POLITEKNIK MALAYSIA
BAGAN DATUK

DIGEST OF NAVAL ARCHITECTURE @ POLITEKNIK BAGAN DATUK

1st Print 2021 @ Politeknik Bagan Datuk

Published by:
Politeknik Bagan Datuk, No. 1, PT8121, Lorong Lagenda 1, Medan Niaga Lagenda, 36400 Hutan Melintang, Perak Darul Ridzuan.

Tel. : 05- 6413416
Fax. : 05-6413205
Web : https://pbd.mypolycc.edu.my

Digest of Naval Architecture @ Politeknik Bagan Datuk

e ISSN: 2805-5047

EDITORIAL

Advisor
Ts. Dr. Hj. Zunuwanas bin Mohamad

Head of Research, Innovation and Commercialization Unit
Mohd Zamri Bin Mohd Zin

Editors
Khatijah binti Jamaludin
Saripah binti Nor
Fatimah Amirah binti Jaafar

Cover Design
Nur Shuhadah Binti Mahadi (KKPB)

PREFACE

Assalamu'alaikum and greetings,

Thanks to Allah s.w.t. because with His permission and bounty then the Digest of Naval Architecture @ PBD was successfully published. Next, a word of appreciation and congratulations to Research, Innovation and Commercialization Unit and all researchers for the commitments and efforts given in implementing this noble initiative. Indeed, the publication of this digest reflects the seriousness and perseverance of the people of Politeknik Bagan Datuk to share knowledge, skills and expertise in the scope of TVET and focusly on marine to the public.

The publication of this digest is a platform for lecturers in enhancing the culture of research and writing as well as helping lecturers achieve their professionalism excellence. Congratulations once again, for successfully published this digest for the second time.

I hope that this kind of digest is able to highlight the great talents and ideas of the people of Politeknik Bagan Datuk in the context of cultivating educational knowledge as well as the field of scholarly writing in their respective fields. Finally, as an educator, it is our responsibility to increase good values for the sake of TVET's next generation.

Ts. Dr. Hj. Zunuwanas Bin Mohamad
Deputy Director
Politeknik Bagan Datuk

TABLE OF CONTENTS

DESIGN OF J-RUDDER USING FISH ROBOT CONCEPT

Hj Rohimi Bin Yusof
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
rohimi@pbd.edu.my

Nur Fatehah Binti Hamsah
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
nurfatehahhamsah@gmail.com

Lidya Irdina Binti Mohd Hasrow
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
lidyairdinamohdhasrow99@gmail.com

ABSTRACT

Most merchant ships must take up a lot of space when turning the point. This results in a waste of time and raw materials. When the turning point is taken by large ships, the time and distance required by a ship also increases. But here the solution to this problem is mentioned. The development of the J-rudder is since the rudder can make an almost round turn like a fish robot, saving time and raw material costs. If the merchant ships in the shipping industry use this J rudder, they can solve the problems they face.

Keywords: Wastage time, raw material, fish robot concert, J-Rudder product.

1.0 INTRODUCTION

Rudder is a steering for boat mounted on the back, down and in the middle of a ship for moving motion and turning either left or right. Rudder is a device for changing the direction of the vessel by changing the direction of the liquid current resulting in a change in the direction of the vessel. The rudder is placed at the back of the hull / back of the hull behind the propeller driven mechanically or hydraulically from the platform by moving the steering wheel. Because of the importance of steering roles in running ships it is regulated in the SOLAS International Convention. To produce this j-rudder, we have taken T-Rudder and fish robot as the main reference material. We took this T-Rudder design and changed its design to J- Rudder. T-Rudder is taken as a reference because it has three sections where J-Rudder also has three sections on the T-Rudder, they are merged with each other, while the J- Rudder design we design, the three sections are available on the three sides are merged with each other through the pulley and the belt. Next, we also use the fish robot concept because this project main objective is to reduce the distance taken when turning the point. We also want the vessel to make a nearly round movement when turning the point, so the fish robot is most suitable as the main reference in this project. So, we use the T- Rudder and design of the fish robot concept to be used in the production of J-Rudder. Conventional rudders are somewhat restricted when it comes to maneuverability at slow seed in confined waters. Several manufactures have developed more efficient and advanced rudder system the last two or three decades and quite a few ships are now fitted with modern and more efficient rudders. Example for rudder design.

1.1 Flap Rudder (Backer Rudder)

The flap rudder is different from a conventional rudder in that it utilized an additional flap on the trailing edge for steering. This allows up to twice the steering power compared to a traditional rudder, translating into a much more maneuverable

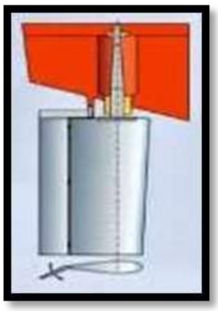


Figure 1: Design Flap Rudder

1.2 Rotor Rudder

The purpose of the T-Rudder is to combine the advantages of the flap and rotor rudder to get the best possible rudder performance. The performance is needed excellent, but unfortunately the price is high.

Figure 2: Design Rotor Rudder

1.3 Combined Flap, Rotor Rudder (T-Rudder)

The purpose of the T-Rudder is to combine the advantages of the flap and rotor rudder to get the best possible rudder performance. The performance is needed excellent, but unfortunately the price is high.

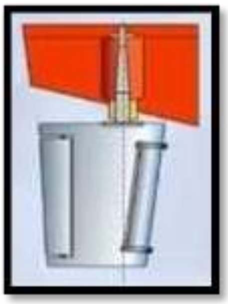


Figure 3: Design Combined Flap, Rotor Rudder (T- Rudder)

1.4 Shaped Rudders (Shilling Rudder)

This is an alternative design to the flap rudder. The shape of the rudder is such that it can be turned up to 70 degrees and still retain excellent performance. The fore body of the rudder is elliptical in shape, but runs into a rear body section, which is concave.

Figure 4: Design Shaped Rudders (Shilling Rudder)

1.5 Expected Turning Performance

Expected turning performance with Flap, Rotor and T- rudder systems. This diagram shows the expected increase in turning performance for a ship equipped with a modern flap- or rotor rudder system.

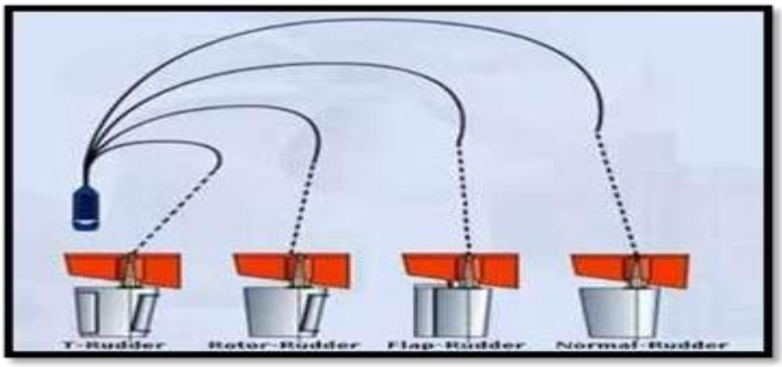


Figure 5: Rudder Turning Performance

The expected turning performance also show with robot fish turning. The fish robot swings its tail only to one side during a turning. We consider that this mode is the most fundamental and important turning mode because the robot can turn with various turning diameter and speed in this mode. In this turning mode, a head and a body of the fish robot are equivalent to a rudder, and the tail peduncle and the tail fin are equivalent to a screw propeller of the ship. If we attend to the resemblance of these functions, we can analyze this mode and control the robot easily.

The fish robot also swings its tail to one side rapidly from stationary state. In this turning mode, inertia force and friction force of the moving tail and a body are changed to the moment of rotation. This mode has excellent characteristics. It is possible to turn from the stationary state, and its turning diameter is the smallest in the whole modes. However, it is difficult to control turning speed and turning angle. Also, to get quick turning, it is necessary that the power source for tail swing should have sufficiently high torque. To realize the movement of fish robot, make a composite photograph. In the photograph, it is confirmed that the prototype fish robot has a correct circular orbit.

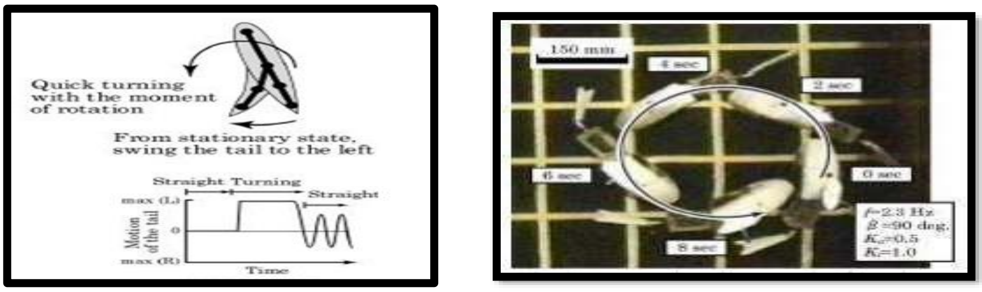


Figure 6: Quick Turning and movement performance of a fish robot

2.0 METHODOLOGY

This methodology is an important element that aims to explain the methodology and implementation of project and design methodology in more detail. It is also a description of the equipment, component steps, rules and techniques used in project production. To produce high quality projects, manufacturing projects need to be carried out in a systematic planning schedule and can meet the specifications required. It also aims to ensure that the implementation does not cause any problems and that the project runs smoothly

2.1 Design Of Rudder

Project methodology is very important as it can facilitate the smooth implementation of projects. This is because it is one of the methods or techniques that can help the research process go smoothly and efficiently. The concept of "turning performance of a fish robot" has been taken for making J-rudder design project. Figure 3, show the case of turning mood. The fish robot swings its tail only to one side during a turning. Consider that this mode is most fundamental and important turning mood, because the robot can turn with various turning diameter and speed in this mode. This turning mood, a head and a body of the fish robot are equivalent to a rudder, and the tail penduline and the tail fin are equivalent to a screw propeller of the ship. If attend to the resemblance of these functions, it can analyze this mood and control the robot easily. So, this concept has been taken for this project while the ship did turn mode.

2.2 Description Of J-Rudder

Based on an understanding of the problem definition, the target design specifications of the machine was generated as given in Table 1:

Table 1: Material and equipment uses

No.	Parts	Materials Used
1.	Rudder Frame	Aluminum
2.	Rudder Body	Aluminum
3.	Supporters	Mild Steel
4.	Pillar	Wooden
5.	Base	Wooden
6.	Panel Control	Wooden
7.	Nuts and Bolts	Mild Steel
8.	Roller	Stainless Steel
9.	Hopper	Stainless Steel
10.	Cover	Stainless Steel

2.3 Design

The design of the newly designed rudder is a result of t-rudder, IT aspires to the t-rudder and design new rudder into j-rudder. The length of the j-rudder is longer than the regular rudder, this is because the rudder has three sections. Compared to other rudder they only have one or two sections only. Like y- rudder that refer to, it has a length of 4 meters. Compared to the j-rudder has a smaller length of 4.5 meters than normal rudder because j-rudder has 3 sections. The results of this design taken from the T-rudder, and the size of its distribution is divided into 3 parts where we measure according to the information from the fish robot. Here was state 3 concept of j-rudder concept using robot fish concept.

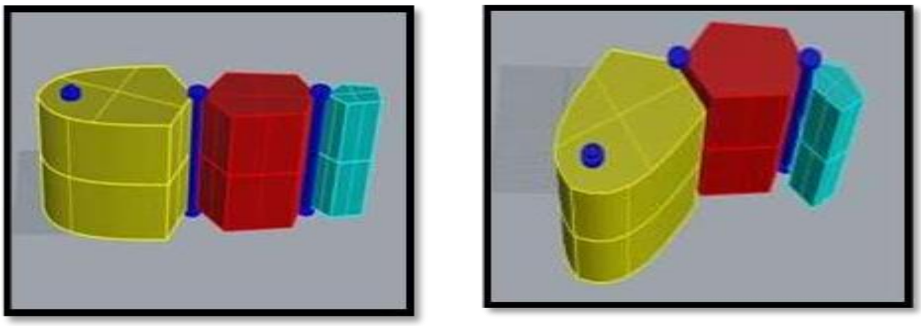


Figure 8: Design J-Rudder and movement with Pulley

2.4 Manufacturing Process

2.4.1 Drilling Process

Drilling proses must identifies the factors that should be considered for optimized drilling operations: health, safety, and environment; production capability; and drilling implementation**.** Drilling is a cutting process that uses a drill bit to cut a hole of circular cross section in solid materials. Drilling processes are used to make a hole on the project. The function of the hole is to place screws to connect between the iron plate and the other iron plate.

2.4.2 Cutting Process

This rudder project has 3 parts. It is large, medium, and small. The cutting process for this project began with the cutting of 0.2mm thick aluminum plate and 15mm wide and 410mm in length by 2 pcs to make a large frame. The second step is to cut the aluminum plate 0.2mm thick and 15mm wide and 300mm long by 2 pcs to create a simple frame. The third step is to cut the aluminum plate 0.2mm thick and 15mm wide and 170mm in length by 2 pcs to create a smaller frame. All three-piece cutting processes use snip. The next step is the bodybuilding process for three parts rudders. 0.1mm thick aluminum sheets and 15mm height are used to make these three pieces. The forming process uses a player while the connectivity process uses blind rivets (4X12) and 0.3mm diameter bolt and nut screws.

2.4.3 Welding Process

Shielded metal arc welding (SMAW) is generated by an electric arc between base metal and a consumable electrode. In this process electrode movement is manually controlled hence it is termed as manual metal arc welding. This process is extensively used for depositing weld metal because it is easy to deposit the molten weld metal at right place where it is required, and it doesn’t need separate shielding.
SMAW Welding is done to make the rudder connectors with the backing. Screws that are 10mm in diameter and 150mm wide are used for connecting the rudder with the

backing. Supporters are also welded to the bearing to allow the rudder to move. Holder to move large part of rudder in weld to nut.

2.4.4 Polishing Process

Polishing is finishing processes for smoothing a work pieces surface using an abrasive and a work wheel or a leather strop. Polishing is often used to enhance the appearance of an item, prevent contamination of instruments, remove oxidation, create a reflective surface, or prevent corrosion in pipes. In this project, grinding machine used for polishing process because grinding machine is a machine tool used for producing very fine finishes and apply polishing process on this project to make very fine finishes and make it smooth and shiny.

2.4.5 Coating Process (Spraying Process)

Coating process is a covering that is applied to the surface of an object, usually referred to as the substrate. The purpose of applying the coating may be decorative, functional, or both. After finished all process, we apply coating process (spray) to decorate this project so that this project will look good, and this process also will cover the corrosion on this project.

3.0 RESULTS AND DISCUSSION

Rudder is a steering wheel mounted on the back, bottom, and centre of a ship to move motion and rotate left or right. Rudder is a tool for changing the direction of a ship by changing the direction of a liquid that produces a change in the direction of the ship. The steering wheel is mounted to the rear of the arm or rear of the fan by a mechanical or hydraulic fan from the platform by moving the steering wheel. Due to the importance of the driver's role in the operation of the ship, it is regulated at the SOLAS.J-Rudder International Convention, a rudder built on fish-based robots. For ordinary rudder they have only one section, while j-rudder is divided into 3 sections, namely sections a, b and c and has different sizes for each section. This j-rudder is built exactly like a fish.

3.1 Analysis Time Take for Rudder

Table 2: Shows the analysis time take for rudder

Round V	Time taken normal Rudder (s)	Time J - Rudder (s)	Degree
3	10.22	7.81	35
6	19.69	15.75	35
9	30.29	24.12	35
12	39.12	30.21	35

Figure 9: Shows the analysis time take for rudder

The purpose of building a j-rudder is to minimize the circle while making a turning point, this will reduce the cost and time it takes for a ship. Other marine industries will also benefit because the marine industries do not have to use high cost for fuel. J-rudder built on this rudder concept certainly has the aim of resembling a fish robot. Certainly, the criteria for fish robot apply in J-rudder. So, the J-rudder took the concept while the fish robot made a turning point to apply it to the J-rudder. As we know, the fish takes a short distance while making a circular motion, so that's why we want to apply it to the ship when making a turning point.

4.0 CONCLUSION

Based on the evidence above, it can be said that the problem faced by the marine industry is that have to make large circles while turning points, which is why needed to take so long and there is also a waste of cost in terms of ship diesel expenditure. According to the j- rudder we have designed; we have learned that j-rudder built using the concept of fish robot has achieved this desired goal and successfully solved the problem while turning point. This objective has been achieved with the evidence we have made, the J-rudder model has proven that the j-rudder can make small circles while turning points. With the angle we applied to the 35-degree angled rudder this rudder can be used and saves the marine industry.

5.0 REFERENCES

Koichi HIRATA, Tadanori TAKIMOTO and Kenkichi TAMURA. Study on Turning Performance of a Fish Robot. (Assessed 07 Jan 2019)

William Lyons, (2019). Working Guide to Drilling Equipment and Operations**,** 1st Edition, Gulf Professional Publishing**,** ISBN**:** 9781856178433

Propulsion and Maneuvering Systems retrieved from https://www.youtube.com/watch?v=mb-NjsxxOcc, ,(Assessed 09 Jan 2019)

Machine Description retrieved from https://www.britannica.com/technology/rudder (Assessed 30 march 2019)

Arc welding processes (SMAW) retrieved from http://www.idconline.com/technical_references/pdfs/mechanical_engineering/Arc_welding_processes_Smaw.pdf. (Assessed 15 march 2019)

TRASH COLLECTOR CATAMARAN BOAT

Mohamed Hairy Bin Yahya
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
mhairy@pbd.edu.my

Mohamad Aliff Hakimi Bin Mohd Noor
Jabatan Kejuruteraan Perkapalan Politeknik Bagan Datuk ami.aliff26@gmail.com

Mohamad Reduwan Bin Rosman
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
reduwan16@icloud.com

ABSTRACT

This study aims to identify appropriate innovations on how to clean the environment more effectively. In this study, the catamaran ship is used as a model for this project. Therefore, the design of the model is based on the research conducted. The results of this project show that the catamaran boat can effectively clean the water areas as a waste collector. This result can be used for other researchers to improve and innovate the new type of garbage collector and improve the environment.

Keyword: Trash Collector Catamaran Boat, waste debris, environment.

1.0 INTRODUCTION

The problem that is now being addressed in more and more countries and areas: water pollution by waste. Unfortunately, rivers, canals, and other bodies of water around the world have been and continue to be misused for the disposal of waste of all kinds, especially plastic waste. In the absence of disposal systems, this has long been the only way for many people to dispose of their waste. It collects in the rivers, clogs the inlets, and bridges and eventually ends up in the sea. For some time now, a change in thinking has been taking place, and people are working hard to get the plastic and synthetics out of the water. The catamaran's garbage collection machine design is used in places where trash enters the water body for disposal. The machine consists of a wheel drive powered by a windmill that collects and removes trash and plastic waste from the water body. The machine removes all waste from the water body, ultimately reducing water pollution and aquatic life deaths, and hopefully improving the aquatic ecosystem

Inland waterways are crucial for human life and other living things. Their water is used for irrigation and drinking, and they maintain the moisture of the earth. Inland waterways have been contributing to transportation where many cities in the world are situated in their locality. Today, the population increases exponentially, and several inland waterways have become a sort of sewage system. As a corollary, the cities are generating large heaps of garbage and filth, which are dumped into the inland waterways through sewers or directly from hands, worsening pollution day-to-day.

Cleaning the trashes by using manual processes would be ineffective as it often covers vast area of works and efforts. Therefore, this paper presents a proposal on rubbish collecting system for inland waterways. The system consists of a heavy-duty marine work boat designed for use in inland waterways where there is a need to collect floating trashes and litters. The design will also prove instrumental in small scale oil recovery operations. The system designed will be the easiest way to manage the inland waterway environments, time saving and cost efficient, thus deemed as the most viable solution as means to clean up the mess created by human.

