**Wave Energy**

Ocean waves contain huge amounts of unexploited renewable energy, offering gigantic opportunities. This energy can be absorbed by wave energy converters (WECs). Ocean energy is a renewable energy type that is becoming more and more important.

Point absorber systems are wave energy converters consisting of oscillating bodies with small dimensions compared to the wave length.

**Purpose**

Numerical simulation of the behaviour of a **heaving point absorber** in relative motion to a floating platform in order to:

- Find an optimal buoy geometry.
- Define the absorbed power for a certain wave climate.
- Assess the effect of restrictions imposed on buoy motion.

**Restrictions & Absorbed Power**

- A restriction on the displacement of the floater is applied to decrease the probability of **slamming**, a phenomenon that may occur when the buoy loses contact with the water surface.
- A second restriction is imposed by the **limited stroke** of the mechanical system connecting the point absorber to the platform.

These restrictions reduce the power that can be absorbed, as can be clearly seen in the figures on the right.

For a given stroke and slamming criterion, optimal values of external damping and supplementary mass can be selected in order to maximize the power that can be absorbed, which is shown in the figure below.

**Linear Model**

- The hydrodynamic coefficients for heave in the equation of motion are determined with the boundary element method software Wamit.
- Energy extraction is modelled by an external damping force, proportional to the velocity.
- Motion control is realized by adding supplementary inertia $m_{sup}$ which allows for adapting the natural period of the floater.

**Buoy Geometry**

Two buoy shapes are investigated:
- A cone (top angle 90°) + cylinder
- A hemisphere + cylinder

Size and draft of the buoy are varied:
- Diameters: 3 - 3.5 - 4 - 4.5 - 5 m
- Draft: 3 different drafts between 2 and 4.5 m

**Platform Size**

The considered platform measures are: 40 m x 40 m x 20 m

**Discussion & Future Work**

- The cone-cylinder shape has a slightly better performance than the hemisphere, but the difference is only 3 to 5%.

The graphs show that the slamming criterion is less restrictive than the stroke criterion, at least when the draft is not too low.

- When the restrictions get more rigorous, power absorption drops faster in higher energy classes.

- In a next step these numerical simulations will be validated by scale model tests. Future work comprises also the investigation of the mutual interaction between the point absorbers in order to find an optimal configuration of the point absorbers in the platform.

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**Acknowledgments**

Research funded by Ph.D. grant of the Promotion of Innovation through Science and Technology in Flanders (IWT-Vlaanderen), Belgium.