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Mechanical Engineering Department

EASY BRING WATER FILTER

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TABLE OF CONTENT

NO	TABLE OF CONTENT	PAGES
	Dedication	4
	Acknowledgement	5
	Abstract	6
1	CHAPTER 1	
	1.1 Introduction	8
	1.2 Problem Statement	9
	1.3 Aim	9
	1.4 Objective	9
	1.5 Scope	9
2	CHAPTER 2	
	2.1 LifeStraw	11
	2.2 Katadyn Pocket Water Filter	12
	2.3 Etekcitey Portable Water Filtration Straw	13
	2.4 Literature About Water Filter	14
	2.5 Literature About Pump	15
3	CHAPTER 3	
	3.1 Introduction	17
	3.2 Easy Bring Water Filter Pack	18
	3.3 Flow Chart And Gantt Chart of Project	19-21
	3.4 Explanation on Product Components	22-23
	3.5 Project Equipment	24-25
	3.6 Material Cost	26
	3.7 Standard Operation Procedures	27
4	CHAPTER 4	
	4.1 Project design	29-30
	4.2 Prototype design	31
	4.3 Finalized design and drawing	32
	4.4 Theoretical research	33-37
	4.5 Questionnaire	38-43
5	CHAPTER 5	
	5.1 Conclusion	45
	5.2 Advantages	46
	5.3 Disadvantages	46
	5.4 Recommendation	47
6	REFERENCES	48

LIST OF FIGURES

No	LIST OF FIGURES	PAGES
1	CHAPTER 2	
	2.1 Lifestraw	11
	2.2 Katadyn Pocket Water Filter	12
	2.3 Etekcity Portable Water Filter	13
	2.4 Media Filter	14
	2.5 Water Pump	15
	2.6 Shadoof	15
2	CHAPTER 3	
	3.1 RO Membrane	20
	3.2 Battery	20
	3.3 Pump	20
	3.4 Solar Panel	21
	3.5 Flexible PUC Hose	21
	3.6 Bag	21
	3.7 Hand drill	22
	3.8 Soldering	22
	3.9 Angle Grinder	23
	3.10 Glue Gun	23
	3.11 Screw Driver	23

DEDICATION

Thank you and grateful to Allah and the support from our supervisor, MR. ROSLAN BIN KAMARUDDIN, we get finished our project 'Easy Bring Water Filter. This project is to design and create a water filter that can be bring into any difficult situation.

We want to thank and give appreciation to Sultan Salahuddin Abdul Aziz Shah Polytechnic and our lecturer for giving us the chance to finish this project without support and idea gave from authorities' polytechnic, as students, maybe we will face many problems while doing the project proposal and project.

Finally, we want to thank our family for giving support to finish this project. We also like to thank to all our outstanding team and class since that without group member our cooperation among group project will not be completed.

ACKNOWLEDGEMENT

Bismillahirrahmanirahim,

Alhamdulillah, Thanks to Allah the most merciful and the most gracious, whom with his willing giving us the opportunity to complete this Final Year Project which is titled Easy Bring Water Filter. This final year project was prepared for Mechanical Engineering Department of Sultan Salahuddin Abdul Aziz Shah Polytechnic, basically for student in final year to complete the undergraduate program that leads to the Diploma in Mechanical Engineering.

Firstly, we would like to express our deepest thanks and appreciation to MR. ROSLAN BIN KAMARUDDIN, a lecturer at Mechanical Engineering Department, Sultan Salahuddin Abdul Aziz Shah Polytechnic and also assign as our supervisor that had guided us for two semester from December 2019 to June 2020 session. We also would like to thank other lecturer and staff of Mechanical Engineering Department, Sultan Salahuddin Abdul Aziz Shah Polytechnic for their cooperation, information, suggestions and guidance during completing this final year project.

Besides that, deepest thanks and appreciation to our family, especially our parents for their cooperation, encouragement, constructive suggestion and full support from the beginning until the end of making the project. Thanks to our friend as well and others, that have contributed by supporting our work and help us in completing this project.

Last but not least, thanks to our Academic Advisor, SIR BRYAN TZE KEON HEE for the great commitment, encouragement and cooperation during the process of completing our Final Year Project.

ABSTRACT

Nowadays, the water pollution was the biggest problem during the flood. This problem has been an issued but stay can't be solve in the best way. So we come out with an idea to design a water filter that can be bring into difficult situation. The water filter is done by using concept of the water filter that can treated unclean water and the concept of portability. The problem that can be faced during flood is the untreated water in the pipe and lack of clean water. We usually will wait for the volunteered to bring the unguaranteed clean water to us at flood relief camp. So this project will come with new ways. First, put the water pumps into the machine by using mini submersible water pump. After that, the water will flow into the filter that consists gravel, sands, coir fibre and activated carbon that will cleaned the untreated water. After the water being filtered, the water will flow into the next part which is Reverse Osmosis Membrane. Lastly, the water flow out through the outlet pipe and ready to use. With this project, a new kind of way to treat the water at the flood will be solved. This project could also be potentially commercialized as it has the potential to be marketed in the business industry because of its function towards the community.

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Water Filter is a well-known and commonly used device in everyday life. Most of the family nowadays has one water filter in their home. In ancient Greek and Sanskrit (India) writings dating back to 2000 BC, water treatment methods were recommended. People back then knew that heating water might purify it, and they were also educated in sand and gravel filtration, boiling, and straining. The major motive for water purification was better tasting drinking water, because people could not yet distinguish between foul and clean water. Nowadays, water filter has evolved and becoming one of the most important thing in this world and even a main device to get clean water for each family in their home.

In these modern days, there are many types of water filter. Before this common water filter just been used at certain place such as at home, hospital and hotel to get clean water for their daily use. However, this could bring a problem to some users. This is because the water filter can't be bringing into different places for different purposes.

The concept of Easy Bring Water Filter is based on the current phenomenal in filtration industry which is filtration method that are used in today's filtration field.

In today's filtration industry, water filters are usually stay or installed in one place. It means that the water filter just can be used for one place or building for water filtration method. It has limited function. Users in this modern days prefer filter that can be used in any place. It means that they did not have to waste money to buy two filters for same purposes but different places. With the aid of Easy Bring Water Filter, filtration process can be a lot easier than the old water filter.

Easy Bring Water Filter is the innovation from water filter at home and the concept of portability. Easy Bring Water Filter is a new way to filter the water in difficult situation and this project is able to overcome problem of "untreated water" in different situation such as flood situation, camping and rural area. Before this common water filter just been used at certain place such as home, hospital, so the Easy Bring Water Filter was design to ease the community to filter the water in any place and situation.

1.2 PROBLEM STATEMENT

Nowadays, water filter becomes one of the important things in our daily life. It is usually being used to filter the untreated water in the system at buildings such as at home, hotel and restaurant. Example of the biggest untreated water problem that we will face is when in the flood situation. So, we usually will wait for the volunteer to bring the unguaranteed clean water to us at flood relief camp. The water maybe contains bacteria that can cause Diarrhea.

The other problem is if we want to go to do outdoor activities such as camping or go for volunteering in the rural area, we usually buy the mineral water from the shop or bring water that had been filtered from our home, it will be a burdened to us to carry it into the jungle. Therefore, The Easy Bring Water Filter Pack is designed to overcome these problems.

1.3 AIM

To design and fabricate a new design of water *filter that is able to bring in* different and difficult situation.

1.4 OBJECTIVE

The project is the result of modification from the way to filter water from different situation by referring to the problems faced by users. On top of our group concerns on the issues raised, our group has developed three objectives for this project. The objectives of our project are:

- To study how flood water can be filtered into treated water as drinking purposes.
- To create a new innovation of multi-functional bag.
- To investigate how the water filter changes the pH of the untreated water to clean water.

1.5 SCOPES

Scope or limitation of the project must be done as a reference while doing the project so that it will achieve the objectives without exceeding it. The scope assigned based on the objectives of the project. For the Easy Bring *Water Filter, the scopes are:*

- Used to remove dirty and rubbish in the untreated water.
- Help the community to get clean water in needed time.
- Filter the water with 99% efficiency.

