



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN WATER TRASH COLLECTOR PROTOTYPE
FOR RIVER BANK APPLICATION**

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

by

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FACULTY OF ENGINEERING TECHNOLOGY

2016

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: DESIGN WATER TRASH COLLECTOR PROTOTYPE FOR RIVER BANK APPLICATION

SESI PENGAJIAN: 2015/16 Semester 2

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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 Technology (Refrigeration and Air-Conditioning System) (Hons.). The member of the supervisory is as follow:

.....
(EN. AMIR ABDULLAH BIN MUHAMAD DAMANHURI)

ABSTRAK

Malaysia adalah sebuah negara yang mempunyai sungai yang cantik. Tetapi pada masa ini, keadaan sungai di Malaysia dalam keadaan yang teruk kerana sikap penduduk Malaysia yang sering membuang sisa-sisa pembuangan di dalam sungai atau tasik. Dengan ini, menyebabkan pencemaran sungai. Antara kenyataan masalah yang dapat dibuat ialah pembuangan terus sisa-sisa pembuangan ke dalam sungai. Sebagai contoh, banyak pembinaan kilang-kilang yang beroperasi berhampiran dengan kawasan sungai. Di mana, hasil sisa- sisa buangan kimia terus dilepaskan ke dalam sungai. Selain itu, tumpahan minyak yang terjadi boleh menyebabkan kurangnya oksigen pada kehidupan laut dan boleh menyebabkan kehidupan di dalam air terancam. Antara objektif projek ini adalah untuk mereka sejenis alat yang dinamakan “Water Trash Collector” yang berupaya untuk mengutip sampah pada permukaan air. Di mana rekaan ini dapat boleh mengurangkan kos pembersihan dan kos penyelenggaraan. Pihak kerajaan terlalu banyak melabur wang untuk membina perangkap sampah. Tetapi tidak memberi impak yang besar. Antara skop yang dijalankan ialah mereka projek ini dengan menggunakan perisian solidwork dan mengemukakan idea-idea yang bagaimana untuk mengubah suai rekabentuk yang sedia ada. Jangkaan untuk projek ini ialah untuk mengurangkan kos pembelanjaan dan kos penyelenggaraan. Disamping itu, dapat mengurangkan kadar pembuangan sampah di dalam sungai. Selain itu, projek ini memberi kesan yang positif pada alam sekitar dan dapat mengurangkan kadar pembuangan sampah yang berlaku.

ABSTRACT

Malaysia is one of the countries in the world had a beautiful river. But at this time the condition of the river is polluted with the behavior of some people like to throw the domestic waste into the river. Therefore the water pollution will happen. The problem statement that can be made is domestic waste directly into the river. For example, many of the factories that operate close to the river. Where the remnants of chemical waste directly discharged into the river. Moreover, the oil spills that occur can cause a lack of oxygen to the marine life and can lead to life in water is threatened. The objectives of this project are to design a device that is named "Water Trash Collector " that attempts to collect trash on the surface of the water. In which this invention may be reducing the cost of cleaning and maintenance costs. The government has too much invest money to build a garbage trap. But do not have a big impact. The scope of the project is carried out by using software solid work and present ideas on how to modify existing designs. Expectations for this project is to reduce the cleaning cost and maintenance cost. Therefore, it can reduce the rate of waste disposal in the river. In addition, the project had a positive effect on the environment and can reduce landfills happen.

DEDICATION

To my beloved parents

En. Nasir Bin Omar and Pn. Norjidah Bt Shafie

My Talented supervisor

En. Amir Abdullah Bin Muhamad Damanhuri

My supportive co-supervisor

En. Azman Bin Ibrahim

My beloved and caring

Siblings and the one

ACKNOWLEDGEMENT

Alhamdulillah with deepest gratitude and appreciation, I would like to give thanks to the people who helped me in making my Final Year Project get degree certificate.

To my supervisor En. Amir Abdullah Bin Muhamad Damanhuri and my good-naturedly co-supervisor En. Azman Bin Ibrahim who shared and continuously sharing their knowledge with students like me from nothing to something. Thank you for both of you.

To the institution where I am studying, Universiti Teknikal Malaysia Melaka, where I am finishing my Bachelor's Degree Mechanical Engineering Technology (Refrigeration and Air-Conditioning System) and to all staffs give the opportunity to be educated without spending too much.