Nowadays, many developed countries such as Britain and United States (US) have invented various types of rubbish collector boat that could perform in several natures of inland waterway. Some of the inventions have reached global market, equipped with multifunctional criteria including harvesting agricultural plants and recreational purpose, but the major function of the boats is to collect rubbish that floats on the waterways

2.0 METODOLOGY

In this project use few of designing software such as, Rhinoceros, MAXSURF and AUTOCAD. This project also uses CURA software for printing the model of this X-bow ship in 3D printed model. Firstly, this project redesigned the shape of bow in MAXSURF software. Second, after finishing the modification of hull transfer the design into Rhinoceros software for designing 22 some of structure and superstructure on ship. The design will be in 3D view when transfer in Rhinoceros software. The design was separated to few parts to ease the printing process and shorting the time of printing the model. It also helps us to maintain of the quality of printing the model. The hull and structure were split to few parts in this process. The separated design was transferred to CURA software. This software helps us to define the size and density of the model for 3D printing. It also helps us to convert the design to the format that acceptable by the 3D printing machine which is the g. code format. After the converting process to g. code format, transfer that g.code file into memory card by using the card reader. Then insert the memory card to 3D printing machine to start printing. After finishing the hull model printing, joint all the hull part by using super glue to form the catamaran boat. Then start to smooth the hull model by using sandpaper before the model go to paint process and assemble all the structure to form a complete ship.

In this project the main aim of this machine is to lift the waste debris from the water surface and dispose them in the tray. Here are fabricating the remote operated river cleaning machine. The collecting plate and chain drives are rotating continuously by the motor. The collecting plate is coupled between the two chain drives for collect the waste materials from river. The collected wastages are thrown on the collecting tray with the help of conveyer. This project is having propeller which is used to drive the machine on the river. The propeller is run with the help of two PMDC motor. The total electrical device is controlled by RF transmitter and receiver which use to control the machine remotely.

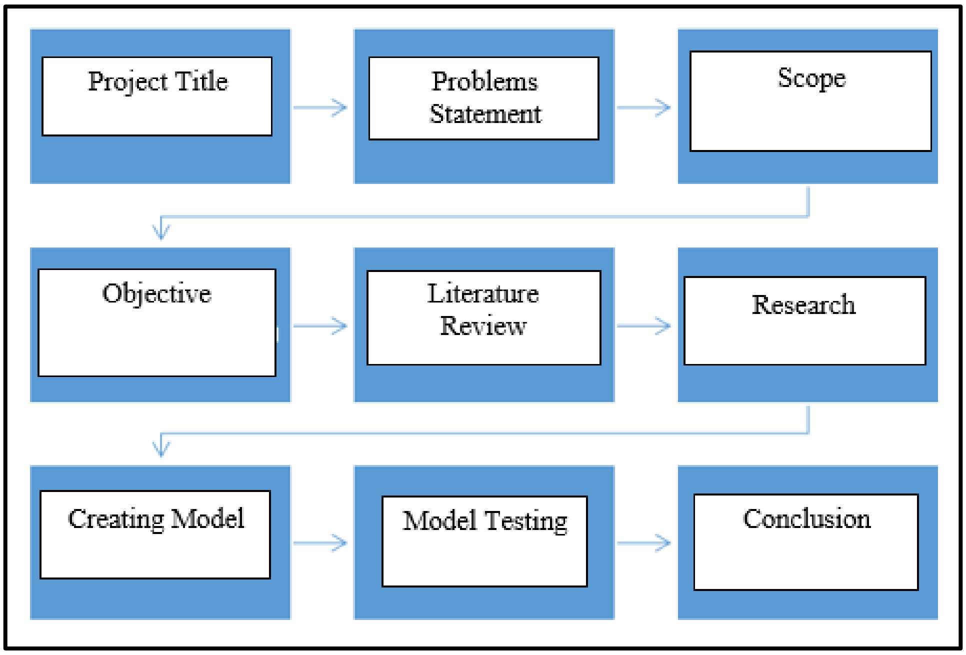


Figure 1: Flow Chart Project

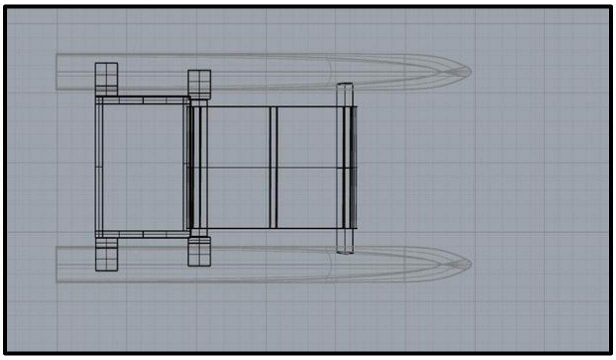


Figure 2: Top View

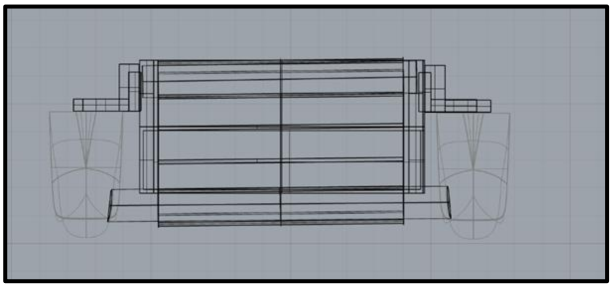


Figure 3: Front View

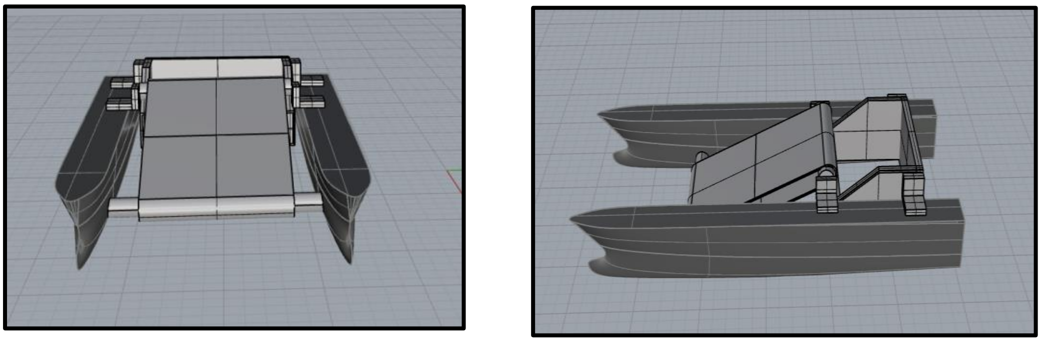


Figure 4: Perspective View

3.0 RESULT AND DISCUSSION

The aim of function analysis method is to establish the functions required by the rubbish collecting system to perform the desired task which is to collect rubbish from inland waterways. How a rubbish collecting system should perform in the desired manner. It begins with waste collecting process, to collect both solid and liquid waste. The collection of both wastes may be simultaneous or independent from each other, depending on what kind of collecting method has been adopted by the system. Next, the collected waste should be stored appropriately in the storage container to ensure the effectiveness of the system at the highest level. This project found that catamaran is very suitable to became trash collector because of slim body that will make it easy to go to any small river. also speed that it can be easy to go to another place faster.

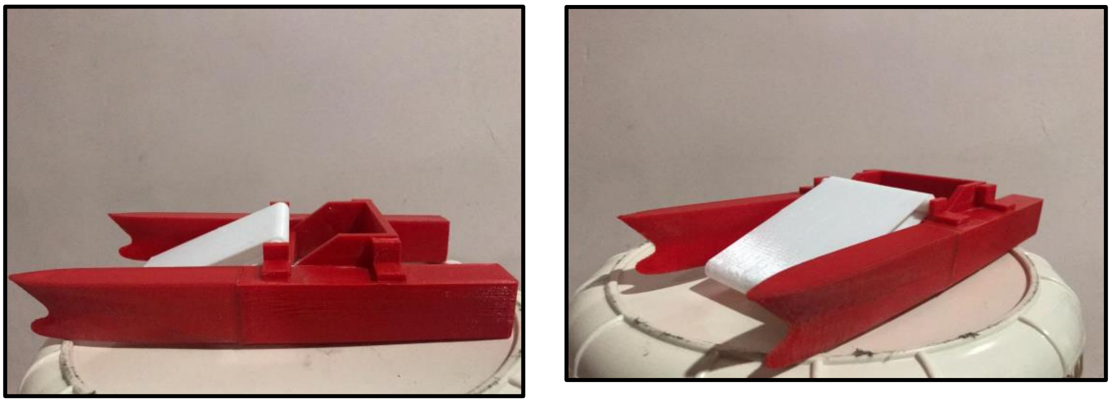


Figure 5: Model Result

4.0 CONCLUSION

This research study investigates only a medium part of this study. Therefore, there may be another advance researcher that may develop something that more useful in the world of shipping industries. Based on this group observation, This project recommend to research about the density of water for the ship will be working to make the ship more suitable for every water density in every country, because the density and the depth of water in every state and country is very different. In addition, This project recommend that this projects be viewed in a positive way to improve the cleaning system and reduce water pollution. Through this project, I hope in the future that this project will be used to make the best trash collector ship to make this environment more beautiful and no pollution.

5.0 REFERENCES

https://mavideniz.com.tr/our-production/vessels-boats/trash-debris-cleanup-vessel/trash-debris-cleanup-vessel/

Design Of Rubbish Collecting System For Inland Waterways (2015) Retrieved From https://Www.Researchgate.Net/Figure/Objectives-For-Rubbish-Collecting-System-Design-For-Inland-Waterway_Fig1_309392547

https://en.wikipedia.org/wiki/Multihull#Catamaran

Automatically collect waste from rivers and lakes with boats from BERKY retrieved from https://berky.de/garbage?gclid=Cj0KCQjwsYb0BRCOARIsAHbLPhEBYwICR3g7nHkM

Trash Skimmer retrieved from https://kedadredging.com/PRODUCTS/Trash_Skimmer/?gclid=Cj0KCQjwsYb0BRCOA

INVESTIGATION ON THE EFFECT OF CHINE SHAPE TO THE STABILITY OF A BARGE

Nik Muhammad Hafidz Bin Nik Abdul Rahman
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
nikhafidz@pbd.edu.my

Muhammad Hadi Aqil Bin Mohd Azhar
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
hadiaqil3117@gmail.com

Muhammad Amirul Hakimi Bin Adnan
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
amirulhakimi0501@gmail.com

ABSTRACT

This paper addresses a study of the effect of chine shape to the stability of a barge through parametric approach. Ship stability is influenced by shape, dimension, and location of centre of gravity. There are various chine shapes for each type of vessel and this paper is aimed to discuss the stability performance based on these shapes. As barge is a shoal-draft flat-bottomed boat and a well-known transport of bulk goods in shipping industry, it is crucial to investigate the relationship between stability and chine shapes of a barge.

Keywords: Stability, Chine, Barge

1.0 INTRODUCTION

Maritime transportation is the soul of the global economy. It enables intercontinental business, the bulk transport of raw materials, and the import or export of economical sustenance and manufactured goods. The international maritime transportation industry contributes for the carriage of around 90% of the world trade. Seaborne transportation continues to grow, bringing benefits for clients across the world through economical freight costs. Thanks to the increasing efficiency of shipping as a mode of transportation and increased economic freedom, the forecasts for the industry's further growth continue to be resilient. There are over 50,000 merchant ships trading worldwide, delivering every kind of cargo. The global fleet is registered in over 150 nations and operated by over a million seafarers of various nations.

Barge is one of the most famous ship cargoes in shipping industry at all around the world. Pontoon barges are used for an extensive variety of cargoes including bulk loads such as coal, rock, logs, low to medium centres of gravity goods, vehicles, and enormous loads such as industrial equipment and storage tanks, which possess very high centres of gravity, and wind exposed areas. Pontoon barges are also used as work platforms for various types of equipment including cranes and pile drivers in offshore operation.

Stability considerations are essential to conduct maritime transportation and other operations safely and thus a study on the effect by chine shape to the stability of barge is vital.

2.0 METHODOLOGY

This chapter discusses about the research design, data collection, research instrumental, drawing/design technique and various data analysis method for investigation on the effect of chine shape to the stability of a barge.

2.1 Research Methodology

The study is conducted by the experimental research design.

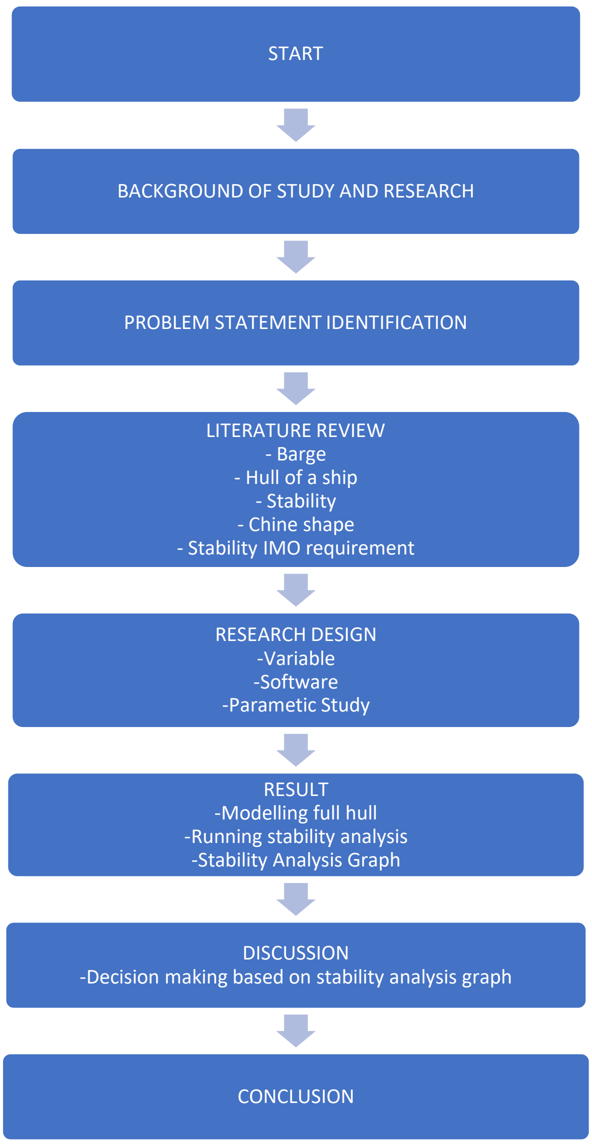


Figure 1: Process Flow of Study

2.2 Design Specification

Design specification identifies the characteristics, function and other information required to describe the design. It provides information to create a proper design concept in the process which is done after analysing the data. It is based on the sequence of generating the specification as shown below:

i. **Stability**
   The intact stability criteria as required by IMO for pontoon.

2.3 Design Selection

Both strength and weakness of each design are compared to determine the perfect one. Three ideal typical type of chine shape are selected and applied to the 100 m barge.

i. **Hard Chine Shape**

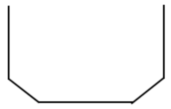


Figure 2: Hard Chine

ii. **Soft Chine**

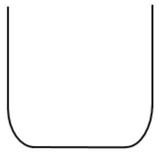


Figure 3: Soft Chine

iii. **Straight Chine Shape**

Figure 4: Straight Chine

2.4 Data Collection Method

Parametric study is applied based on height and width of the chine. 19 chine shapes are developed based on chine shapes and dimension limitation of 3 feet width and height of chine. All 19 hulls are developed in MAXSURF Modeler and analysed using MAXSURF Stability as required by IMO.

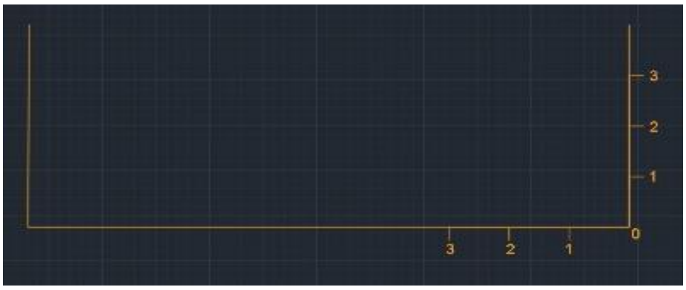


Figure 5: Straight Chine of H 0-0

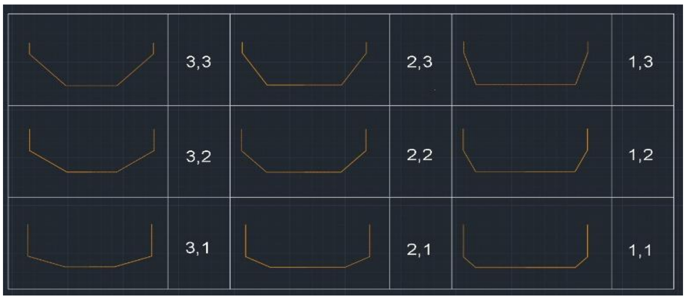


Figure 6: Hard Chine of H 1-1 till H 3-3

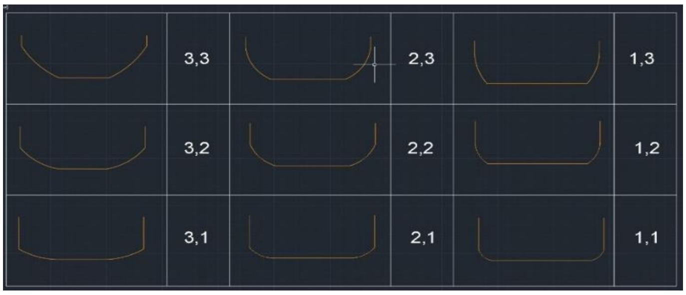


Figure 7: Soft Chine of S 1-1 till S 3-3

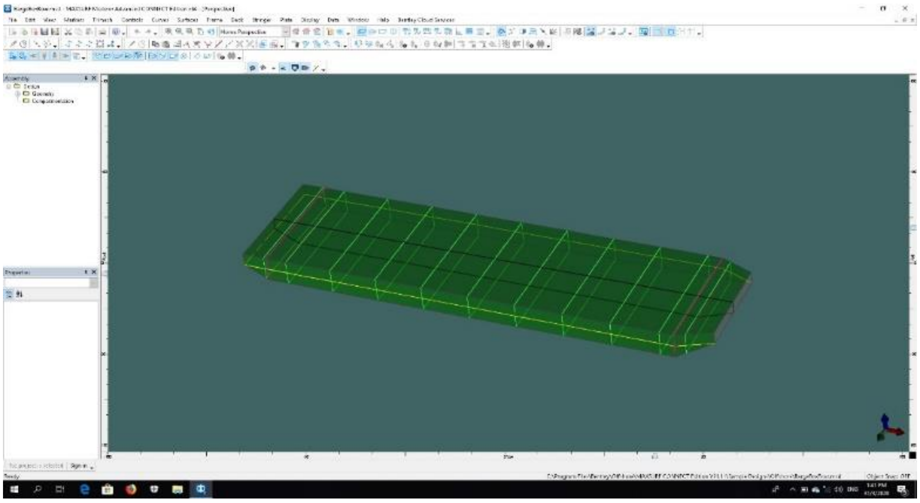


Figure 8: Hull modelling in MAXSURF Modeler

3.0 RESULT AND DISCUSSION

The graph shows that the chine shape design with the lower height becomes more stable i.e., greater GZ area and angle of vanishing stability as shown by the comparison between H 3-1, H 3-2, and H 3-3; H 2-1, H 2-2, and H 2-3; and H 1-1, H 1-2, and H 1-3. It also shows that better stability characteristics are obtained by widening the chine width as shown by the comparison between H 3-3, H 2-3, and H 1-3; H 3-2, H 2-2, and H 1-2; and H 3-1, H 2-1, and H 1-1. It proves that soft chines are better in stability performances compared to their hard chine counterparts as shown by the comparison between S 3-1, S 3-2 and S 3-3 with H 3-1, H 3-2, and H 3-3; S 2-1, S 2-2 and S 2-3 with H 2-1, H 2-2, and H 2-3; and S 1-1, S 1-2 and S 1-3 with H 1-1, H 1-2, and H 1-3. As the H 0-0 possess the lowest chine height and widest chine width, it has the greatest stability characteristics compared to all other hard and soft chine designs.

