WOSC

World Ocean Science Congress 2024

"Sustainable Utilization of Oceans in Blue Economy"

BEST PAPER AWARD

This is to certify that the paper entitled....Hydrodynamic Assessment of a pair of Pilerestrained H-shaped floating Breakwater presented by Aparna Panda has been awarded as the best paper at the **World Ocean Science Congress 2024** on the theme of **"Sustainable Utilization of Oceans in Blue Economy"** jointly organized by NIOT, IIT – Madras and VIBHA, held at IIT-Madras Research Park, Chennai from February 27th to 29th, 2024.

G. A. Ramadass
Chairman
Dr.G.A.Ramadass
Director - NIOT

NATIONAL INSTITUTE OF OCEAN TECHNOLOGY · NIOT · CHENNAI

INDIAN INSTITUTE OF TECHNOLOGY MADRAS

vibha विज्ञान भारती

Co-Chairman
Dr. S.A.Sannasiraj
Professor - IIT Madras

Hydrodynamic assessment of a pair of pile-restrained H-shaped floating breakwater

Aparna Panda, Manu and D. Karmakar

Department of Water Resources and Ocean Engineering, National Institute of Technology Karnataka, Surathkal, Mangaluru-575025, India

Abstract

Floating breakwaters serve the basic purpose of countering the depleting mooring spaces in the busy harbour and operate as an offshore protection measure in deep water regions. Floating breakwaters always offer an efficient solution for weak sea beds, supported by mooring or piles. Lower fabrication, transportation, and installation costs compared to fixed breakwaters make floating structures popular for wave attenuation and WEC integration. Research works performed in recent years have shown the effectiveness of the porous floating breakwaters towards reducing reflected wave amplitude. Studies from recent times demonstrate the ability of porous floating breakwaters to maximize the reflected waves and reduce transmission. Cost-effective alternatives to conventional massive breakwaters are emerging in the form of innovative floating structure configurations optimized for deep-water energy trapping and dissipation.

In the present study, a pair of interconnected H-shaped stratified floating porous structures supported by piles is modelled numerically using the Multi-Domain Boundary Element Method (MDBEM) based on small amplitude wave theory. The numerical model developed using MDBEM approach is validated with the results from previous literature. The hydrodynamic response of waves interacting with a pair of pile-restrained H-shaped floating breakwaters is investigated by analyzing wave reflection, transmission, and dissipation coefficient along with wave force coefficient on the structures. The present study investigates the effect of varying structural parameters on the efficiency of consecutive floating structures for both normal and oblique incident waves. The analysis considers various relative submergence depths and relative structural widths examines efficiency across different water depths and the influence of Bragg resonance through changes in relative spacing. The study reveals that the two H-shaped structure configuration is mostly effective in the intermediate water region. The study indicated that, on increasing the number of structures and reducing the spacing between the structures the wave reflection can be enhanced due to the presence of breakwater system. Further, the leeside structure experiences the maximum wave impact irrespective of the number of structures. In addition, the seaside structure of a two-H shaped structure is more vulnerable to wave impact than the three-H shaped structures considering under intermediate water depth region.

Keywords: Multiple breakwaters; H-shaped structure: Reflection and Transmission Coefficients, Multi-Domain Boundary Element Method (MDBEM); Wave force coefficient.