



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**OPTIMIZATION OF RTCS MAIN FRAME BY USING
NUMERICAL METHOD**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours.

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I hereby, declared this report entitled “Optimization of RTCS Main Frame by Using Numerical Method” 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 fulfillment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

Encik Mohd Idain Fahmy Bin Rosley
(Project Supervisor)

ABSTRAK

Sungai Melaka merupakan salah satu daya tarikan untuk pelancong di Melaka. Disini terdapat aktiviti meniki bot menyusuri sungai Melaka untuk melihat keindahannya. Kos yang tinggi telah dikeluarkan oleh Kerajaan Negeri Melaka bagi mengindahkan persisiran sungai dengan membuat pembaikan pada struktur perumahan yang ada disepanjang sungai. Hasilnya indeks tahap kualiti air semakin meningkat dan perskitaran sungai Melaka semakin meriah dan indah. Walau bagaimanapun , sungai Melaka terus dibelenggu dengan pencemaran sampah. Sampah ini terhasil dari aktiviti seharian manusia yang tidak menghiraukan kebersihan dan juga aktiviti pembersihan sungai Melaka. Pembersihan sungai Melaka (flushing) dilakukan dengan membuka pintu empangan dihilir bagi membenarkan air laut masuk kedalam sungai. Air laut yang masuk akan membersihkan kekotoran lumpur dan bercampur dengan air sungai bagi menyahkan bau. Tetapi kemasukan air laut juga menyebabkan kesan sampingan. Air laut yang masuk akan menolak bersama sampah yang terkumpul diempangan untuk turut serta masuk kesungai Melaka. Dari masalah pencemaran air ini, konsep system pengumpul sampah sungai diperkenalkan dengan menggunakan bot pemungut sampah. Walaubagaimanapun satu inovasi yang lebih menjimatkan kos dan efisien telah dicipta iaitu pengumpul sampah sungai. Mekanisma terapung yang digunakan penting untuk memastikan system pengumpul sampah sungai mempunyai kecekapan untuk terapung dengan menggunakan system apungan dan konsep tangki balast. Projek ini mengkaji spesifikasi konsep apungan pengumpul sampah didalam air dan kajian sebelumnya menerangkan tentang ciri-ciri yang digunakan dalam peranti ini. Dalam usaha untuk menyelesaikan masalah-masalah didalam inovasi yang terdahulu, kajian telah keatas pemungut sampah sungai yang direka berdasarkan beberapa konsep idea dan cadangan bahan yang akan digunakan. Kajian yang

dijalankan akan mengenalpasti setiap rekabentuk mempunyai ciri-ciri tertentu,kebaikan dan keburukan. Tambahan pula, SolidWorks adalah perisian yang digunakan untuk merekabentuk sistem pengumpul sampah sungai . Perisian. Solid Thinking digunakan untuk menentukan kemampuan rekabentuk, ketahanan dan kesan terhadap faktor persekitaran. Setelah rekabentuk yang dikehendaki diperolehi berdasarkan data dan maklumat yang mencukupi, Selective Laser Sintering (SLS) digunakan untuk menghasilkan prototaip komponen atau model mengikut skala yang ditetapkan.

ABSTRACT

Sungai Melaka is one of the tourist attractions in Malacca. There are boating to see the beauty of the river. Malacca State Government has issued a high expenditure for the beautification of riverfront with making repairs to existing residential structures along the river. As a result, the index of water quality is rising and river surroundings Melaka more festive and beautiful. However, the Melaka River continues to be plagued with waste pollution. The waste resulting from human activities is not concerned about daily hygiene and cleaning activities river. Melaka River cleaning (flushing) is carried out by opening the door of the dam downstream to allow sea water into the river. The sea water mixed with river water that goes to wash the mud and dirt to aid smelly. They also cause side effects. Seawater entry will be refused with the accumulated garbage at dammed into Melaka River. From the problem of water pollution, a cost-effective technology has been introduced known as River Trash Collector System (RTCS) to collect the rubbish. It used floating mechanism and concept of ballast tanks to ensure River Trash Collector System (RTCS) has competence to float on the river. The project is studying the specifications of float mechanism for River Trash Collector System (RTCS) in the water and the previous study describes the features that are used in these devices. In order to solve the problems encountered in the previous innovation, research has conduct to River Trash Collector System (RTCS) based on ideas of designed and suggestions of materials to be used. The study will identify each design has particular characteristics, advantages and disadvantages. Furthermore, Solid Works software is used to design the system for River Trash Collector System (RTCS). Meanwhile, Solid Thinking software is used to determine the ability of design, durability and impact on the environment. After the desired design is obtained based on data and information adequate, Selective Laser Sintering (SLS) machines used to produce components according to scale the model established.

