

Archimedes Principle Demonstration Using a Submarine Apparatus

Introduction and Pedagogy:

- The report, prepared by Himujjwal Bhattacharya during an internship at IIT Guwahati under Prof. Uday Shanker Dixit, focuses on demonstrating Archimedes' Principle using a submarine apparatus.
- Pedagogy emphasizes active learning, differentiated instruction, scaffolding, cooperative learning, a positive attitude, learning assessment, and technology integration.

Archimedes' Principle:

- It states that a body immersed in a fluid experiences an upward buoyant force equal to the weight of the fluid it displaces.



Fig 2.1 Floatation of the Prototype



Fig 2.2 Sinkage of the Prototype

- Buoyancy is categorized into three types: positive, negative, and neutral.

Historical Context:

- Archimedes discovered the principle while trying to determine if King Hieron's crown was made of pure gold.
- Historical contributions related to buoyancy from Indian scholars like Aryabhata, Bhaskara II, and Brahmagupta were noted.

Applications of Archimedes' Principle:

- Used in the design of ships, submarines, hydrometers, hot air balloons, densitometers, and fluid mechanics.

Project Prototype:

- A model submarine was created using a bottle and a balloon to demonstrate buoyancy.
- When air is blown into the balloon, it inflates and increases buoyancy, making the bottle float. Removing air from the balloon reduces buoyancy, causing the bottle to sink.

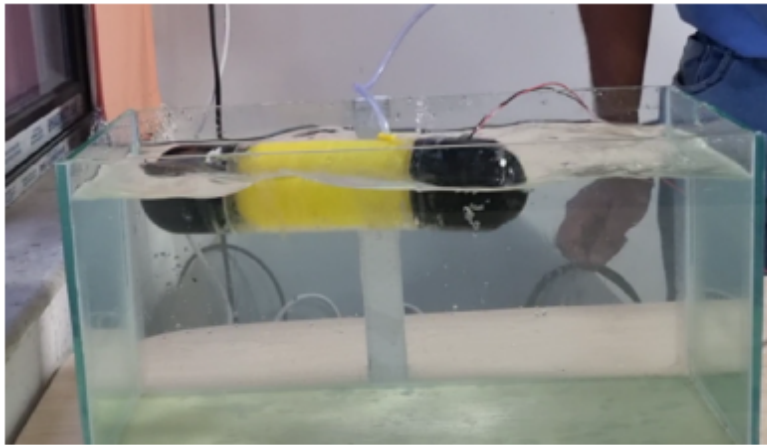


Fig 3.10 Floatation of the Submarine

Construction and Working of the Actual Model:

- The model was constructed using 3D printed parts and involved processes like drilling and cutting.
- A hand pump was used to blow air into the balloon, and a propeller was added to demonstrate propulsion.

Equations and Formulas:

- The report included equations for calculating buoyant force, weight of the fluid displaced, weight of the object, net buoyant force, and density of the object.

Conclusion:

- The educational tool developed effectively demonstrates Archimedes' principles and facilitates interactive learning.