CHAPTER 2: LITERATURE REVIEW

LITERATURE REVIEW

The literature review was made to get information related to the project developed. In this view, the focus is more on project that have been carried out either made directly or just by observation. In the context of this project design, a detailed information about all aspects is important to ensure that each process can run properly. This chapter reviews the similar product according to our project which is Easy Bring Water Filter. LifeStraw and Katadyn Pocket Water Filter used the same concept of portability. These water filters can filter water in any place and in different situation. Since the water pollution is on the rise globally, the innovation of the water filter needed to be carried out. By using the concept of portability likes the other water filter, Easy Bring Water Filter is designed to ease the community to filter the untreated water. Therefore, the LifeStraw and Katadyn Pocket Water Filter were used as the reference for our project.

2.1 LifeStraw



Figure: 2.1

The LifeStraw water filters are designed by the Swiss-based Vestergaard Frandsen. The LifeStraw is now used as a tool for survivalists and packed in emergency preparedness kits in addition to being used to help combat clean water scarcity worldwide. LifeStraw is ideal for emergency preparedness, as well as for campers and hikers who may be drinking from rivers or lakes and are unsure of the water safety.

LifeStraw has received significant accolades since its original design was invented in 2005. Time Magazine named LifeStraw the “Best Invention of 2005.” In 2008, it won the Saatchi and Saatchi Award for “World Changing Ideas”. The disadvantage of this product is it just can filter a plenty amount of water. It is not suitable to use if the human want to filter a lot of water.

2.2 Katadyn Pocket Water Filter



Figure: 2.2

The Katadyn Pocket is a filter designed with longevity and reliability in mind. Made with solid metal pieces and a silver impregnated ceramic filter, it can treat over 13,000 gallons before needing a replacement cartridge, and it comes with a whopping 20-year warranty.

The Pocket would be ideal for river trips, or guides who are treating water for large groups of people where weight is not as much of a concern. Since it is a pump, it can treat as much or as little water as desired. It requires some muscle to pump through the silver impregnated ceramic depth filter. The disadvantage of this product is it requires a lot of human energy to pump the water so the human will be tired after they used this product.

2.3 Etekcicity Portable Water Filter Filtration Straw



Figure: 2.3

This water filter is tested in agreement with FDA Standards. The users also can filter more water on a single filter. This product comes with additional accessories such as water pouch, pre-filter, and many others to help with proper water filter. The UF membrane filter which is that had been used in this water filter is a better technology to help with more filtration than other commonly existing technologies.

The disadvantages of this Etekcicity Portable Water Filter Filtration Straw is the water filter is slower when it comes to filtering the water through device. It is not suitable because it is limited for one person for each use and just for drinking purposes. It can't filter water for a huge amount of human such as in the flood situation which is water is the main priority because it has a lot of purposes such as cleaning, cooking, and drinking.

2.4 Literature about 'Water Filter'



Figure: 2.4

Water Filter is a well-known and commonly used device in everyday life. Most of the family use at least one water filter in their home to get clean water for their daily uses. In ancient Greek and Sanskrit (India), the water treatment methods were recommended back to 2000 BC. People back then knew that heating water might purify it, and they were also educated in sand and gravel filtration, boiling, and straining. The major motive for water purification was better tasting drinking water, because people could not yet distinguish between foul and clean water.

After 1500 BC, the Egyptians first discovered the principle of coagulation. They applied the chemical alum for suspended particle settlement. Nowadays, water filter has evolved and becoming one of the most important device in the world. The basic shape of water filter also has changed since the first model was developed around 1700s. Now we can find many water filter shape and size that suitable for different place.

2.5 Literature about 'Pump'



Figure:2.5

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

Pump was first invented by Egyptians around 2000 BC. Egyptians invent the Shadoof to raise water. It uses a long suspended rod with a bucket at one end and a weight at the other. Nowadays, pumps continuously evolved into many shape and type.



Figure: 2.6

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

Methodology can be ‘analysis of the principle methods, rules, and postulates employed by a discipline’, ‘the systematic study of methods that are, can be, or have been applied with discipline’ or ‘a particular or set of procedures’.

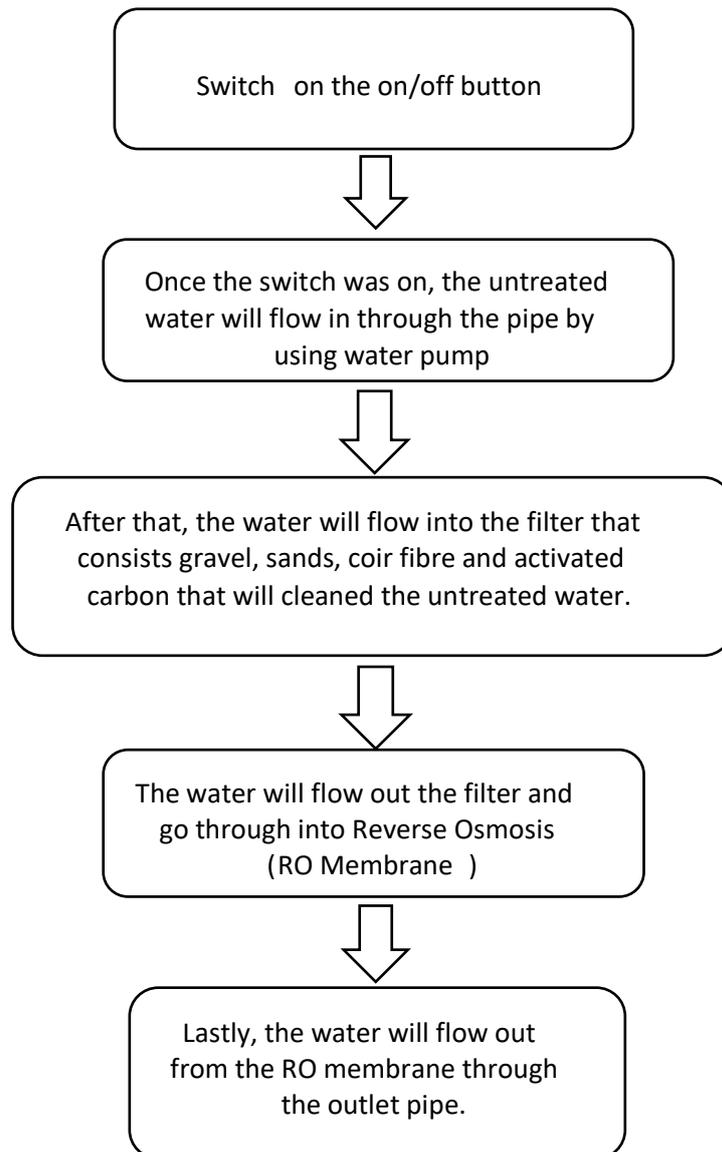
Methodology includes a philosophically coherent collection of theories, concept or ideas as they relate to a particular discipline or field of inquiry. Methodology refers to more than a simple set of methods rather, it refers to the rationale and the philosophical assumptions that underlie a particular study relative to the scientific method. This is why scholarly literature often includes a section on the Methodology of the researches.

Each step of project is a process to complete the project. Every step must be followed one by one and must be done carefully. If or when any error occurs, it can make a project probably not to operate properly and perfectly.

This chapter will discuss about the design of the project which is Easy Bring Water Filter Pack. The step to make this project must be follow by according to the process flow below to achieve the stated objectives of this project.