DEDICATION

To my beloved parents,

Jamilah bt Roslan, Nur Ainin Sofiya bt Azharudin, Nur Ainin Athirah bt Azharudin
and Muhammad Daniyal Wafiey bin Azharudin.

Thank you for all support, sacrifices, patient and willingness to share with me.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

RTCS	–	River Trash Collector System
PVC	–	Polyvinyl Chloride
CAD	–	Computer Aided Design
CAE	–	Computer Aided Engineering
FEM	–	Finite Element Method
CAM	–	Computer Aided Modeling

CHAPTER 1

INTRODUCTION

1.0 Research Background

The Malacca River which flows through the middle of Malacca City in the Malaysian state of Malacca was a vital trade route during the heyday of Malacca Sultanate in the 15th century. The river starts from the foothills in the neighboring state of Negeri Sembilan and feeds into the Straits of Malacca. Malacca River is now better known as a tourist and recreation. There are boat rides along the river Melaka to see events around the state run by PPPSM. Moreover PPPSM also were responsible to ensure the cleanliness and beauty of the river Melaka maintained that continues to attract tourists.

A USD\$100 million (RM350 million) infrastructure project to revive and rejuvenate the river which is the central to Malacca as an historic city was carried out. This has included construction of a tidal barrage, restoration of buildings and bridges, dredging, concrete river banks with river walkways. Land reclamation projects have extended the river mouth further into the Straits.(De Witt 2010)

In recent year, to tidy up the Malacca River, water will be discharge once it water level tallness achieved 7 meters. Generally the water will be discharge amid 2-3am consistently as this is high tide period. At that point, they let sea water into the river and close the entryway to give the river a chance to water blend with sea water. The mixing methodology of sea water expels smell of river brought on by natural matter found in waterway. By then, the water will be released to the sea through the gate of the river between Malacca Waterway and ocean. At that point, the water will be discharged to the sea through the door worked between Malacca River and sea. This flushing methodology evacuates the terrible stench of Malacca River utilizing sea water. However, a new problem arises when the sea water into the river declined

with the rubbish that has accumulated in the dam. A research by Li in (2009), a major barrier to water pollution forecasting is the absence of a proficient system for water pollution checking. Customary water pollution examining is tedious, costly, and must be taken for little sizes. Water pollution has turned into a wellspring of human disease. On the other hand, water which sustains human has ended up undetectable killer of humankind. Besides that, there has a lot of trash in the water. Trash float at water level, permitting ocean water bound with trash, oil, and cleansers persistently to spill into it. Thus, water pollution is about amounts of polluting substance discharged and how enormous a volume of water is released. A little amount of a harmful synthetic may have little effect on the off chance that it is spilled into the sea from a boat. Be that as it may, the same measure of the same synthetic can have a much greater effect pumped into a lake or river, where there is less perfect water to disperse it.

(Kean Hua & Ping 2016) also indicated that utilization of strategy in controlling and dealing with the water assets in Malacca River can be effectively actualizes. Be that as it may, the arrangement will take a long haul to actualize. Furthermore, the Malacca River that loaded with refuse and plastics bottles in the past is currently being spotless utilizing trash collector boat which is changed by them. This cleaning boat has a gap with a net in front to trap the garbage into it. This procedure just needs one watercraft driver and another gatherer. The gatherer is mindful to gather the huge waste into the receptacle to anticipate blockage. The garbage will be gathered once per day, and every procedure just takes around 3 hours for the entire river. This garbage authority vessel made the procedure of gather trash simple and quick if contrast with last time. Figure 1.1 below shows the trash collector boat in operation system.



