Geophysical Research Abstracts
Vol. 17, EGU2015-12165, 2015
EGU General Assembly 2015

An innovation in physical modelling for testing marine renewables technology

David Todd, Richard Whitehouse, John Harris, and Mark Liddiard
HR Wallingford, Coasts & Estuaries, Wallingford, United Kingdom (d.todd@hrwallingford.com)

HR Wallingford has undertaken physical modelling of scour around structures since its creation as a government research laboratory in 1947. Since privatisation in 1982 HR Wallingford has carried out a large number of studies for offshore developments including renewable energy developments and offshore wind in particular, looking at scour around offshore foundations and cables. To maintain our position as both a research and consultancy organisation delivering high quality work we have developed a new purpose built physical modelling facility. The Fast Flow Facility is a dual-channel, race track shaped flume and the only large scale physical modelling facility of this kind offering wave, fast tidal current and recirculating sediment capabilities. The 75 m long, 8 m wide and 2.5 m deep Fast Flow Facility has two working channels of 4 m and 2.6 m width. Holding up to a million litres of water the facility can generate waves with significant wave heights, Hs, of up to 0.5 m and maximum wave heights of up to 1 m in combination with flows of up to 2 m/s (∼4 knots).

This state-of-the-art facility combines fast, reversible currents with wave generation and sediment transport modelling in a single flume, allowing us to further develop our understanding of sediment transport within the marine environment and keep us at the forefront of sediment transport research. The facility has been designed with the marine renewables sector in mind, with a 4 x 4 x 1m deep sediment pit in the centre of the flume allowing investigations to provide improved understanding of the detailed processes which lead to scour, and enabling improvements in prediction capabilities for marine scour in different sediment seabed compositions (non-cohesive and cohesive) for a range of structure types (monopiles, jackets, gravity base foundations, jack-ups etc.). The facility also enables the testing of scour protection methodologies at relatively large scale (typically 1: 10 – 1:20) and allows for improved and more efficient designs to be developed prior to construction.

Further, the size of the facility gives HR Wallingford the ability to increase the scale of physical modelling tests while simultaneously reducing the risks for marine renewables developers and operators, particularly with respect to foundations and subsea infrastructure. The testing of devices at prototype scale (such as scour protection measures, foundation design and protection of underwater cables etc.) in advance of full development can lead to major cost savings.

Within this presentation we highlight the key features of the facility, presenting preliminary results of experiments utilising the capabilities and discuss the wider applicability of the facility to the marine renewables sector.