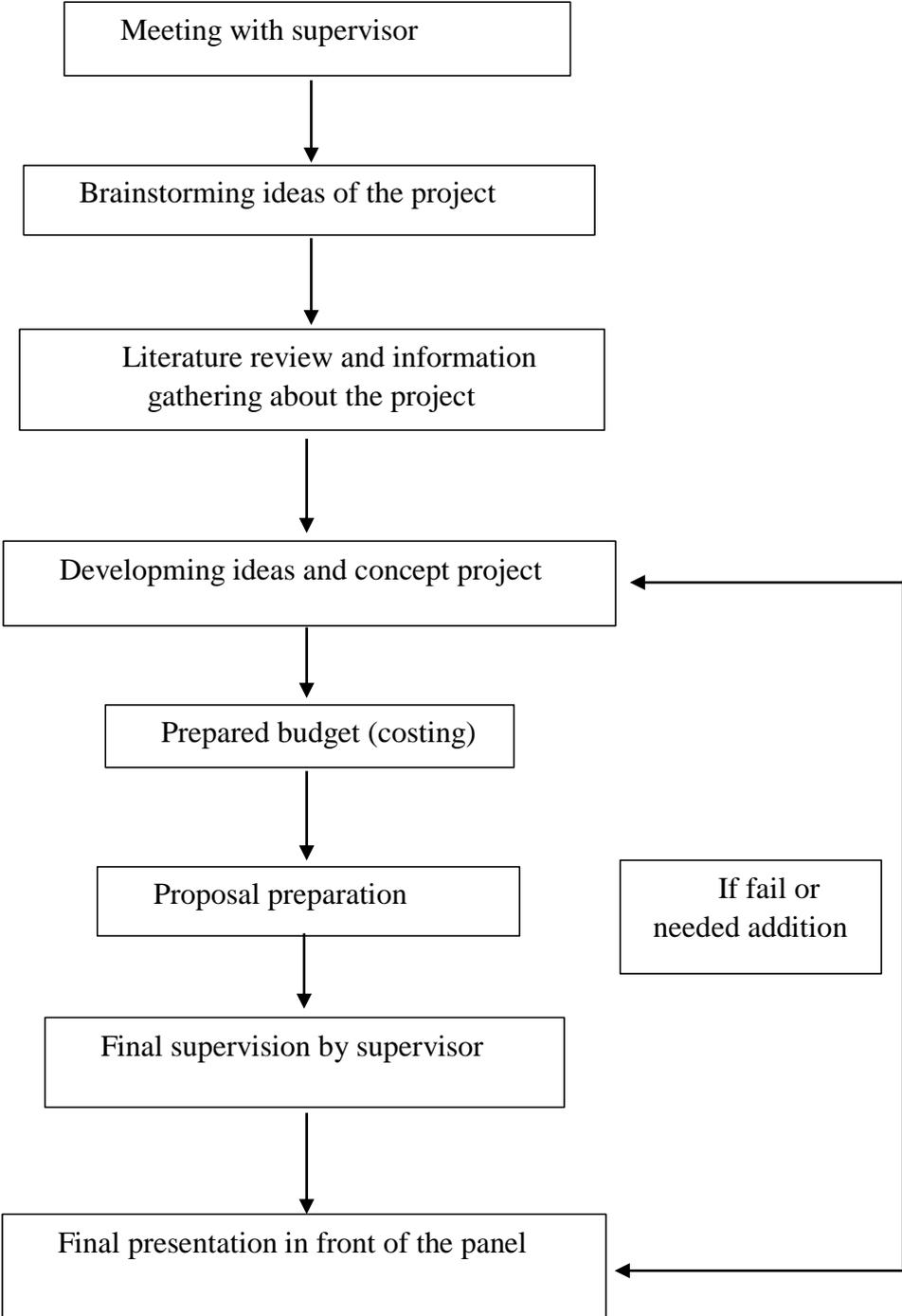
- Process of designing.
- Process of making.
- Testing the mechanism.

3.2 EASY BRING WATER FILTER



3.3 FLOW CHART AND GANTT CHART OF PROJECT

Project Implementation Procedure



SEMESTER 4

PROGRESS/WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Setup team															
Selecting a supervisor															
Decide a concept															
Sketch out the ideas															
Concept description															
Research															
Discuss with lecture about concept															
Study of component															
Budget preparations															
Preparing proposal															
Preparation for presentation															
Hand in chapter 1-3															

SEMESTER 5

PROGRESS/WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project preparation	█	█													
Order material		█	█												
CAD Drawing				█	█	█									
Prototype construction					█	█	█	█							
Testing project							█	█							
Prototype troubleshooting								█							
Finalize prototype									█	█					
Poster design											█				
Video and report										█	█	█			
Preparation for presentation											█	█	█		
Submission proposal														█	█

3.4 EXPLANATION ON PRODUCT COMPONENTS

Table 3.1 Explanation on product components

COMPONENT	FUNCTION
<p>1. Reverse Osmosis Membrane</p>  <p>Figure 3. 1 RO Membrane</p>	<p>Reverse Osmosis Membrane is a component that carry a process in which dissolved inorganic solids (Arsenic, Cadmium, Lead, Nitrate, Fluoride, Selenium, and Radionuclide) are removed from a solution (such as water). This is accomplished by house hold water pressure pushing the tap water through a semipermeable membrane. In fact, RO processes began being utilized by municipalities back in 1977. Since then, Reverse Osmosis has become increasingly popular because it is safe, cost-effective, and easy to maintain.</p>
<p>2. Battery</p>  <p>Figure 3.2 Battery</p>	<p>Battery 12 DC V. Its function is to be the power supply and supply the energy toward the motor pump to make pressure. The pressure that had been made by the pump will pump in the water using the pipe through the water filter.</p>
<p>3. Water Pump</p>  <p>Figure 3. 3 Pump</p>	<p>Micro Electric High Pressure Diaphragm Water Pump Self Priming DC 12V 60W Motor 5L/min Its function is to be the alternative ways to pump in the contaminated water through the pipe to be filtered by the water filter.</p>

MATERIAL	EXPLANATION
<p data-bbox="188 264 387 297">4. Solar Panels</p>  <p data-bbox="347 656 639 689">Figure 3.4 Solar Panel</p>	<p data-bbox="818 327 1407 394">Solar panels absorb the sunlight as a source of energy to generate electricity or heat.</p> <p data-bbox="818 416 1407 842">A photovoltaic (PV) module is a packaged, connect assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 365 Watts (W). A single solar module can produce only a limited amount of power; most installations contain multiple modules.</p>
<p data-bbox="188 907 475 940">5. Flexible PVC Hose</p>  <p data-bbox="296 1301 691 1335">Figure 3.5 Flexible PVC Hose</p>	<p data-bbox="818 907 1407 1099">Flexible PVC hose is used to transport the water that had been pumped in by the water pump. Hence, this hose is used due to its high durability in robust environment such as in extreme heat condition and more.</p>
<p data-bbox="188 1406 280 1440">6. Bag</p>  <p data-bbox="395 1783 592 1816">Figure 3.6 Bag</p>	<p data-bbox="818 1406 1407 1644">The main part. The bag will be the body for the other components. It designs to ease human to bring it on their back. The material of the bag is water resistant material, so the component in the bag will be safe if there are some leaking or rains.</p>

3.5 PROJECT EQUIPMENT

Table 3.2 Project Equipment

EQUIPMENTS	FUNCTION
<p>1. Hand Drill</p>  <p>Figure 3.7 Hand Drill</p>	<p>The hand drill is a tool with multi purposes. The hand drill is used to make holes for the hose to go through. The hole also for the water to flow in and flow out.</p>
<p>2. Soldering Gun</p>  <p>Figure 3.8 Soldering Gun</p>	<p>A soldering iron is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two workpieces.</p> <p>A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current (supplied through an electrical cord or battery cables) through a resistive heating element. Cordless irons can be heated by combustion of gas stored in a small tank, often using a catalytic heater rather than a flame. Simple irons less commonly used than in the past were simply a large copper bit on a handle, heated in a flame.</p>

3. Grinder



Figure 3.9 Angle grinder

An angle grinder, also known as a side grinder or disc grinder, is a handheld power tool used for grinding (abrasive cutting) and polishing. Angle grinders can be powered by an electric motor, petrol engine or compressed air. The motor drives a geared head at a right-angle on which is mounted an abrasive disc or a thinner cutoff disc, either of which can be replaced when worn. Angle grinders typically have an adjustable guard and a side-handle for two-handed operation

4. Glue Gun



Figure 3.10 Glue Gun

A hot glue gun is a very useful tool for joining modelling materials and even more substantial materials can be fixed together with it. 'Sticks' of solid glue are pushed into the back of the gun, the trigger is pressed pushing the glue stick forward and molten glue comes out of the nozzle.