Figure 1. 1:Trash Collector Boat

The River Trash Collector System (RTCS) is one option available to solve pollution at Malacca River was invented by Nurhidayah binti Hanizat as student degree Bachelor of Manufacturing Engineering Technology. In order to solve water pollution cases, River Trash Collector System (RTCS) is designed based on several concept ideas and suggestion of material to be used. The general idea comes from Sea bin concept which acts as a trash collector in sea area. But, there are several improvements necessarily in River Trash Collector System (RTCS) especially, floating mechanisms also important to make sure the River Trash Collector System (RTCS) has an efficiency to float by using buoy system and ballast tank concept. Figure 1.2 below shows the River Trash Collector System (RTCS) concept in operation system.

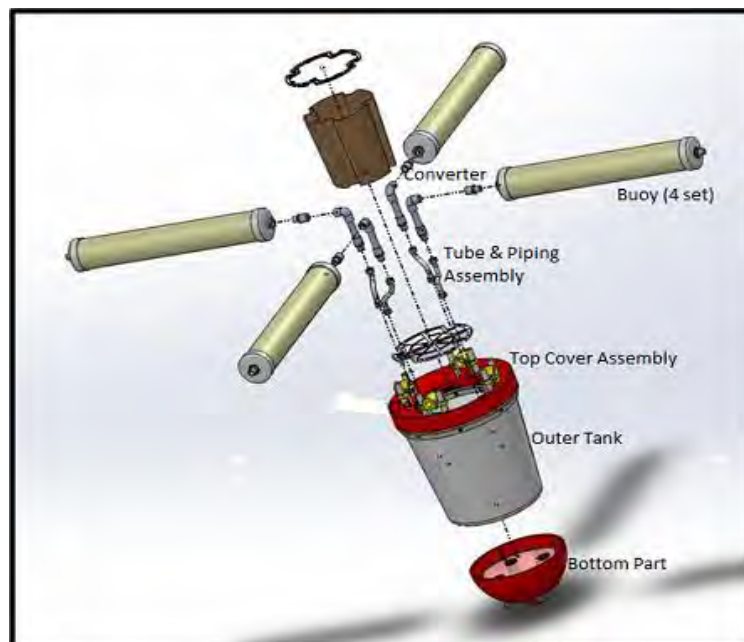


Figure 1. 2:Prototype of River Trash Collector System (RTCS)

1.0 River Trash Collector System (RTCS)

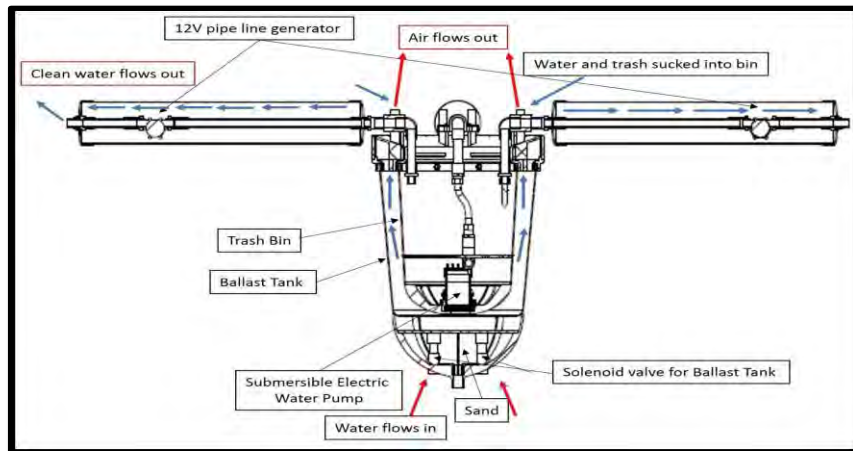


Figure 1. 3: Cross Sectional of River Trash Collector System (RTCS)

The process of River Trash Collector System (RTCS) is as follows:

- i. Water flows in at the bottom side when the water pump functions by using power source such as water turbine generator and solar panel.
- ii. Trashes will flow in at the top side of the bin and trapped at the trash bin inside. Then, clean water flows out by passing through the four corners buoy system.
- iii. Air in the water flows out from the River Trash Collector System (RTCS).

