

Abstract Submitted
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Validation of a Transient Rotating Reference Frame CFD Model

OTHMANE KHOUNGUI, JUSTIN LADD, CARLOS VELEZ, University of Central Florida — Uni-directional impulse turbines are used for the extraction of wave energy by converting oscillating air flow generated by waves into uni-directional rotational energy. Due to the inconsistent nature of ocean waves, airflow within an OWC is bi-directional and inherently transient. Such complex fluid dynamics require a varying rotor RPM incorporated in the CFD simulation to adequately resolve the flow field during turbine startups and changing air flow direction. The software Numeca is used to introduce a user defined function which defines a varying rotor rpm in a three dimensional transient viscous simulation of air flow through a uni-directional turbine. A scaled turbine prototype is used in a wind tunnel to measure the rotors RPM and Torque. Additionally, a radial pressure profile is developed in front and behind of the rotor blades. The experimental data is used to validate the accuracy of this varying rotating reference frame CFD model.

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