5. Screwdriver



Figure 3.11 Screwdriver

A screwdriver is a tool, manual or powered, for turning (driving or removing) screws. A typical simple screwdriver has a handle and a shaft, and a tip that the user inserts into the screw head to turn it. The shaft is usually made of tough steel to resist bending or twisting.

3.6 MATERIAL COST

Table 3.3 Material Cost

NO	MATERIALS	QUANTITY	PRICE PERUNIT (RM)	TOTAL (RM)
1	Reverse Osmosis Membrane	1	RM 25.64	RM 25.64
2	Battery	1	RM 44.98	RM 44.98
3	Solar panels	1	RM 38.40	RM 38.40
4	Solar controller	1	RM 18.00	RM 18.00
5	Bag	1	RM 25.00	RM 25.00
6	Water pump	1	RM 38.80	RM 38.80
7	Male elbow	3	RM 3.00	RM 9.00
8	Straight male connecter	4	RM 2.00	RM 8.00
9	Flexible hose	2M	RM 1.50	RM 3.00
10	RO Membrane housing	1	RM 24.00	RM 24.00
11	Silica sand	1kg	RM 1.00	RM 1.00
12	Fine gravel	1kg	RM 1.00	RM 1.00
13	Coarse gravel sand	1kg	RM 1.00	RM 1.00
14	Carbon	1/2kg	RM 12.50	RM 12.50
	TOTAL			RM250.32

3.7 STANDARD OPERATION PROCEDURE

PROCEDURES	SAFETY PRECAUTIONS	DETAILS
<pre> graph TD A[The bag is carried on the back of the user] --> B[The flexible hose is placed into the water] B --> C[When the switch is on, the untreated water will flow into the water filter] C --> D[Next, the water will flow into RO Membrane through flexible hose] D --> E[Lastly, the water will flow out through the outlet hose and ready to used] </pre> <p>The bag is carried on the back of the user</p> <p>The flexible hose is placed into the water</p> <p>When the switch is on, the untreated water will flow into the water filter</p> <p>Next, the water will flow into RO Membrane through flexible hose</p> <p>Lastly, the water will flow out through the outlet hose and ready to used</p>	<ul style="list-style-type: none"> • Make sure to put the bag on a flat or stable ground before use it. • Remember to turn off the On/Off switch if the water filter is not used to avoid electrical waste 	<ul style="list-style-type: none"> • The water filter is not suitable for muddy water. • Remember to put or placed the hose into the water. Not just the tip of the hose just touch the water. • The battery is rechargeable so if the battery is low just put the bag at suitable place under the sun to charge it by using the solar panels.

CHAPTER 4: RESULT AND DISCUSSION

4.1 PROJECT DESIGNS

With this new way of water filter, the untreated water can be filtered easily and ease the user of the filter. We came up with many different designs. After testing many different methods, we managed to successfully choose the best design for this final year project.

