UNIVERSITI TEKNOLOGI MARA

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MEC299

PROPULSION SYSTEM DESIGN OF AMPHIBIOUS BOAT

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TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

1.1 Background of Study

In this era of globalisation, amphibious boats often being the talk of the town and become the hottest trend and for good reason like its amphibian quality. An amphibious boat is a transport-viable boat with wheels and has capabilities to function on water and on land. For now, there are only 4 companies in this world that create this type of boat spread across the 5 continents from East to West. They are known as Sealegs, ASIS Boats, Iguana Yachts, and Ocean Craft Marine ("Intro to the Amphibious Boat world", 2020).

To be able to move around freely, an amphibious boat or any sea transportation in typical must have its own propulsion system and a better resistance. Marine propulsion systems are the systems to produce the thrust to push a boat across water. The propulsion system can simply be described as a diesel engine connected directly to a propeller shaft that drives the propeller or additional complex systems containing diesel engines powering an electrical generator, supplying electrical power to an electrical motor through an advanced control system. The whole system of propulsion depends on the vessel size, trade, and type of operation. The effect of hull roughness on boat resistance can be investigate using Computational Fluid Dynamics (CFD) simulations as it can precisely predict the increase in frictional resistance due to the surface roughness (Song et al., 2020).

Nonetheless, a faulty marine propulsion system could lead to serious outcomes for a vessel, cargo, and the people onboard. These consequences can be financial losses, delay in delivery time or a fatal threat to safety of the people onboard (Vizentin et al., 2020). Therefore, this proves how important it is to learn deeply how the propulsion systems work and analyse the resistance thoroughly to prevent such unwanted things from happening.

1.2 Problem Statement

Structural failures occur when the loading exceeds the real strength of the structure, and they are described as a loss of the structures or part of its components'

load-carrying capability. Failures can cause worldwide catastrophic destruction, resulting in fatalities, or partial damage, resulting in pollution or operational delays, yet the structure can eventually be restored or recovered. Failures of ship propulsion systems include shaft lines, crankshafts, bearings, foundations, and so on. Ship structural collapse can be caused by external (impact, severe weather) or internal factors (inadequate dimensioning, material grade, and fatigue). Damage to one or more blades might cause the ship's propeller to function abnormally. This can provide uniaxial force that varies once per revolution in a constant transverse direction across the shaft. This variable force produces a couple, which can lead to propeller hub fatigue failure. A fatigue fracture with a single origin point that travels across the shaft from the side where the force is applied and resulting in the final overload failure happening on the opposite side from the fluctuating force characterises a uniaxial kind of failure (Vizentin et al., 2020).

To overcome these problems, a study about the design of propulsion system of an amphibious boat and resistance analysis will be the main aims in this project.

1.3 Objectives

The main objectives of this project are:

1. To design a propulsion system for an amphibious boat
2. To analyse the resistance of an amphibious boat

1.4 Scope of Work

For this project, an amphibious boat using planing hull will be designed using *PolyCAD* software with specific dimensions according to lines plan. Then, the design will be analysed using *Rhino Computational Fluid Dynamics (CFD)* simulation to check whether the resistance is acceptable or vice-versa.

1.5 Significance of Project

Based on the problems mentioned previously, amphibious boats will surely bring a lot of advantages to people, nature, and especially to country. For instance, this boat doesn't need too much energy to be use not like usual boats as people don't need to ask for other people to launch it. It can directly be launched or retrieved from the garage or storage where it was stored with ease. No trailer or any other vehicles needed to move

it. In addition, it can be one of important assets to one's country. This boat can get past obstacles, variable depths, and debris easily meaning that it can be used to help people who are in remote areas, high water level areas and so on during any natural disaster. Such boat is capable to reduce the emission of combustion engine and oil spillage and preserving the earth ecosystem at once. Currently, most of amphibious boats are used for leisure purposes not for war purposes anymore. A new creation like this could attract tourists regardless of the countries. Without realising, this can help boosting country tourism sector.