

Effect of Blade Layout on Unidirectional Rotation of a Vertical-Axis Rotor in Waves

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Abstract : Ocean waves are a rich renewable energy source that is nearly untapped to date, even though many wave energy conversion (WEC) technologies are currently under development. The present work discusses a vertical-axis WEC rotor for power generation. The rotor was specially designed to allow easy rearrangement of the same blades to achieve different rotor configurations and result in different wave-rotor interaction behaviors. These rotor configurations were tested in a wave tank under various wave conditions. The testing results indicate that all the rotor configurations perform unidirectional rotation about the vertical axis in waves, but the response characteristics are somewhat different. The rotor's unidirectional rotation about its vertical axis is essential in wave energy harvesting since it makes the rotor respond well in a wide range of the wave frequency and in any wave propagation directions. Result comparison among different configurations leads to a preferred rotor design for further hydrodynamic optimization.

Keywords : unidirectional rotation, vertical axis rotor, wave energy conversion, wave-rotor interaction

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