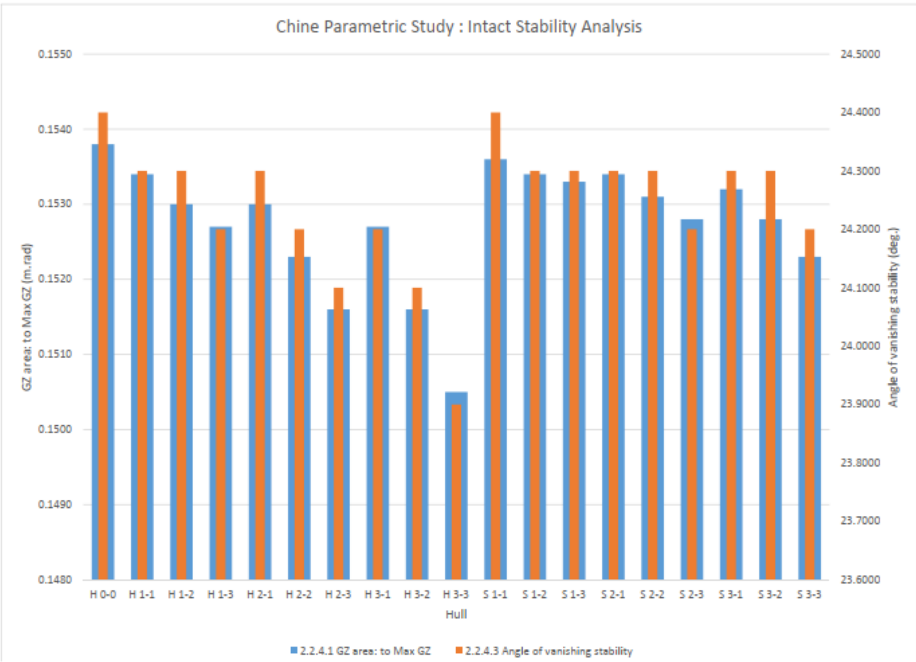


Figure 9: Intact Stability Result

4.0 CONCLUSION

The stability of barge can be improved by lowering the height and widening the width of chine shape design. The study also finds that every soft chine shape has better stability characteristics compared to their hard chine counterparts. The straight chine hull, H 0-0 represents all optimum characteristics of the most stable design, only hull that has the highest value of GZ area to max GZ and angle of vanishing stability. Nevertheless, all type of design meets the minimum stability criteria as required by the IMO and chine shape selection may be further investigated in term resistance and seaworthiness characteristics to suit the purpose of barge either as a static pontoon for shore operation or as a sea-going and offshore barge.

5.0 REFERENCES

Barge. (January 2020). Retrieved from Wikipedia the Free Encyclopaedia: https://en.wikipedia.org/wiki/Barge

Barges: History Afloat. (March 2017). Retrieved from Locaboat Holidays: https://www.locaboat.com/en/barges-history-afloat/

Chine (boating). (August 2017). Retrieved from Wikipedia the Free Encyclopaedia: https://en.wikipedia.org/wiki/Chine_(boating)

Christine. (n.d.). Nautical Terms Relating to Boat Hulls and Boatbuilding. Retrieved from Christine DE Merchant's Web Page: https://www.christinedemerchant.com/nautical-terms-hull.html

How To Buy A Kayak: The Ultimate Guide. (25 March 2019). Retrieved from Outside Pursuits: https://www.outsidepursuits.com/how-to-buy-a-kayak/

Index of IMO Resolutions. (4 December 2008). Retrieved from International Maritime Organization: http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Maritime-Safety-Committee-(MSC)/MSC-40-1981-92-2013/Pages/default.aspx

Kayak Materials & Hull Design. (2019). Retrieved from Offshore inflatable boat specialist: https://offshore-marine.myshopify.com/pages/kayak-basics-hull-shapes
Stability. (n.d.). Retrieved from Wärtsilä Encyclopaedia of Marine Technology: https://www.wartsila.com/encyclopedia

6.0 APPENDIX

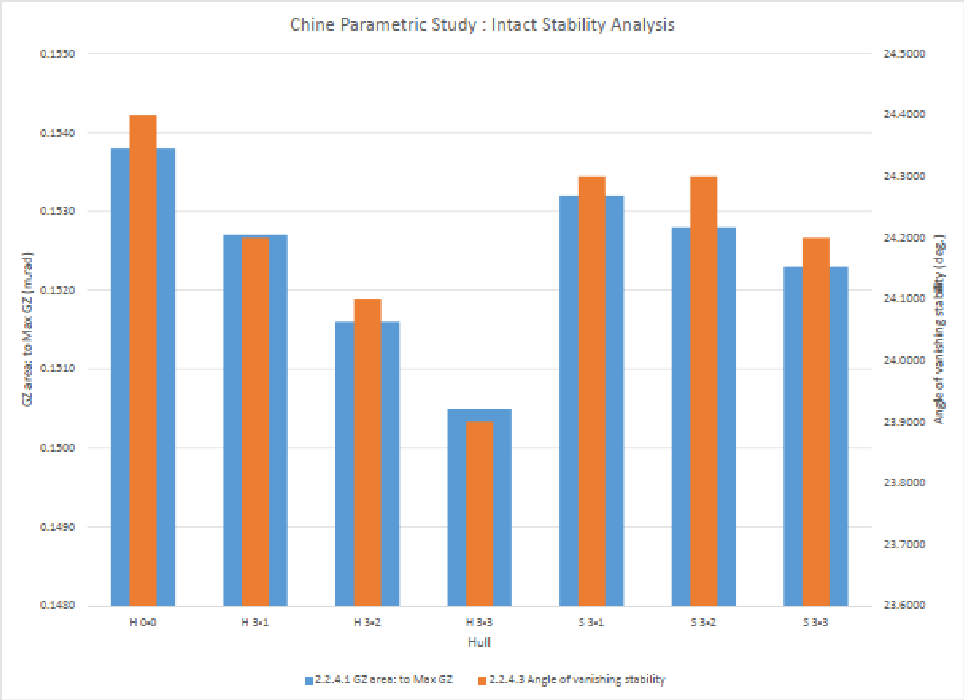


Figure A: Comparison of Chine with Same Chine Width of 3 feet

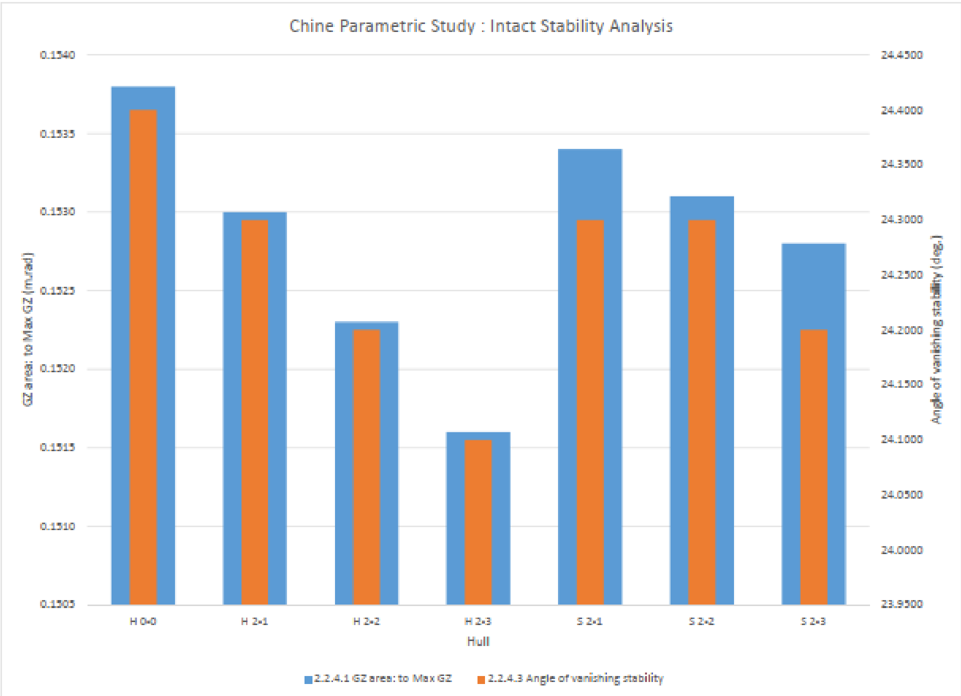


Figure B: Comparison of Chine with Same Chine Width of 2 feet

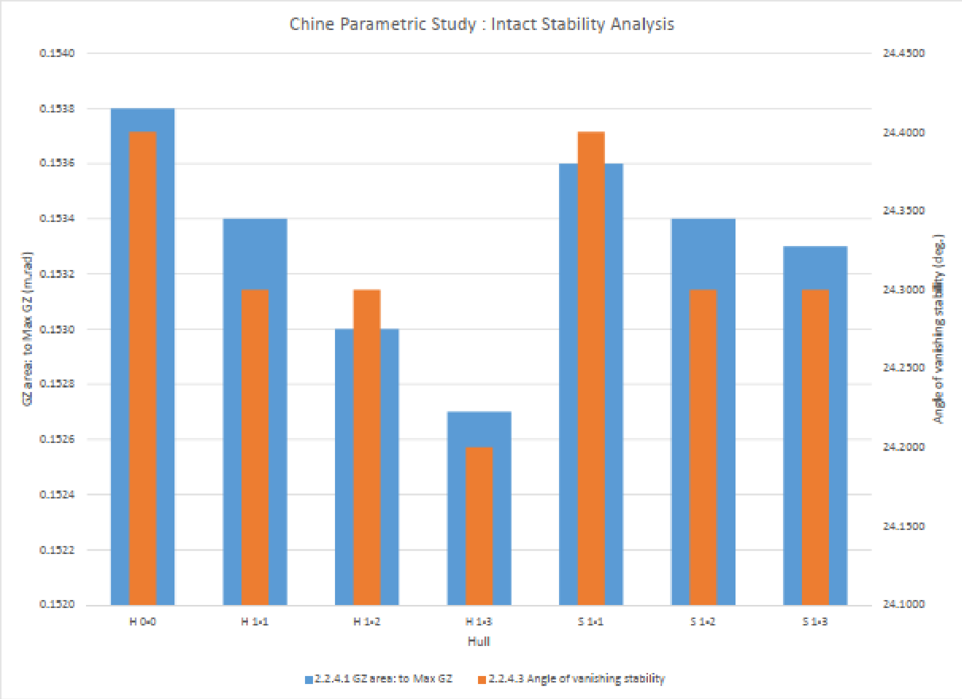


Figure C: Comparison of Chine with Same Chine Width of 1 feet

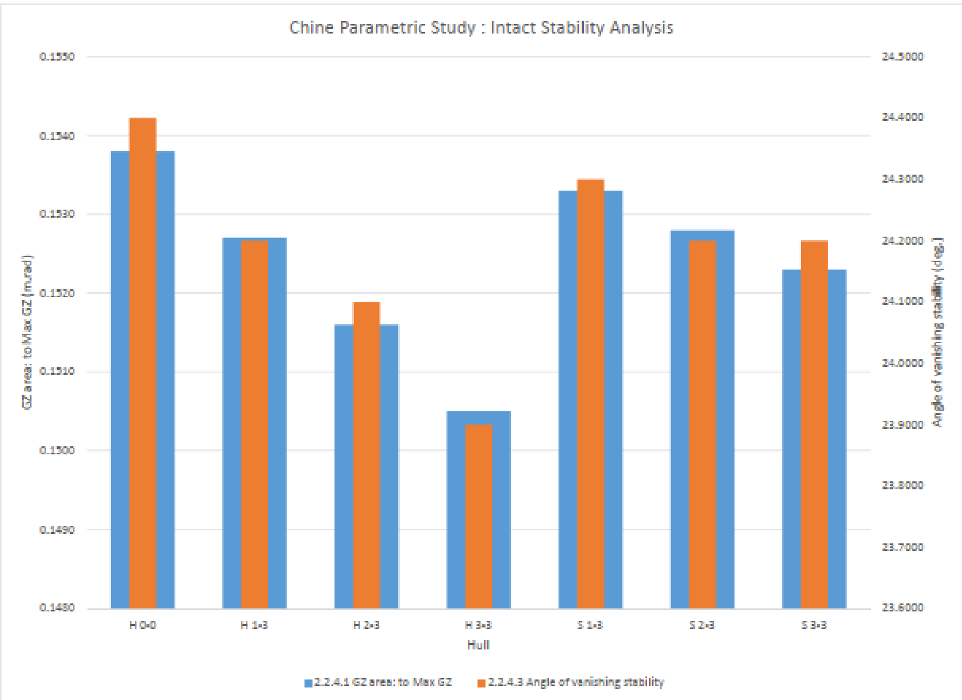


Figure D: Comparison of Chine with Same Chine Height of 3 feet

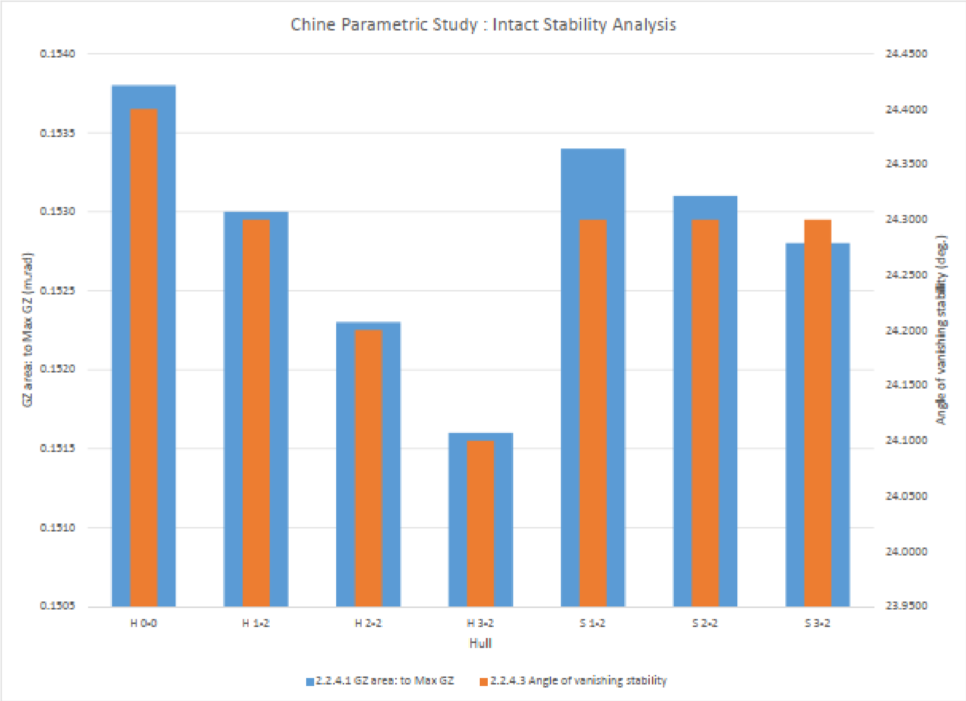


Figure E: Comparison of Chine with Same Chine Height of 2 feet

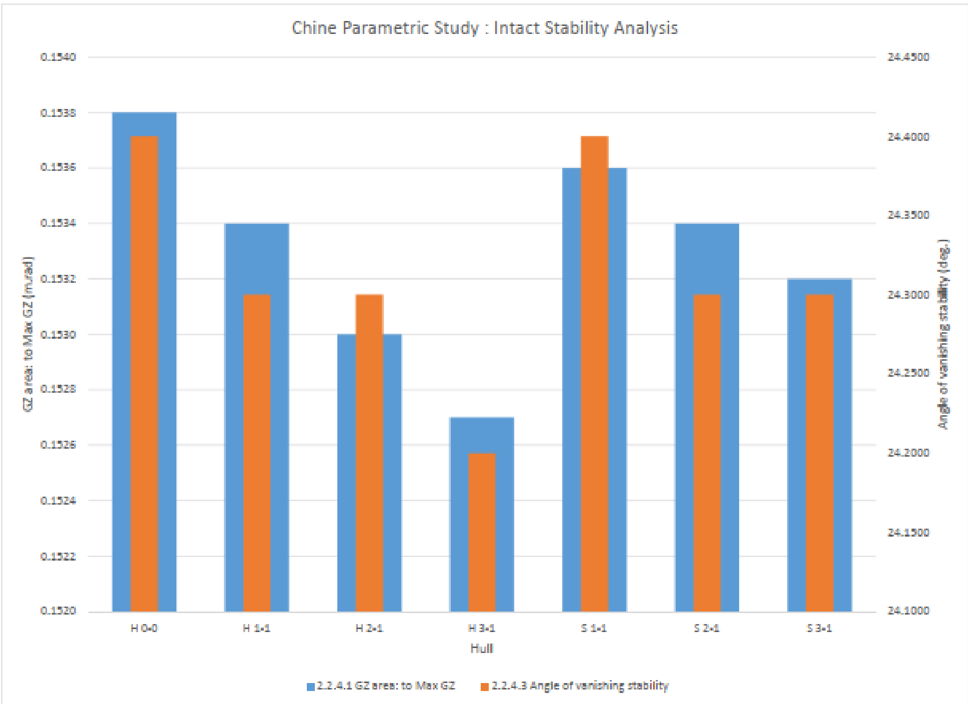


Figure F: Comparison of Chine with Same Chine Height of 1 feet

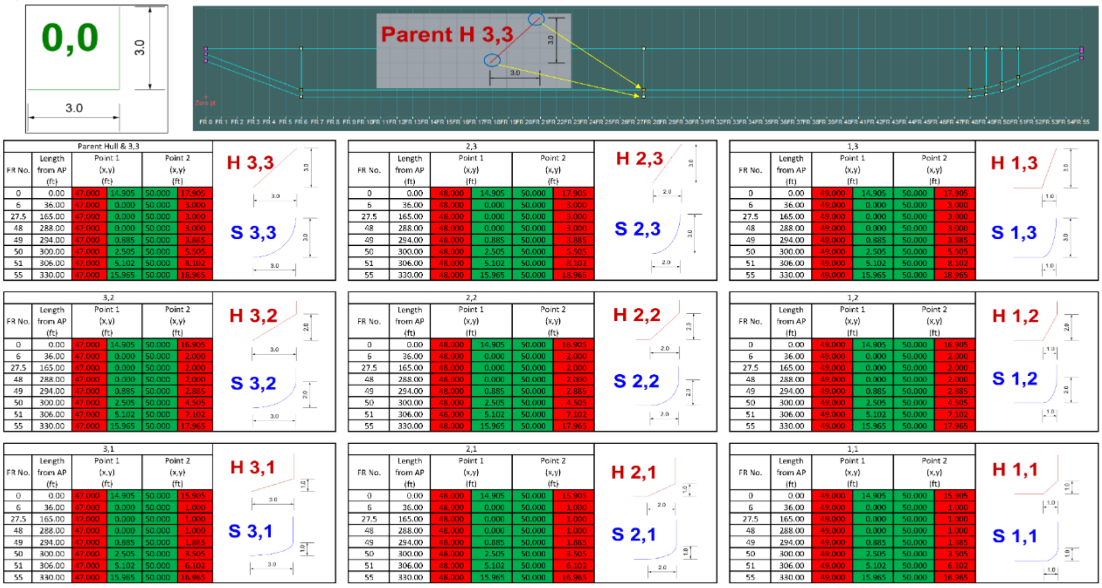


Figure G: Dimensions of 19 Hulls

Type	Y	Z	Model	2.2.4.1 GZ area: to Max GZ	2.2.4.2 Angle of equilibrium ratio	2.2.4.3 Angle of vanishing stability <=100m in length	*	Status	
H	0	0	H 0-0	8.0578	0.0000	24.0000	Pass	Pass	Pass
H	1	1	H 1-1	8.0397	0.0000	23.9000	Pass	Pass	Pass
H	1	2	H 1-2	8.0213	0.0000	23.9000	Pass	Pass	Pass
H	1	3	H 1-3	8.0034	0.0000	23.8000	Pass	Pass	Pass
H	2	1	H 2-1	8.0217	0.0000	23.9000	Pass	Pass	Pass
H	2	2	H 2-2	7.9847	0.0000	23.8000	Pass	Pass	Pass
H	2	3	H 2-3	7.9483	0.0000	23.7000	Pass	Pass	Pass
H	3	1	H 3-1	8.0036	0.0000	23.8000	Pass	Pass	Pass
H	3	2	H 3-2	7.9478	0.0000	23.7000	Pass	Pass	Pass
H	3	3	H 3-3	7.8928	0.0000	23.5000	Pass	Pass	Pass
S	1	1	S 1-1	8.0486	0.0000	24.0000	Pass	Pass	Pass
S	1	2	S 1-2	8.0401	0.0000	23.9000	Pass	Pass	Pass
S	1	3	S 1-3	8.0327	0.0000	23.9000	Pass	Pass	Pass
S	2	1	S 2-1	8.0401	0.0000	23.9000	Pass	Pass	Pass
S	2	2	S 2-2	8.0244	0.0000	23.9000	Pass	Pass	Pass
S	2	3	S 2-3	8.0082	0.0000	23.8000	Pass	Pass	Pass
S	3	1	S 3-1	8.0319	0.0000	23.9000	Pass	Pass	Pass
S	3	2	S 3-2	8.0086	0.0000	23.8000	Pass	Pass	Pass
S	3	3	S 3-3	7.9851	0.0000	23.8000	Pass	Pass	Pass

Figure H: Intact Stability Result from MAXSURF Stability

FURTHER STUDY OF X-BOW HULL PERFORMANCE IN WAVE

Azwansyah Zulkifli
Marine Engineering Department, Politeknik Bagan Datuk
azwansyah@pbd.edu.my

Fatimah Amirah Jaafar
Marine Engineering Department, Politeknik Bagan Datuk
amirah@pbd.edu.my

Khatijah Jamaludin
Marine Engineering Department, Politeknik Bagan Datuk
khatijah@pbd.edu.my

ABSTRACT

This paper is a continuation research from previous research in assessing the resistance performance of X-bow design for displacement hull. Resistance performance of tanker L_{pp} = 138.0 m was analyzed in wave condition. CFD as analysis tools was used to achieve the objectives of this research. Firstly, tanker with X-bow hull is designed using Maxsurf and then by exporting the file into SHIPFLOW format, the researcher proceeds with the analysis of the design in wave condition. Three solvers are used in SHIPFLOW analysis which is XPAN, XMESH and XBOUND. Each of the solvers has unique characteristics in analyzing resistance performance of X-bow design in wave condition. The wave condition set in SHIPFLOW was based on the wave height to length between perpendicular ratios of 1/36. The researcher validates the result by analyzing the resistance performance of X-bow in calm water condition using CFD and compared it with model test result conducted by Azrul (2012). The percentage difference between the CFD result and model test result in calm water condition is 6.52%. Thus, by changing the parameters into wave condition, the resistance assessment was carried out. In wave condition, X-bow design gives higher resistance compared to calm water condition. The percentage increasing of total resistance from calm water condition to wave condition is 15.76%. From the result, it shows that, the component of total resistance that dominates is wave making resistance as the ship increases in speed.

