DESIGN IMPROVEMENT AND ANALYSIS OF MALACCA RIVER CLEANING BOAT

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DECLARATION

I declare that this Choose an item. entitled " Design Improvement And Analysis Of Malacca River Cleaning Boat" is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Name : Muhammad Adib Bin Norman

Date : 11 January 2023

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Product Design) with Honours..

Signature : 

Supervisor Name : Ts.Mohd Kamal Bin Musa

Date : 11 January 2023

DEDICATION

To my beloved family

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

To my honored supervisor

Ts.Mohd Kamal Bin Musa

and my co-supervisor,

En.Azman

To all UTeM's lecturers

Thank you for your guidance and persistent help to me complete this project.

ABSTRACT

The degradation in water quality was caused by rapid development and population growth in the absence of a specialize monitoring system and planning methods for river preservation. Sewage, home garbage from commercial and residential sectors, and waste from wet markets and industry are the main causes of pollution. In the action of collecting floating trashes process, the government & non-government from all around the worlds put efforts on inventions, creating machines, crafted the most efficient mechanism to trap all the floating debris in their living area to prevent these trashes from entering the seas .Conventional methods used by Perbadanan Pembangunan Sungai Dan Pantai Melaka (PPSPM) for collection of floating trash are manual by human and trash is transported manually at the collecting center. These methods are risky, costly and time consuming. PPSPM having a demand to make an improvement on existing river cleaning boat by applying conveyor unit on the boat. The study will focus on design improvement and application conveyor unit on the existing river cleaning boat used by PPSPM. This study will also focus on the conveyor type and the analysis on the boat hydrostatics features (buoyancy and stability) using Delftship software. The design of the River Cleaning Boat having a critical issue on the selection of conveyor unit and the buoyant force that acting on the system. The specification of the conveyor unit was identified by calculation on the parameters according to the common conveyor's data collected and calculations. By considering all the parameters of river surface cleaning systems and eliminating the drawback of the methods used earlier, there have been several mechanisms proposed. DELFTShip software were used to identify the buoyant force of the boat platform for the identification of draft on the conveyor application. The conveyor was designed to be adjustable angle by applying automatic mechanisms (linear actuatuor) so that it could be retracted and cover with metal plates to perform a platform for users to pass through. Based on consultation and research the angle of the conveyor was set as 20° - 30° in order to maintain balance and buoyancy of the boat. Various research methodology is used such as questionnaire with PPSPM, morphological chart method, systematic combination methods and Pugh and Weighted Rating methods. In the nutshell, the design of Malacca Cleaning Boats was studied, the parameters of a conveyor unit were identified, and the best design of collector unit was generated.

ABSTRAK

Kemerosotan kualiti air disebabkan oleh perkembangan pesat dan pertumbuhan penduduk jika tidak ada sistem pemantauan khusus dan kaedah perancangan untuk pemeliharaan sungai. Kumbahan, sampah rumah dari sektor komersial dan kediaman, dan sampah dari pasar basah dan industri adalah penyebab utama pencemaran. Dalam tindakan mengumpulkan proses sampah terapung, pemerintah & bukan pemerintah dari seluruh dunia berusaha membuat penemuan, membuat mesin, membuat mekanisme yang paling cekap untuk memerangkap semua serpihan terapung di kawasan tempat tinggal mereka untuk mengelakkan sampah ini memasuki laut .Kaedah konvensional yang digunakan oleh Perbadanan Pembangunan Sungai Dan Pantai Melaka (PPSPM) untuk pengumpulan sampah terapung adalah manual oleh pekerja dan sampah diangkut secara manual di pusat pengumpulan. Kaedah ini berisiko, mahal dan memakan masa. PPSPM memiliki permintaan untuk membuat penambahbaikan pada bot pembersih sungai sedia ada dengan memggunakan aplikasi *conveyor* di atas bot. Kajian ini akan menumpukan pada ppenambahbaikan reka bentuk dan penggunaan *conveyor* pada bot pembersih sungai yang digunakan oleh PPSPM. Kajian ini juga akan memfokuskan pada *conveyor* dan analisis pada ciri hidrostatik bot (daya apung dan kestabilan) menggunakan perisian Delftship. Reka bentuk Bot Pembersihan Sungai mempunyai masalah kritikal mengenai pemilihan *conveyor* dan daya apung yang bertindak pada sistem. Spesifikasi unit penghantar dikenal pasti dengan pengiraan pada parameter mengikut data dan pengiraan untuk parameter conveyor. Dengan mempertimbangkan semua parameter sistem pembersihan sungai dan kaedah pengumpulan sampah yang digunakan sebelumnya, terdapat beberapa mekanisme yang dicadangkan. Perisian DELFTShip digunakan untuk mengenal pasti kekuatan pelampung platform bot untuk mengenal pasti draf pada unit *conveyor*. Unit *conveyor* dirancang untuk sudut yang dapat disesuaikan dengan menerapkan mekanisme automatik (*linear actuator)* . Berdasarkan perundingan dan penyelidikan, sudut unit *conveyor* ditetapkan sebagai 20 ° - 30 ° untuk menjaga keseimbangan dan daya apung bot. Pelbagai metodologi penyelidikan digunakan seperti soal selidik dengan PPSPM, kaedah *Morphological Chart*, *Systematic Combination Chart* dan *Pugh and Weighted Rating Methods*. Ringkasnya, reka bentuk *River Cleaning Boat* telah dikaji, parameter unit *conveyor* dikenal pasti, dan reka bentuk unit *conveyor* terbaik dihasilkan.