Figure below shows the water orientation for River Trash Collector System (RTCS)

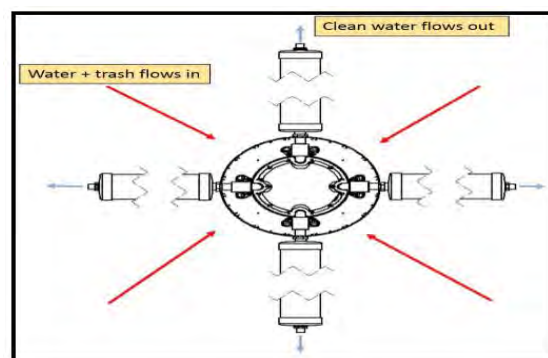


Figure 1. 4: Water Orientation of River Trash Collector System (RTCS)

1.0.2 Outline of RTCS View

These are outline of RTCS from the past review. A few perspectives of configuration are given to translate the detailed outline. The outline of RTCS is as per the following:

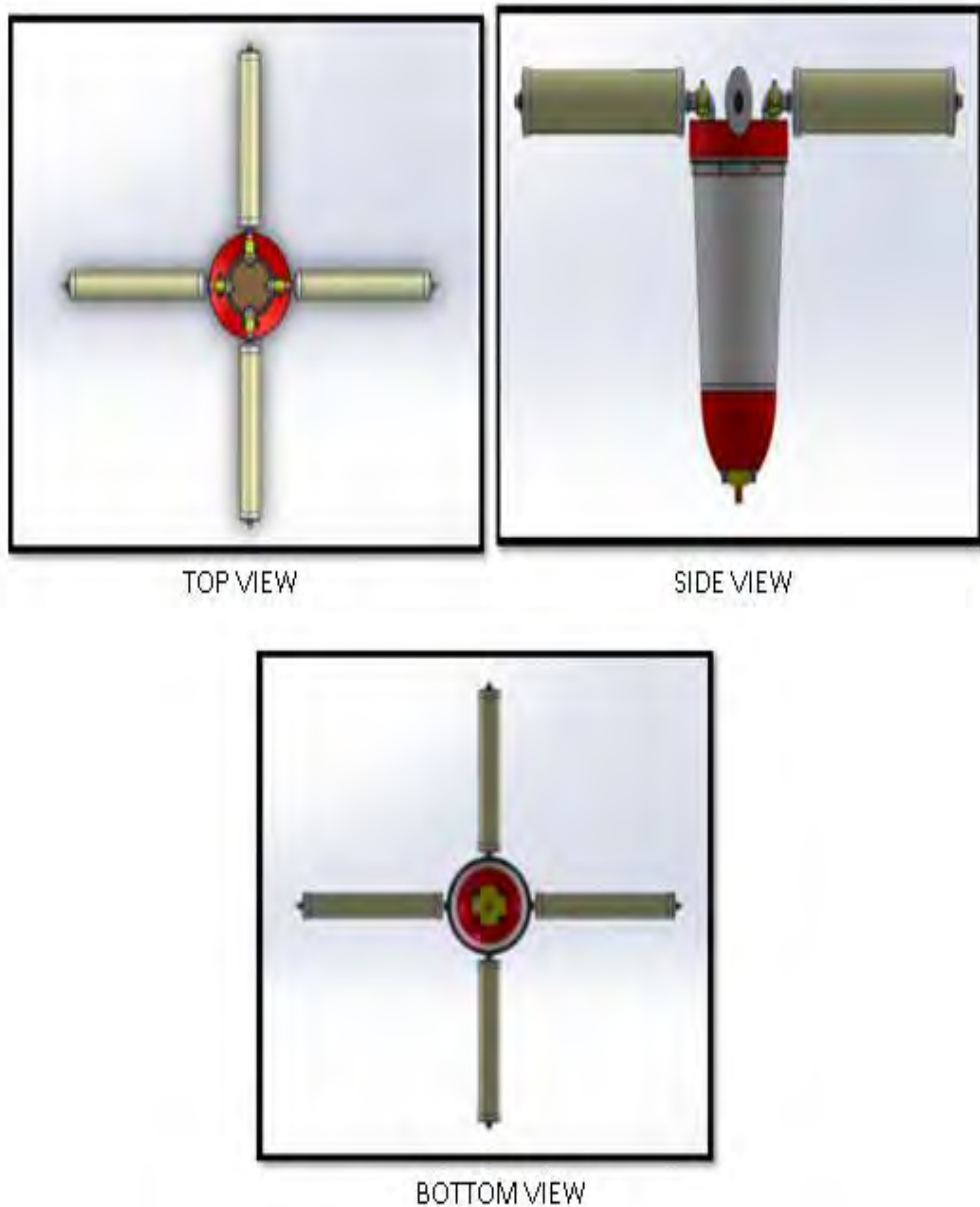


Figure 1. 5: RTCS Outline View

1.1 Problem Statement

River Trash Collector System (RTCS) has a floating mechanism in their concept to make sure that trash collector can float in the water area. A connector having a floating structure in corporate a floating holder for coupling segment associated with a compact electrical contraption to a base through a drifting instrument. The floating holder is shaped of plastic as a different part from a connector fundamental body that gave the fitting coupling segment. The coasting holder has a first holder and a second holder for squeezing and supporting a coupling deck of the connect or principle body from inverse sides. The principal holder and the second holder have locking snares and are coupled to each other specifically or through the connector fundamental body. Also, the principal holder and the second holder have necessarily shaped bolster parts for supporting the coupling deck of the connector primary body. So, it can connect all the sides off floating mechanism for River Trash Collector System (RTCS).

However, there are improvements to be made to existing forms to be customized according to the needs and problems faced. The problem that has been encountered is as follows:

- i. Constraints of space to put RTCS due to the small width of the Malacca river cause RTCS difficult to put in suitable areas to avoid being hit when the boat odds. Movement and disputes between the boats also produced strong waves that can cause RTCS budge and functions affected.
- ii. The ability to cope with the burden of body-connection between the float and the body made of PVC breakable because they could not support the weight of the body.
- iii. Float shape and size causes the body not being able to sink that affect the function of RTCS.