Keywords: Resistance performance, X-bow Hull, Wave Condition

1.0 INTRODUCTION

Nearly 90 years ago, R.E. Froude interpreted the lower resistance of a torpedo boat, after fitting of a torpedo tube as the wave reduction effect of the thickening of the bow due to the torpedo tube. The use of bulbous bow is then recognized by D.W. Taylor as an elementary device in reducing the wave-making resistance. In 1907, D.W. Taylor fitted the battleship “DELAWARE” with a bulbous bow to see its effect in ship powering. Despite great activities in the experimental field to explore the potential of bulbous bow, finally bulbous bow had been asserted as the elementary device or component in practical shipbuilding after 70 years. There is no doubt that bulbous bow improves most of the properties of the ships but designing a ship with correct bulbous bow and power prediction are still difficult due to lack of design data.

Since then, bulbous bow had been widely used in shipbuilding industry to reduce the resistance of ship to have maximum ship operability. However, many research bodies such as the ULSTEIN Group and DAMEN Group had undergoes an extensive research regarding the design of bow that can reduce a significant resistance profile in compared with the conventional bulbous bow would do. For this reason, DAMEN, and Delft Technical University (Hydromechanics Laboratory) have been working together for almost 10 years in implementing a new type of bow in practical shipbuilding industry. The research is mainly focusing on applying the new bow to high-speed hull forms. The first innovation was the “Enlarged Ship Concept” which is successfully applied on the larger DAMEN Patrol Boats since 1999. The concept of the new design introduced initially by the DAMEN group since 1999 is the Axe Bow Design for high-speed vessel.

In 2005, the ULSTEIN Group from Norway comes up with the design of the X-Bow and it is first implemented on an A-Series Anchor Handling Tug Supply Vessel (BOURBON ORCA, AX104). The ULSTEIN concept or design is believed applicable to all types of vessels such as tanker, bulk carrier, LNG carrier, tugboat, and others. The X-bow design is different from the conventional bulbous bow as the bow is slope backward instead of forward. These giving many advantages to the ship implement this design in term of fuel consumption, comfort and safety of the crew and other aspects too.

Figure 1: Bourbon Orca of the Ulstein, George Delozie (2006)

Some research had been done on X-bow design by Azrul Md Azmi (UTM researchers) to compare the performance of the X-bow and Bulbous bow in term of resistance in calm water. The result from the calm water resistance test showed that the X-bow had a poor performance in overcoming the resistance compared to the bulbous bow. Hence, for the purpose of this research, further studies of X-bow design for a displacement hull should be continue in wave condition since in real life the actual condition of the ship facing is the wave. This research will focus mainly on assessing the performance of the X-bow in wave condition by means of model test to obtain the data to be analyzed. CFD as a tool used by researcher to early estimate the resistance performance of X-bow tanker in wave condition before the actual model test is carried out to validate the result.

Figure 2: Tanker model with X-bow design, MTL036B

2.0 METHODOLOGY

2.1 Full Scale and Model Details

In this research, tanker model with X-bow design MTL036B is selected to be tested in wave condition to assess its resistance performance. MTL036B is had been modified from station 12 to forward extremity by replacing Bulbous bow with X-bow design. The model had already constructed and are undergoing resistance test in wave condition based on protocol of ITTC 1957 Procedures and Guidelines. The model and full-scale details of the tanker model with X-bow design are as in Table 1 below and the body plan of the X-bow tanker is presented in figure 3.

Table 1: Full Scale and Model Details of Tanker with X-bow Design

	MTL 036B	
	Ship	Model
LOA	149.50 m	2.99 m
LBP	139.70 m	2.79 m
LWL	147.20 m	2.94 m
Beam	21.80 m	0.43 m
Depth	12.50 m	0.25 m
Design Draft	8.70 m	0.17 m
Displacement	21635 tons	173.10 kg
Volume Displacement	21107 m^3	0.169 m^3
LCB and LCG	70 m from AP	1.4 m from AP
VCG	8.2 m above baseline	0.164 m above baseline
Cb	0.756	
Cm	0.989	
Cw	0.870	
Cp	0.764	
Wetted Surface Area	4653.425 m^2	1.861 m^2
Trim	NO TRIM	
Trial Speed	14 knots	1.019 m/s

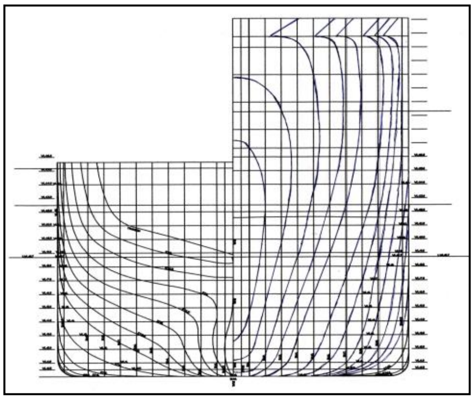


Figure 3: MTL036B Body Plan

2.2 Ship flow Command Structure

During the research period, model test cannot be done due to technical problem arises where wave generator still in maintenance period. Thus, the result of CFD using SHIPFLOW is only presented in this paper. The CFD command structure is first validated with the previous model test result in calm water condition. By changing the condition to wave, the researcher shall obtain the wave making coefficient to determine the total resistance of tanker with X-bow design in wave condition. In this research, two solvers are used to obtain the wave making coefficient as well as the wave contour profile generated by the tanker with X-bow design as it is moving in wave condition. The solvers that the researcher used are XPAN and XMESH. In XPAN analysis, two types of potential flow analysis are done on linear free surface boundary condition and nonlinear free surface boundary condition. This analysis is to determine the wave contour generated by the ship hull as it is moving in wave condition. Then, in XMESH analysis, nonlinear free surface condition is applied for 3 body of the offset group and free surface for the vessel. In using SHIPFLOW to analyze the resistance performance, correct sectioning and meshing is to be ensure first before any analysis shall be done. Refer to figure 4 showing X-bow design completed in sectioning and meshing.

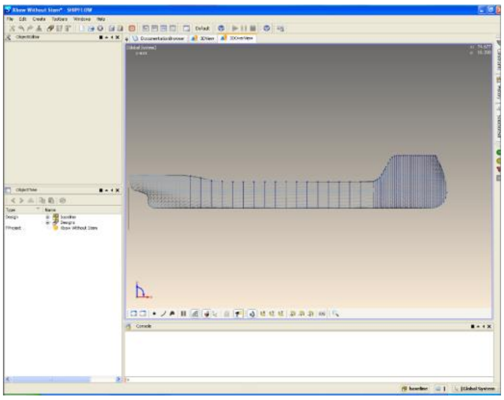


Figure 4: X-bow meshing and sectioning

3.0 RESULT AND DISCUSSION

The researcher first validates his command structure in SHIPFLOW by comparing the result produce by the CFD with the model test result in calm water condition. An acceptable range of percentage difference between result from CFD and model test is obtained for about 6.52%. If compare CFD with Hull speed the percentage difference obtained is 5.25%. However, it is important that the model test result is the trusted result in resistance performance assessment. Refer to table 2 for the total resistance produce by CFD at speed of 10 to 16 knots in calm water condition.

```
xflow
title( title = "SHIPFLOW v =8knot" )
program( xmesh, xpan, xbou )
hull( mono, h1gr = "hull", fbgr = "bulb", ogrp = "stern", fsflow )
offset( file = "off_file", lpp = 100, xaxdir = -1, ysign = 1, xori = 100,
zori = 6.65 )
vship( fn = [0.1314], rn = [1.2e+07], reflen = 100 )
end
xmesh
body( grno = 1, offsetg = "bulb", station = 4, point = 16 )
body( grno = 2, offsetg = "hull", station = 88, point = 16 )
body( grno = 3, offsetg = "stern", station = 14, point = 16 )
free( grno = 4, point = 16, str1 = 1, df1 = 0.02, nbd2 = 1, ibd2 = [2],
stau = 11, stam = 21, stad = 21 )
transom( grno = 5, point = 4, nbd1 = 1, ibd1 = [2], stad = 21 )
end
xpan
control( free, nonlin )
twcut( on )
iterati( maxit = 20 )
relaxat( rftrim = 6.65, rfsink = 6.65 )
wavecut( numt = 5, twavec = [1,1.2,1.4,1.6,1.8], dxwave = 0.1 )
end
```

Figure 5: Command Code used in SHIPFLOW

Table 2: Percentage difference of total resistance between CFD and model test in calm water condition

Speed (Knots)	R_T CFD (kN)	R_T Holtrop (kN)	R_T Model Test (kN)	Percentage difference with Hullspeed (%)	Percentage difference with model test (%)
Calm Water Condition					
10	118.24	154.56	138.51	11.59	14.63
11	163.54	188.91	178.71	5.71	8.49
12	205.37	230.36	228.82	0.67	10.25
13	276.85	281.77	281.76	0.00	1.74
14	357.73	346.17	366.04	5.43	2.27
15	468.36	427.96	472.75	9.47	0.93
16	515.23	530.23	555.8	4.60	7.30
			Average Percentage Difference	**5.35**	**6.52**

Referring to table 3, the percentage of increment of total resistance from calm water condition to wave condition can be seen higher at 10 knots to 13 knots in which the higher increment occurs at 10 knots at percentage of 33.04%. As the speed goes higher, the percentage of total resistance decrease until 15 knots and increase back at 16 knots for about 10.37%. It can be deduced that, at lower speed (e.g., 10 knots) the frictional resistance dominates instead of wave making resistance. Due to higher volume of X-bow design, at lower speed X-bow tends to have more resistance due to its larger volume at forward part of the ship. At the start of speed 10 knots, it gives higher resistance but as the speed increasing, X-bow can be seen that it can have percentage of increasing from calm water condition to wave condition of total resistance below than 10%. The reason behind this low percentage increasing of total resistance might be proved that X-bow design can perform well in wave condition instead of calm water condition although there is still increasing of total resistance from calm water condition and wave condition at 15.76%. It is logic also to think that, when a ship moving in wave condition where the wave itself carried certain amount of energy and thus the ship need to overcome the energy carried out by the wave to move forward on water. Above all, the trend of total resistance is that as the speed goes higher, then the total resistance is much higher and thus the ship itself needs to overcome this resistance to move on the water.

Table 3: Result comparison of total resistance using CFD in wave condition with Holtrop and model experiment in calm water condition

Speed (Knots)	R_T CFD (kN)	R_T Holtrop(kN)	R_T Model Test (kN)	R_T CFD (kN)	Average Percentage Increment of Total Resistance
	Calm Water Condition			**Wave Condition**	
10	118.24	154.56	138.51	184.28	33.04
11	163.54	188.91	178.71	219.62	22.89
12	205.37	230.36	228.82	268.44	17.31
13	276.85	281.77	281.76	319.14	13.27
14	357.73	346.17	366.04	392.27	7.17
15	468.36	427.96	472.75	502.37	6.27
16	515.23	530.23	555.8	613.45	10.37
					15.76

Figure 6 shows the graph of total resistance versus ship speed. As the speed increase, the total resistance of the ship also will increase, this will eventually lead to higher effective power needed by the ship. In wave condition, from 10 knots to 16 knots, higher total resistance can be seen compared to the calm water condition. Wave theory states that, as the ship speed increase, the component of total resistance that dominates is wave making resistance instead of frictional resistance. Although wave making resistance dominate, there are still another component of total resistance that act on the ship which give higher resistance value as the ship speed increase. However, as discussed earlier the percentage increasing of total resistance from calm water condition to wave condition is 15.76%, if comparison were to make between bulbous bow and X-bow then the bulbous bow needed to be analyzed at the same condition of X-bow design being analyze. Then, the percentage of increasing of total resistance from calm water condition to wave condition between bulbous bow and X-bow can be seen and thus researcher can justify which hull is better in term resistance performance.

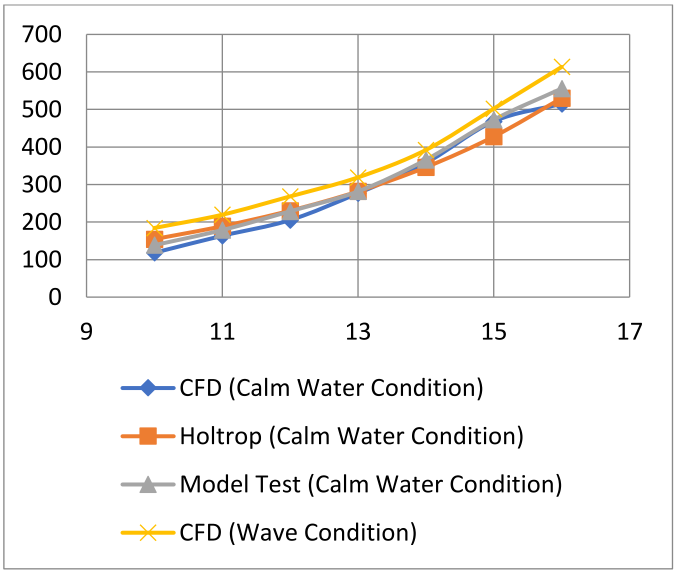


Figure 6: Total resistance versus ship speed graph both in calm water condition and wave condition

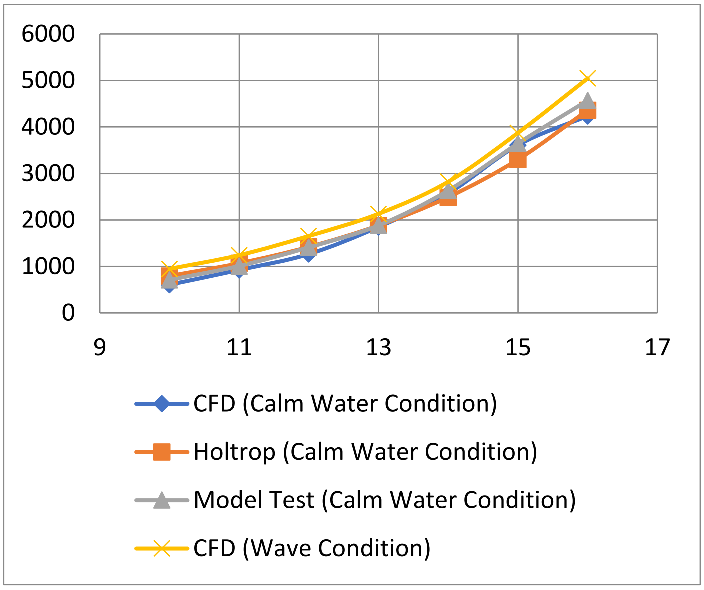


Figure 7: Comparison of total effective power in wave condition using CFD with Holtrop and Model Test in calm water condition

5.0 CONCLUSION

The result obtained shows that the resistance of X-bow for displacement hull increases in wave condition. Previously, resistance of the X-bow was tested in calm water condition, and it is compared with the Bulbous bow. Due to higher wetted surface area, the resistance of X-bow in calm water condition was higher than Bulbous bow at percentage of 11.97%. In wave condition, the percentage of increasing of total resistance from calm water condition to wave condition is 15.76%. This is due to the wave making resistance that dominates as the ship moving faster in wave condition. It is logic that as the ship moving in wave condition, the total resistance of the ship also will increase. The same trend also can be seen on the effective power required by the ship to overcome the total resistance acting on the ship. as the total resistance increases, more power is needed by the ship to move forward. Above all, the result produced was only using CFD as tools to estimate the resistance performance of X-bow design in wave condition. Model test still needed to be conducted to have the rigid result that can be used to compare with the result produced by the CFD.

5.0 REFERENCES

Biran, A. B. (2003). *Ship Hydrostatics and Stability*. Butterworth-Heinemann.

Harvald. SV.AA. (1983). *Resistance and Propulsion of Ship*. New York: A Wiley Interscience Publication.

Azrul (2012). X-bow Design Study for a Displacement Hull. UniversitiTeknologi Malaysia, Skudai : Degree Thesis

"A Method for Resistance and Flow Prediction in Ship Design", SNAME Transaction, Vol.98, 1990

International Towing Tank Conference (ITTC) Recommended Procedure, Testing and Extrapolation Methods, Resistance Test.

Min, S.K. & Kang, H.S. (2009). *Study on the Form Factor and Full-Scale Ship Resistance Prediction Method*. JASNAOE 2009

Doctors, L.J. (2006), Sahoo, P.K (2006), pretlove.L: "*CFD Prediction of the Wave Resistance of a Catamaran with Staggered Demihull"* International Conference on Marine Hydrodynamics, Visakhapatnam, India, 5-7 January 2006

Bhattacharyya, R. (1978). *Dynamics of Marine Vehicles*. New York: A Wiley-Interscience Publication.

INVESTIGATION ON THE EFFECT OF CHINE SHAPE TO THE RESISTANCE OF A BARGE

Zamri bin Yusoff
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
zamyusoff@pbd.edu.my

Nor Anis Suhadah Binti Jasri
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
anisuhad23@gmail.com

Nuralia Afiqah Binti Husin
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
aliaafiqah125@gmail.com

ABSTRACT

This paper addresses a study of the effect of chine shape to the resistance of a barge through parametric approach. Ship resistance is influenced by the shape, principal dimension, wetted surface, velocity, and block coefficient. The total resistance of all type of the chine shape which is soft chine shape, and the hard chine shape are presented and discussed in this paper. There are various chine shapes for each type of vessel and this paper is aimed to discuss the resistance based on these shapes. The velocity is fixed. As barge is a shoal-draft flat-bottomed boat and a well-known transport of bulk goods in shipping industry, it is crucial to investigate the relationship between resistance and chine shapes of a barge. Maxsurf modeller and resistance then is used to create all type of chine shape and calculate the total resistance.

