COST COMPARISON STUDIES OF FISHERMAN BOAT FOR WOOD AND FIBERGLASS MATERIAL

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ABSTRACT

This thesis presents the designing and analysis of cost estimation between wood and fibreglass material. This thesis also contains loading analysis that applied at boat hull. The designing will involve the characteristic of flexible boat that have durability and can use in any condition at the shore environment. The materials that will use in built this boat also need to consider for high resistant. Furthermore, the environment of shore will make any accident and this design needs to prevent boat from broke –up from floating wood, coral and anything at the shore. The loading of fish and their other load can make boat sink, so this problem need to be analyze probably in this thesis to get the great design that can withstand a lot of load. Result from analysis showed that this design can with stand with 2400N that applied at the boat hull and this boat also have a special characteristic such as it can move faster in wave, stable and safe from seawater enter in the boat.

ABSTRAK

Kajian yang dijalankan ini adalah mengenai merekabentuk dan menganalisa kos pembuatan bot nelayan pesisir pantai menggunakan kayu dan gentian kaca..Selain daripada itu,kajian juga menyentuh berkaitan dengan ciri – ciri asas pembinaan bot dan bahagian – bahagian yang perlu dititik beratkan didalam pembinaan bot yang lasak dan tahan lama.Penggunaan bahan untuk membuat bot juga akan dijalankan analisa dan kajian yang terperinci bagi merekabentuk sebuah bot yang mampu beroperasi dalam keadaan yang sukar dan memerlukan kelasakan yang tinggi.Selain itu,keadaan persekitaran persisir pantai memungkinkan pelbagai kemalangan berlaku.Justeru,rekabentuk yang dihasilkan ini haruslah mampu menahan segala kemungkinan seperti ditusuk kayu,batu karang yang timbul dan sebagainya.Jumlah bebanan dan tangkapan ikan yang banyak memungkinkan sesebuah bot itu karam,lalu permasalahan ini dikaji begitu teliti untuk mendapatkan rekabentuk bot yang terbaik dan mampu membawa bebanan yang besar. Keputusan daripada analisa mendapati bahawa bot ini mampu menahan beban yang dikenakan iaitu sebanyak 2400N dan mempunyai beberapa keistimewaan iaitu mampu bergerak pantas,stabil dan selamat daripada tujahan ombak dari hadapan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Specific Project Synopsis

This project title is Cost Comparison Studies of Fisherman Boat for Wood and Fiberglass Material. This project involves the survey and analysis about current design of fisherman boats that in the market. This analysis is about strength of material, durability, stability, shape of structure and aerodynamics. Modifications are required to improve current design of boat structure. With the newly designed analysis fisherman boat structure, testing sample is required to be conducted and to verify the design. The design project analysis will consider cost estimation.

1.2 Problem Statement

The boat building industry has entered an unprecedented period of experimentation of new design and new materials for use in the fabrication of what were once called composites hull. Some have met with success, but most have met with failure. In Malaysia, a lot of fisherman use wooden boat for fishery activity at seashore and a lot of boat building company or fisherman just build boat without design and analyse the effect of the boat design in effectively. The problems are the boat cannot be

overload or cannot carry more payloads and the hull braked up or crack. This problem can be settle if the manufacture or builder have create a correct design, using right material and use the correct production method. The problem also can be reduced if the manufactures build boat without thinking the profitable by reducing the production cost. The increase in wood price is liability for fisherman because the fisherman wages is all about RM600 to RM700.The maintenances of wooden boat also high and take time to do it.

1.3 Project Objective

There are three objectives of this project as follow:

a) To produce a detail design of fisherman boat.
b) To investigate the comparison of the current and propose design of fisherman boat.
c) To investigate suitable material for replace wood as the main material in boat building.

1.4 Project Scope of Work

There are three scopes of my project:

a) Modification on current design of Fisherman Boat Structure.
b) Design a Fisherman Boat Structure with sketch and draw by using AutoCAD software.
c) Analyze the different in fabrication costs between wood and fiberglass material boat.

1.5 Project Planning

This project is begin and start with investigation and makes a research and literature review via internet, reference books, supervisor and other relevant academic material that related to this project. To make this project more accurate and suitable, study more about this topic and more than six week to make a literature review. Every week, improvement of knowledge needed to make sure this project will be performing very well.

Beginning week, need to do some schedule management for this project. All schedule will be apply in a Microsoft Project to make a Gantt chart. It takes a week to accomplish all schedules.

Then, discuss with supervisor and continue detail about scope of this project. After that, from the literature review, need to take a few current design of fisherman boat structure to make a comparison. This comparison is about the shape of boat hull, strength of composite material, advantages and disadvantages of design, durability, buoyancy and aerodynamics.

