

## Analysis and Design of a Wave Energy Conversion Buoy

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## ABSTRACT

In the sea various methods have been conducted to capture wave energy which include the use of pendulums, pneumatic devices, etc. Floating devices, such as a cavity resonance device take advantages of both the water motion and the wave induced motions of the floating body itself. The wave energy converter is known commercially as the WAGB(Wave Activated Generator Buoy) and is used in some commercially available buoys to power navigation aids such as lights and horns. This wave energy converter consists of a circular floatation body which contains a vertical water column that has free communication with the sea. A theoretical analysis of this power generated by a pneumatic type wave energy converter is performed and the results obtained from the analysis are used for a real wave energy converter buoy. This paper is shown to have an optimum value for which maximum power is obtained at a given resonant wave period. Also, the length of the internal water column corresponds to that of the water mass in the water column. If designed properly, wave energy converter can take advantage not only of the cavity resonance, but also of the heaving motion of the buoy. Finally, simulation is performed with a LabVIEW program and the simulation results are applied to a wave energy simulator for modifying design data for a wave energy converter.

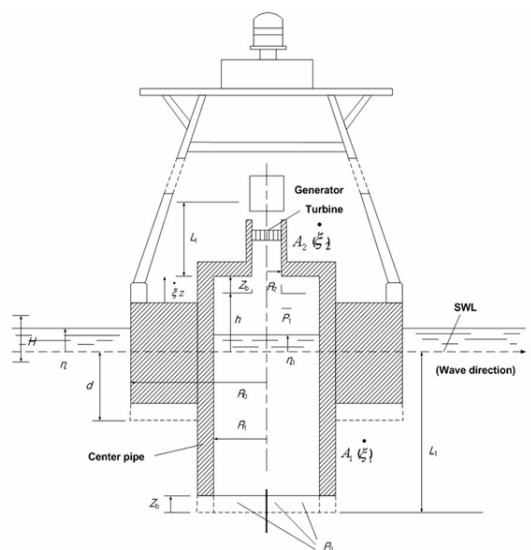
**KEY WORDS:** wave, energy, converter, resonance

## INTRODUCTION

In this paper, our interest is forced on the basic mathematical description of water wave and the analysis of air flow and motions for a wave power generation system. Also, this paper suggests a power increment method of WEC(wave energy converter) with system modifications.

In a random sea, the WEC is subjected to waves of varying heights and periods. The increased buoyant force due to crest is canceled by the decreased buoyancy due to the trough.

It is essential that the WEC is provided for optimum control of the oscillatory motion, in order to achieve maximum power conversion. In an oscillator WEC, normal modes of oscillation are a function of several parameters, such as the mass, wave height, period, and heaving motion.



*Fig. 1 Schematic diagram of the WEC for buoy*