Keywords: Resistance, Chine, Barge, Maxsurf.

1.0 INTRODUCTION

Maritime transportation is the soul of the global economy. It enables intercontinental business, the bulk transport of raw materials, and the import or export of economical sustenance and manufactured goods. The international maritime transportation industry contributes for the carriage of around 90% of the world trade. There are over 50,000 merchant ships trading worldwide, delivering every kind of cargo. The global fleet is registered in over 150 nations and operated by over a million seafarers of various nations.

Barge is one of the most famous ship cargos in shipping industry at all around the world. Pontoon barges are used for an extensive variety of cargoes including bulk loads such as coal, rock, logs, low to medium centres of gravity goods, vehicles, and enormous loads such as industrial equipment and storage tanks, which possess very high centres of gravity, and wind exposed areas. Pontoon barges are also used as work platforms for various types of equipment including cranes and pile drivers in offshore operation. Barge is a long flat-bottomed boat for carrying freight on canals and rivers, either under its own power or towed by another. The main reason for this shape is to ensure that the cargo carrying capacity is enhanced and more bulk can be hauled and transferred. A barge is a type of vessel which is mainly used for the purpose of carrying cargo. The most important part about barge in the fact that they are not independent boats or vessels.

The resistance of a ship associated with the expenditure of energy spends by the engine. With further increase in speed, the value of resistance began to increase more. Therefore, it is crucial to minimize the total resistance. This is critical for ship operators operating barge as this will affect the journey time and fuel consumption of the towing in business point of view.

Resistance considerations are essential to conduct maritime transportation and other operations at minimum cost and therefore, it is necessary that some research to be taken to study the effect of resistance to a barge.

2.0 METHODOLOGY

This chapter discusses about the research design, data collection, research instrumental, drawing/design technique and various data analysis method for investigation on the effect of chine shape to the resistance of a barge. the process is to change the chine shape by using parametric design to investigate which chine are more efficient on resistance.

2.1 Research Methodology

The study is conducted by the experimental research design.

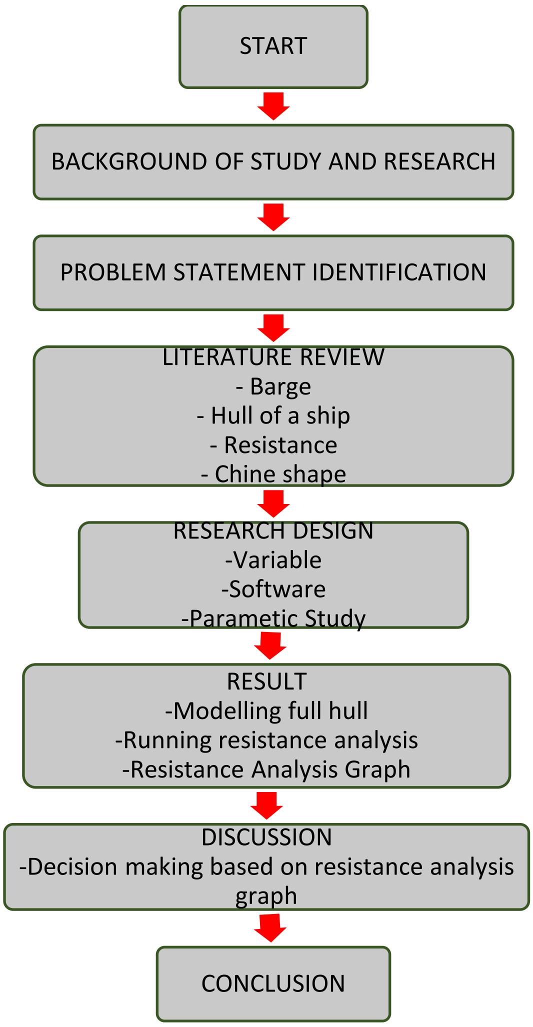


Figure 1: Process Flow of Study

a) Design Specification

Design specification identifies the characteristics, function and other information required to describe the design. It provides information to create a proper design concept in the process which is done after analysing the data. It is based on the sequence of generating the specification as shown below:

ii. **Resistance**

Which type of chine is suitable for reducing the resistance.

b) Design Selection of Parametric Design

A parametric design is the exploration of relationships and Trade-offs between different design parameters and the building performance result from the simulation of those design parameters. Both strength and weakness of each design are compared to determine the perfect one. Three ideal typical type of chine shape are selected and applied to the 100 m barge.

i. **Hard Chine Shape**

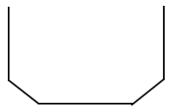


Figure 2: Hard Chine

ii. **Soft Chine**

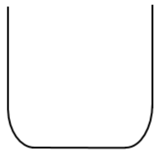


Figure 3: Soft Chine

iii. **Straight Chine Shape**

Figure 4: Straight Chine

c) Project Design

It depends on the chine shape of the barge that estimated by using the parametric design concept.

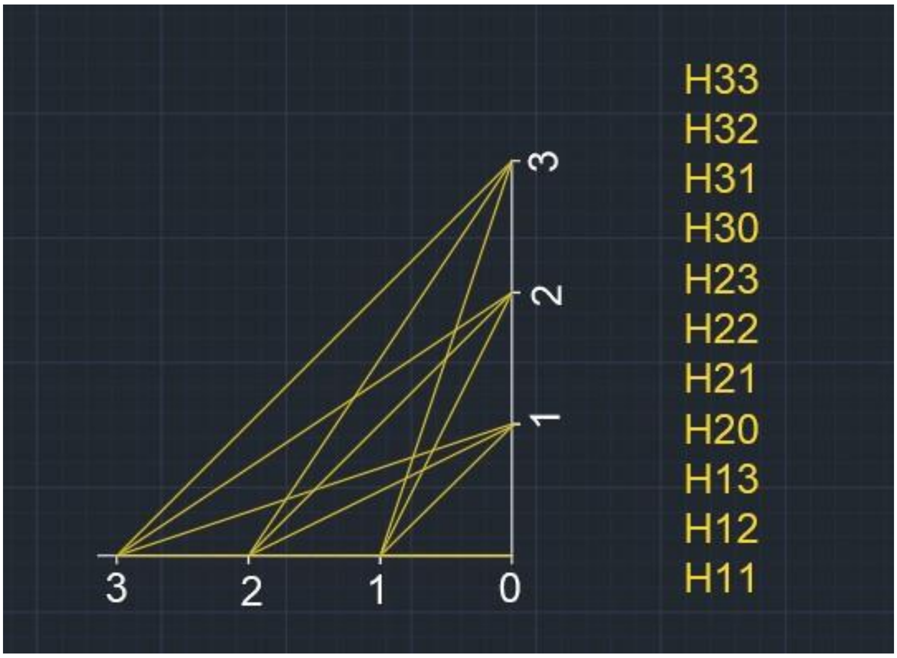


Figure 5: Example parametric study for hard chine shape.

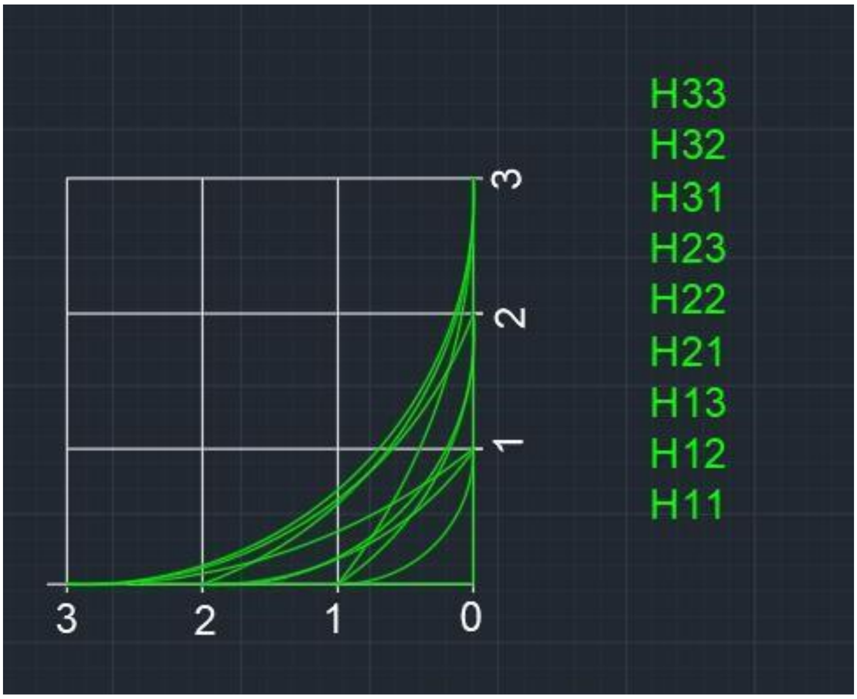


Figure 6: Example parametric study for soft chine shape

d) Data Collection Method

Parametric study is applied based on height and width of the chine. 19 chine shapes are developed based on chine shapes and dimension limitation of 3 feet width and height of chine. All 19 hulls are developed in MAXSURF Modeler and analysed using MAXSURF Resistance.

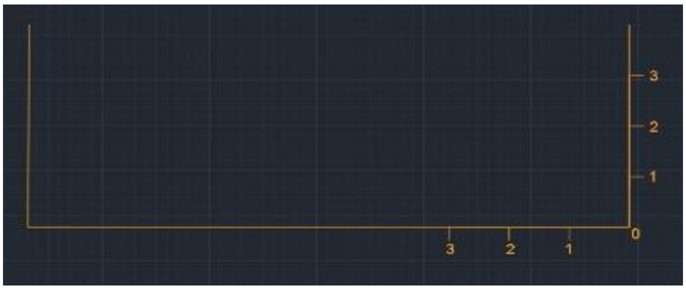


Figure 7: Straight Chine of H 0-0

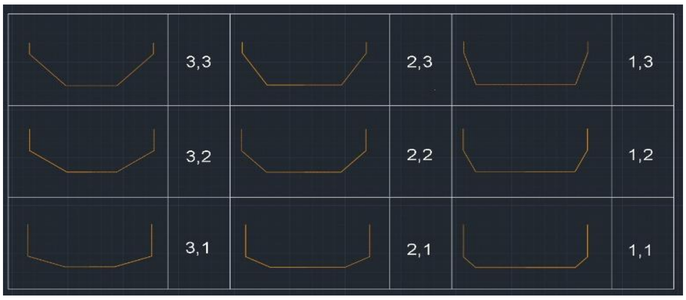


Figure 8: Hard Chine of H 1-1 till H 3-3

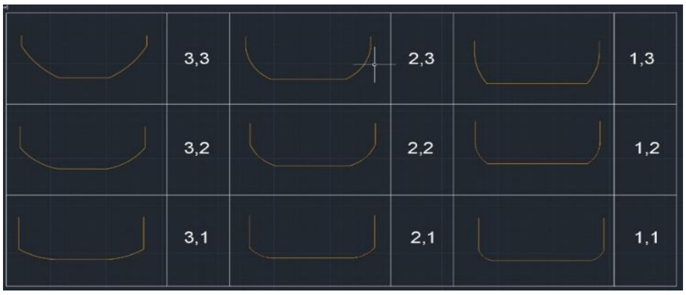


Figure 9: Soft Chine of S 1-1 till S 3-3

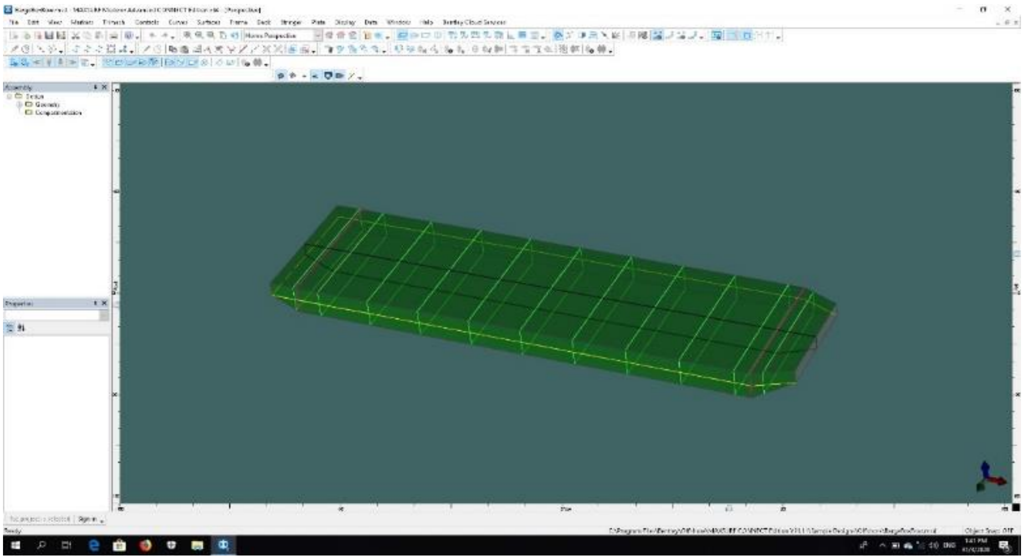


Figure 10: Hull modelling in MAXSURF Modeler

3.0 RESULT AND DISCUSSION

Maxsurf Modeler is the boat design module of a comprehensive range of software for Naval Architects. It is used to create the structure of the barge based on the information given by the construction plan.

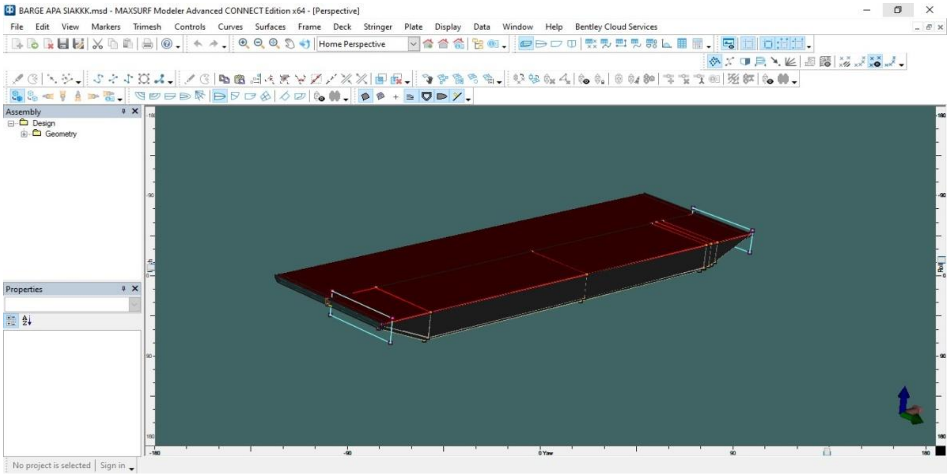


Figure 12: Analysis using Maxsurf Modeller

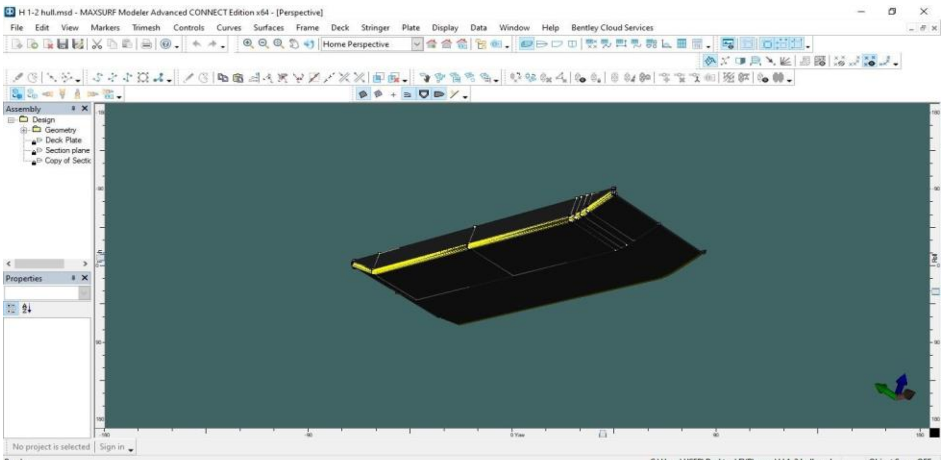


Figure 13: Analysis using Maxsurf Modeller

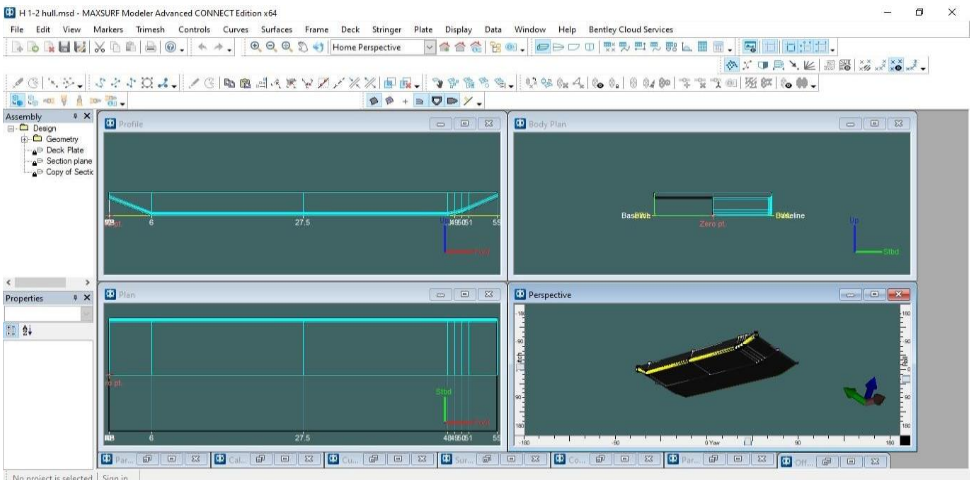


Figure 14: Analysis using Maxsurf Modeller

Maxsurf Resistance (previously called Hull speed) directly opens a Maxsurf model, and lets you estimate the resistance and power requirements for any Maxsurf design. The analysis of the barge hull is divided by 2 categories. First the analysis are goes with the soft chine shape and after that with the hard chine shape. The result obtained show which chine shape that is more efficient.