The next task is preparation of progress presentation and report writing. These tasks take two week to be finish. On that particular week, preparation needed to make a presentation.

The sketching a new design of boat structure is improvement from a comparison a few current design. This sketching and finalize drawing takes two week to be done finish. To make a sketching, A4 paper needed by using a manual sketched. For the engineering drawing is done by using Solid work and AutoCAD software. But the design process will start after finish PSM 1.

Analysis process is start after PSM 1. These project analyses starting with finds the value price of wood in market and compare it with fibreglass material. Analysis

stage is taking a much time to complete because a lot of company and supplier that needed to find the real value price for material. After done the analysis process, next process is correction or redesign model. This task scheduled takes several weeks to finish.

Lastly, the final report writing and prepare the presentation. This takes about one week to arrange and accomplish. A report is guided by UMP thesis format and also guidance from supervisor.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A boat is a craft or vessel designed to float on, and provide transport over, water. A boat's propulsion can be by propellers, oars, paddles, setting poles, sails, paddlewheels, or water jets. Boats are generally smaller than ships and the different is the roughly horizontal, but cambered structures spanning the hull of the boat are referred to as the "deck". In a ship there are often several, but a boat is unlikely to have more than one. The similar but usually lighter structure which spans a raised cabin is a coach-roof. The "floor" of a cabin is properly known as the sole but is more likely to be called the floor. A floor is properly, a structural member which ties a frame to the keelson and keel. The underside of a deck is the deck head.

They are many type of boat structure. The vertical surfaces dividing the internal space are "bulkheads". The front of a boat is called the bow or prow. The rear of the boat is called the stern. The right side is starboard and the left side is port. Many boats have a section called the gralper, designed to reduce water flow to the non-hydrodynamic parts of the boat.

A boat stays float because its weight is equal to that of the water it displaces. The material of the boat itself may be heavier than water (*per volume*), but it forms only the outer layer. Inside it is air, which is negligible in weight. But it does add to the volume. The central term here is density, which is mass ('weight') per volume.

The mass of the boat as a whole has to be divided by the volume below the waterline. If the boat floats, then that is equal to the density of water (1 kg/l). To the water it is as if there is water there because the average density is the same. If weight is added to the boat, the volume below the waterline will have to increase too, to keep the mass or weight.

2.2 History of Boat

Until the mid 19th century all boats were of natural materials using primarily wood. As the forests of Britain and Europe continued to be over-harvested to supply the keels of larger wooden boats and the Industrial Revolution cheapened the cost of steel, the age of the steel ship began. In the mid 20th century aluminium gained popularity, being lighter and easier to work with than steel. Around the mid 1960s, boats made out of glass-reinforced plastic, more commonly known as fiberglass, became popular, especially for recreational boats. The glass- reinforced plastic boats also call as 'FRP' (Fiberglass Reinforced Plastic) boats.

Fiberglass boats are extremely strong, and do not rust, corrode, or rot. Fiberglass provides structural strength, especially when long woven strands are laid, sometimes from bow to stern, and then soaked in epoxy to form the hull of the boat. One of the disadvantages of fiberglass is that it is heavy and to alleviate this, various lighter components can be incorporated into the design. One of the more common methods is to use cored fiberglass, with the core being balsa wood completely encased in fiberglass. While this works, the addition of wood makes the structure of the boat susceptible to rotting. Similarly, 'advanced composites' are simply other methods designed to introduce less expensive and, by some claims, less structurally sound materials. Today, many people make their own boats or watercraft out of materials such as styrofoam or plastic.