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LIST OF SYMBOLS AND ABBREVIATIONS

D,d	-	Diameter
kg	-	Kilograms
m	-	Metres
km	-	Kilometres
α	-	Angle
PPSPM	-	Melaka River and Coastal Development Corporation
DC	-	Direct current
F_b	-	Bouyant force
ρ	-	Fluid density
AC	-	Alternating current
Mt	-	Shaft torque (Nm)
N	-	Necessary shaft power (kw)
n	-	Revs of driving wheel (1/min.)
T	-	Traction force (N)
dp	-	Pitch diameter of driving wheel (m)
v	-	Chain velocity (m/sec.)
Qty	-	Quantity

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Problem Statement

The evolving of tourism in Malacca River lead to the increase of the economy as Malacca promotes heritage tourism with its various heritage sites. Based on figure 1.3 below, the current methods used for collection of floating trash used by PPSPM are manual by human and trash is transported manually at the collecting center. The use of improper tools and mechanism lead to risky, costly and time consuming trash collecting process. By considering all the parameters of river surface cleaning systems and eliminating the drawback of the methods used earlier, there have been several mechanisms proposed.

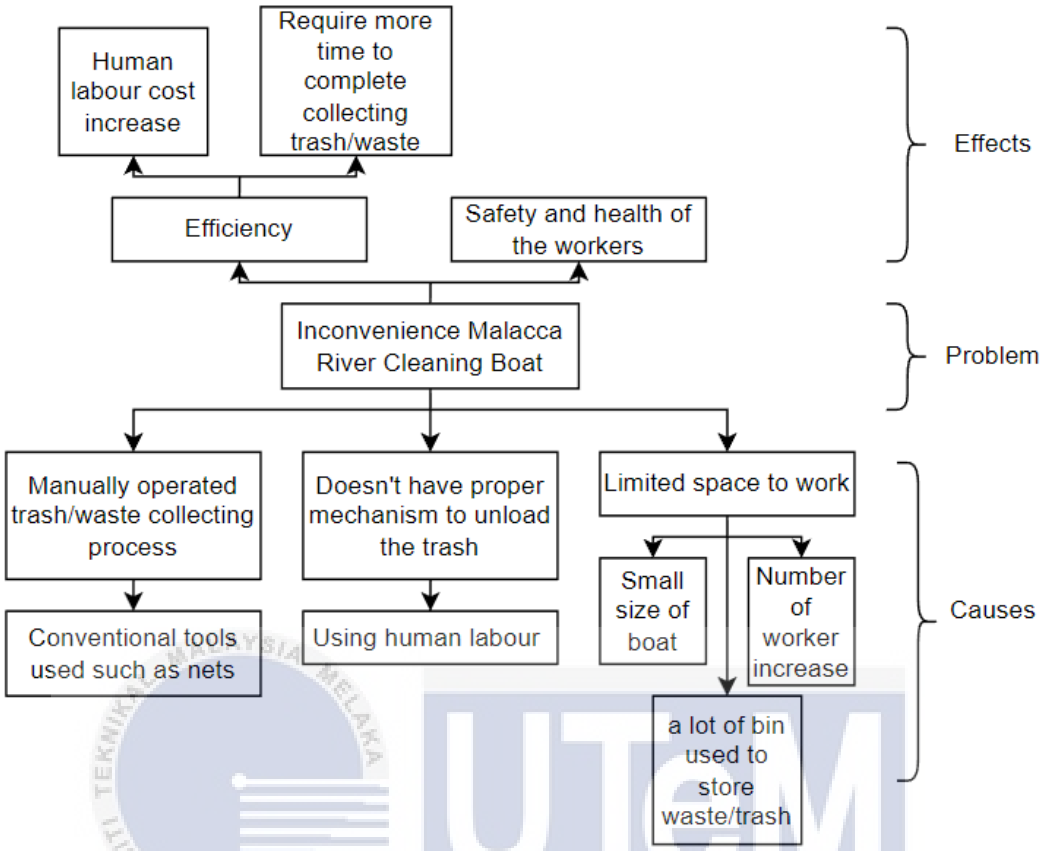

Figure 1.3 Problem Tree Identification

1.2 Background

Melaka River is one of the famous tourist destinations in Malaysia. It is known worldwide for its beauty, tranquility, and crystal clear water ripples. It originates from the foothills of Negeri Sembilan which is neighboring state of Malacca.It crossed through the middle of the Malacca City and ends into the Malacca Strait. Melaka River has significant heritage importance and gained its popularity after the steps were followed to recover this beautiful river. Malacca River is one of important water sources in Malacca, where it is one of tourist centre and attractions listed by UNESCO in 2008 as historical and heritage place.

