DECLARATION

I hereby, declared this report entitled "A Study of Fabrication Costs of Testing Rig for River Trash Collector System with the Application of Solid Thinking Inspire." is the results of my own research except as cited in references.

Signature	:	…….
Author's Name	:	Nurhafizah binti Halim
Date	:	……

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 Engineering Technology (Process and Technology) with Honors. The member of the supervisory is as follow:

…….

Encik Fariduddin Bin Mukhtar

ABSTRAK

Sejak tahun kebelakangan ini, Sungai Melaka telah dibersihkan dan pernah menjadi salah satu sungai yang paling kotor di dalam Malaysia dan menjadi contoh yang baik kepada negeri lain di Malaysia. Pencemaran air telah menjadi satu kebimbangan yang semakin meningkat kerana terdapat banyak sisa-sisa yang dilupuskan dalam laut, tasik dan sungai. Air adalah penting kerana manusia memerlukan air untuk menjalani kehidupan harian seperti untuk mandi, minum, masak, membasuh pakaian dan banyak lagi. Untuk menyelesaikan masalah ini,'*River Trash Collector System'* (RTCS) telah dicipta. Sebelum mencipta RTCS, ujian ke atasnya perlu dilakukan. Bagi melakukan ujian ini, satu tempat khas untuk pengujian RTCS dicipta iaitu ujian rig dimana ujian rig ini dapat menampung berat tangki air untuk menguji keadaan produk konsep sistem pengumpul sampah sungai jika berada di sungai sebenar tanpa mengubah atau memberi kesan yang teruk ke atas produk itu. Konsep dan sebut harga untuk membina ujian rig ini juga diambil di tiga kedai mengimpal besi yang berbeza. Konsep idea itu seterusnya di masukkan ke dalam perisian Solid Work untuk reka bentuk dalam tiga dimensi (CAD). Seterusnya, ketiga-tiga konsep idea tersebut perlu menjalani tekanan analisa. Setiap konsep idea itu terdapat kebaikan dan kekuranganya yang tersendiri. Perbandingan ketiga-tiga analisa akan dilakukan dan analisis dan sebut harga yang bagus akan dipilih sebagai konsep yang terbaik. Lalu, konsep idea yang telah dipilih itu seterusnya akan dibandingkan pula analisis dan kosnya dengan konsep idea dari produk kumpulan RTCS.

ABSTRACT

In recent year, Malacca River has been cleaned and have being the one of the dirtiest river in Malaysia change into a good example to others state. Water pollution has become growing concern as more waste is being disposed of in our oceans, lakes and rivers. Water is important because people need water to living their daily life such as to shower, drink, cook, wash and so many more. To solve this problem, River Trash Collector System (RTCS) are fabricate. The concept of this project is acknowledge via Seabin. . In order to solve the problem of the concept of a river trash collector system product, the rig test will undergo certain methods to obtain concept ideas and material proposals to be used. The purpose of this project is to study the commercial testing rig design regarding its structure, material and costs. Each commercial design has certain features, advantages, and disadvantages. Furthermore, SolidWorks is software used to design test rig and use welding to design a physical part scale model or assembly using a three-dimensional solid model (CAD) design. Then, the selected of commercial design will compared with group product design. The comparison is based on the good stress analysis and the low cost to fabricate this test rig. This research use Solidthinking Inspire Software to make an analysis to analyze which is the best result that can support the load given.

DEDICATION

Dedicate to my respectful father, Halim Bin Abdul Manap who are always there for me, to my beloved mother who are always give a good advice and support, to my siblings who are always pray for me, to my supportive friends. To my supervisor Encik Fariduddin Mukhtar and my co supervisor Encik Idain Fahmy Rosley who are always gives guidance and encouragements. To all UTeM's lecturers and lab instructor who are always help me. I would like to say thank you from bottom of my heart and thanks because trust me to complete this thesis.

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Alhamdulillah, I would like to express our thankfulness to Allah S.W.T for giving me all the strength in fulfilling and completely this final year project.

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Last but not least, I would like to express my gratitude to my loving parents and friends who had helped and given encouragement during the research. May Allah give His blessing to all of us.

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LIST OF ABBREVIATIONS, SYMBOLS, AND NOMENCLATURE

RTCS	-	River Trash Collector System
CAE	-	Computer Aided Engineering
CAD	-	Computer Aided Design
FEM	-	Finite Element Method

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter will explain the overview and the purpose of this study. This chapter includes the background of the study, problem statement, objectives that is expected to be achieved and the scope of the study that is going to be conducted.

