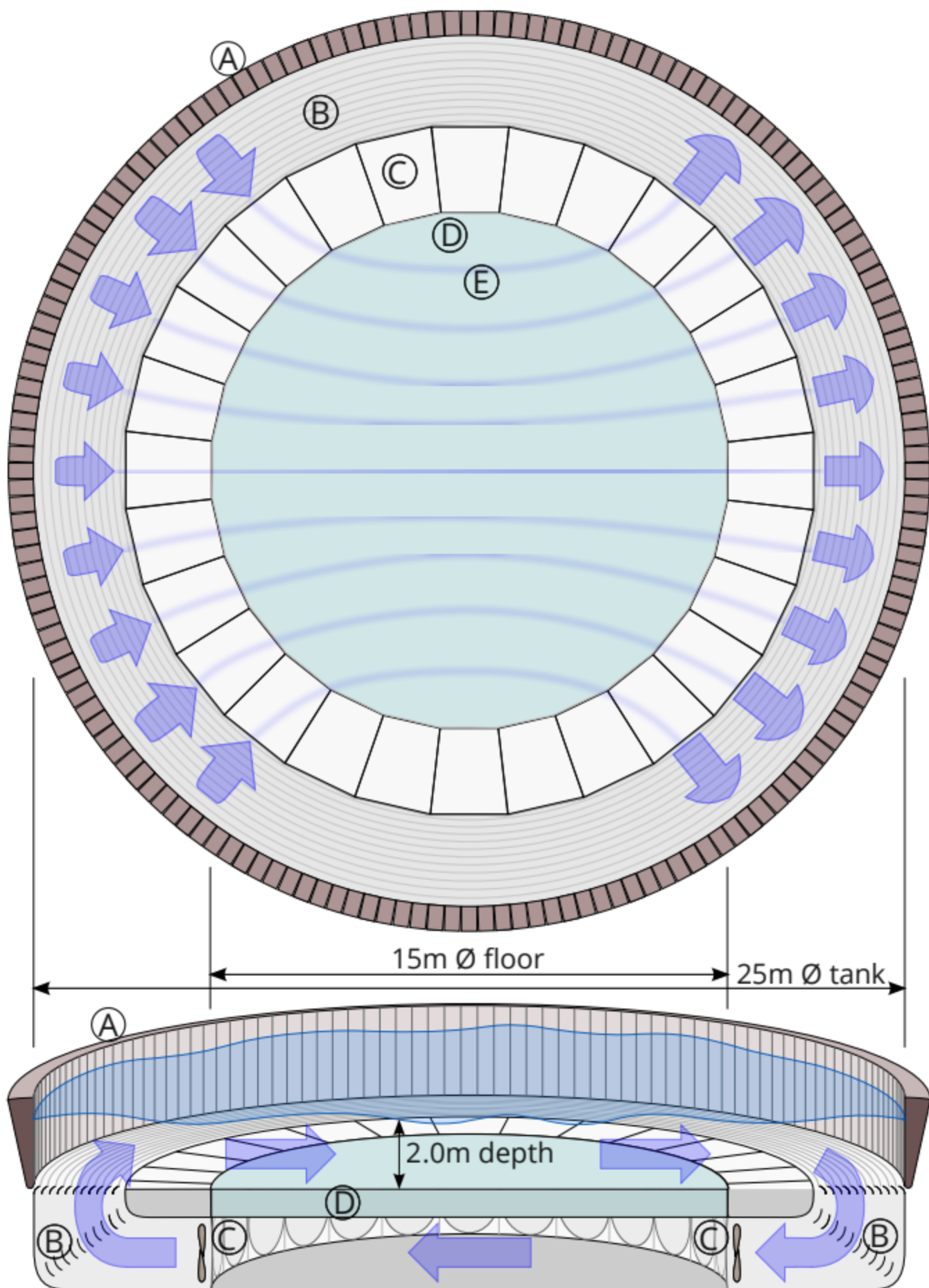


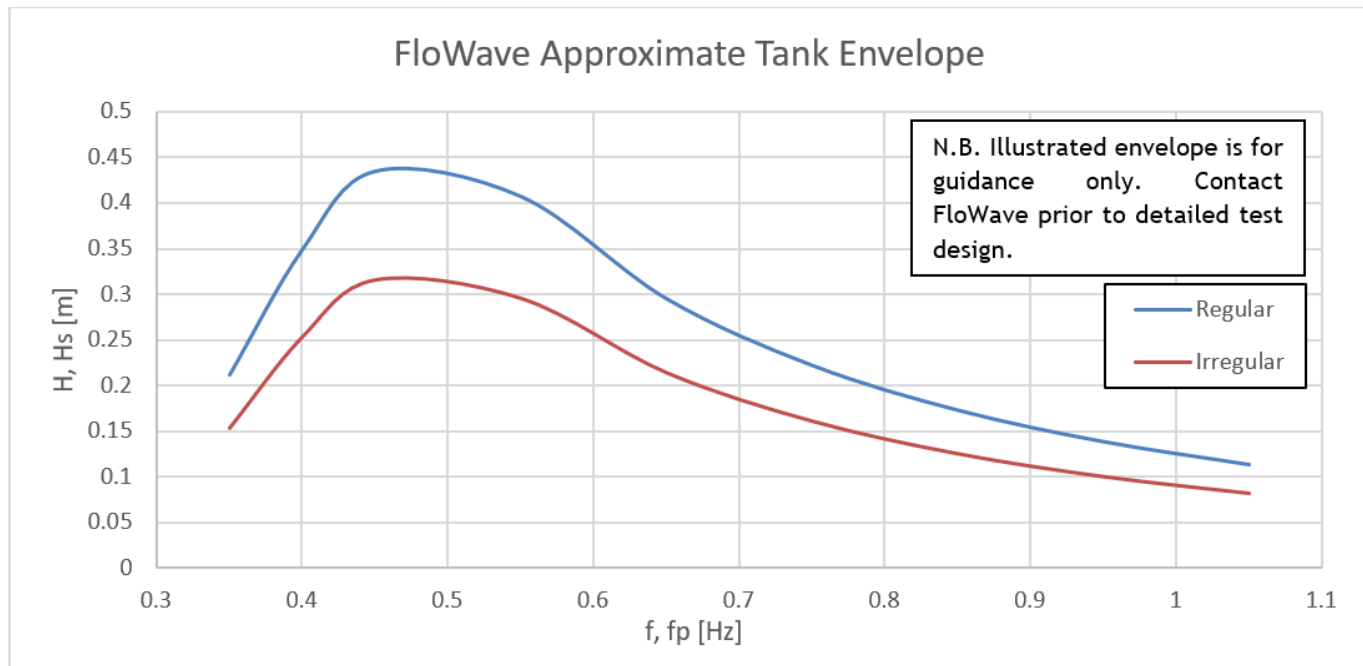
Name of organization FloWave Ocean Energy Research Facility		Year of information updating 2025
Year established 2013		Year of joining the ITTC 2025
Address FloWave Ocean Energy Research Facility Max Born Crescent The Kings Buildings Campus Edinburgh EH9 3BF United Kingdom		Status in the ITTC Regular member
Contact details (phone, fax, e-mail) +44 131 650 3555 Flowave@ed.ac.uk		Website www.flowwave.eng.ed.ac.uk
Type of facility Wave and Current Basin	Year constructed/upgraded 2014	
Name of facility FloWave	Location (if different from the above address)	
Main characteristics (dimensions of tank/basin/test section; for simulators: full mission, part task or desk top) Diameter: 25m Depth: 2m Working Diameter: 10m (current) – 15m (wave)		
Drawings of facility		



Detailed characteristics (carriages, wave/current/wind generators, instrumentations, etc.)