To my parents, for their unending love and support, for providing all my needs financially and morally, for their patience and understanding during my tiring days during the final year projects. My heart for both of you „Mak“ and „Abah“.

To all my friends and communities for helping and for being there to support me whenever I have difficulties during my thesis.

Last but not least, thanks to all involved in my Final Year Project directly or indirectly.

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CHAPTER 1

INTRODUCTION

1.0 Background

River pollution is a form of water pollution which refers to the introduction of different chemicals and other pollutants such as sewage, food waste and farm effluents into rivers. Rivers are among the most important sources of freshwater on our planet and this is one of the most important reasons why we have to address river pollution issue very seriously. Polluted rivers have the extremely harmful effect on river ecosystems mostly because water pollution causes the significant drop in oxygen levels, and many animals are not able to tolerate low levels of oxygen in rivers. Malaysia is one of the countries in the world have a beautiful river. But at this time the condition of the river in is polluted with the behaviour of some people like to throw the domestic waste into the river. This action can make it flood occurred and make many people nearest the river suffer. Besides that, the water pollution will happen. The government was invested on every year to make sure the condition of the river at the good condition. Many programs from Ministry of Agriculture did launch to give more expose about the deterioration of habit like to throw the domestic waste into the river. Besides that, the government also are invested much money in building the trash trap but this solution does not give the big impact to make sure the river clean from the waste. Another program from the government is to ensure the river environment clean from the waste is hired the contractor to collect the waste. But sometimes the contractor not followed the schedule to collect the trash.

This problem makes it the waste increase every day and certainly give the bad reputation to tourist when visit. One of the solutions is designed the waste trap to collect the trash to follow the schedule or time set. From this problem, Water Trash Collector with Pump will be designed to solve this problem. Besides that, water trash collector can reduce the cost. Where used the water pump as the medium to suck the waste and trap into container tank.

1.1 Problem Statement

The main causes of water pollution are waste domestic which is consists of garbage and sewage dumped indiscriminately into the river/lake. This resulted in a lack of oxygen in the water that can be a threatened aquatic life. The polluted river can also become a source of disease and animals that drink this water can even pass this disease to people after people eat an infected animal. Another problem is high cleaning cost. The government invested much money in building trash trap. High maintenance cost, the government is hired the contractor to collect the waste by using the boat.

1.2 Objective

The objectives of this project are:

1. To design and develop the prototype of trash collector for river bank application.
2. To evaluated the performance of prototype trash collector.

1.3 Scope

The scopes of this project are:

1. Designing trash collector part by using SolidWork software.
2. Propose the best design/improvement be made in existing design powered by electricity.
3. Fabricate and make assembly all the part and test run in the study area.

CHAPTER 2

LITERATURE RIVIEW

2.1 Introduction

Water (H₂O) is a chemical compound that is in liquid form at normal pressure and at room temperature. The total global water reserves are ~1.4 billion km³, of which around 97.5% is in the oceans and the remaining 2.5% is from fresh water present in the atmosphere, ice on mountains and ground water (Shakhashiri, 2011). Every all living thing on earth needs water to life and survive. In the face this earth, water is the most frequently encountered mainly in liquid form. However, there are also large quantities of water that exists in the form of gas vapor in the atmosphere and in solid form ice and snow (Al-Mayah, 2009).

A water molecule can be separated or broken down into basic elements by passing an electric current through it. This process is known as electrolysis describes two hydrogen atoms accept electrons to form the H₂ gas at the cathode while four OH⁻ ions combine to form O₂ gas oxygen at the anode. These gasses form bubbles and can be collected. Water a one of the universal solvent. This is because the water molecule consists of two atoms of hydrogen combine with one atom of oxygen This structure makes the water molecule has a positive charge on the hydrogen atoms and oxygen atoms on the negative. The water molecules have different of dipoles. Temperature characteristics allow the formation of a unique density stratified environment that ultimately controls the characteristics of chemical and biological aquatic environment. The layer formed as a result of the high surface tension that allows some organisms use them as surfaces for life.

The ability of water is to dissolve other materials allowed aquatic plants get the nutrients needed for the physiological process of water around it. Aquatic plants such as green algae do not require special structures to absorb nutrients or complex transportation system such as that shown by terrestrial plants to transport these materials to the tissues that need it most. Water and mineral can enter the body through any part of this plant are by diffusion only. These materials will penetrate through the cell membrane is exposed to the outside environment.