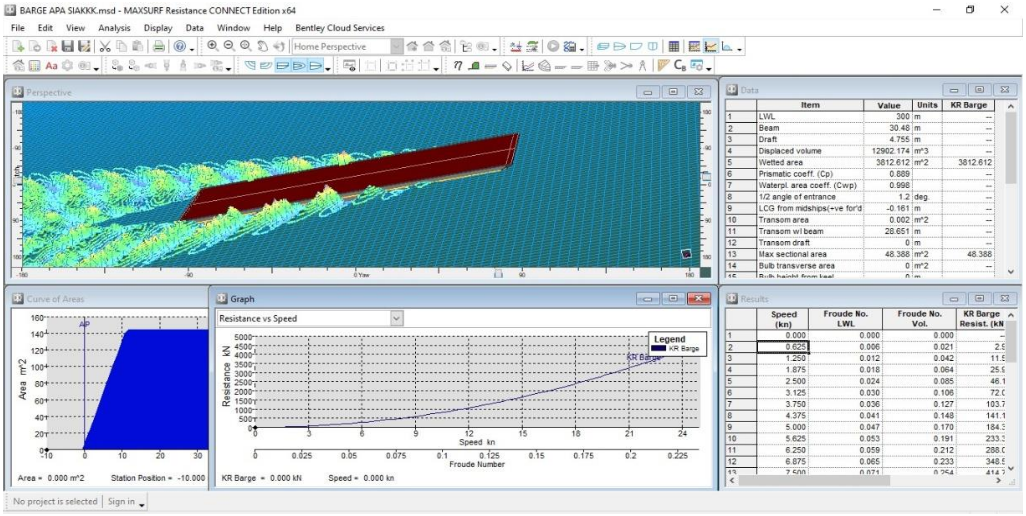


Figure 15: Analysis using Maxsurf Resistance

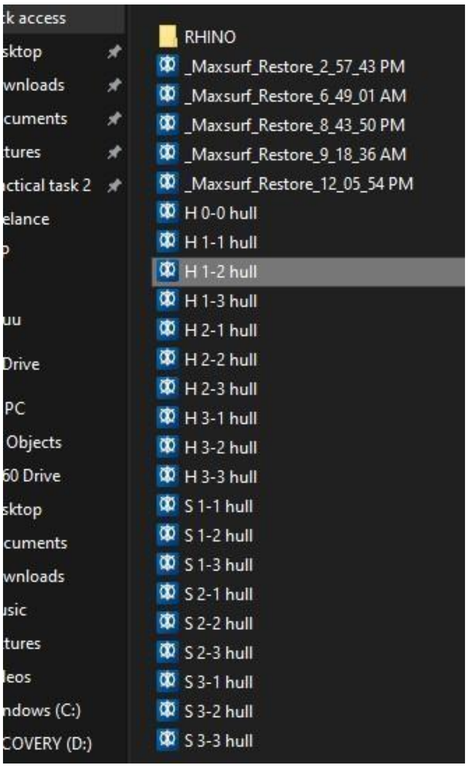


Figure 16: Analysis using Maxsurf Resistance

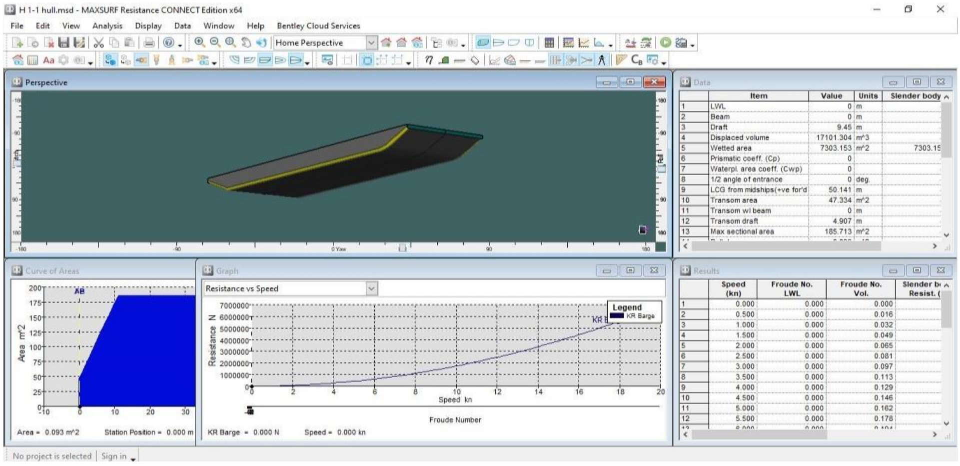


Figure 17: Analysis and result using Maxsurf Modeller

	Speed (kn)	Froude No. LWL	Froude No. Vol.	Slender body Resist. (N)	Slender body Power (W)	KR Barge Resist. (N)	KR Barge Power (W)
1	0.000	0.000	0.000	--	--	--	--
2	0.500	0.000	0.016	--	--	4310.88	1108.85
3	1.000	0.000	0.032	396.57	204.01	17243.50	8870.82
4	1.500	0.000	0.049	892.29	688.55	38797.88	29939.03
5	2.000	0.000	0.065	1586.29	1632.12	68974.01	70966.59
6	2.500	0.000	0.081	2478.58	3187.73	107771.89	138606.62
7	3.000	0.000	0.097	3569.15	5508.39	155191.52	239512.25
8	3.500	0.000	0.113	4858.01	8747.12	211232.90	380336.58
9	4.000	0.000	0.129	6345.21	13057.04	275896.04	567732.73
10	4.500	0.000	0.146	8032.87	18596.09	349180.92	808353.83
11	5.000	0.000	0.162	9946.33	25584.17	431087.56	1108853.00
12	5.500	0.000	0.178	12228.51	34599.88	521615.95	1475883.34
13	6.000	0.000	0.194	15353.37	47390.74	620766.08	1916097.98
14	6.500	0.000	0.210	20381.11	68152.16	728537.97	2436150.03
15	7.000	0.000	0.227	29051.23	104616.72	844931.61	3042692.62
16	7.500	0.000	0.243	44203.56	170552.08	969947.01	3742378.86
17	8.000	0.000	0.259	68380.13	281422.22	1103584.15	4541861.87
18	8.500	0.000	0.275	104285.04	456015.30	1245843.04	5447794.77
19	9.000	0.000	0.291	159067.63	736483.14	1396723.69	6466830.68
20	9.500	0.000	0.307	223353.96	1091580.43	1556226.08	7605622.70
21	10.000	0.000	0.324	319136.74	1641781.24	1724350.23	8870823.97
22	10.500	0.000	0.340	429719.58	2321201.91	1901096.13	10269087.60
23	11.000	0.000	0.356	555876.49	3145643.28	2086463.78	11807066.71
24	11.500	0.000	0.372	678781.53	4015746.95	2280453.18	13491414.41
25	12.000	0.000	0.388	800693.76	4942949.48	2483064.33	15328783.83
26	12.500	0.000	0.405	1024255.98	6586534.95	2694297.24	17325828.07
27	13.000	0.000	0.421	1145739.14	7662448.75	2914151.89	19489200.27
28	13.500	0.000	0.437	1363141.75	9467019.45	3142628.30	21825553.54
29	14.000	0.000	0.453	1473320.39	10611180.86	3379726.46	24341540.99
30	14.500	0.000	0.469	1797431.37	13407839.46	3625446.36	27043815.74
31	15.000	0.000	0.485	1810011.56	13967255.84	3879788.02	29939030.91
32	15.500	0.000	0.502	2082323.77	16604218.41	4142751.43	33033839.63
33	16.000	0.000	0.518	2411672.75	19850746.33	4414336.60	36334895.00
34	16.500	0.000	0.534	2378158.45	20186601.68	4694543.51	39848850.15

Figure 18: Analysis and result using Maxsurf Modeller

4.0 CONCLUSION

In conclusion, the study shows that modified chine shape of barge will change the value to a higher value or lower value of resistance. It is also show that the original barge is the optimized form of chine design that has less resistance compared to the other. This research including the condition of barge and the other important factor such as oil consumption and speed when adjusted to the preferable design. The study presents a parametric modelling approach to the design of ship hull forms which allows to create and vary ship hulls quickly and efficiently using software. Hence, based on result it shows the soft chine shape will produce less resistance compared to hard type. Further investigated in term stability and seaworthiness characteristics can be carry out to suit the purpose of barge either as a static pontoon for shore operation or as a sea-going and offshore barge.

5.0 REFERENCES

Barge. (January 2020). Retrieved from Wikipedia the Free Encyclopaedia: https://en.wikipedia.org/wiki/Barge

Barges: History Afloat. (March 2017). Retrieved from Locaboat Holidays: https://www.locaboat.com/en/barges-history-afloat/

Chine (boating). (August 2017). Retrieved from Wikipedia the Free Encyclopaedia: https://en.wikipedia.org/wiki/Chine_(boating)

Christine. (n.d.). Nautical Terms Relating to Boat Hulls and Boatbuilding. Retrieved from Christine DE Merchant's Web Page: https://www.christinedemerchant.com/nautical-terms-hull.html

How To Buy A Kayak: The Ultimate Guide. (25 March 2019). Retrieved from Outside Pursuits: https://www.outsidepursuits.com/how-to-buy-a-kayak/

Index of IMO Resolutions. (4 December 2008). Retrieved from International Maritime Organization: http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Maritime-Safety-Committee-(MSC)/MSC-40-1981-92-2013/Pages/default.aspx

Kayak Materials & Hull Design. (2019). Retrieved from Offshore inflatable boat specialist: https://offshore-marine.myshopify.com/pages/kayak-basics-hull-shapes

Stability. (n.d.). Retrieved from Wärtsilä Encyclopaedia of Marine Technology: https://www.wartsila.com/encyclopedia

WATER JET PROPULSION (E-SPEEDY FISHING BOAT)

Muhammad Zaim Danial Rosli
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
zaimdanial29@gmail.com.my

Ahmad Zulfathah Mohamad
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
zulfatah2000@gmail.com.my

Khatijah Jamaludin
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
khatijah@pbd.edu.my

ABSTRACT

Water jet propulsion are a project undertaken to enhance the speed of the boat. Although there are many other alternatives used for ship speed, water jet propulsion is something new and will be a key alternative to ship speed. Every ship that is manufactured certainly has own speed, but it must have problems after a long time. Instead, many of the older ships and ships created today are equipped with tools that can improve ship speed. However, the production rate of these devices is very limited. In addition, in this project the focus is on selecting the right design to be the main source of reference. This is because each of these designs has the right parameters and data. At present, one of the alternatives used is change the propeller. This is because the design is easy to make. The type for this propeller were easily obtained by previous ships. With this water jet propulsion, the speed of the ship will increase. This is because it has a high level of speed. In addition, the water jet propulsion is so fast. This is because the production is of high quality. Therefore, with this water jet propulsion project it will help a little in improving the ship's speed while sailing.

Keyword: Waterjet Propulsion, Ship Speed, Type of Propeller, Waterjet Design.

1.0 INTRODUCTION

Fishermen refer to those who earn money by catching fish or marine life including snails and seaweeds. Their income from fishing activities is more than any other activity. In Malaysia, fishermen are divided into 2 categories: coastal fishermen and deep-sea fishermen. The difference in this category lies in the type of capture device and the distance to their catch area from the beach.
Some key areas are discussed and explained. A questionnaire had been developed as a survey tool; divided into three parts, covering cost factor, engine factor and operation factor. The questionnaire was developed based on Likert scale and distributed to randomly selected respondents among the fishermen community at Manjung, Perak. The data was then processed using Statistical Package for Social Science (SPSS). The results showed that inshore fishermen are not satisfied with petrol outboard motor, with more than 95% confidence level. [1]
After researching and identifying the issues that arise, this project is focus on a fishing boat using water jet propulsion to replace the 3-blade propeller. [1].

2.0 METHODOLOGY

This chapter explain the detail of the progression or which ways the work being implemented and the available result. This progress is important to be fulfil for the project requirement status. This subtopic will give the details about the work progress in making the design of water jet propulsion, design of fishing boat and model based on the flow chart and figure below.

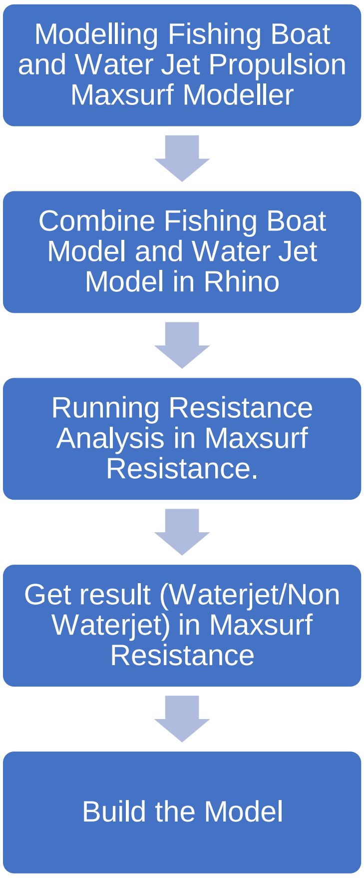


Figure 1: Simplified diagram of the flow chart

a) Modelling Fishing Boat and Water Jet Propulsion in Maxsurf Modeller
MAXSURF Modeller provides fast, flexible, and intuitive modelling of all types of hulls, superstructures, and appendages. An unlimited number of trimmed NURB surfaces can be used to model any vessel from yachts to workboats to the largest ships. [2]

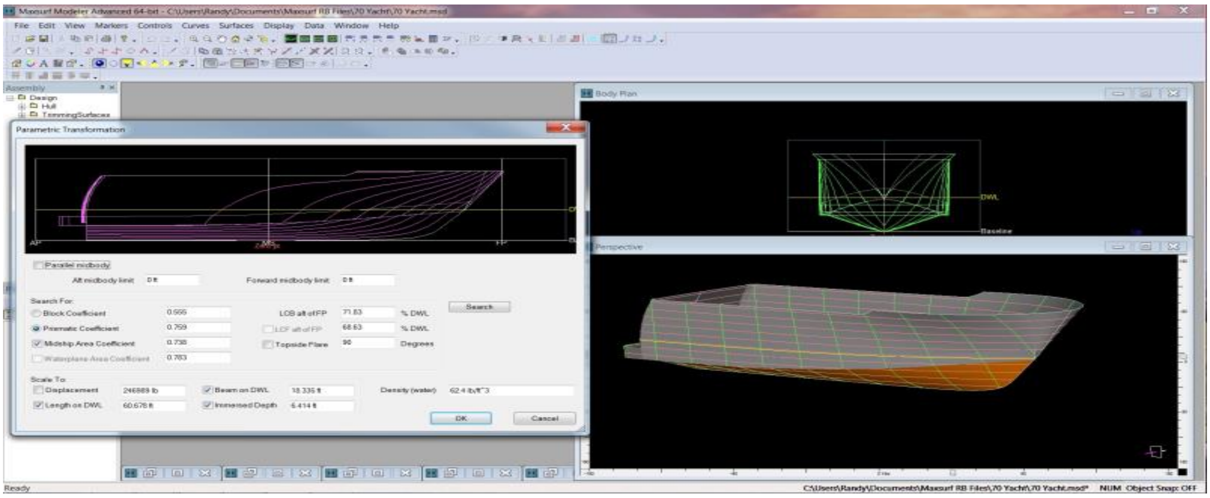


Figure 2: Fishing Boat hull design in maxsurf modeller

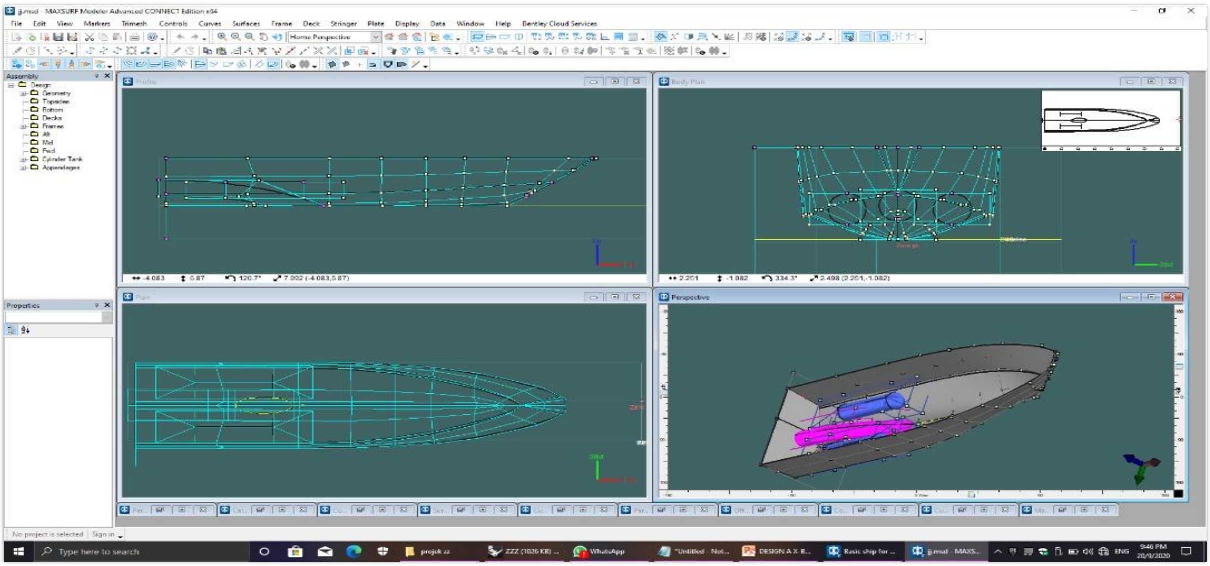


Figure 3: Complete Fishing Boat and Water Jet Propulsion Design.

b) Combine Fishing Boat Model and Water Jet Model in Rhino

Rhino can create, edit, analyze, document, render, animate, and translate **NURBS** curves, surfaces, and solids with no limits on complexity, degree, or size. Rhino also supports polygon meshes and point clouds. Its accuracy and flexibility make it possible to students to explore and build their ideas without having to spend much time learning “CAD”. [3]

Figure 4: Rhinoceros software [3]

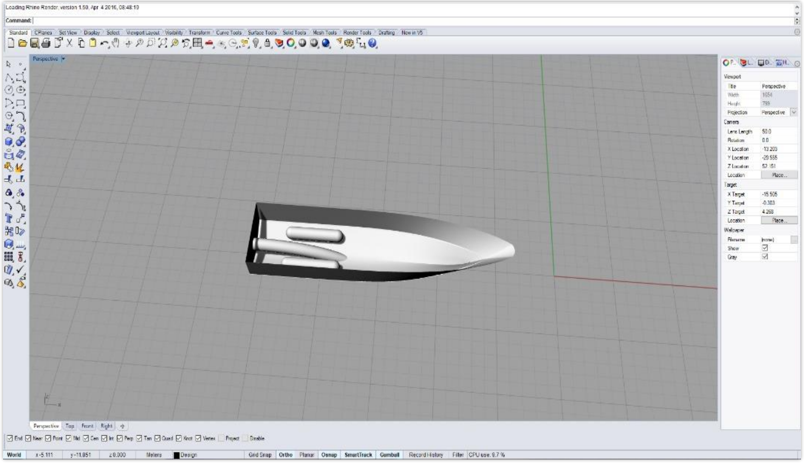


Figure 5: Complete combination Fishing Boat Model and Water Jet Model in Rhino

3.0 FINDINGS AND DISCUSSIONS

With this module, Maxsurf provides tools for quickly predicting the resistance of a ship hull using a choice of tank testing regression methods or an analytical Slender Body method. With Maxsurf Resistance, the Naval Architect has a powerful tool for getting quick answers using proven methods without manual calculations. [4].
In this part, from the results, the resistance of fishing boat with waterjet and without waterjet can be determined. The comparison on both fishing boat had been calculated by Maxsurf Resistance.

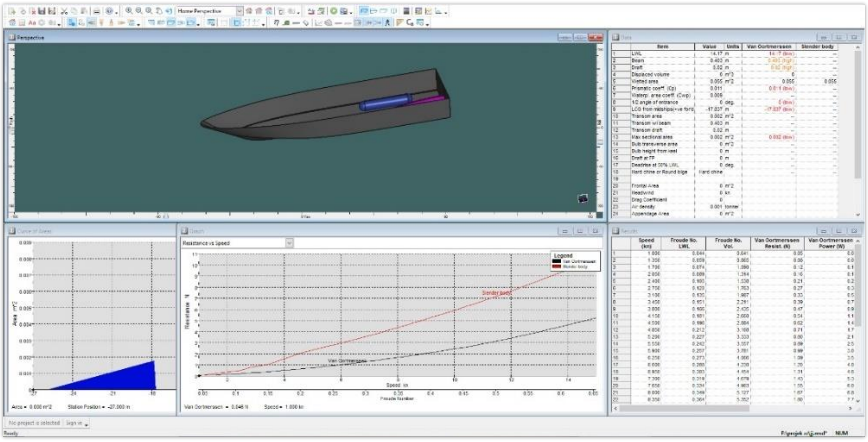


Figure 6: E-speedy Fishing Boat running Resistance Analysis.

