VICTIMS**

MUHAMMAD AMIR DANIAL BIN NAZARI

**A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Mechanical Engineering Technology (Automotive Technology) with
Honours**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I declare that this Choose an item. entitled “ Development Of Mobile Clean Water Supply Unit For Flood Disaster Victims ” is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature

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Date

: 18 JANUARY 2022

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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 Mechanical Engineering Technology (Automotive Technology) with Honours.

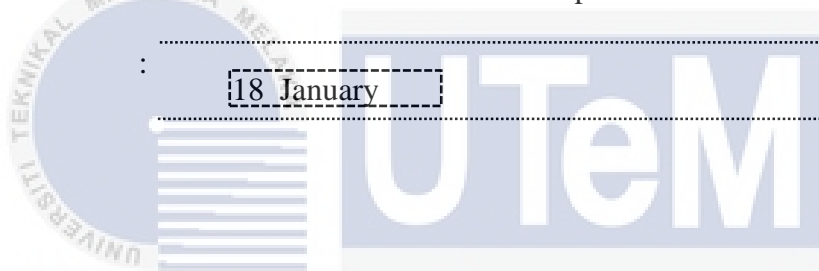
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DEDICATION

To my father and mother

To Siblings

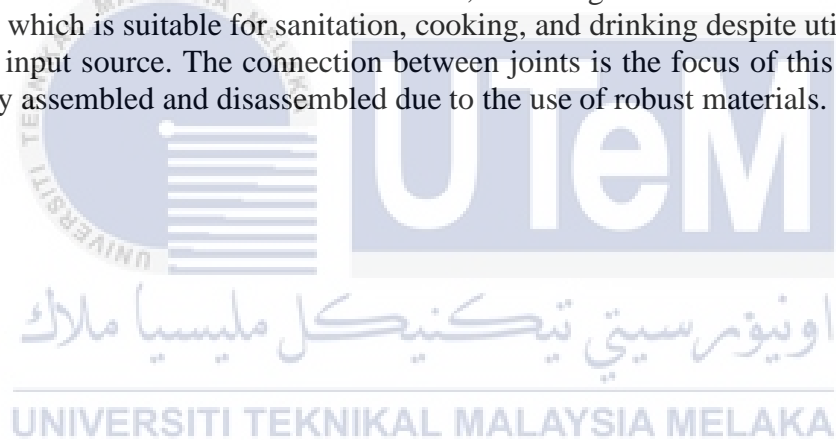
To Friends

And to Myself



ABSTRACT

In places where flood disasters occur often, a shortage of clean water is a concern. Some of the existing methods of supplying clean water may not be particularly successful as a result of the crisis, as well as location, infrastructure, and other constraints. For flood disaster victims, developing mobile clean water supply units may be an alternative option. The system is intended for raw water sources in flood-prone regions that need 7500 liters per day or 25 people. The design of this water purification system was based on current technology and research. Even if conventional procedures are used, it is critical to design a system that is mobile, easy to assemble and disassemble, and robust enough to transport the unit to disaster areas where it is needed. This design uses a turbo water pump to boost pressure, thus increasing the flowrate of the filter, but the filter was selected at random using a morphological chart based on market availability, assuming the area lacks power and clean water. The filter was being researched by another student, so the investigation is still continuing. After he confirms the filter selection, this design will utilize the chosen filter for this system, which is suitable for sanitation, cooking, and drinking despite utilizing polluted water as an input source. The connection between joints is the focus of this design, which can be easily assembled and disassembled due to the use of robust materials.



ABSTRAK

Di tempat-tempat di mana bencana banjir sering terjadi, kekurangan air bersih menjadi perhatian. Beberapa metode penyediaan air bersih yang ada mungkin tidak terlalu berhasil karena krisis, serta lokasi, infrastruktur, dan kekangan lain. Bagi mangsa bencana banjir, membangun unit bekalan air bersih bergerak boleh menjadi pilihan alternatif. Sistem ini ditujukan untuk sumber air mentah di wilayah yang dilanda banjir yang memerlukan 7500 liter sehari atau 25 orang. Reka bentuk sistem pembersihan air ini berdasarkan teknologi dan penyelidikan terkini. Walaupun prosedur konvensional digunakan, sangat penting untuk merancang sistem yang mudah alih, mudah dipasang dan dibongkar, dan cukup kuat untuk mengangkut unit ke kawasan bencana di mana ia diperlukan. Reka bentuk ini menggunakan pam air turbo untuk meningkatkan tekanan, sehingga meningkatkan kadar aliran saringan, tetapi saringan dipilih secara rawak menggunakan carta morfologi berdasarkan ketersediaan pasar, dengan anggapan kawasan tersebut kekurangan daya dan air bersih. Tapisan sedang diteliti oleh pelajar lain, jadi penyelidikan masih diteruskan. Setelah dia mengesahkan pemilihan filter, reka bentuk ini akan menggunakan filter yang dipilih untuk sistem ini, yang cocok untuk sanitasi, memasak, dan minum walaupun menggunakan air yang tercemar sebagai sumber input. Sambungan antara sendi adalah fokus reka bentuk ini, yang dapat dipasang dan dibongkar dengan mudah kerana penggunaan bahan yang kuat.



ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

All praises go to Allah S.W.T in giving the strength to complete my Final Year Project. Mainly, I would like to the School of Microelectronic Universiti Malaysia Perlis for lending a chance to gain knowledge during my bachelor degree. With all knowledge gain from the start until now, I have gain the ability to complete my final year project.

I would like to extend my deepest gratitude to En Mohd Arizam bin Abdul Wahap as my supervisor for giving the support needed and sharing his knowledge, experience and guidance while this final year project is being carried out. All of the knowledge and experience shared I'll treasure and use it in my future. Thanks again for having the patience in guiding me and leading me to completing this final year project. All support, suggestions and contribution by them is a huge support to my final year project. Without this strong role, this final year project cannot be a success.

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Special thanks to my father Nazari bin Sha'ari and my mother Rozita binti Shamsuddin in supporting in the making of this final year project a success. I would like to thank also my siblings Mohamad Nasruddin bin Nazari. All of their physical, mental and financial support has a big impact in creating this final year project a success. I would like to acknowledge the assistance from my colleagues that is Muhammad Amirul Haziq bin Mazlan in supporting ideas. Not forget to all my discord members which non stop answering my question about something that I misunderstanding . From the moment of entering this university until graduation, through up and downs during my undergraduate study their support and memories will never fade.

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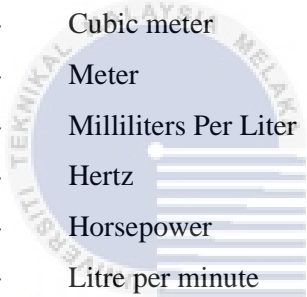
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LIST OF SYMBOLS AND ABBREVIATIONS

D,d	-	Diameter
L	-	Litre
LPH	-	Litre per hour
GPD	-	Gallons per day
cm	-	Centimeter
mm	-	Milimeter
kg	-	Kilogram
Psi	-	Pounds per square inch
KW	-	Kilowatt
m ³	-	Cubic meter
m	-	Meter
ml/L	-	Milliliters Per Liter
Hz	-	Hertz
Hp, hp	-	Horsepower
L/min	-	Litre per minute
V, v	-	Volt
l	-	Length
w	-	Width
h	-	Height
QFD	-	Quality Function Deployment
VOC	-	Voice of Customer
HOQ	-	House of Quality
NTU	-	Nephelometric Turbidity Unit
PVC	-	Polyvinyl chloride
UPVC	-	Unplasticized polyvinyl chloride
HDPE	-	High Density Polyethylene
	-	



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CHAPTER 1

INTRODUCTION

1.1 Background

Malaysia is physically positioned in the tropics near the Equator and, since it is still surrounded by the sea. Malaysia's east coast states get hit annually by monsoon rains between the end of the year 2020 and the early weeks of the new year. However, keep in mind that tropical rain usually comes in the form of heavy rain or thunderstorms, causing rivers to overflow. This will affect the residents living close to the river.

The flood-hit area in Malaysia is estimated at 29,800 km, or 9% of the country's total geographical area. Heavy rains from Siberia are sometimes brought to the peninsula by seasonal monsoon winds, which trigger seasonal monsoon floods on the east coast of Kelantan, Terengganu, Pahang, and East Johor. This is especially so in the East Coast region of the peninsula where the occurrence of such floods is considered a way of life (Chan, 1995). These are common and widespread, and they often turn into disasters, crippling the economy, communications, and public services, as well as causing property damage and death (Chan, 1996).

Vast capital development in urban area has diminished rain catchment area/ capability due to unstable surfaces, excessive rainfall, and insufficient water channels, the amount of water that can seep into the soil has been reduced, resulting in increased surface. When rivers and drainage systems are unable to deal with a sudden increase in water capacity in the catchment area, flash floods occur. Flash floods in Kuantan, Pahang, on December 25, 2012,

flooded several streets and buildings, causing retail malls to shutter their doors. By the end of 2013, the East Coast had been devastated by the worst flood in Malaysian history, rendering Kuantan almost immobile (See et al., 2017). In addition, there is a lack of drainage infrastructure. Existing infrastructure is often inadequate to handle newly developing regions. When the population grows, the infrastructure becomes insufficient, and floods become more often.

