Investigation into the Coupling of a Wave Energy Converter with a Reverse Osmosis Desalination Plant

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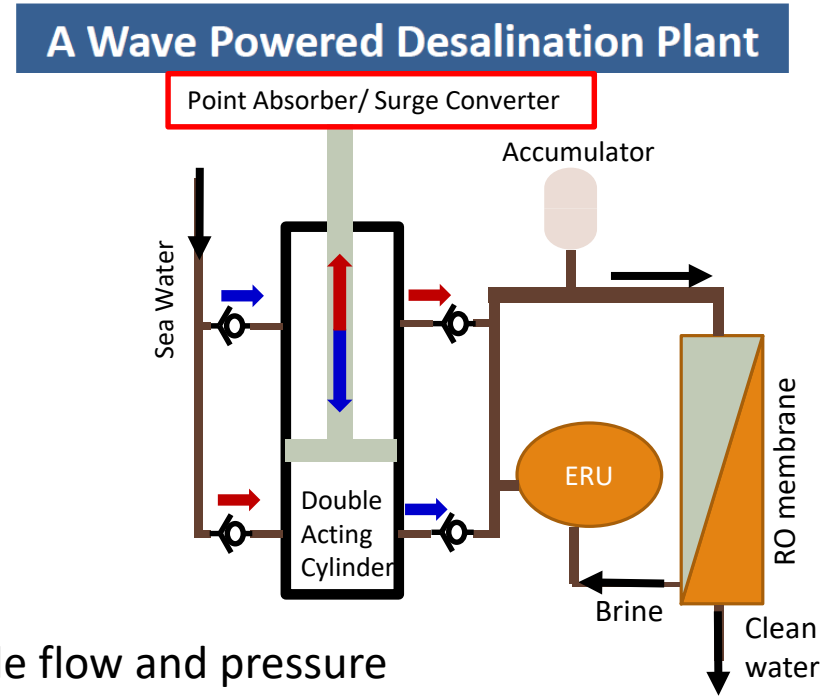
Wave Powered Desalination:

- Different technologies are proposed by several companies in recent times
- Considered as a viable route for commercialization of wave energy
- Reduction in energy transformation, no intermediate transfer to electrical energy



Challenges:

- Water quality under variable flow and pressure
- Membrane integrity under variable flow and pressure
- Optimum working condition of the desalination plant and wave energy converter-identifying the most efficient combination

Project Activities :

Task 1. Review of WEC PTO suitability and characteristics
Task 2. Commissioning of RO laboratory test rig
Task 3. Laboratory test programme
Task 4. Numerical modelling of wave-powered desalination systems
Task 5. Design guidelines for wave-powered desalination

WEC PTO suitability and characteristics

- Two fundamental configurations of wave energy technology investigated: a heaving buoy & an oscillating wave surge converter
- Two energy recovery technologies investigated: a Clark pump and a pressure exchanger intensifier
- Clark pump -----requires a low PTO pressure (~20 bar) with a larger feed flow,
- Pressure exchanger-intensifier------ requires a higher PTO pressure (~50 bar) with a lower feed flow.

Design guidelines for wave-powered desalination

- Necessary to design the PTO, including the number of membranes and size of the energy recovery technology based on the incident wave climate and the response of the wave energy converter
- The performance of the wave-powered desalination plant can be optimised by varying the effective size of the pump driven by the wave energy converter
- Fluctuations in the pressure and flow can cause an increase in the recovery ratio, but with an associated increase in the salinity of the permeate, although within potable limit (<500 ppm).