# Experimental and numerical modelling of point absorbers

## Introduction

Point absorbers are oscillating Wave Energy Converters (WECs) with horizontal dimensions that are much smaller than the predominant incident wave lengths. By damping their motion electricity is produced. A numerical model in frequency and time domain has been developed to simulate the behaviour of a floating point absorber for varying control parameters, different floater geometries and wave characteristics. The model is based on linear theory and has been validated by experimental tests.

## Experimental setup

The experimental tests are conducted in the wave flume of Flanders Hydraulics Research, in Antwerp, Belgium in cooperation with Maritime Technology Division of Ghent University. The flume has a length of 70 m, a width of 4 m and a depth of 1.45 m. The wave paddle is driven by a hydraulic piston and is able to generate wave heights up to 0.65 m. The model is installed at a distance of 12 m from the paddle. At the end of the flume absorbing material is placed in order to minimize reflection.

The test setup consists of a floating body with diameter 31.5 cm connected to a rod both oscillating with respect to a fixed structure. The rod is attached to a rotating belt which is supported by four bearings. The test setup is modelled on a scale 1/15.9. A photograph of the experimental test setup is shown in Figs. 1 and 2.

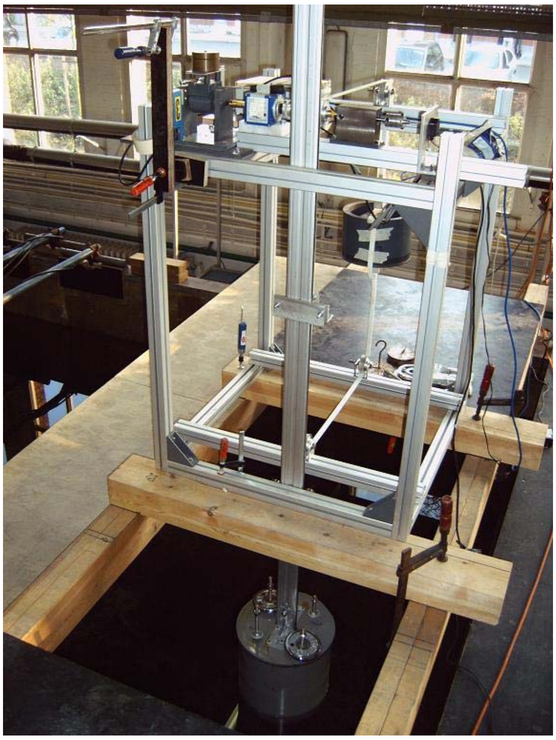

**Figure 1 - Test frame with measurement instrumentation.**

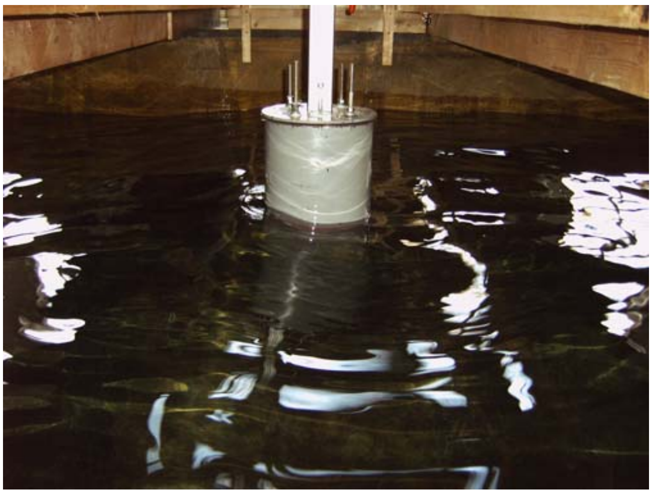

**Figure 2 - Heaving point absorber in wave flume of Flanders Hydraulics Research, Antwerp.**

## Numerical model

The experimental tests are intended to validate numerical simulations which are based on linear theory both from the fluid point of view as from the buoy motion point of view. This means that small waves are assumed as well as small body motions compared to the incident wave lengths. The hydrodynamic parameters are calculated with a potential theory Boundary Element Method (BEM) software package.

## Results

Figure 3 shows an example of the measured buoy motion and the numerically determined buoy position as a function of time in a small irregular wave with certain control parameters. The correspondence is excellent, showing that linear theory can be used to predict the point absorber behaviour for small waves and small buoy motions.

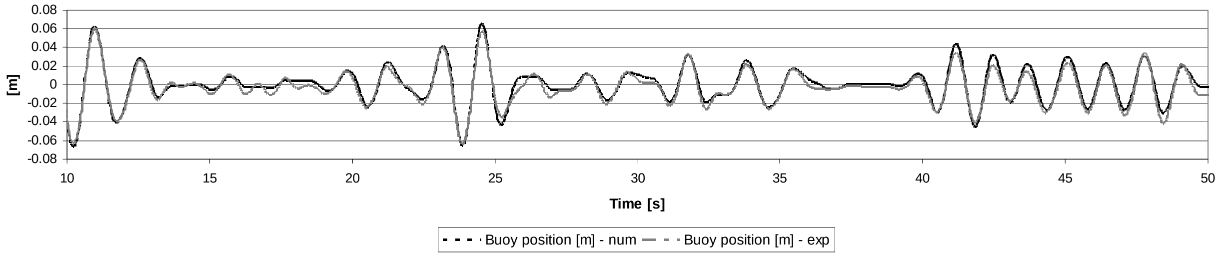


**Figure 3 - Measured and numerically calculated buoy position [m]. Buoy: cone with cylindrical upper part, diameter 31.5 cm, draft = 22 cm, wave characteristics: $H_s$ = 6.2 cm, $T_p$ = 1.59 s.**

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