Design 1

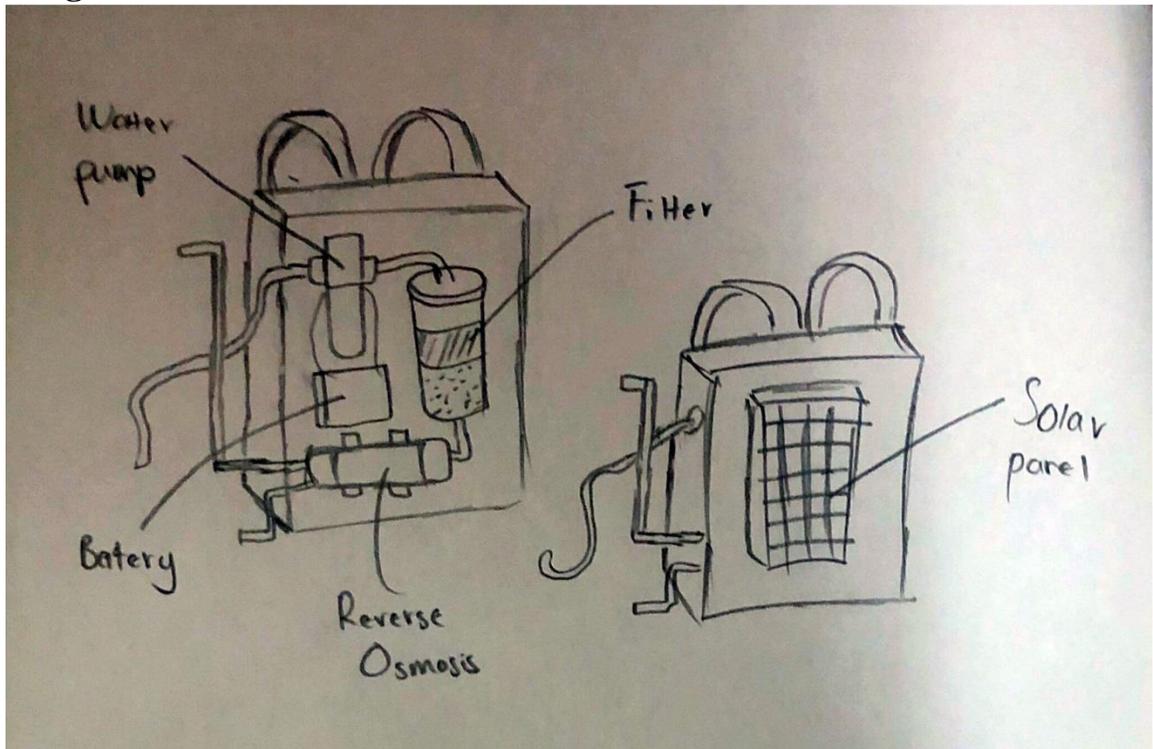


Figure 4.1 First Design

Design 2

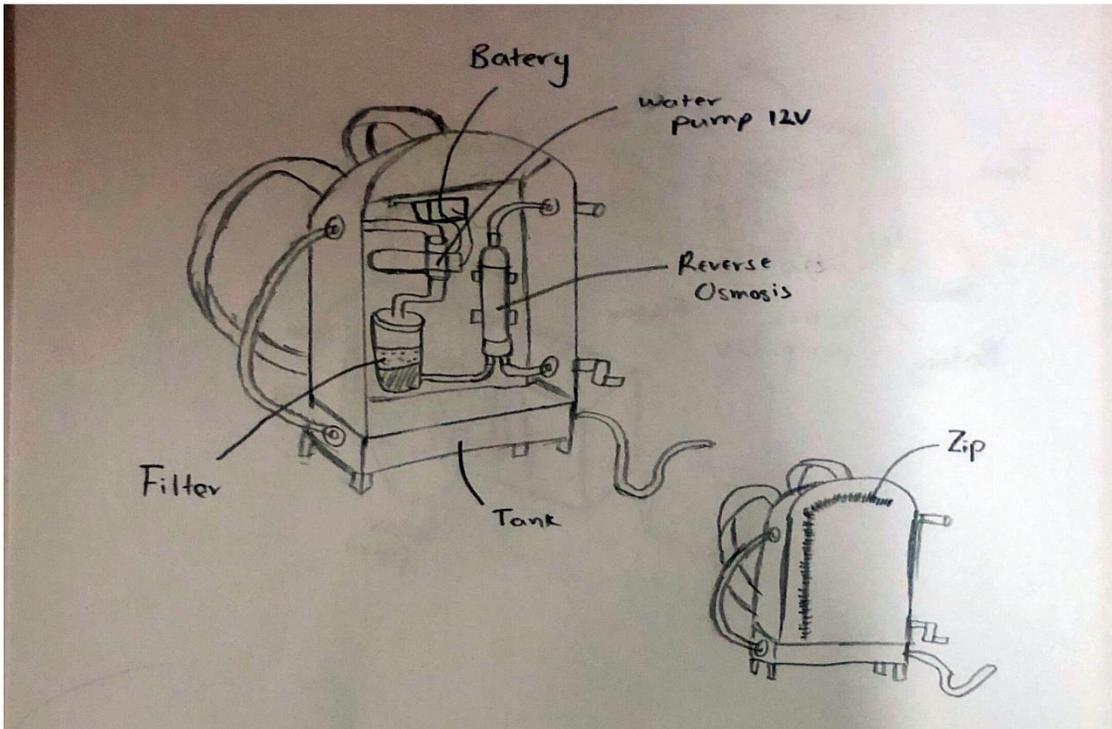


Figure 4.2 Second Design

Design 3

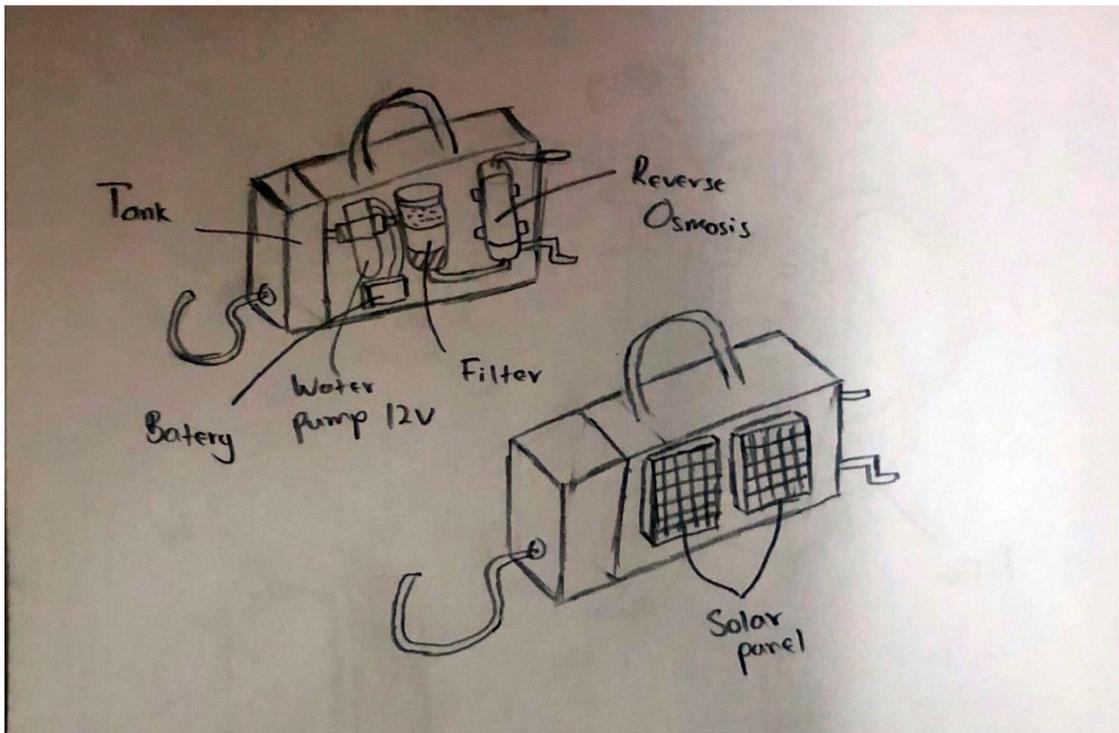


Figure 4.3 Third Design

4.2 PROTOTYPE DESIGN



4.4 PROTOTYPE

4.4 THEORETICAL RESEARCH

4.4.1 Filtration

The resultant water after sedimentation will not be pure, and may contain some very fine suspended particles and bacteria in it. To remove or to reduce the remaining impurities still further, the water is filtered through the beds of fine granular material, such as sand, etc. The process of passing the water through the beds of such granular materials is known as Filtration.

4.4.2 How Filters Work: Filtration Mechanisms

There are four basic filtration mechanisms:

Sedimentation:

The mechanism of sedimentation is due to force of gravity and the associate settling velocity of the particle, which causes it to cross the streamlines and reach the collector.

Interception:

Interception of particles is common for large particles. If a large enough particle follows the streamline that lies very close to the media surface it will hit the media grain and be captured.

Brownian Diffusion:

Diffusion towards media granules occurs for very small particles, such as viruses. Particles move randomly about within the fluid, due to thermal gradients. This mechanism is only important for particles with diameters < 1 micron.

Inertia:

Attachment by inertia occurs when larger particles move fast enough to travel off their streamlines and bump into media grains.

4.4.3 Filter Material

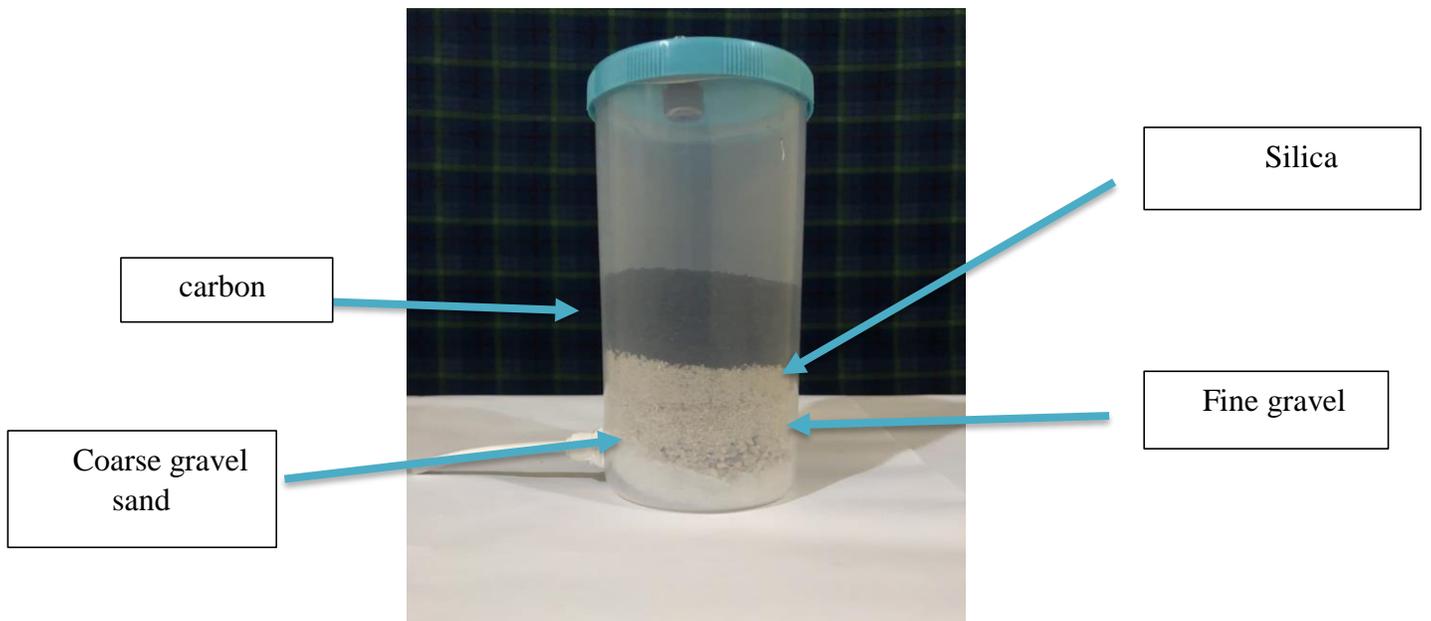


Figure 4.6: Filter material

1. Coarse Gravel Sand

- The layers of sand may be supported on gravel, which permits the filtered water to move freely to the under drains, and allows the wash water to move uniformly upwards.
- The size of the gravel is actually between 2.4 mm to 4.8 mm.
- The primary role of the gravel in the bio-sand filter is to prevent clogging of the PVC pipe with sand. For household intermittent sand filters, 2 layers of gravels are usually employed: on the bottom, a 5cm layer of 6 – 15mm gravel, followed by a second 5cm layer of 1 – 6mm coarse sand. The first layer is sufficiently deep to cover the inlet to the pipe and should be large enough to keep the openings in the filter bottom free for the flow of water out of the filter, and the upper layer fine enough that the overlying filter sand will not sink into its pores.
-

2.Fine Gravel

- The size of the fine sand in this filter is actually between 1.2 mm to 2.4 mm.