2.1.1 Causes of Water Pollution

The water is polluted by cause in the water itself. Take the oceans around 80 percent of ocean pollution enters our seas from the land. Any human activity can have an effect on the quality of water environment. When farmers fertilize the fields, the chemicals they use are gradually washed by rain into the groundwater or surface waters nearby. Sometimes the causes of water pollution are quite surprising. Chemicals released by smokestack can enter the atmosphere and then fall back to earth as rain, entering seas, rivers, and lakes and causing water pollution. That is called atmospheric deposition. Water pollution has many different causes and this is one of the reasons why it is such a difficult problem to solve.

2.1.1.1 Sewage and Wastewater

There are billions of people on Earth, so treating sewage is a big priority. Sewage disposal is a major problem in developing countries as many people in these areas don't have access to sanitary conditions and clean water. Untreated sewage water in such areas can contaminate the environment and cause diseases such as diarrhea (Phillips, 2010). Sewage in developed countries is carried away from the home quickly and hygienically through sewage pipes.

Sewage is treated in water treatment plants and the waste is often disposed into the sea. Sewage is mainly biodegradable and most of it is broken down in the environment (Mustafa, 2006). In developed countries, sewage often causes problems when people flush chemical and pharmaceutical substances down the toilet. When

people are ill, sewage often carries harmful viruses and bacteria into the environment causing health problems.

2.1.1.2 Mining Activities

Mining is the process of crushing the rock and extracting coal and other minerals from underground. These elements, when extracted in raw form, contain harmful chemicals that can increase the number of toxic elements when mixed with water can cause health problems. Mining activities emit several metal waste and sulfur from the rocks and are harmful to the water (Tutu, 2012). Figure 2.1 show the effect of mining activities to life.



Figure 2.1: Mining Activities

2.1.1.3 Marine Dumping

The garbage produced per household in the form of paper, aluminum, rubber, glass, plastic food collected and thrown into the sea. Trash takes from 2 weeks to 200 years to decompose. When things like this into the sea, they not only cause pollution but also dangerous animals in the sea (Kapoor, 2012). Figure 2.2 show the marine life affected because of marine dumping.



Figure 2.2: Marine Life Affected

2.1.1.4 Industrial Waste

Industries produce the huge amount of waste which contains toxic chemicals and pollutants which can cause air pollution and damage to us and our environment. They contain pollutants such as lead, mercury, sulfur, asbestos, nitrates and many other harmful chemicals (Hanjra, 2012). Many industries do not have the proper waste management system and drain the waste in the fresh water which goes into rivers, canals and later into sea.

The toxic chemicals have the capability to change the color of water, increase the amount of minerals, also known as Eutrophication, change the temperature of water and pose a serious hazard to water organisms. Tables 2.1 show the water pollutants by the industrial sector.

Table 2.1: Water Pollutants by Industrial Sector

Sector	Pollutant
Iron and steel	BOD, COD, oil, metals, acids, phenols and cyanide
Textiles and leather	BOD, solids, sulfates and chromium
Pulp and paper	BOD, COD, solids, chlorinated organic compounds
Petrochemicals and refineries	BOD, COD, mineral oils, phenols, and chromium
Chemicals	COD, organic chemicals, heavy metals, SS and cyanide
Non-ferrous metals	Fluorine and SS
Microelectronics	COD and organic chemicals
Mining	SS, metals, acids and salts

2.1.1.5 Oil Leakage

Oil spills make up about 12% of the oil that enters the ocean. The rest come from shipping travel, drains, and dumping. An oil spill from a tanker is a severe problem because there is such a huge quantity of oil being spilled into one place. Oil spills cause a localized problem but can be catastrophic to local marine wildlife such as fish, birds, and sea otters.

Oil cannot dissolve in water and forms a thick sludge in the water. This suffocates fish, gets caught in the feathers of marine birds stopping them from flying and blocks light from photosynthetic aquatic plants. The figures 2.3 show the penguins were affected by a fuel oil spill.



Figure 2.3: Penguins were affected by a fuel oil spill

2.1.1.6 Radioactive Waste

Operations conducted by nuclear power stations produce radioactive waste. Nuclear-fuel reprocessing plants in northern Europe are the biggest sources of man-made nuclear waste in the surrounding ocean.