Figure 7: Wave pattern Fishing Boat at 15 knots

3.1 Comparison Result Fishing Boat with Waterjet and without Waterjet

3.1.1 Result (With Waterjet)

Table 1: Resistance VS Speed Result (Waterjet) is made by Maxsurf Resistance

	Speed (kn)	Froude No. LWL	Froude No. Vol.	Van Oortmerssen Resist. (N)	Van Oortmerssen Power (W)	Slender body Resist. (N)	Slender body Power (W)
1	1.000	0.044	0.641	0.05	0.02	0.07	0.04
2	1.350	0.059	0.865	0.08	0.05	0.14	0.10
3	1.700	0.074	1.090	0.12	0.10	0.28	0.24
4	2.050	0.089	1.314	0.16	0.17	0.39	0.41
5	2.400	0.105	1.538	0.21	0.26	0.47	0.58
6	2.750	0.120	1.763	0.27	0.38	0.73	1.03
7	3.100	0.135	1.987	0.33	0.52	0.89	1.42
8	3.450	0.151	2.211	0.39	0.70	1.08	1.91
9	3.800	0.166	2.435	0.47	0.91	1.38	2.69
10	4.150	0.181	2.660	0.54	1.16	1.70	3.62
11	4.500	0.196	2.884	0.62	1.44	1.98	4.58
12	4.850	0.212	3.108	0.71	1.77	2.23	5.57
13	5.200	0.227	3.333	0.80	2.14	2.46	6.59
14	5.550	0.242	3.557	0.89	2.55	2.69	7.67
15	5.900	0.257	3.781	0.99	3.01	2.91	8.83
16	6.250	0.273	4.006	1.09	3.52	3.14	10.09
17	6.600	0.288	4.230	1.20	4.08	3.37	11.43
18	6.950	0.303	4.454	1.31	4.69	3.60	12.88
19	7.300	0.319	4.679	1.43	5.36	3.85	14.46
20	7.650	0.334	4.903	1.55	6.09	4.10	16.15
21	8.000	0.349	5.127	1.67	6.87	4.36	17.93
22	8.350	0.364	5.352	1.80	7.72	4.62	19.83
23	8.700	0.380	5.576	1.93	8.63	4.89	21.88
24	9.050	0.395	5.800	2.06	9.60	5.16	24.01
25	9.400	0.410	6.025	2.20	10.64	5.44	26.29
26	9.750	0.425	6.249	2.34	11.74	5.71	28.66
27	10.100	0.441	6.473	2.49	12.92	5.99	31.14
28	10.450	0.456	6.698	2.63	14.16	6.29	33.80
29	10.800	0.471	6.922	2.79	15.52	6.58	36.54
30	11.150	0.487	7.146	2.97	17.04	6.88	39.45
31	11.500	0.502	7.370	3.15	18.65	7.22	42.71
32	11.850	0.517	7.595	3.34	20.36	7.53	45.88
33	12.200	0.532	7.819	3.53	22.17	7.84	49.21
34	12.550	0.548	8.043	3.73	24.09	8.18	52.84
35	12.900	0.563	8.268	3.93	26.11	8.51	56.50
36	13.250	0.578	8.492	4.14	28.23	8.85	60.30
37	13.600	0.594	8.716	4.35	30.47	9.18	64.26
38	13.950	0.609	8.941	4.57	32.82	9.53	68.38
39	14.300	0.624	9.165	4.80	35.28	9.86	72.51
40	14.650	0.639	9.389	5.02	37.87	10.22	76.99
41	15.000	0.655	9.614	5.26	40.57	10.59	81.76

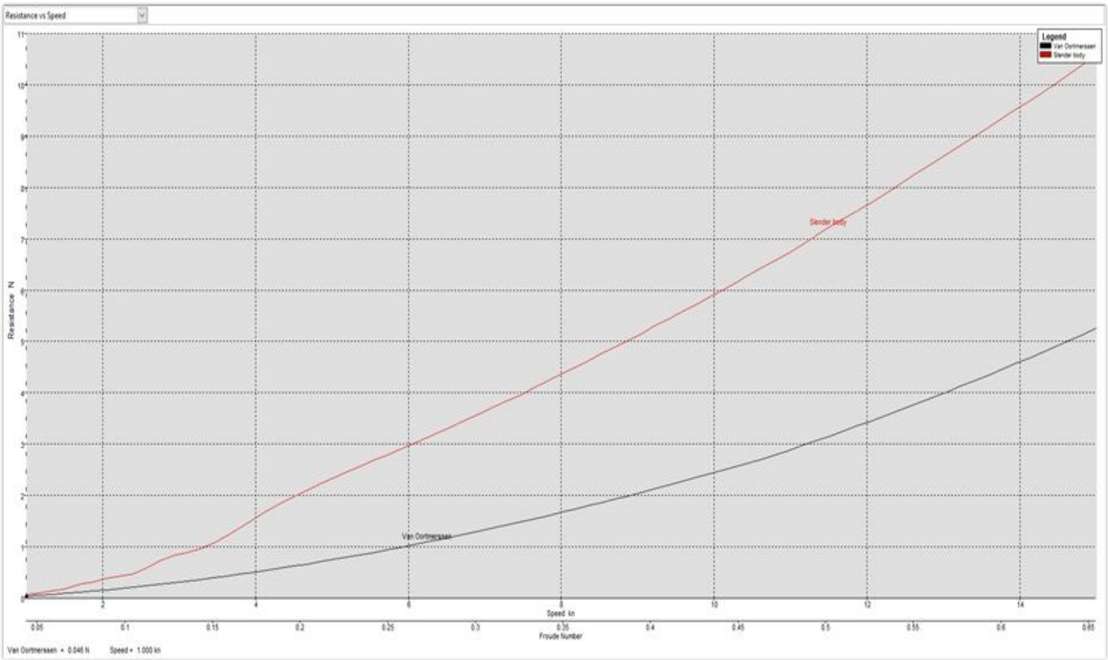


Figure 8: Resistance vs Speed Graph (Waterjet) is made by Maxsurf Resistance

3.1.2 Result (Without Waterjet Propulsion)

Table 2: Resistance vs Speed Result (Without Waterjet) is made by Maxsurf Resistance

	Speed (kn)	Froude No. LWL	Froude No. Vol.	Van Oortmerssen Resist. (N)	Van Oortmerssen Power (W)	Slender body Resist. (N)	Slender body Power (W)
1	1.000	0.044	2.871	0.01	0.01	0.01	0.01
2	1.350	0.059	3.876	0.02	0.01	0.02	0.01
3	1.700	0.074	4.881	0.03	0.02	0.03	0.02
4	2.050	0.089	5.886	0.04	0.04	0.04	0.04
5	2.400	0.105	6.891	0.05	0.06	0.05	0.06
6	2.750	0.120	7.896	0.06	0.09	0.06	0.09
7	3.100	0.135	8.901	0.08	0.12	0.08	0.12
8	3.450	0.151	9.906	0.09	0.16	0.09	0.16
9	3.800	0.166	10.911	0.11	0.21	0.11	0.21
10	4.150	0.181	11.916	0.13	0.27	0.13	0.27
11	4.500	0.196	12.921	0.15	0.34	0.15	0.34
12	4.850	0.212	13.926	0.17	0.41	0.17	0.41
13	5.200	0.227	14.930	0.19	0.50	0.19	0.50
14	5.550	0.242	15.935	0.21	0.60	0.21	0.60
15	5.900	0.257	16.940	0.23	0.70	0.23	0.70
16	6.250	0.273	17.945	0.26	0.82	0.26	0.82
17	6.600	0.288	18.950	0.28	0.95	0.28	0.95
18	6.950	0.303	19.955	0.31	1.10	0.31	1.10
19	7.300	0.319	20.960	0.33	1.25	0.33	1.25
20	7.650	0.334	21.965	0.36	1.42	0.36	1.42
21	8.000	0.349	22.970	0.39	1.61	0.39	1.61
22	8.350	0.364	23.975	0.42	1.80	0.42	1.80
23	8.700	0.380	24.980	0.45	2.02	0.45	2.02
24	9.050	0.395	25.985	0.48	2.24	0.48	2.24
25	9.400	0.410	26.990	0.51	2.49	0.51	2.49
26	9.750	0.425	27.995	0.55	2.74	0.55	2.74
27	10.100	0.441	29.000	0.58	3.02	0.58	3.02
28	10.450	0.456	30.004	0.62	3.31	0.62	3.31
29	10.800	0.471	31.009	0.65	3.63	0.65	3.63
30	11.150	0.487	32.014	0.69	3.98	0.69	3.98
31	11.500	0.502	33.019	0.74	4.36	0.74	4.36
32	11.850	0.517	34.024	0.78	4.76	0.78	4.76
33	12.200	0.532	35.029	0.83	5.18	0.83	5.18
34	12.550	0.548	36.034	0.87	5.63	0.87	5.63
35	12.900	0.563	37.039	0.92	6.10	0.92	6.10
36	13.250	0.578	38.044	0.97	6.60	0.97	6.60
37	13.600	0.594	39.049	1.02	7.12	1.02	7.12
38	13.950	0.609	40.054	1.07	7.67	1.07	7.67
39	14.300	0.624	41.059	1.12	8.25	1.12	8.25
40	14.650	0.639	42.064	1.17	8.85	1.17	8.85
41	15.000	0.655	43.069	1.23	9.48	1.23	9.48

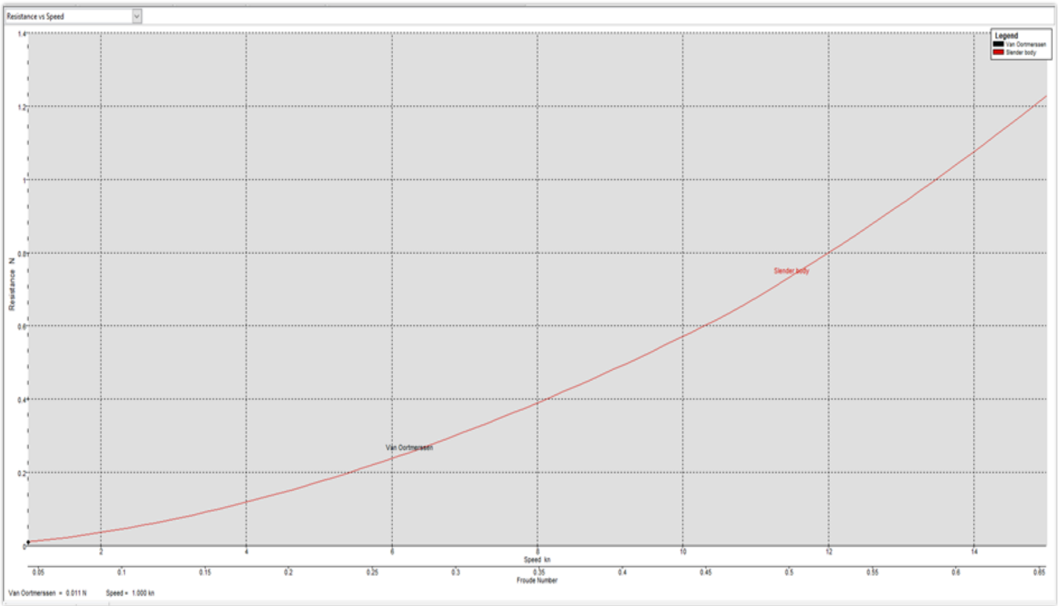


Figure 9: Resistance VS Speed Result (Without Waterjet) is made by Maxsurf Resistance

5.0 CONCLUSION

This project investigates only the medium and small parts of this studies. Therefore, there may be another advance in consumer attitudes to change something that may be useful for the world shipping industry. It is recommended that further development can be made in this investigation on the effect of using water jet propulsion. First, it is suggested to verify the result of Resistance Analysis Data with Maxsurf Resistance. Furthermore, to validate the result from this project and investigate the speed of others shipping vessel.

5.0 REFERENCES

Perception Towards the Performance of Outboard Motors Among Malaysian Coastal Fishermen in Manjung, Perak.[1]

https://www.researchgate.net/publication/333101948_Perception_Towards_the_Performance_of_Outboard_Motors_Among_Malaysian_Coastal_Fishermen_in_Manjung_Perak

Maxsurf Modeller retrieved from

http://charlestonmarineconsulting.com/maxsurf-naval-architecture-software/maxsurf-modeler/. [2]

Rhino retrieved from

https://www.visualarq.com/info/what-is-rhino/ [3]

Maxsurf Resistance retrieved from

http://charlestonmarineconsulting.com/maxsurf-naval-architecture-software/maxsurf-resistance/ [4]

6.0 APPENDIX

Figure A: The process of building E-Speedy Fishing Boat Model

Figure B: E-Speedy Fishing Boat model

INVESTIGATE THE EFFECTIVENESS NEW FLOATING RUBBISH TRAP

Saripah binti Nor
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
sarinor@pbd.edu.my

Muhamad Ali Bin Romizan
Jabatan Kejuruteraan Perkapalan, Politeknik Bagan Datuk
ali@pbd.edu.my

ABSTRACT

Pollution of rivers is a serious problem that should be taken seriously in order to preserve one of the natural resources of water supply. One of the alternatives to save rivers from pollution is river conservation and restoration programs that include enforcing laws to eliminate sources of pollution on their own, raising awareness and environmental education among the public and industry, and promoting dialog. Clogged drains overflowing with debris are the main problem in the residential area. This is due to solid waste and domestic debris such as containers, leaves, bottles and plastic bags being dumped into the drains. A blocked drain affects the safety of residents. The lack of a concrete slab covering the drain will worsen the condition of the drain. Nothing will prevent large items from flowing from the drains into the rivers and polluting them. The bad smell of garbage in a clogged drain affects the surrounding area. Sometimes, flooding occurs when the drains in the clogged sewers overflow and flow into the streets. To avoid this problem, maintenance should be done as often as possible. Therefore, this area should be manned with garbage collectors to ensure smooth drainage for sewage or water to be recirculated. The study of Floating Rubbish Trap in Malaysia is important to produce our local Floating Rubbish Trap' product.

Keyword: Water pollution, Clogged drain, flooding, floating rubbish

1.0 INTRODUCTION

Water is the basic element of life; without its life would not exist. It is one of the most important resources for man, and yet it is taken for granted because water is everywhere, and it flows freely when we turn on the tap. The usage for water increases as population grows until the demand sometimes overshoots the supply or availability. Although the quantity of water on Earth is same all the time, the quality of the water that is available has drastically changed. Oceans are the largest water bodies on the planet Earth. Over the last few decades, excessive human activities have severely affected marine life on the Earth’s oceans. Ocean pollution, also known as marine pollution, is the spreading of harmful substances such as oil, plastic, industrial and agricultural waste, and chemical particles into the ocean.

As floating waste accumulates in the ocean at alarming rates, the need for efficient and sustainable remediation solutions is urgent. One solution is the development and mobilization of technologies that either.

1) prevent floating rubbish from entering waterways or
2) collect marine and riverine floating rubbish pollution.

Every watershed is affected by what takes place on the land. Once used, water flows out as quickly as it comes, down into the drain and into our rivers. Many ways have been practiced reducing the water pollution. One of the ways is to treat wastewater at the source points.

This can be accomplished by constructing Floating Rubbish Trap at the source point to treat water prior to discharge into the river. Generally, Traps are devices that collect floating rubbish from waterways before they enter wetlands and marine waters. They are used in urban water infrastructure such as storm water drains, urban wetlands. They generally collect larger items from the water, such as take away containers, leaves, bottles, and plastic bags. Smaller pollutants, such as dirt, chemicals, heavy metals, and bacteria are not collected directly by the
Floating Trap: however, some small particles are caught up in the larger items in the trap and thus prevented from reaching the waterway (Hughes, 2004).Upstream solutions that help to reduce plastic waste at the source **(**Gallo et al., 2018**,** Rochman, 2016**,** Sherman and van Sebille, 2016**,** ten Brink et al., 2018**)**

Marine plastic pollution is a complex and extensive problem, and there are no simple solutions. Technological developments cannot be separated from policy, which likewise cannot be separated from individual and industry efforts. Only through continued combined efforts to find creative solutions across technology, policy, and advocacy can we stop plastic leakage into the oceans and mitigate its effects. Until then, we hope that this Inventory serves as a tool that stakeholders can use to learn about the options available to prevent plastic leakage into waterways and clean up plastic pollution.

1.1 RESEARCH PROBLEM

Storm water pollutants are generated from urban land-use activities and are transported from street surfaces by storm water runoff before discharging into receiving waters. Community awareness of the environmental effects of urban storm water pollution and their expectation that urban aquatic ecosystems are protected from environmental degradation has resulted in an increased emphasis on urban storm water quality. Many local authorities have implemented storm water management strategies for the protection of receiving waters. These include major public awareness campaigns to encourage environmental sensitivity and structural methods to physically remove pollutants from storm water. Such initiatives are essentially focused on visible pollutant impacts and concerned with reducing gross pollutants, particularly litter. However, urban storm water transports a variety of material ranging from large gross pollutants to fine particulates, all of which impact urban receiving waters and therefore require a wastewater treatment device that can remove the various types of the pollutants (Walker et. al., 1999).

Pollution carried by urban storm water is considered a significant contributor to the degradation of receiving waters. Urban storm water pollutants include gross pollutants, trace metals and nutrients that are associated with sediments, and dissolved pollutants (Walker et.al., 1999). The generation and transport of pollution in urban systems during a storm event is multifaceted as it concerns many media, space, and time scales (Ahyerre et. al., 1998). During the storm event, the concentration of pollutants in first flush runoff is believed more polluted than the remainder due to the washout of deposited pollutants by rainfall.

To preserve the good quality of water resources, it is essential to control the water pollution in river by treating the wastewater especially the first flush during storm event which carries with its concentrations of pollutants that have accumulated during the period of dry weather between storms. An effective system of wastewater treatment, such as Floating Rubbish Trap is important to cater the various types and size of pollutants. Floating Rubbish Trap as another alternative to replace the existing rubbish trap to prevent choking waterways and to preserve water.

1.2 OBJECTIVES

The objectives of the study are summarized as follows:

i. To evaluate the effectiveness of Floating Rubbish Traps system in removing pollutants during storm event and dry weather conditions.
ii. To investigate the occurrence and the influence of first flush to the concentration of pollutants entering Floating Rubbish Traps system during storm events.
iii. To obtain hydrologic data and Event Mean Concentration (EMC) for the purpose of the evaluation of Floating Rubbish Traps system.

1.3 SCOPE OF STUDY

The scopes of this study are:

i. To improve the design criteria of the existing Floating Rubbish Trap system to provide a better quality of surface water runoff for the system.
ii. To determine the relationship between the reductions of the first flush runoff pollution load and the total rainfall amount.
iii. To come out with hydrograph for storm water events.

2.0 RESEARCH OF LITERATURE

2.1 WATER POLLUTANT

Water is considered polluted if some substances or condition is present to such a degree that the water cannot be used for a specific purpose. Olaniran (1995) defined water pollution to be the presence of excessive amounts of a hazard (pollutants) in water in such a way that it is not long suitable for drinking, bathing, cooking or other uses. Pollution is the introduction of a contamination into the environment (Webster.com, 2010). It is created by industrial and commercial waster, agricultural practices, everyday human activities and most notably, models of transportation. Water pollution is generally induced by humans. It results from actions of humans carried on to better self. These could be treated under the various activities that man engages in, that lead to pollution. The growth of human population, industrial and agricultural practices is the major causes of pollution (Eguabori, 1998). Water pollution becomes worse as a result in urban areas. Agricultural, domestic, and industrial wastes are the major pollutants.

2.2 GROSS POLLUTANT TRAP (GPT)

Another effective solution is the installation of the Gross Pollutant Trap (GPT) figure 1. This system (Gross Pollutant Trap - GPT) is one of the effective methods in dealing with river pollution. Gross Pollutant Trap - GPT is a tool used to keep contaminants larger than 5 mm from polluting waterways. GPT installed at the end of the drain locations have been identified contain large quantity of rubbish and other pollutant before entering the rivers. In the food premises such as restaurants, canteens and night market, there are need to install water filter systems to threat the pollutant from grease and oil before entering the drains and rivers. There is a very wide range of devices for the treatment of gross solids. Selection of suitable devices depends on many factors including catchment size, pollutant load, the type of drainage system and cost (DID, 2000c).

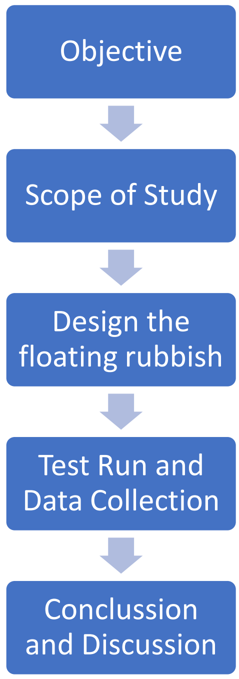
Figure 1: Gross Pollutant Trap

3.0 RESEARCH METHODOLOGY

This chapter will discuss on the research methodology that will be implemented in this study. The aim of this study is to produce an effective water pollution treatment system. This study especially to

a) Evaluate the effectiveness of Floating Rubbish Traps system in removing pollutants during storm event and dry weather conditions.
b) Investigate the occurrence and the influence of first flush to the concentration of pollutants entering Floating Rubbish Traps system during storm events.
c) Obtain hydrologic data and Event Mean Concentration (EMC) for the purpose of the evaluation of Floating Rubbish Traps system

3.2 FLOW CHART.



3.3 DESIGN OF FLOATING RUBBISH TRAP

The detail drawing is sketch by using AutoCAD. The material using to build the floating rubbish trap is plastic container, steel iron and angle iron.