3.Silica sand

- Sand, either fine or coarse, is generally used as filter media. The size of the sand is measured and expressed by the term called effective size. The effective size, i.e. D10 may be defined as the size of the sieve in mm through which ten percent of the sample of sand by weight will pass.
- The uniformity in size or degree of variations in sizes of particles is measured and expressed by the term called uniformity coefficient. The uniformity coefficient, i.e. (D60/D10) may be defined as the ratio of the sieve size in mm through which 60 percent of the sample of sand will pass, to the effective size of the sand.
- The size of the fine sand in this filter is actually between 0.6 mm to 1.2 mm.

4.Carbon

- The function of carbon is to remove contaminants and impurities, using chemical adsorption.
- Carbon works via a process called adsorption, whereby pollutant molecules in the fluid to be treated are trapped inside the pore structure of the carbon substrate.
- Active charcoal carbon filters are most effective at removing chlorine, sediment, volatile organic compounds (VOCs), taste and odor from water. They are not effective at removing minerals, salts, and dissolved inorganic compounds.
- Natural filter media: this water filter media is created from materials such as bituminous, wood and coconut shell, no chemicals or other substances are added to water, therefore a natural filtration process is achieved.
- Excellent for enhancing the taste and odor of tap water.

4.4.4 SOLAR

- Solar panels absorb the sunlight as a source of energy to generate electricity or heat.
- A single solar module can produce only a limited amount of power; most installations contain multiple modules.
- Easy Bring Water Filter also have a solar panel to charge a 12 V DC battery. Solar panels can absorb the sunlight as a source of energy to generate electricity or heat. Then the energy that absorb by the solar panel flow to the converter which is convert 18V to 12V. After that, the energy has been converting by the converter and go through to the battery.

Figure 4.15 Solar panel



4.7 Solar

- How long Solar Panel Can Supply energy to the Battery
Energy that can be store in battery = $7.2\text{AH} \times 12\text{V}$
= 86.4-Watt Hour
- Energy can supply to battery = 10 Watt \times (the hours exposed to sunshine, X)

$$86.4 \text{ Watt} = 10 \text{ Watt} \times X$$

$$\circ X = 86.4 \text{ Watt} \div 10 \text{ Watt}$$

$$X = 8.64 \text{ Hours}$$

So, the solar panel need at least 8 hours to supply the full energy to battery

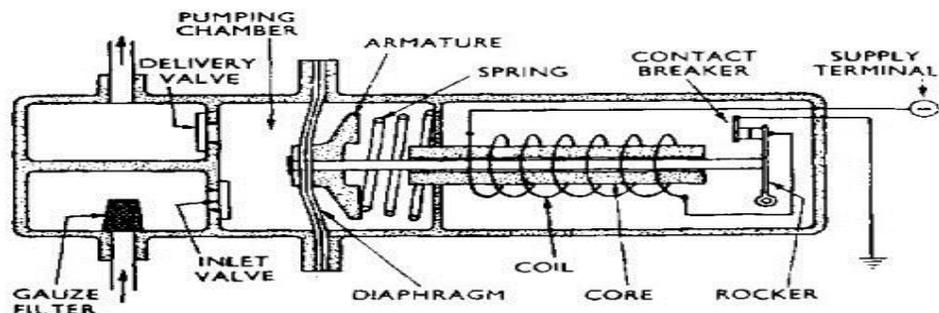
4.4.5 PUMP

DIAPHRAGM PUMP

A diaphragm pump (also known as a Membrane pump) is a positive displacement pump that uses a combination of the reciprocating action of a rubber, thermoplastic or Teflon diaphragm and suitable valves on either side of the diaphragm (check valve, butterfly valves, flap valves, or any other form of shut-off valves) to pump a fluid.

There are three main types of diaphragm pumps:

- Those in which the diaphragm is sealed with one side in the fluid to be pumped, and the other in air or hydraulic fluid. The diaphragm is flexed, causing the volume of the pump chamber to increase and decrease. A pair of non-return check valves prevent reverse flow of the fluid.
- Those employing volumetric positive displacement where the prime mover of the diaphragm is electro-mechanical, working through a crank or geared motor drive, or purely mechanical, such as with a lever or handle. This method flexes the diaphragm through simple mechanical action, and one side of the diaphragm is open to air.
- Those employing one or more unsealed diaphragms with the fluid to be pumped on both sides. The diaphragm(s) again are flexed, causing the volume to change.
- When the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and fluid is drawn into the chamber. When the chamber pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is forced out. Finally, the diaphragm moving up once again draws fluid into the chamber, completing the cycle. This action is similar to that of the cylinder in an internal combustion engine. Diaphragm Pumps deliver a hermetic seal between the drive mechanism and the compression chamber, allowing the pump to transfer, compress, and evacuate the medium without a lubricant.
- An elastomeric diaphragm can be used as a versatile dynamic seal that removes many of the limitations found with other sealing methods. They do not leak, offer little friction, and can be constructed for low pressure sensitivity. With the right material consideration, diaphragms can seal over a wide range of pressures and temperatures without needing lubrication or maintenance.





QUESTIONNAIRE

A: Respondent Information

SECTION A: DEMOGRAPHIC DATA OF RESPONDENTS

Age:

Occupation:

Gender:

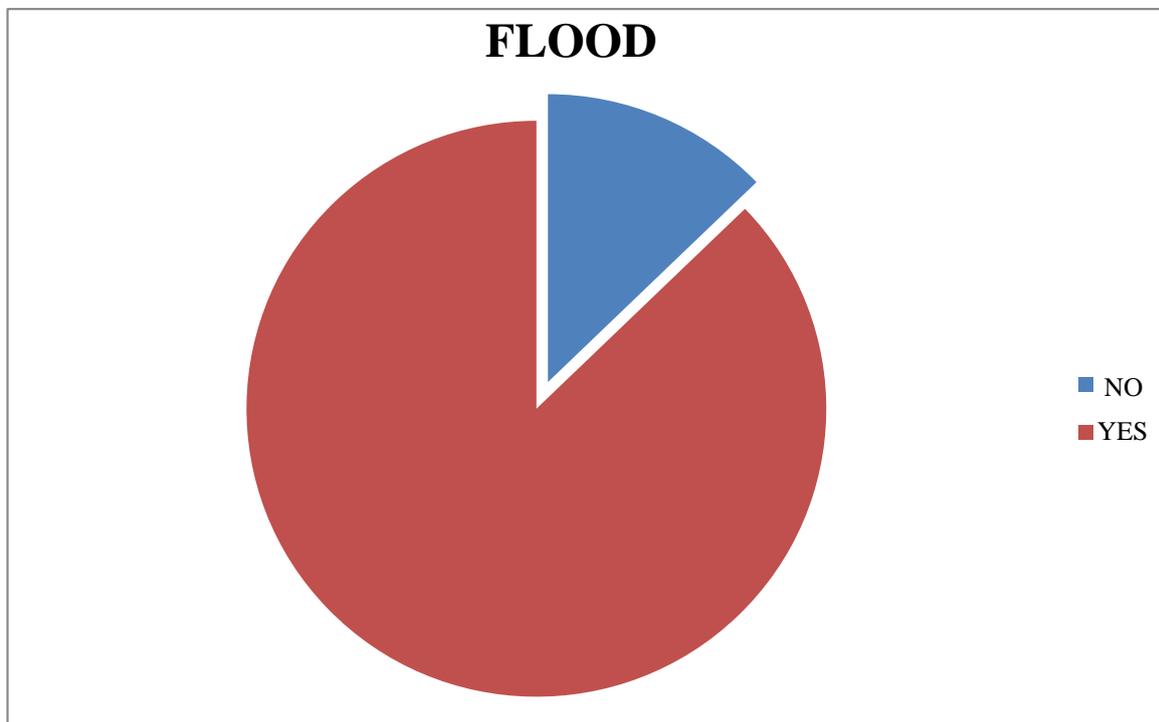
SECTION B: Questionnaire

Please tick (/) your answer in the space provided.