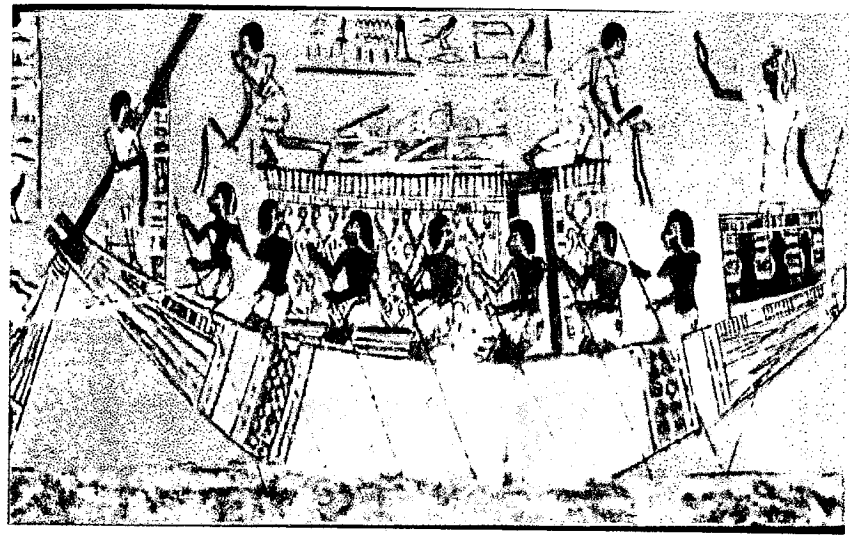

Figure 2.0: Egyptian tomb painting from 1450 BCE. Caption: "Officer with sounding pole...is telling crew to come ahead slow. Engineers with cat-o'-nine-tails assuring proper response from engines."National Oceanic & Atmospheric Administration (NOAA) Central Library. Image ID: theb2121, Historic C&GS Collection.

2.3 Types of Boat

There are a lot of boats in the world but there are depend to the use or the function of the boat. Most of boat in this world was use for sport, transportation, fishing, safety and their other function. When we are shopping for a new boat, first consider the water in which we will use the boat. Then take into consideration how many people will generally use the boat, and then determine how the boat will be used. Boats come in a wide range of colors and cockpit configurations that we can live with if we like all of the other attributes the boat has to offer.

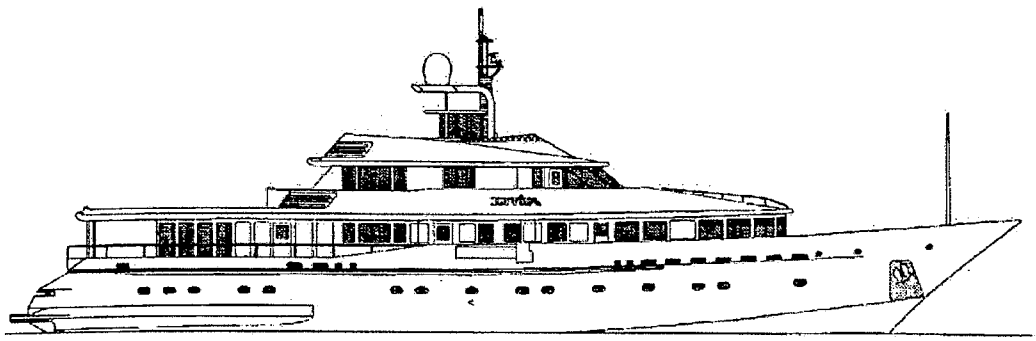

Figure 2.1: Cruise Boat [11]

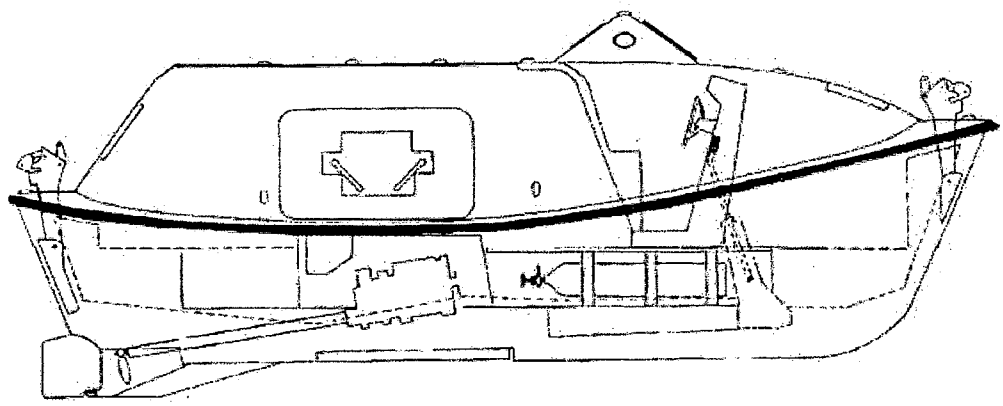

Figure 2.2: Lifeboat at off-shore[4]

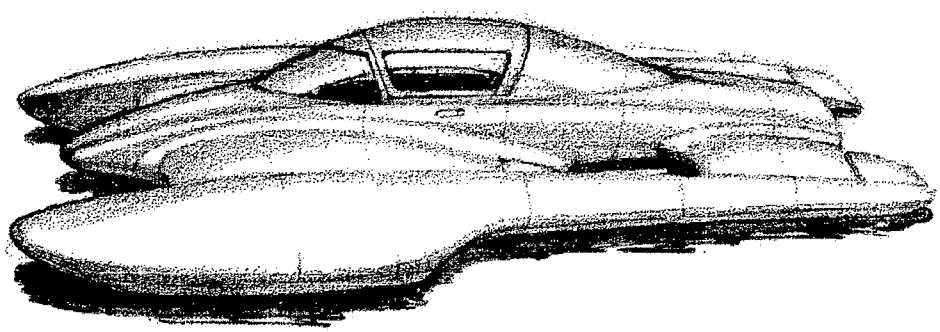

Figure 2.3: F1-Powerboat [4]