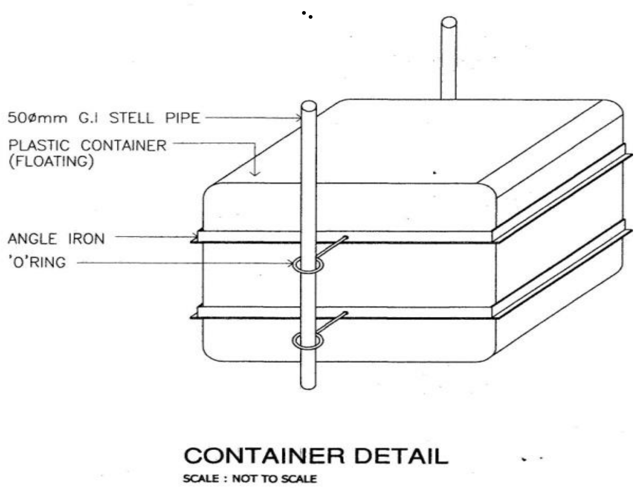


Figure 2: Floating Rubbish Trap Detail

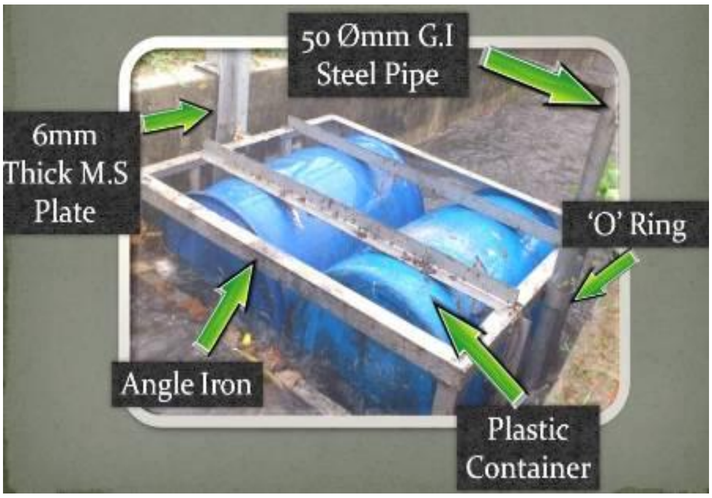


Figure 3: Floating Rubbish Trap Material

4.0 RESULT

The results indicated that the traps system is effective in improving water quality during storm event where the effluent of discharge water of the Traps system is complying with parameter limit as stated in Standard A and Standard B of Environmental Quality Act (1974). First flush analysis shows that the concentration of pollutants in first flush runoff is found more polluted than the remainder while the values of EMC for TSS, COD, and BOD are higher compared to other pollutants. Despite of functioned for water quality control, the Floating Rubbish Trap is also benefit for water quantity control where it provides detention time, storage, and decrease the peak flow of the water flowing through the system.

Figure 4: Floating Rubbish Trap when operation

Figure 5: Floating Rubbish Trap

Figure 2 shows that the rubbish trap can float when the storm water occur and collected all the floating rubbish in figure 3. This trap can restrain the rubbish from drain to the nearest river or ocean.

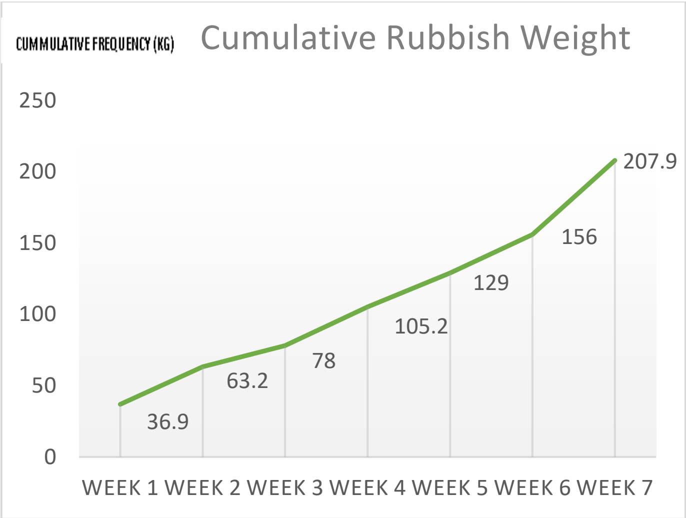


Figure 6: Cumulative Rubbish Trap

Figure 3 show the cumulative rubbish weight collected within 7 weeks. The highest weight is collected on week 7, 52 kg of rubbish collected, and the total cumulative weight for 7 weeks is 207.9 kg of rubbish.

5.0 CONCLUSION

From the data collected, it appears that the floating garbage trap is effective in capturing floating garbage. The conclusions are based on the results obtained and the objective of making this garbage trap. Floating Rubbish Trap uses energy flow and does not require external energy to operate. Floating Rubbish Trap structure that uses the concept Modular Pontoon during operation. It is designed to catch floating garbage, Floating Rubbish Trap floats on the water surface in the drain.

6.0 REFERENCE

Aminuddin A.G, Azamathulla H.M, Tze L. L. B, Ravikanth C.H., Zakaria N.A., Cheng S. L., Azlan M. Y., (2011). Flow Pattern And Hydraulic Performance Of The REDAC Gross Pollutant Trap", 22, pp. 215–224

Owa, F.D (2013) Water Pollution: Sources, Effects, Control and Management" (2013), Vol 4. No 8

Jae W. J., (2013). Event Mean Concentration (EMCs) and first Flush Characteristics of Runoff from a Public park in Korea. Volume 56 Issue 5 pp 567-604

DID. (2000a). Urban Stormwater Management Manual for alaysia (MASMA). Volume 5: Runoff Estimation.

DID. (2000b). Urban Stormwater Management Manual for Malaysia (MASMA). Volume 12: Source Control BMPs.

DID. (2000c). Urban Stormwater Management Manual for Malaysia (MASMA). Volume 13: Treatment Control BMPs.

Ahyerre, M., Chebbo, G., Tassin, B., Gaume, E., (1998). Storm water quality modeling, an ambitious objective?. Water Science and Technology 37, 205–213.

Allison, R.A., Chiew, F.H.S, McMahon, T.A. (1999). A Decision-Support-System for Determining Effective Trapping Strategies for Gross Pollutants. Cooperative Research Centre for Catchment Hydrology.

Argue J.R. (2001). On-site Stormwater Retention (OSR): Why? When? And Some Basic Concepts. Stormwater Industry Association OSR Workshop.

Artina, S., Bolognesi, A., Liserra, T., Maglionico, M., Salmoiraghi, G. (2006). Experimental analysis of first foul flush in an industrial area. Water Pollut. VIII: Model.Monitor. Manage. 95, 423–432.

AN INNOVATION OF HAND SUPPORT AND THERAPY

A.T.Khairul Asyraf,
Department of Electrical engineering,
Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam
asyraf2317@gmail.com

Z. Mohamad,
Politeknik Bagan Datuk
zunuwanas@yahoo.co.uk

W.R.W.Omar
Department of Electrical engineering,
Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam
rosemehah@gmail.com

ABSTRACT

Hand support devices are very helpful for embraced patients for daily living, for example, paraplegic patients, accidental effects and so on that cause limited movement. It is vital for patients with major and minor injuries to undergo rehabilitation process to improve their condition effects from the injuries. There are a wide range of existing support tools nowadays, but the support device only works for one use only as a hand support example. Hand support provides various benefits to the patients which improve their quality of life and fasten the recovery time. There are two functions in one device such as hand support device and therapy can help patients as daily support devices or undergo therapy on their own, with the presence of these hand support devices and therapies can help hand and therapeutic support on their own so can also help the hospital. Hand support device has the potential in providing a supplemental home-therapy device for certain patients and acts as a daily used device for minor injury patients.

Keywords: hand support, movement, therapy

1.0 INTRODUCTION

It has been recognized that any damage that included nerve framework can bring about an issue with the muscle or sensation. Nerves interface the mind and spinal line to the muscles and skin which giving the development and feeling. In the event that there is damage to the nerve, there will be an interference in the data being passed on to the skin or muscles to and from the cerebrum[1]. The bigger nerves in your arm and leg, which are about the span of a pencil are comprised of countless nerve filaments, like the phone link and the nerve strands are assembled in fascicles. Farshid (2017) A few nerves like the middle and ulnar nerve in your arm have engine and tactile fascicles giving you development and feeling to your hand.
In nerve damage, the nerve will attempt to repair itself by growing recovering nerve units. These recovering units will then endeavor to become down the nerve to reinnervate muscle or skin. On the off chance that they make a right association, engine nerve to muscle or tactile nerve to skin, at that point recuperation of muscle capacity and skin sensation will happen. Assuming be that as it may, the recovering nerve strands don't make a right association then no recuperation will happen [3].

Nerves will recover at the rate of 1 inch for every month. While sensation can be recaptured even after long stretches of denervation, muscle reinnervation won't happen after drawn out stretches of time without nerve innervation. Consequently, it is important to inspire nerve to muscle as fast as could be expected under the circumstances on the off chance that it won't recoup alone. Ates (2013) The undertaking proposed here is a specialized practicality investigation of an electrodiagnostic tests, including electromyography (EMG) and nerve conduction contemplates are utilized to check whether the muscle is recouping.

1.1 Hand Function

According to Abolfathi (2008), hand work is portrayed as the capacity to utilize the turn in day-by-day life to perform regular exercises. Hands and fingers assume crucial part in human life particularly in every single human movement, for example, to bolstering, to get things, to play out certain work, to compose and others. The constraint of hand work is because of the wounds and sicknesses that happened to involvement by a man. An investigation in Denmark demonstrates that the rate of wounds to the hand and wrist was 28.6% of all wounds and this includes a 34% of the household mischances, 35% were relaxation mishaps, 26% were word related and 5% were auto collisions. Also, the most incessant reasons for confirmation were breaks (42%), ligament sores (29%) and wounds (12%). Other than of the wounds, hand work likewise influenced by a malady including osteoarthritis where 90% of ladies and minimal under 80% percent of men has been affirmed to have these illnesses in a gathering of 70-74 years and a gathering of over 80 years, is perceived to have 99% for ladies and more than 95% for men.

The measurements of the above demonstrated that hands and fingers are effortlessly cracked and when a man misfortune the capacity to utilize the hand work, it is probably going to influence the people to depend entirely on other individuals to finish everyday exercises. The level of freedom is shift as it relies upon the individual action to composed hand development and function [6]. The principal motivation behind recovery is to help diminish the weaknesses and reestablish practical execution by hand. British Association (2016) There are numerous methods and devices acquainted with help encourage and accelerate the recuperation of the hands. This incorporates scope of movement works out, reinforcing works out, and oxygen consuming, or continuance works out. A scope of movement practice reason to improve the adaptability of joints and alleviate firmness from hands and fingers, while reinforcing exercise included certain weight to build the muscle quality to help and ensure the joints, and oxygen consuming perseverance practice performed to diminish joints swelling at times.

Other than of this activity, a tangible gadget has been additionally acquainted with increment the functionalities of hands, for example, hold compel estimation gadgets, finger squeeze constrains sensors, virtual reality gloves and exoskeleton framework. The appraisal of hand find that the capacity of hand has concentrated on hold or squeeze quality and scope of hand movement subject to assessment of the exercises. Figure 2.1 showed eight main types of functional grasp played by normal hands in daily activities. This functional grasp is vital in increased the hand function especially if the person performed during the rehabilitation practice.

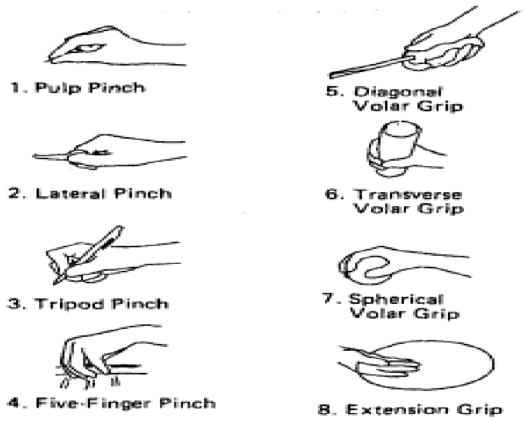


Figure 1: Eight types of grasps. Adapted from Sollerman C. and Ejeskar A. (1994).

It is to take note of that when a man encountered damage to a nerved, they in all probability have issue with the muscle and misfortune in sensation [7]. There are few kinds of nerve damage that influence the hand sensation. First degree damage (neurapraxia) will recoup quick from certain days to 3 months, second degree damage (axonotmesis) slower than initial one as the nerve need to develop to reinnervate the muscle or skin and the nerve grow an inch for every month, third damage encountered an incomplete recuperation and it relies upon a few variables, fourth and fifth degree damage require surgery for recuperation as a tissue has obstructing any recuperation and ultimately the 6th degree damage is a blend alternate sorts of nerve damage and recuperation and treatment will change. Olandersson (2005) Now and again, if a man encounters outrageous damage a surgery is required to enhance the nerve recuperation. A portion of the suggested surgery are nerve repair, nerve unite, nerve exchange or neurolysis.

After the surgery, the individual is required to do recovery practice to get back sensation and enhance hand usefulness. In any case, right now not all restoration procedure is satisfactory for a wide range of wounds. This is concurred by Grubisic, Kavanagh and Grazio (2015) as the greater part of the frameworks are lacking for utilization in serious instances of hand inabilities, for example, for patients in the last phases of rheumatoid joint inflammation and osteoarthritis. Distinctive patients may require diverse sorts of recovery, or the recuperation would not be worked. Other than of recovery, in this high innovation period different mechanical instruments can be utilized by patients to help in restoration. Orihuela-Espina (2016) A portion of the preferred standpoint utilizing robots are it ready to give therapy to quite a while periods in a steady and exact way without exhaustion, can be modified to perform diverse useful modes, can gauge, and record a scope of practices and ready to execute as a remote to human control. Nonetheless, automated is an extremely costly and unyielding devices. In this manner, this investigation will recognize satisfactory apparatuses that will enable patients to accelerate the recuperation and increment the hand work. This examination likewise will make and build up a device that is adaptable where patients can use whenever without feeling awkward and cheap.

2.0 METHODOLOGY

This section describes the investigative focus, research methodology and specific methods used in this study. The methodology used was a mixed methods research framework encompassing both quantitative and qualitative methods and measures. In this part, planning must be in a proper manner in the way of identifying an information and requirement, such as hardware and software. Planning is also sometime can be the way for investigator to identify the problem statement as a reason to proceed with the study. For this project planning phase are done by data collection and requirement of hardware and software. Usually for this early stage, the method of planning was by primary collection, which is more to interview and meeting with outsider to get information. The questionnaires of data collection are distributed to the staff of physiotherapy unit, staff nurse, and neurology specialist doctor. By data collection, requirement for hardware and software can be plan as well.
At this stage, project resources and requirements, literature studies and schedule to get more information in this study are planned. In this study, the subjects are consisting of public with or without hand therapy for the usability test and stroke disease patient who are desire to heal. The population of subjects are among the Polytechnic Premier Sultan Salahuddin Abdul Aziz Shah, Shah Alam, focusing on Electrical Engineering Department. For stroke patient, will be at the unit rehabilitation Pusat Perubatan University Malaya (PPUM).

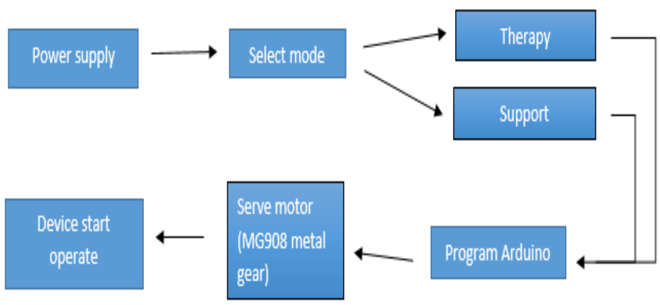


Figure 2: Block diagram

By using this support device can solve the problems faced on behalf of the patient. This support device operates using power supply sources and has two modes of choice, which is to support the hand side and the therapy, after choosing the program mode will perform the responsibility by using Arduino Uno. In turn, the program will signal to the motor to execute the selected mode (Figure 2)

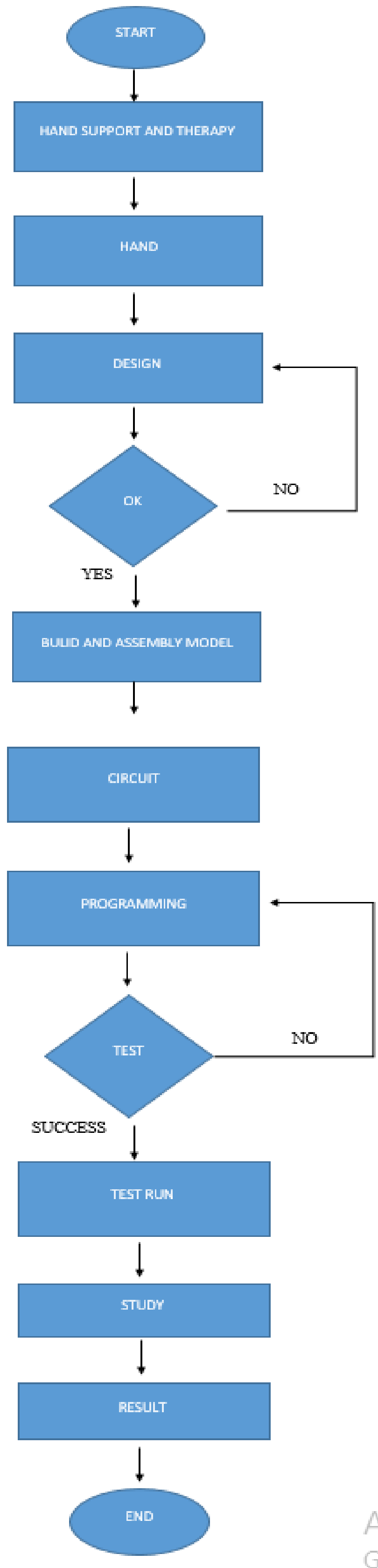


Figure 3: Flow Chart

3.0 RECOMMENDATION OF AN INNOVATION

This device can provide support to the hands of patients who cannot perform daily routine and give therapy to patient's hands in one device. The hand of the patient who cannot move the finger to perform the activities can be assisted by this support device. For therapy also, to ensure that the therapy performed at the hospital can be performed at home alone. Usability in terms of this motor device can provide strength to the fingers that cannot be transmitted and can undergo therapy to the patient's fingers. Lastly survey paper will be given to patient or consumer and to hospital knowing opinion on design and this product applicability and opinion that could be voiced.

4.0 CONCLUSION

At the end of the conclusion, this device can help patient to support the hand for daily life use and do therapy in one device. More that, it can analyze a hand support and therapy device in daily life at home. Finally, the design a hand support and therapy device that more portable, comfortable, and suitable for using.

5.0 REFERENCES

Farshid, A., Lorenzo, M. & Etienne, B. (2017). International Conference on Rehabilitation Robotics (ICORR).17-20.

Ates at.al. (2013). “Script passive orthosis: Design and technical evaluation of the wrist and hand orthosis for rehabilitation training at home,” in Rehabilitation Robotics (ICORR), 2013 IEEE International Conference on. IEEE, 1–6.
.
British Association of Hand Therapists (2013). What is a hand therapist? London: BAHT. Available at:tp://www.handtherapy.co.uk/index.php?option=com_content&view=article&id=123&Itemid=104 Accessed on 03.10.14

Olandersson, S., Lundqvist H. & Bengtsson, M. (2005). Finger-Force Measurement-Device for hand rehabilitation“ in Rehabilitation Robotics Conf. 135-138.

Orihuela-Espina, F., et. Al. (2016). ‘Robot training for hand motor recovery in subacute stroke patients: A randomized controlled trial’. Journal of Hand Therapy, 29(1), 51-57.

Illustration of PBD Campus, Courtesy of Proven Holding (M) Sdn. Bhd.

eISSN 2805-5047