NO	QUESTION	YES	NO
1	whether your place is flooded every year		
2	Do you find it difficult to get clean water in the event of a flood or a picnic in the jungle?		
3	Do you always go on a picnic?		
4	when you are camping, do you have enough clean water		
5	Its easier to have easy bring water filter?		

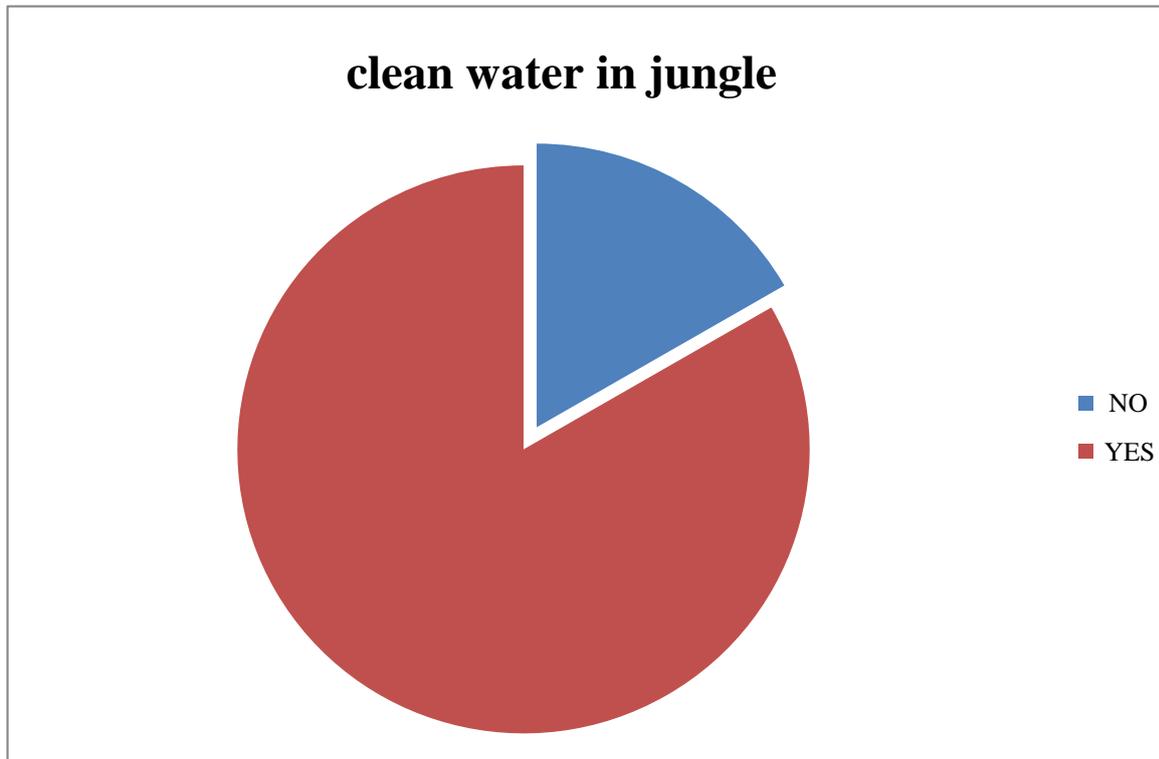
1.Respondents perspective on whether your place is flooded every year?

	Frequency	Percent
NO	3	13.04
YES	20	86.96
TOTAL	23	100.0



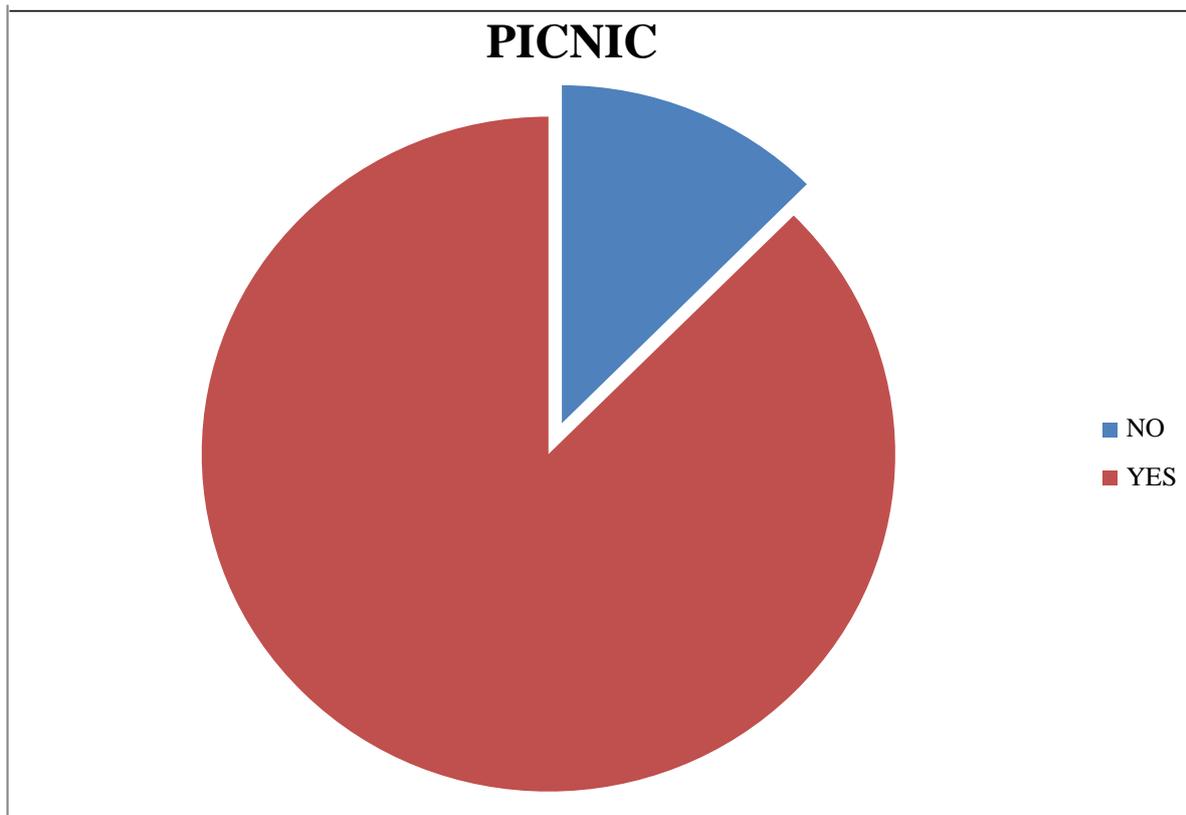
2. Responden perspective on do you find it difficult to get clean water in the event of a flood or a picnic in the jungle?