1.1 Research Background

Water pollution has become growing concern as more waste is being disposed of in our oceans, lakes and rivers. Water is important because people need water to living their daily life such as to shower, drink, cook, wash and so many more. In recent year, Malacca River has been cleaned and being the one of the dirtiest river in Malaysia change into a good example to others state. From grade B, Malacca River has enhanced it to the grade A. Without proper method, it can effect to people and all living animals. Malacca River is a tourist attraction, if there has trash or water pollution at Malacca River, it will drop the reputation of the state of Malacca. For cleaning process at Malacca River, the workers need to use the collector boat trash to collect the trash frequently. This cleaning boat has a gap with a net in front to trap the litter into it. This process needs two workers which is a driver of the boat and a collector of the trash. Figure 1.1 below shows the trash collector boat in cleaning system.

Figure 1.1 Trash Collector Boat

The cleaning system by using a collector boat is not a proper method to collect the trash because the worker needs to check frequently along at Malacca River. (Nurhidayah, 2016) who are doing this project last semester, has generate an idea and concept to fabricate the prototype of River Trash Collector System (RTCS) with an advantages to solve this problem at Malacca River. The project of River Trash Collector System (RTCS) is design to remove the floating trash, oil, fuel and detergents from the river. Figure 1.2 below shows the prototype of River Trash Collector System (RTCS).

Figure 1.2: The prototype of River Trash Collector System (RTCS)

1.2 RTCS (River Trash Collector System)

The concept of River Trash Collector System (RTCS) is acknowledged via Seabin, that utilization a container to collect junk from port in Australia. The concept of Seabin is arranged at the water surface and is plumbed into a shore construct water pump in light of the dock. The water will flows into the container of the Seabin and bring all the trash to the container. The trash will trap at the container, and the water will flows back to the sea. The example trash that can be collected by the Seabin is includes the plastics, bottles, and polystyrenes. Figure 1.3 below shows the Seabin working system.

