

## **Aero-Acoustic Analysis of Wells Turbine for Ocean Wave Energy Conversion**

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**3:00-3:30 pm Coffee Hour**  
**3:30-4:30 pm Seminar**

### **Abstract**



Probably the most intensively studied principle of harnessing the energy from ocean waves is the oscillating water column (OWC) device. The OWC converts the water wave motion into a bi-directional air flow, which in turn drives an air turbine. The Wells turbine as a candidate for OWC power take off systems has been the object of considerable research in the last decades. The vast majority of the investigations focused on the aerodynamic performance. However, assessing the environmental impact of an in situ Wells turbine in more detail requires an in depth understanding of the acoustic emission associated with its operation. A systematic analysis of the effects of rotor hub to tip ratio and cascade solidity showed that optimum total-static efficiency and low sound emission can be achieved with moderate values of both parameters. By contrast an increased operating range can be obtained with higher hub to tip ratio rotors and high solidity cascades. Apart of that a number of enhanced design parameters such as blade skew, blade tip modifications and airfoil contour have been studied. Applying blade skew has been proven to extend the operating range and more remarkably lower the noise emission under overload conditions. Supplemental guide vanes enhance peak efficiency remarkably, however, with some degradation of stall margin and sound emission.

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