The degradation in water quality was caused by rapid development and population growth in the absence of a specialised monitoring system and planning methods for river preservation. Sewage, home garbage from commercial and residential sectors, and waste from wet markets and industry are the main causes of pollution. Nonpoint pollution can also be found in the agricultural, construction, and municipal sectors. Based on the report, Sungai Melaka, which is still listed of moderately polluted river with water quality index (Water Quality Index, WQI) for 2017. It was reported that the causes of this water pollution are from agricultural, industrial, residential, commercial activities and sewage as well as some land development activities.

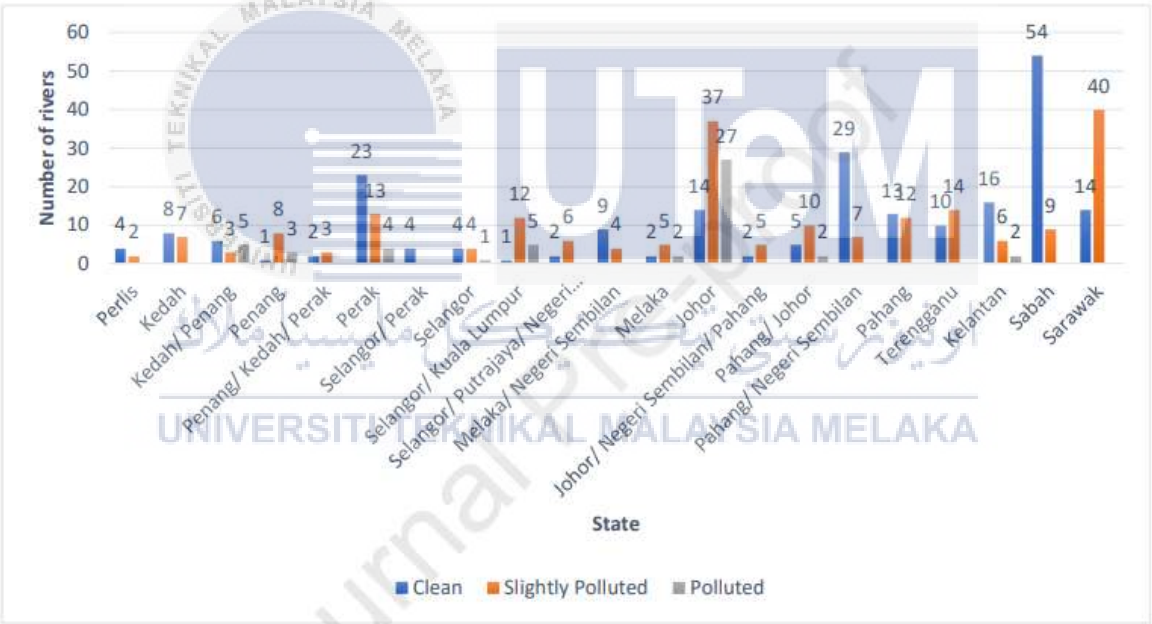

Figure 1.1 River Water Quality By States From 2008 To 2017

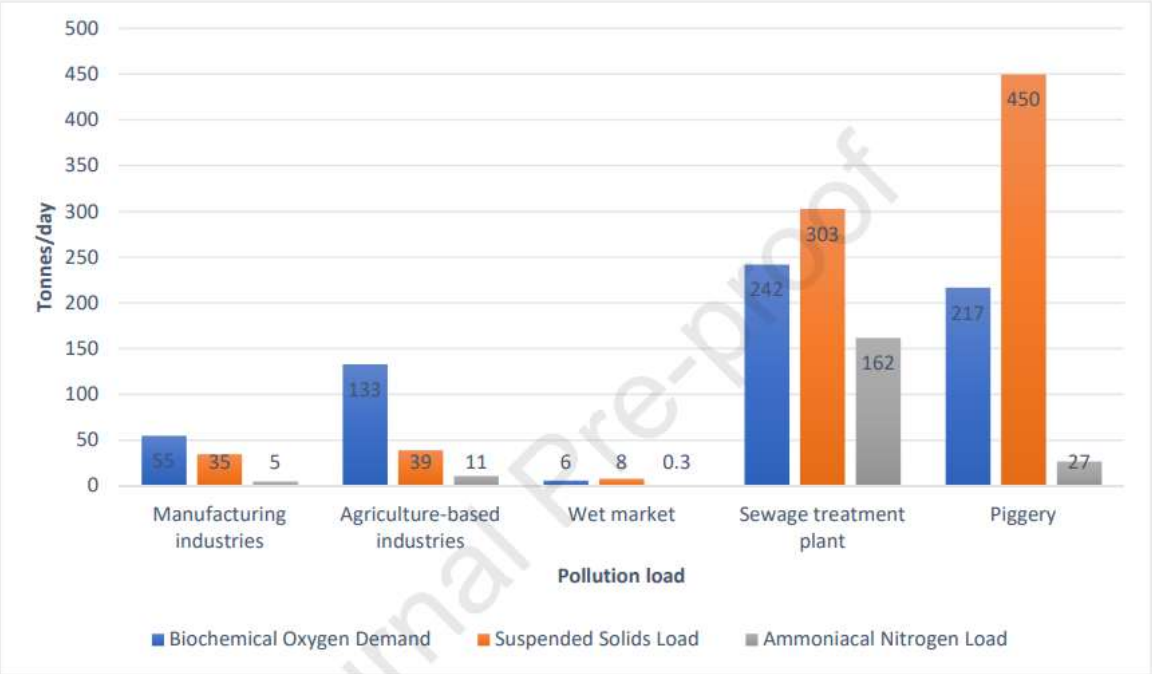

Figure 1.2 Assessment On Pollution Load

Melaka River and Coastal Development Corporation (PPSPM) founded and currently operates the Melaka River Cruise which responsible in managing Sungai Melaka,develop, implement and promote infrastructure projects to increase its value and establish guidelines (standards) relating to management, business use, conservation and development around rivers and beaches.Due to lack of staff and outdated equipments they perform exhausting cleaning activities depending on the amount of trash in each location. This require improvement on their equipments. Various researchers and companies have developed either conceptual design or prototype and even full-scale operational cleaning boats with a different goals. Due to many parameters anfd ideation involved in developing design improvement of the existing Sungai Melaka cleaning boat, a systematic approach need to be done such as the engineering design process.

The existing river cleaning boat utilized hulled type of boat sized 4.88 m(16 feet) x 3.05 m (10 feet). Floating trash will be take out by workers manually using net. One or two operators

are required to transfer the trash manually into the collecting box at the riverside which they called it as RORA. It is an exhausting process, especially during bad weather such as heavy rain or flash floods where the garbage is clogged heavily. Further, the collecting process needs to stop frequently whenever the trash already blocked the net or the current were to strong.

1.3 Research Objective

