



A Novel, Robust, Near-shore, Wave Energy Converter for Remote Communities

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Introduction

- Wave energy relatively immature technology – essential that related LCOE falls to a comparable level
- Industry struggling with survivability vs CAPEX/OPEX



- Simple, robust devices required
- Near shore location
 - No requirement for large heavy lift vessels
 - PTO shore based
 - Reduction in grid connection costs
- Potential to provide energy dependency for remote communities



WEC Concept

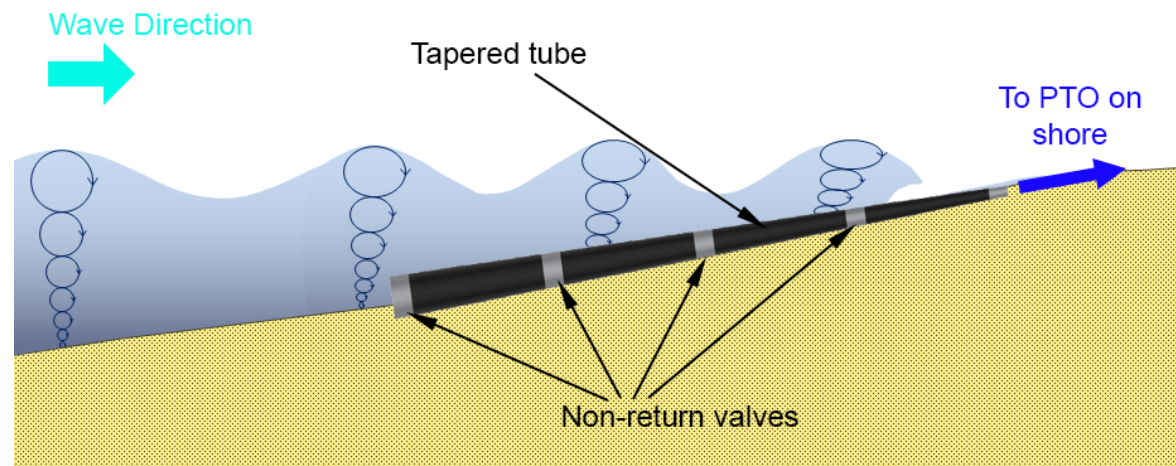
AIM - to test the feasibility, both experimentally and numerically, of a novel concept for a robust wave energy converter (WEC) operating in the near-shore region.

- Primarily off the shelf parts, facilitates maintenance
- Wave orbital velocities build up pressure in compartments in tapered tube
- Non-return valves separate compartments
- Max. pressure to PTO

Feasibility Study

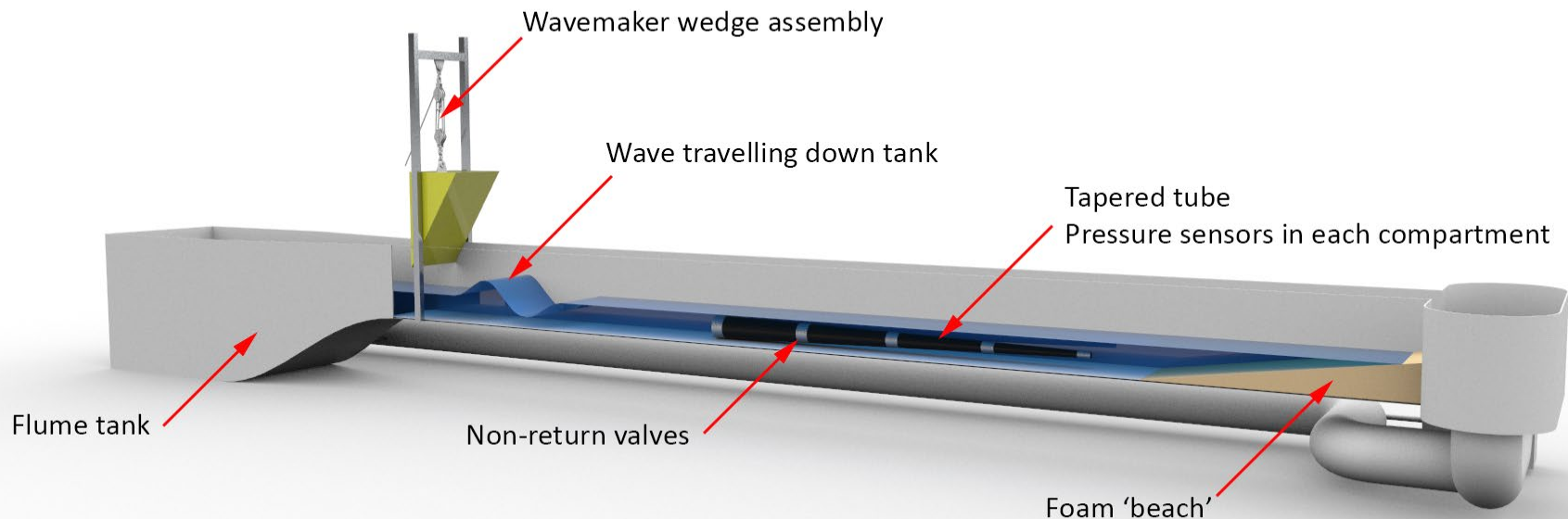
Proof of concept required:

- Tank testing
- CFD



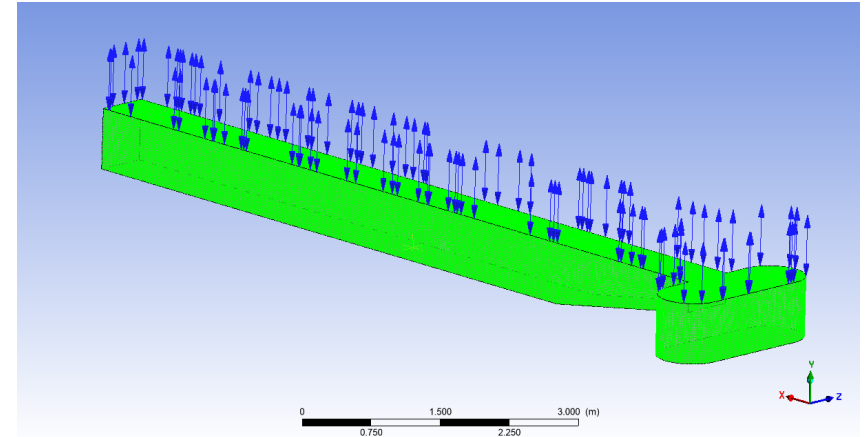
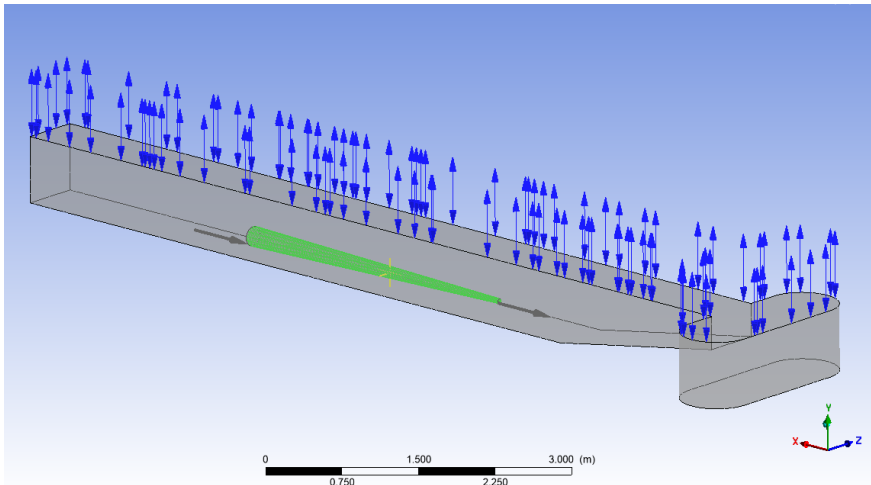
Tank Testing

- Model to be constructed and tested in UoE Flume (Feb 2022)
- Waves generated by drop wedge wavemaker
- Pressure monitored in WEC compartments and external to device
- Results compared to direct model in CFD



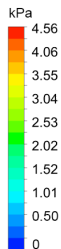
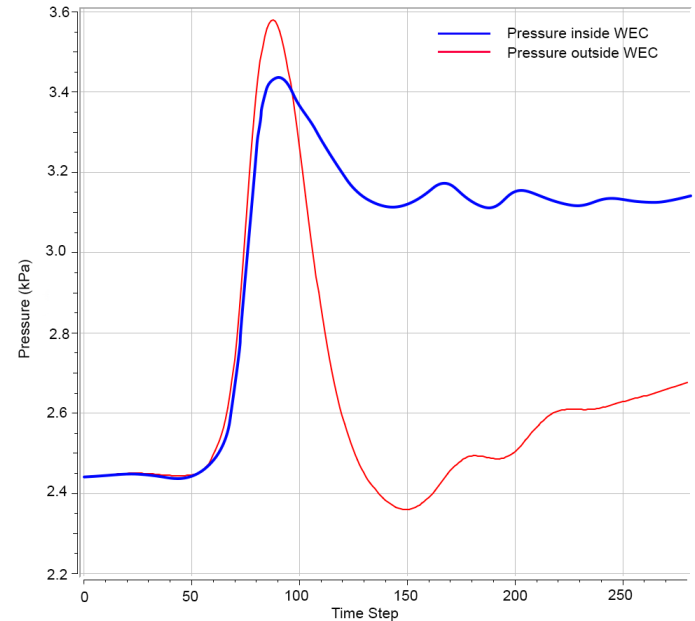
CFD - Setup

- CFX, multiphase, volume of fluids methods used
- Current flume: Length = 9m, Width = 0.6m, Depth = 0.6m
- Mesh – Hex dominant, 573919 elements, 20mm max edge length
- Waves generated by moving wall (moving mesh)
- Same physical size as flume – direct comparison



CFD - Initial Results

- Wave height = 0.21m, speed = 3.78m/s, length = 2.75m
- Monitor points internal and external to WEC
- External pressure (red), internal pressure (blue)
- Pressure internally stays higher as 'no-return' valve prevents backflow
- Change in internal pressure $\approx 1\text{kPa}$



Conclusions & Future Work

- Simple, robust, nearshore WEC devices could provide energy security for remote communities
- A concept for a new WEC device, based on off-the-shelf components, has been introduced
- Initial CFD analysis shows positive results, with tank testing to be carried out in February 2022

Further work:

- *Undertake tank testing and update numerical model with actual tested device parameters*
- *Comparison of numerical and experimental results*
- *Illustrate feasibility of concept and apply for further funding*



Any Questions?

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