Harvesting the Blue Wave Energy by Circular Electromagnetic Generator

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Oceans provide an enormous quantity of clean and sustainable wave energy that can generate enough electricity to power the entire globe. However, due to the inefficiency and ineffectiveness of current technologies, much of this energy has not been harvested. This research project was conducted to fabricate and test a new inexpensive, light, portable, and efficient device to capture wave energy. The Circular Electromagnetic Generator (CEG) has a magnetic ball traveling within a ring-shaped hollow tube coiled with copper wire. As waves propel the ball to move, electricity is generated. A dumbbell shaped transducer was created to understand how the magnetic ball size and velocity of the ball moving through the coiled wire would affect the electrical output. It was observed that larger magnetic balls moving at higher speeds produced greater voltage. A CEG unit was fabricated and a Wave and Rocking Shaker was used to simulate the wave movement. The performance of the CEG was evaluated. The experimental results showed that small tilt angles and low rocking speeds can induce the CEG to produce electricity. This meant that the CEG unit can capture the kinetic energy even from small waves. This CEG unit along with a circuit board made up of a full wave rectifier, smoothing capacitor, and LED was placed inside a sealed waterproof container. The waterproof CEG unit prototype was able to float above water and generate electricity as the water waves moved. Additionally, a CEG farm was proposed and modeled to capture large amounts of wave energy.

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