Wave and Current Specifications

- 168 Edinburgh Designs Ltd. active absorbing wavemakers in a circular configuration
 - Typical wave heights up to approximately 0.4m, optimised at periods of 2 seconds
- 28 submerged flow drive units in a circular configuration.
 - Current velocities up to 1.6 m/s across a 10-12m diameter test section. Wave and current combined conditions typically up to 1.0 m/s.
- Full 360-degree independent directional control of wave and current
- Regular (long crested) and pseudo-random (long and short crested) sea states.
 - Pseudo-random sea states from standard spectra (e.g. JONSWAP, PM)
 - Standard directional spreading functions (e.g. Cos2s)
 - Custom sea states and spectra available on request



Instrumentation

- 6 DoF optical motion capture
 - 8no. Oqus 7+ cameras located on tank perimeter
 - 1no. Oqus 210c colour video camera
 - 6no. Qualisys Oqus 5+ underwater cameras
- Data Acquisition
 - Modular National Instruments combined PXI and CompactDAQ system
 - +/- 10V: 48 channels
 - 4-20mA: 24 channels
 - More specialist applications/modules may be available upon request
- Wave measurement
 - Up to 16no. gauges upon request
- Current measurement
 - 1no. Vectrino Profiler ADV
 - LaVision Minishaker PTV measurement system (LED illumination).
- 6 DoF AMTI OR6-7 floor mounted loadcell
- Submersible inline tension/compression loadcells (Applied Measurements DDENA and Futek LSB210)
 - Multiple units typically measuring up 500N, with 2000N DDENA unit for larger loads.
- Selected accelerometers and gyrometers

Infrastructure

- 15m diameter raisable floor for dry model installation and access.

- Instrumentation/access gantry (approximately 1m above water level)
- 5t overhead crane
- Large roller-shutter door access and 800kg forklift for model delivery and handling
- Onsite workshop to support model build and modification services.

Applications (Tests performed)

FloWave primarily performs test for the offshore renewable energy sector. Selected applications and examples include:

Wave Energy

- Tests conducted for the *Wave Energy Scotland (WES) Novel Wave Energy Converter Programme (NVEC)* for multiple clients including *Mocean Energy* and *AWS*. These tests were conducted in compliance with the IEC TS 62600-103 guidance for early stage development of wave energy converters. Tests explored sea keeping, power performance and survivability.
- Advanced control strategies for Wave Energy explored through the EPSRC (UK research council) funded *HAPiWEC* programme, using a remote laboratory infrastructure combined with a bespoke power take off system and point absorber buoy.

Tidal Energy

- Combined wave-current testing exploring seakeeping and mooring dynamics/kinematics for floating wind clients including *Orbital Marine Power* and *Sustainable Marine Energy*.
- Deployment of fully instrumented turbines in single and array configurations, exploring blade loading, power generation, wake development and emulated electrical grid integration. Work funded under multiple projects by the EPSRC (UK research council).

Floating Offshore Wind

- Seakeeping, mooring behaviour and emulated wind (software-in-loop) tests for clients including *EnerOcean*, *Stiesdal AS*, *Trivane*, *Marine Power Systems*, and *GICON*.

Other technologies and applications

- Cable umbilical dynamics were explored through measurements of loads and dynamics (via underwater motion capture) in wave and current environments for the EPSRC (UK research council) funded *CableDyn* project.
- Control strategies for remotely operated vehicles (ROVs) were examined through a variety of academic and commercial projects, including the EPSRC funded *ORCA* project.
- Multiple sensor technologies (primarily acoustic) have been tested in the facility for deployment in the field, primarily energetic tidal sites such as the Pentland Firth, Orkney.
- Fundamental studies into the directional wave breaking were performed through the EPSRC-SFI (joint UK and Ireland research council funding) *Wave Breaking in Crossing Seas (WBICS)* project. The facility constructed a high density (64 point) measurement array to obtain novel insights into the formation of steep and large waves at sea.

Published description (Publications on this facility)

Ingram, D., Wallace, R., Robinson, A., & Bryden, I. (2014). The design and commissioning of the first, circular, combined current and wave test basin. In Proceedings of Oceans 2014 MTS/IEEE Taipei, Taiwan Article 131217-002 Institute of Electrical and Electronics Engineers. <https://doi.org/10.1109/OCEANS-TAIPEI.2014.6964577>

Robinson, A., Ingram, D., Bryden, I., & Bruce, T. (2015). The generation of 3D flows in a combined current and wave tank. Ocean Engineering, 93, 1-10. <https://doi.org/10.1016/j.oceaneng.2014.10.008>