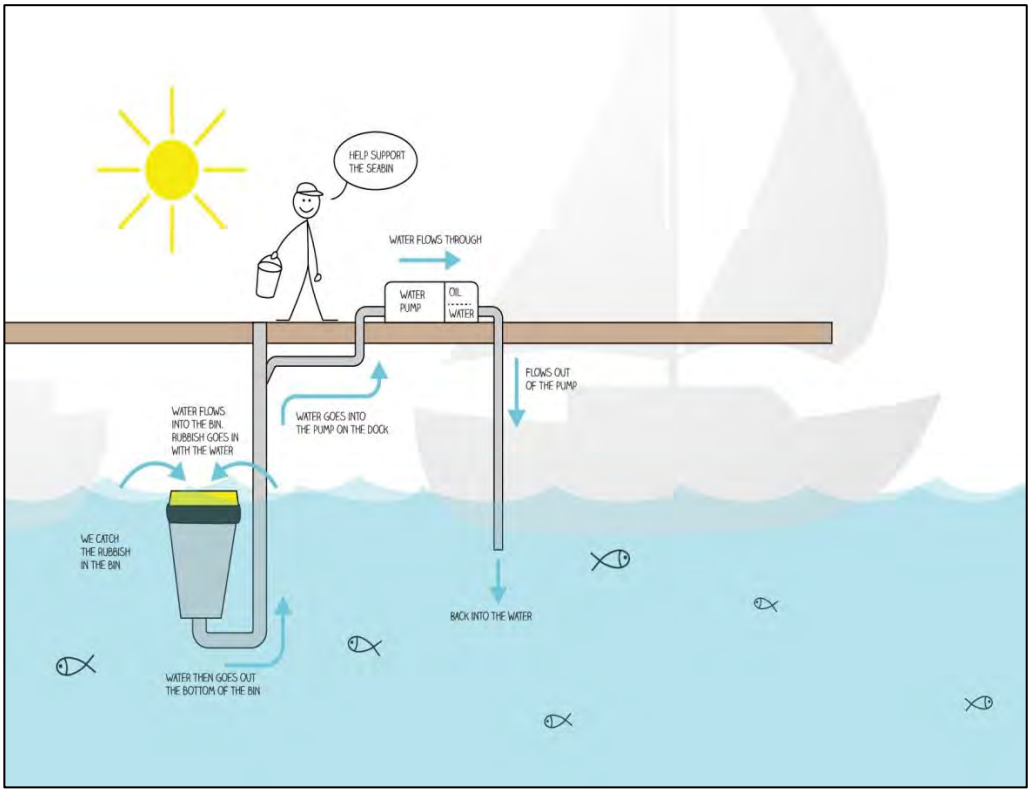

Figure 1.3 The Seabin Working System

In system monitoring for Seabin and River Trash Collector System (RTCS) both are conduct by one worker. However, for Seabin system monitoring the worker needs to check frequently whether the trash is full or not. It is different with River Trash Collector System (RTCS) system monitoring which is it has a weight measurement where,it has one sensor that can trace if the container is fully with trash, the worker will received one message. At that time, the worker needs to go that place to collect the trash. This system monitoring is made to make the work of collect the trash is easier and no need to check the trash frequently. The difference between Seabin and River Trash Collector System (RTCS) in term of material is Seabin is made from aluminium which is the weight is 42 kg and the River Trash Collector System Collector (RTCS) will made 100% of fibre glass. The weight of River Trash Collector System (RTCS) will be less than 42kg which is it more light from the Seabin. Besides that, River Trash Collector System (RTCS) save more cost because it made from a fibre glass.

Based on a few types of selection criteria which is the design concept is determined by the characteristics needed such as ease of handling, ease of use, ease

of manufacture, durability and attractive design. River Trash Collector System (RTCS) will use hybrid which is it has battery to save the electricity cost. The River Trash Collector System (RTCS) will run about 12 (twelve) hours per day to collect the trash. This project will use electric 240 volt and at the same time, it will charge the turbine. When the turbine is fully charge, the electric will stop automatically and start to using the battery.

1.3 Testing Rig

To fabricate the RTCS, a test rig needs to fabricate to test the condition of RTCS. A test rig is a frame made from hollow sections structure of some suitable material that used to test and analyze the capability and performance of components. The test rig also is simulating the practical situations and checking the effective working by reduces the error and also the costs. By using a testing rig, the situation where the performance of RTCS can be measure when the water flow analysis has conducted to it. Besides that, the tidal water situation can be analyzed when the RTCS is performing on it. The structures of the testing rig need to be strong material because it will support for 500 gallons of water tank. By then, based on the result, the manufacturer or the researchers will estimate the water flow and modification of the RTCS structure design will be done if needed.

1.4 Problem Statement

In order to fabricate the new of River Trash Collector System (RTCS), the tidal testing rig needs to be done first so that it can show what will happen to River Trash Collector System (RTCS) when the water analysis is conduct to it. The testing rig for water flow need to design since at Universiti Teknikal Malaysia Melaka (UTeM) has no equipment and laboratory to make a testing rig for water flow. Therefore, a one design of testing rig for River Trash Collector System (RTCS) needs to be done. The most important thing to design the testing rig for River Trash

Collector System (RTCS) besides design the shape, the fabrication costs need to be count as well. Fabrication cost is the total of costs in the process to make the product.

1.5 Research Objective

The objectives of this research were as follows:

i. To study the commercial testing rig design of testing rig regarding its structure, material and costs.
ii. To analyze testing rig for RTCS using Solid Thinking Inspire.
iii. To fabricate a testing rig.

1.6 Scope of the Research

In this project of testing rig for River Trash Collector System (RTCS), to fabricate the testing rig for River Trash Collector System (RTCS). Besides that, to compare the fabrication cost of commercial designs from different welding shops. The concept idea of test rig from welding shops needs to make to three dimensional (CAD) and the design need to do stress analysis. The best result and minimum cost of fabrication test rig were selected. Understand the study of structural design and analysis. This concept idea rig test needs to go through stress analysis using Solid Thinking Inspire. Lastly, report writing and documentation need to be prepared.

1.7 Significance Research

This research is to fabricate test rig that has a strong structure that going to be used for water flow analysis for RTCS before its launches at Sungai Melaka. The test rig need to be strong and can support the two medium size of water tank and one large size of water tank. Both have their own load that has applied on it. A

research of this RTCS is a turning point which from the rate of contamination of water standard. Water pollution has become growing concern as more waste is being disposed of in Sungai Melaka. Water is important because people need water to living their daily life such as to shower, drink, cook, wash and so many more. Therefore, to deal with the problem of water contamination mostly in Sungai Melaka, the RTCS is based on eco-friendly technology concept that can help to minimize the contamination.

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CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter reviews on testing rig, manufacturing costs, material of testing rig for RTCS and design concept. Besides, these chapters brief more description of the importance of testing rig.

2.1 Testing Rig

Testing rig has been widely used to measure and estimate the capability and potential components for industry use by a researchers and manufacturers. The testing rig are capable to testing an unlimited amount of parameters in so many kind of testing methods. The term of testing rig is sometimes it can test bay, testing station, pressure test and all but it all refer to components that carry out of the testing rig itself.

Based on Antoni Gronowicz (2012), has made a rig for testing robot leg. Antoni said that the rig has made a frame from a hollow section. Besides that, the rig also has a set of servomotors with controller, a supervising computer and a measuring system.

