

## Analysis of Amphibian Vehicle Using Ansys

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**Abstract**— An amphibious vehicle is a motor vehicle that can travel on both land and water. It has wide range of applications in defense ministry, transport, tourism but the main aim of this project is to design it efficiently for rescue purposes. It involves the process of design followed with analysis and fabrication processes. This paper is presenting the methods and various types of analysis using ansys workbench 16.0. The steps to solve different types of analysis such as static structural, vibrational, thermal and fluid flow analysis are stated briefly. In later stage we have stated and explained the analysis of different body parts of amphibious vehicle. Static structural analysis of flat bottomed boat, flappers, steering rod, rear axial shaft and drum brakes has been successfully done similarly fluid flow analysis of flat bottomed boat, flappers and thermal analysis of breaks has been done too. As the analysis is an important aspect of this project, it will help to analyze the amphibious vehicle accurately thus the various strengths and required forces can be calculated. An amphibian vehicle has great future benefits though it still requires some focused work in research and development field.

**Keywords**— ansys workbench, static structural analysis, fluid flow analysis, amphibious vehicle.

### I. INTRODUCTION

Today's world require speed in each and every field. Hence rapidness and quick working is the most important. The engineers are constantly faced with the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. The machine "Amphibian Vehicle" is an innovative that requires theoretical and practical knowledge to manufacture [1]. In this research paper we have shown the analysis of various components of the amphibian vehicle. We have used ansys workbench 16.0 to perform various analysis such as Structural analysis, thermal analysis. It's necessary to analyse these components to check for their safety and to study how various stresses acts on the vehicle.

### II. OBJECTIVES

- To study the analysis of different components of amphibian vehicle.
- To solve problem faced during designing of vehicle.
- To provide modifications if necessary.
- To check the safety of design.

### III. PROPOSED METHODOLOGY

Analysis is the process of breaking a complex topic or substance into smaller parts in order to gain a better understanding of it. Webster defines analysis as a detailed examination of anything complex in order to understand [2] its nature or to determine its essential features thorough study [3]. Cambridge dictionary defines analysis as the process of studying or examining something in an organized way to learn more about it or a particular study of something.

- Fluid flow analysis
  - a. Steady , non-steady
  - b. Uniform , non- uniform
  - c. Laminar ,turbulent
  - d. Compressible, non- compressible

- e. One, two and three dimensional
- Vibration analysis
  - a. Free
  - b. Forced
  - c. Damped
  - d. Random
- Static-structural analysis
  - a. Types
  - b. Stress analysis
  - c. Strain analysis
  - d. Torsional analysis
  - e. Deflection analysis
- Thermal analysis
  - a. Steady state
  - b. Unsteady state
- Thermal electric

**Different types of analysis on various parts which we will be using:**

- Boat
  - a. Fluid flow analysis
  - b. Static structural analysis
- Flappers
  - a. Fluid flow analysis
  - b. Static structural analysis
- Rear axial shaft
  - a. Static structural analysis
- Rudder (optional)
  - a. Fluid flow analysis
- Steering rod
  - a. Static structural
- Brakes
  - a. Thermal analysis
  - b. Static analysis

**3.1 Steps to Solve Different Types of Analysis****3.1.1 Steps of Static-Structural Analysis [4]****➤ Create Analysis System**

From the Toolbox, drag a Static Structural or Static Structural template to Schematic.

**➤ Define Engineering Data**

You must define stiffness in some form (for example, Young's modulus, hyperplastic coefficients, and so on).

**➤ Define Part Behaviour**

You can define a Point Mass for this analysis types

**➤ Define Connections**

Contact, joints, springs, beams, mesh connections, and end releases are all valid in a static structural analysis.