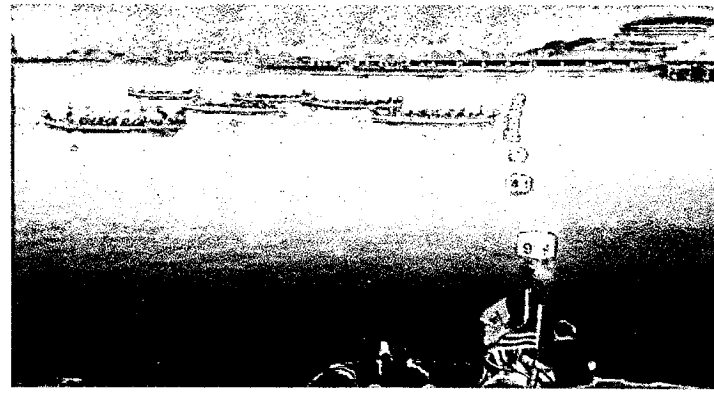

Figure 2.4: Dragon boat

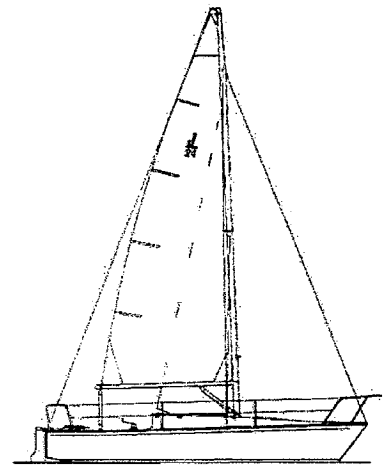

Figure 2.5: Sailing boat [4]

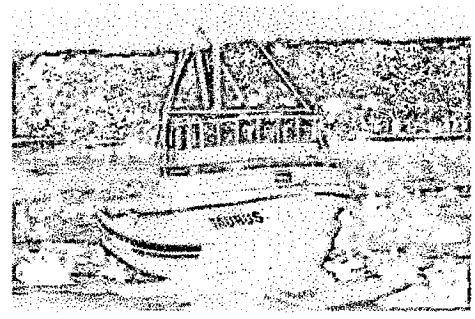

Figure 2.6: Fisherman boat [4]

2.4 Parts of a Boat

Boats come in many styles and shapes, but the names of the different parts remain consistent. Every boat operator should know the following terms and definitions.

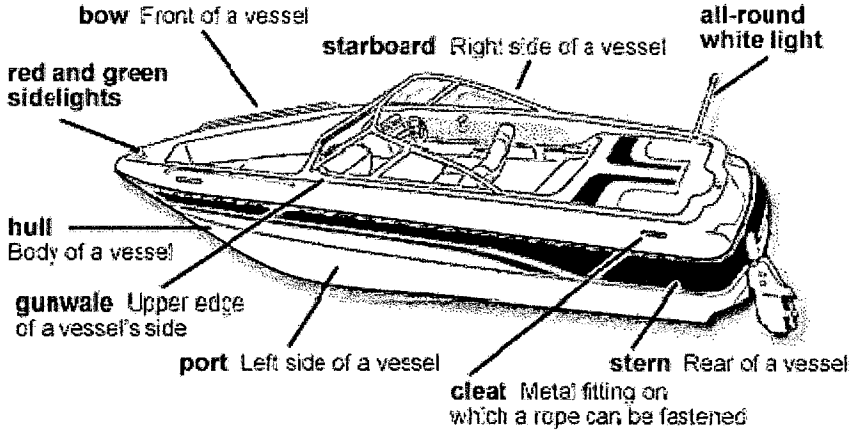

Figure 2.7: Boat part from side view [5]

i. Bow: Front of a vessel

ii. Stern: Rear of a vessel

iii. Starboard: Right side of a vessel

iv. Port: Left side of a vessel

v. Hull: Body of a vessel

vi. Gunwale: Upper edge of vessel's side (generally pronounced gunnel)

vii. Cleat: Metal fitting on which a rope can be fastened

viii. Navigation lights include all-round white light and red and green sidelights