	Frequency	Percent
NO	6	16.67
YES	30	83.33
TOTAL	36	100.0



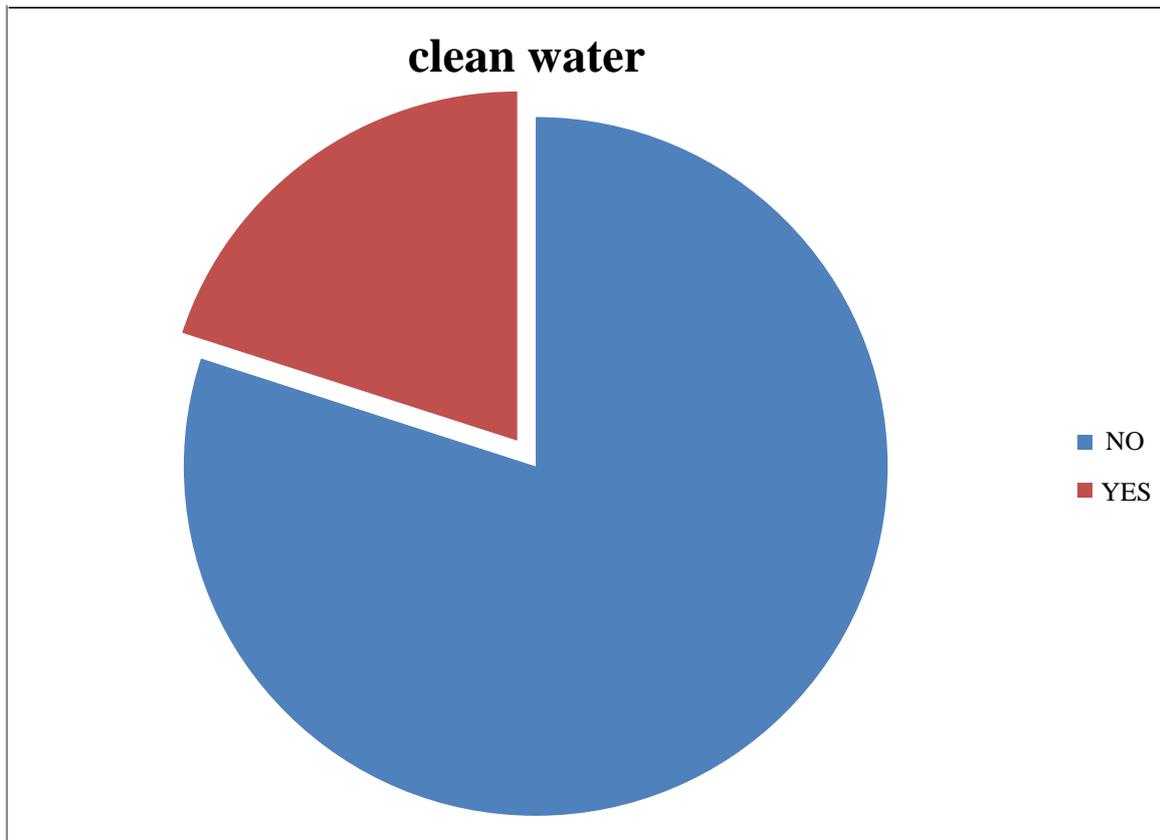
3.Responden perspective on do you always go on a picnic?

	Frequency	Percent
NO	3	12.5
YES	21	87.5
TOTAL	24	100.0



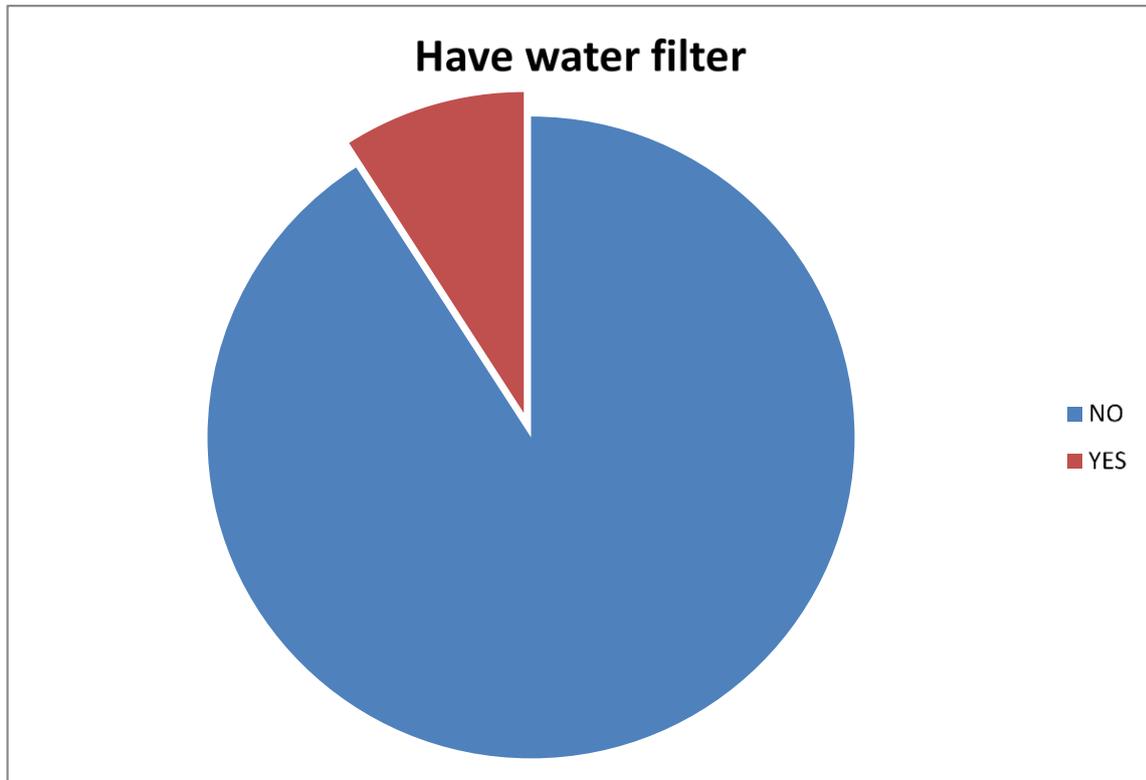
4.Responden perspective on when you are camping, do you have enough clean water?

	Frequency	Percent
NO	20	80.0
YES	5	20.0
TOTAL	25	100.0



5.Responden perspective on Its easier to have easy bring water filter?

	Frequency	Percent
NO	20	90.91
YES	2	9.09
TOTAL	22	100.0



CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

With Easy Bring Water Filter, a new type of filtration process is going to be introduced. This method is different to the old method, filtration process is more efficient specifically for human effort and the place to use it. This prototype is great in terms of portability because it enables the user to carry it on the back of the user to bring it to different places. It can cover many different place than the previous one which is commonly just for one place for one purpose.

This project could also be potentially commercialized as it has the potential to be marketed in the business industry because of its function and convenience towards the community especially people in Malaysia because of the flood problem in this country. It capable to change the pH of untreated water to normal pH of water for that can used by community. Other than filtered the untreated water during flood, this project also can be used during camping.

This project could also possibly be made as research or thesis project for upcoming undergraduates and students to develop or upgrade this project to other new level. Consequently, this project also contributes perfectly for people with the need of clean water. Easy Bring Water Filter could also be a helpful device for government or Non-Government Organization (NGO) during flood session in the country.

Lastly, Easy Bring Water Filter can be established as environmental and user friendly product and could be important for the future in the filtration industry.

5.2 ADVANTAGES

The filtration industry has invented and developed many kinds of filtration product to fulfil objectives used of many users. Easy Bring Water Filter, is a product that requires minimal effort to filter untreated water. In water filter industries, there are many type and method of filtration product that had been made. I believe that each of the method and product produced has it owns good value so do Easy Bring Water Filter. Some of the advantages discovered during this project are:

5.2.1 Portability: User can carried the water filter on their back and can be bring into different places in different situation. Common water filter just for one building or one place only.

5.2.2 Save Time: Easy Bring Water filter can save time of the user because it use battery to carry on the filtration process. It different than the other portable water filter that need the user to suck in for the water to be filtered.

5.2.3 Reduce Cost: The user no need to wait for the authorities to bring clean water for their daily uses during flood session. The user can save their money from buying the water for their emergency uses during flood session and during their camping.

5.3 DISADVANTAGES

There are advantages in the project, there are also disadvantages. It's common for product to have some disadvantage. The disadvantages can be improved in the future for better product. These are disadvantages were discovered during testing of the Easy Bring Water Filter:

5.3.1 Not suitable for muddy water

5.3.2 Not have backwash system

5.3.3 The material in the filter can't be change easily.

5.4 RECOMMENDATION

Easy Bring Water Filter is a device designed to help the filtration industry. This water filter provides an easier way to filter water in different places. There are few recommendations that can be made to this water filter after a few tests had been made:

5.4.1 The size of the bag can be more compact and small

5.4.2 The water filter should have a backwash system to make it easier for the user to change the filter.

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