Mining and refining of uranium and thorium are also cause of marine nuclear waste. Waste is also produced in the nuclear fuel cycle which is used in many industrial, medical and scientific processes. Figure 2.4 show the symbol of radioactive.



Figure 2.4: Symbol of Radioactive

2.1.1.7 Underground Storage Leakage

A tank or piping network that has at least 10 percent of its volume underground is known as an underground storage tank (UST). They often store substances such as petroleum, that are harmful to the surrounding environment should it become contaminated (Owa, 2013). Much underground storage tanks (UST) constructed before 1980 are made from steel pipes that are directly exposed to the environment. Over time the steel corrodes and causes leakages, affecting surrounding soil and groundwater. Figure 2.5 show the underground storage leakage happened.



Figure 2.5: Underground Storage

2.1.2 Effects of Water Pollution

The main problem caused by water pollution is that it kills the life that depends on these water bodies. Dead fish, crabs, birds and seagulls, dolphins, and many other animals often wind up on beaches, killed by pollutants in their habitat living environment. Pollution disrupts the natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and shellfish, and the food chain continues to be disrupted at all higher levels.

Eventually, humans are affected by this process as well. People can get diseases such as hepatitis by eating seafood that has been poisoned. In many poor nations, there is always the outbreak of cholera and diseases as a result of poor drinking water treatment from contaminated waters.

Nutrient pollution from upstream creeks and streams often flow downhill and even travel miles into other larger water bodies. The effect is that it breeds algae growth and causes the growth of much more water organism. This algae attack affects fish and other aquatic animals by absorbing and reducing their oxygen supply. Algae growth also clogs fish gills. Naturally, the order of ecosystem in that water is affected negatively, as the destruction or introduction of any foreign organism alters the entire food chain in there.

2.1.3 Preventing Water Pollution

It is easy to be overwhelmed by the problem of water pollution and thinks that individuals cannot make a difference. If each person in a township can be responsible in the way they deal with waste, sewage and the things that cause pollution, there would be a remarkable improvement to the problem. Preventing water pollution can be a two-way approach.

2.1.3.1 Individual

Know where all your drains and sewage lead to and make an effort not to throw waste water into drains and how to dispose of the chemicals and hazardous waste. If there are organic matter in your waste or sewage, think of ways to compost them, or follow laid down instructions given by your local council on how to dispose of the organic waste. Ensure that you comply with the waste disposal arrangements made by your council. Look out for, and be mindful of where to dispose the hazardous chemicals and medicines.

2.1.3.2 Government

Governments can invest in research, and assist with the provision of logistics for industries, farms, and businesses to dispose of the waste. Planning with these industries and farms creates an awareness of the consequences of their actions and establishes a commitment to reducing the negative impact of nutrient pollution.

Education on the dangers of water pollution is extremely important, as it helps people to apply the right attitudes when dealing with the environment. Education activities that get people informed and empowered to help protect water should be encouraged and invested in.

Laws must be enforced, with very hefty fines and actions for industries that do not comply with water pollution prevention laws. If industries know that they are being monitored and checked regularly, they will usually ensure best practices of waste and chemical dumping at all cost.

2.2 Malacca River

The river is an important element of the environment to humans. Since time immemorial, a human being has a close relationship with the river, because the river serves as a transport, communication, source of water supply for domestic and agricultural as well as a source of protein to humans.

Malacca is the third smallest state after Perlis and Penang. Malacca is located between Negeri Sembilan and Johor to the north to the south. Meanwhile, it is bordered by the sea on the west, known as the Straits of Malacca.

Malacca River is a major transport route for links between urban and rural areas. In other words, people build settlements close to the banks of the Malacca River is highly dependent on the river for drinking water supply and for daily use such as bathing, washing, and also suppliers of food, particularly fish and so on. Malacca River is also important as a supplier of water for agricultural and animal husbandry activities in rural areas (Hua, 2014).

As the State of Malacca is located in a strategic location, the government took the opportunity to develop Malacca as an International port. This situation has created a strong bond between humans and the river through socio-cultural activities, spirituality, heritage, and economy.

Malacca River state thrives when the Malacca Strait is recognized as a center of trade and the growing number of people who came from other states to Malacca to build settlements close to the river (Hua, 2016). The increasing numbers of a boat (canoe) in Malacca River illustrate the importance of the river as the road transport either to carry passengers or goods including husbandry products from one place to another place along the river. Progress Malacca River as road transport has also created job opportunities in that field.