As a consequence of uncontrolled logging in hilly regions and large-scale rural agriculture, deforestation is being managed improperly. Flash floods in rural regions are caused by this. Moreover, trees play a role in the local water cycle by returning water vapor to the sky. Rainwater soaks into the soil and keeps it moist. Many complicated tree root systems help to preserve rich soils. The soil is now exposed to direct sunshine until the tree cover is removed, allowing it to dry. In the lack of trees, erosion happens often, washing the soil surrounding rivers and streams. A forest serves as a natural water purifying plant. Soil erosion exposes contaminants to the soil, which then seep into the water supply, contaminating our drinking water (*Deforestation - Causes, Effects and Solutions To Clearing of Forests - Conserve Energy Future*, n.d.)

According to the article from myMetro, when the river water level reaches a dangerous level, people along the river are usually advised to evacuate to the closest flood evacuation center. Angkatan Pertahanan Awam (APM) is in charge of rescue operations as well as serving as the secretariat for data collection on flood victims who have relocated. According to Mohd Arif, his party also works closely with other security authorities such as the Kelantan Jabatan Saliran (JPS) dan Saliran dan Jabatan Kebajikan Masyarakat (JKM) (*7,000 Mangsa Banjir Dijangka Pindah*, n.d.). However, theirs is a group of family leaders who would examine their homes in their free time with the authorities' approval to verify that they were secure and free of any strange events. No burglary or theft will occur

due to flooding. According to Kerian District Police Chief Superintendent Mazuki Mat, the action is also intended to reduce the crime of property theft while a home is empty (*Mangsa Banjir Tinjau Rumah Elak Diceroboh*, n.d.).

1.2 Problem Statement

According to this article, there are lack of clean water for flood victims, especially those in evacuation center according to Rosmah Sijam, 41. She said that just drinking water was provided, but that the availability of water for other purposes was uncertain, since toilet water was also unavailable. There is also no water accessible for bathing or sanitation (*Mangsa Banjir Di Kota Belud Kecewa Bekalan Air Di Pusat Pemindahan Tidak Mencukupi* / *Astro Awani*, n.d.). Without drinkable water, the health of the visitors will be gravely harmed, and their capacity to carry out everyday activities may be harmed as well. Because most of the water sources have been polluted by flood water and are unfit for household use, particularly drinking, lack of access to clean water is a serious concern.

Furthermore, water sources contaminated with high silt and suspended solids will make water treatment procedures more difficult because excessive turbidity makes appropriate treatment impossible. Water with a foul odor and taste is contaminated and contains germs. As a result, proper water treatment is required before use to remove disease-causing chemicals. Extreme flooding events may result in current transportation infrastructure disasters. Flood victims will lose communication with the authorities as a result. Clean water eventually could not reach the flood victims. After a flood, the process of restoring water delivery infrastructures is a problem for water providers. Due to the severe flooding that occurred, the area will be severely impacted. Due to this circumstance, fixing the water treatment plant would take a long time and there will be a delay in distributing water to flood-affected communities. In terms of health, the emphasis on water scarcity has forced

victims to drink water of uncertain hygienic quality, most water sources are filthy. This situation makes the sufferer susceptible to a variety of ailments, and it will increase the number of people who need immediate medical attention during the flood.

1.3 Project Objective

Specifically, the objectives are as follows:

- a) To design mobile clean water supply unit for flood disaster victims.
- b) To analysis mobile clean water supply unit.
- c) To fabricate the prototype.

1.4 Project Scope

The scope of this research are as follows:

- To design mobile clean water supply unit using SOLIDWORKS.
- To optimize strength analysis using SOLIDWORKS.
- To fabricate the prototype using selected material.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter is focusing on the research and design of a water filtration device for flood victims based on the design parameters. The data gathered was analyzed to determine the methods and systems that will be needed to develop or build a new water supply system design. The aim of this project is to create a clean water delivery system using flood water as a source which the system should be mobility, ease of assemble and disassemble and robust. Furthermore, research was conducted on a previous project titled "mobile water filtration system," which was the source for the system structure and guidelines for designing this system. Journals and academic papers were used to collect knowledge about solutions to apply the latest technology in order to further understand the project's core and findings. Suggestions from a prior project also provided a fresh outlook on approaches and improved the project's design.

2.2 Overview

A flood is one of the most dangerous natural disasters. It occurs when an excessive amount of water is gathered in a certain region. It often occurs as a result of severe rain. River overflows are creating widespread flooding in rural regions, resulting in this natural disaster. Infectious organisms such as E.coli, Salmonella, and Shigella, as well as the Hepatitis A Virus and typhoid, paratyphoid, and tetanus agents, are often found in flood water. The majority of illnesses linked with floods are caused by consuming polluted food or water. Agricultural or industrial chemicals, as well as hazardous agents found at flooded hazardous