- iv. Aesthetic concept which a float made of PVC cylinder seems less aesthetic to impress people.
- v. Material durability effect because the float made of PVC material will always submerged in water and this will shorten its lifespan.

1.2 Research Objectives

The objectives of this research were as follows:

- i. To generate a new concept design main frame for River Trash Collector System (RTCS) using Solid works software.
- ii. To optimized the selected concept main frame for River Trash Collector System (RTCS) using Solid Thinking software.
- iii. To redesign the optimized result conceptual main frame of buoyancy mechanism for River Trash Collector (RTCS) using Solid works software.

1.3 Scope of the Research

The aim of this project is study produce some of main frame drawing for RTCS by sketching. Concept Selection Method is used to selected the model that can fulfill the criteria. The selected model concept will then be redesigned into 3D drawing using solid work software. The model drawings were subsequently optimized using Solid-Thinking software to obtain an aesthetic and less weight. After that, the drawings will be redrawn to get appropriate form using solid works software. Then, prototype will produce by Selective Laser Sintering machine. The resulting concept idea will be used in the future for RTCS development.

1.4 Significance of Research

Research embarked improved on main frame. A research of this main frame of buoy mechanism identified from the River Trash Collector System (RTCS) which was built. In order to overcome the problem of floating mechanism, the new design which takes into account aesthetic, durability and ability to ensure the efficient functioning of River Trash Collector System (RTCS) in Malacca River. The River Trash Collector System (RTCS) is based on green technology concept that can help on reducing pollution. This concept of design can considered new and

there has improvement characteristics to make sure the River Trash Collector System (RTCS) to good working order and reduce pollution in the water area. The main frame of buoyancy mechanism needs to be strong to carry approximate 860kg load. Moreover, they need to hold six buoys under it. Therefore, the structure must have safety factor too.