SEMI-CIRCULAR BREAKWATER INTEGRATED WITH OSCILLATING WATER COLUMN

IITM Technology Available for Licensing

Problem Statement

- The existing breakwater structures are mounted on a rubble mound structures, and **stones role down under extreme wave actions and that interferes with an Oscillating Water Column(OWC) device**
- Hence, requires **frequent maintenance and not** efficiently convert wave energy into the electrical energy, moreover such breakwater structures are complex and expensive.

Technology Category/ Market

Category – Energy, Energy Storage & Renewable Energy/ Green Energy
Applications –Wave energy converter, Hydrodynamics, Clean energy
Industry – Environmental Engineering, Clean Energy
Market -The wave energy converter market size stood at USD 21.08 million in 2022, and it is expected to grow at a CAGR of 4.70% during 2022–2030, to reach USD 30.44 million by 2030.

Key Features / Value Proposition

Technical perspective

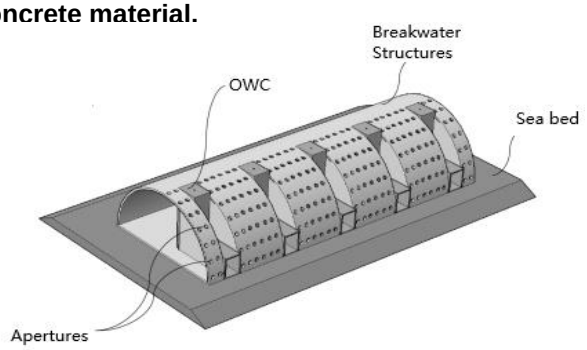
- **Provides a breakwater system integrated with OWC** to protect the shore as well as to extract the wave energy incident on the breakwater and converting to electrical energy at a certain level by having a turbine at the top of the OWC
- **Higher sliding resistance** compared to other types of breakwater structures.
- **Soil subgrade reaction is less** and it can be suited for poor seabed conditions

User perspective

- The breakwater structures are **light in weight, has higher membrane strength, and is easy to handle** and place in the required marine environment
- **Higher efficiency** in conversion of wave energy to electrical energy with this multipurpose application of OWC
- A series of semi-circular breakwater structures integrated with OWC may also o serve **as coastal protection measure.**

Technology

- ***The present invention discloses a breakwater system for power generation, comprising:***
  - **a plurality of breakwater structures mounted on a seabed**
  - **an oscillating water column integrally mounted on each breakwater structure**
- **Each breakwater structure** of the plurality of breakwater structures is defined having a ***semi-circular profile*** and breakwater structures are manufactured from a **prefabricated reinforced concrete material.**



Further, ***the said oscillating water column comprises:***

- **An inlet** provided in a direction of flow of water, and configured to the oscillatory column, receives water from the water body
- **An outlet** provided for the flow of air above the oscillating water column
- The **inlet** is configured to receive water from the water body, for example – ocean, sea and likewise.
- The **outlet** is configured to allow flow of pressurized air from an air chamber of the oscillating water column into surrounding
- The **seabed** is defined, having **a wedge-shaped profile t**o facilitate uniform flow of waves through the seabed and entering of the waves in the respective oscillating water column of the plurality of breakwater structures

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- The oscillating water column includes a first duct and a second duct coupled to the first duct to form an L-shaped oscillating water column, where the L shaped oscillating water column is defined as **Class A type** oscillating water column.
- The **Class B type** oscillating water column has varied air chamber and front wall of Class B type oscillating water column extends up to an edge of the semi-circular breakwater structure profile.
- In **Class C type** an oscillating water column comprising the front wall, such that a portion of the front wall at the first end is a vertical wall.
- The water enters the device through the opening which creates a air mass oscillating inside the enclosed OWC chamber.
- The process by which the primary converter converts the absorbed energy into electrical energy is called Power Take-off (PTO).

Image

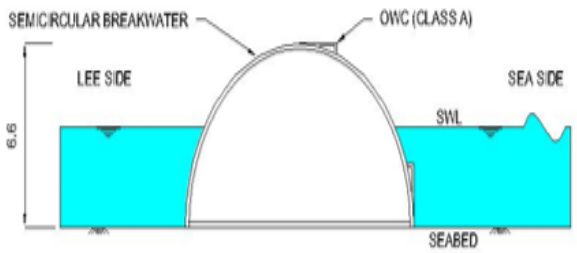

Fig 1. illustrates a side cross-sectional view of a breakwater system disposed in the water body

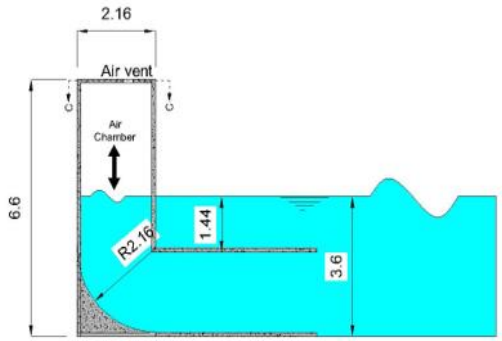

Fig 2 is a representation for the cross section of the **Class A type** oscillating water column

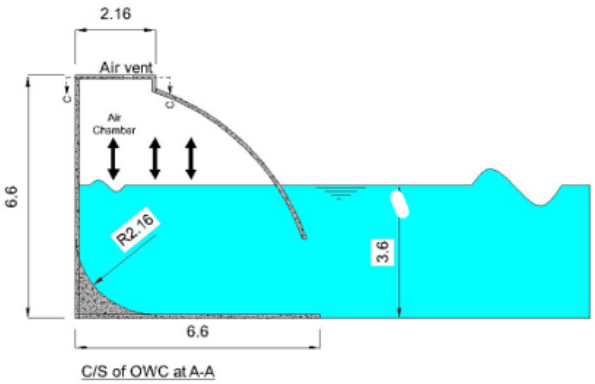

Fig 3 is a representation for the cross section of the **Class B type** oscillating water column

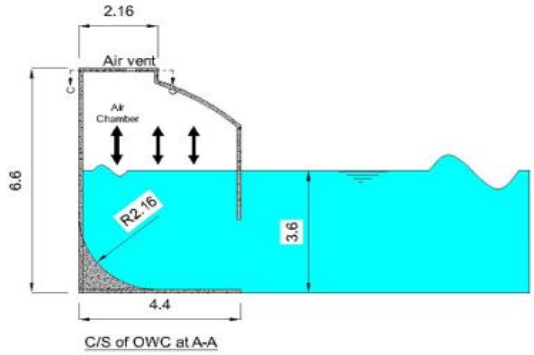

Fig 4 is a representation for the cross section of the **Class C type** oscillating water column

Intellectual Property

- **IITM IDF Ref. 2206**
- **IN202141046704**

Design Patent Ref:
IDF 2226: 357042-001(Granted)
IDF 2311: 357036-001(Granted)
IDF 2312: 357037-001(Granted)

TRL (Technology Readiness Level)

TRL- 2,Technology Concept Formulated

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