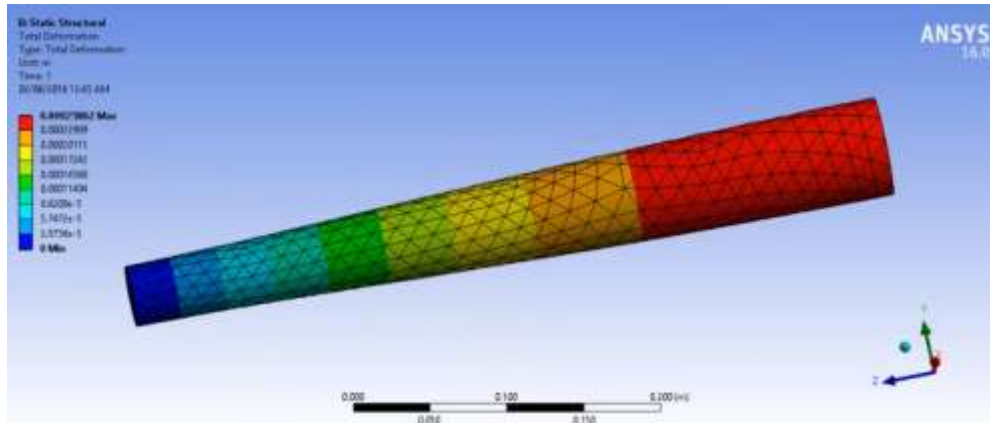
➤ **Apply Mesh Controls/Preview Mesh**

Provide sufficient mesh density on contact surfaces to allow contact stresses to be distributed in a smooth fashion.

➤ **Apply Loads and Supports**

Apply all the loads acting on the component

Solve:



**Fig.1: Example of solution of static structural analysis of hollow cylinder**

### 3.1.2 Steps of Thermal analysis[5]

➤ **Create Analysis System**

From the Toolbox, drag a Steady-State Thermal, to the Project Schematic.

➤ **Define Engineering Data**

Define the Thermal Conductivity for a steady-state thermal analysis.

➤ **Attach Geometry**

There are no specific considerations for a steady-state thermal analysis.

➤ **Define Part Behaviour**

➤ **Apply Mesh Controls/Preview Mesh**

There are no considerations for steady-state thermal analysis itself.

➤ **Define Initial Conditions**

For a steady-state thermal analysis you can specify an initial temperature value. This uniform temperature is used during the first iteration of a solution as follows:

➤ **Apply Loads and Supports**

The following loads are supported in a steady-state thermal analysis:

➤ **Solve**

The Solution Information object provides some tools to monitor solution progress

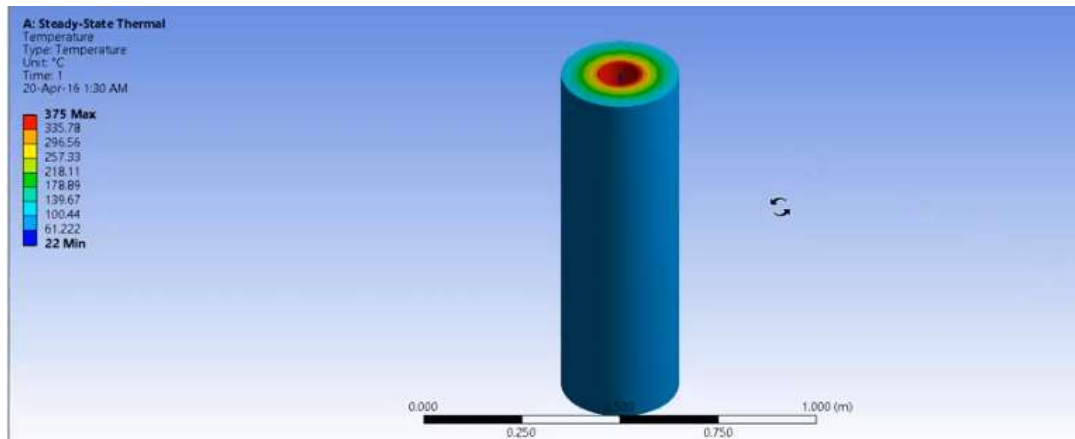


Fig.2: Example of solution of thermal analysis of hollow cylinder

#### IV. RESULT AND DISCUSSION

As mention above the purposed of the project is full filled. The analysis of the amphibian vehicle is done on a normal condition were the operating parameters is perfect. The analysis done on the components helps us to verify the safety of the vehicle. Its helps us decide whether any modifications are necessary.

#### V. CONCLUSION

This research paper describes the importance of Amphibian vehicle in the field of transportation. In this project, the problem faced during the designing and manufacturing of amphibian vehicle will be analysed using ansys workbench 16.0. the steps to solve the different types of analysis such as static-structural, vibrational, thermal and fluid flow analysis of the above mentioned parts that is boat, engine, flapper, rear axial, steering column, rudder have been successfully studied. As the analysis is important aspect of project, it will help to analyze the amphibian vehicle accurately .Thus, after analyzing the various parts, the various strengths of amphibian vehicle can be calculated and the fabrication of amphibian vehicle can be done.

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