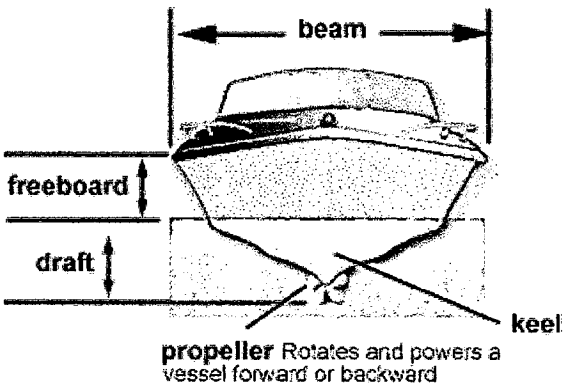

Figure 2.8: Boat parts from front view [5]

i. Beam: Maximum width of a vessel

ii. Freeboard: Distance from water to lowest point of the boat where water could come on board

iii. Draft: Depth of water needed to float a vessel

iv. Propeller: Rotates and powers a boat forward or backward

v. Keel: Main centerline (backbone) of a vessel or the extension of hull that increases stability in the water

Waterline is an imaginary line circumscribing the hull that matches the surface of the water when the hull is not moving.

Midships is the midpoint of the LWL. It is half-way from the forward most point on the waterline to the rear-most point on the waterline.

Baseline an imaginary reference line used to measure vertical distances from. It is usually located at the bottom of the hull.

Length Overall (LOA) is the extreme length from one end to the other.

Length on the Waterline (LWL) is the length from the forward most point of the waterline measured in profile to the stern-most point of the waterline.

A protrusion below the waterline forward is called a bulbous bow and is fitted on some hulls to reduce the wave making resistance drag and thus increase fuel efficiency. Bulbs fitted at the stern are less common but accomplish a similar task. A keel may be fitted on a hull to increase the transverse stability (if filled with a heavy weight), directional stability or to create lift as in a sail boat. Control devices such as a rudder, trim tabs or stabilizing fins may be fitted.

2.5 Length of Boat

A vessel's or boats length overall dictates the equipment the vessel must have to comply with federal and state laws. Length overall is measured from the tip of the bow in a straight line to the stern of the vessel. Bow sprits, rudders, outboard motors, motor brackets, handles, other fittings, attachments, and extensions are not included in the measurement.

2.5.1 Length Classes

Some states have laws that refer to vessel lengths as "classes." However, the U.S. Coast Guard no longer uses these designations to indicate length.

Table 2.1: Classes of boat

CLASS	LENGTH
Class A	Less than 16 feet
Class 1	16 feet to less than 26 feet
Class 2	16 feet to less than 26 feet
Class 3	16 feet to less than 26 feet

2.5.2 Measuring Boat Length

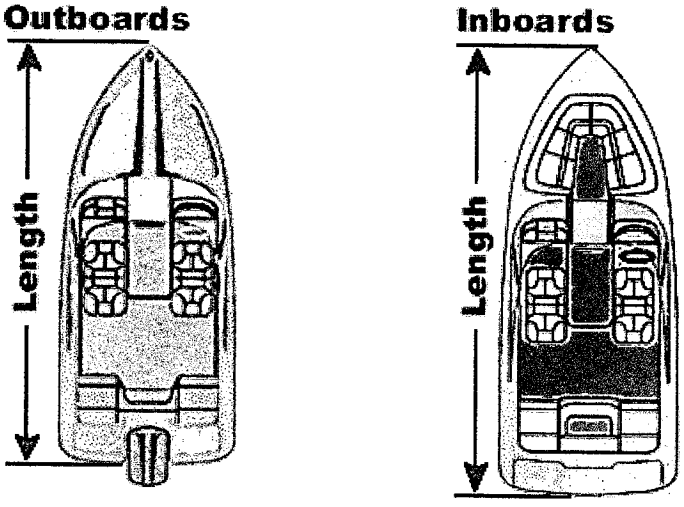

Figure 2.9: How to measure the boat length [5]

2.6 Types of Engines

2.6.1 Outboards

i. An outboard is a portable, self-contained package of an engine, gear case, and propeller that is attached to the transom of a boat.

ii. A growing number of outboard engines are of four-stroke design, but many are still conventional two-stroke engines that burn oil as a lubricant along with the fuel. New-technology two-stroke outboards are direct-injection engines and burn over 75% cleaner than conventional two-stroke outboards.

iii. Steering of outboard boats is controlled by a tiller or steering wheel that swivels the entire engine to direct propeller thrust.

Outboards have more power per pound of weight than do inboard engines.