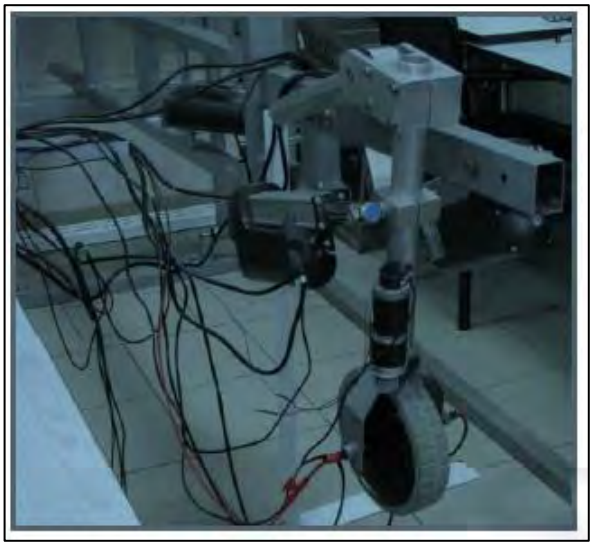

Figure 2.1: Rig For Testing Robot Leg

Based on Nikhil T. et al. (2015), she had made a test rig for estimate the vibration characteristic of beam. A test rig was design to determine the different vibration characteristic of beam. The test rig has developed include variation in cross-section, length and material of beam. The test rig also provide with cantilever, simply supported and fixed-fixed end conditions. The test rig was designed for an aluminium beam with cantilever condition. The test rig developed to perform a wide range of transverse vibration experiments with the minimum of assembly time and the maximum adaptability.

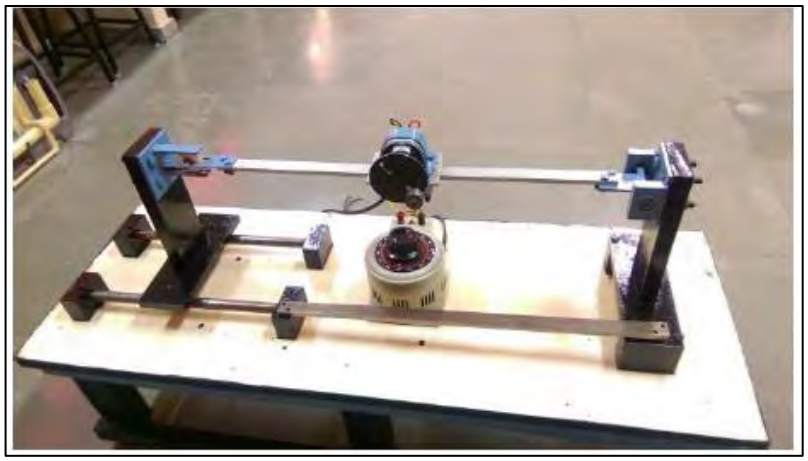

Figure 2.2: Vibration Test Rig

2.2 Manufacturing Cost

Manufacturing cost is concerned with the predication of cost related during fabricate this project. The optimization of manufacturing cost can be done during the early stage of product design. The cost is depends on many variables which is from material cost, labor cost and manufacturing overhead.

(Hendri D.S. et al. 2014) state that the product manufacturing cost estimation in the early phases of the design process is valuable for quickening product time to market, reduce costs, and increase the quality to get items with a high level of competitiveness in free market. Complexity and machining cost are essential factors to estimate the final product cost. Current cost estimation models just consider their calculation in view of the outline which has been resolved previously, with the goal that it is hard to apply a cost estimation model at an early stage in the design process because of lack information. (Hendri D.S.et al. 2014) also state that cost estimation in the early phases of the design process is an attempt towards assessing the cost of item where the item configuration has not been resolved. Budget estimate must be distinguished at an early stage in the design process to improve speed and accuracy.

(Esa Hietikko, 2012) state that the manufacturing cost has two categories which is direct and indirect costs. Direct cost is based on material that has been used to build some component. A good to estimate for material costs of some large production, the total cost would be 50 % but for smaller parts, the total costs will be as low to 10%. Besides that, direct cost is include the labor cost which is the salaries of worker to manufacture and fabricate the product. For indirect cost, it is include work in process, storage and transportation. It is include with raw material and finished product. In order to optimize the manufacturing costs, the manufacturing and the design must be develop.

(Saniya LeBlanc et al. 2013) state that the importance of cost was considered by normalizing the material figure of merit by the raw material cost, and the expenses for specific applications. By reduce the fill factor, less dynamic material is utilized, and the overall cost of the device can be decreased. Tool and manufacturing costs utilized in this fill in as perspectives; real manufacturing costs change by material, process, and application.