The main aim of this research is to undergo design improvement of the Malacca river cleaning boat and analysis in order to support the evidences. Specifically, the objectives are as follows:

a) To conduct research on the previous design concept and its mechanism of current Malacca River cleaning boat used bt PPSPM (Melaka River and Coastal Development Corporation)

b) To propose the best design of conveyor unit design to apply on Malacca river cleaning boat.

c) To develop analysis on the boat hidrostatics features (bouyancy and stability) by using Archimedes Principle's formulation and software simulation.

1.4 Scope of Research

The scope of this research are as follows:

- The study will focusing on design improvement and application conveyor unit on the existing river cleaning boat used by PPSPM. This study will also focus on the conveyor type selection using Morphological chart and the analysis on the boat hidrostatics features (bouyancy) using Delftship software.

CHAPTER 2

LITERATURE REVIEW

2.1 Action Taken to Solve Floating Trash on Water Surfaces

Due to the pollution problems getting to raise and people started to find that the critical health problems on our mother earth, many individuals and company started to generate various of technology application to solve this issue. As we can see from news and articles, the pollution problems led corruption on our living and yet directly affected on our health problems with destructive effects especially once we drank the polluted water (Koshal, 1976). There are some methods with conventional manually collect and advanced automatic robotic system in the design on trash collecting method. With these products create, it increases the efficiency on trash collecting process along the rivers and lakes. These action help to ensure the water quality of the cities and yet increase the reputation of the country.

2.1.1 Methods on Collecting Floating Trash in Malacca

PPSPM, as the state government agency who responsible for developing and managing Sungai Melaka. About 4.7 km length from Taman Rempah to water barrage along Malacca River has been gazette as the river cruising activity. Few types of trash have been reported such as plastic material products, agriculture and aquaculture byproduct, and industrial disposal. The scenario become worst during bad weather of raining season whenever Jabatan Pengairan dan Saliran (JPS) Melaka needs to release overflood water at Batu Hampar dam.