

Investigation on a Wave-Powered Electrical Generator Consisted of a Geared Motor-Generator Housed by a Double-Cone Rolling on Concentric Circular Rails

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Abstract : An electrical generator able to harness energy from the water waves and designed as a double-cone geared motor-generator (DCGMG), is proposed and theoretically investigated. Similar to a differential gear mechanism, used in the transmission system of the auto vehicle wheels, an angular speed differential is created between the cones rolling on two concentric circular rails. Water wave acting on the floating DCGMG produces and a gear-box amplifies the speed differential to gain sufficient torque for power generation. A model that allows computation of the speed differential, torque, and power of the DCGMG is suggested. Influence of various parameters, regarding the construction of the DCGMG, as well as the contact between the double-cone and rails, on the electro-mechanical output, is emphasized. Results obtained indicate that the generated electrical power can be increased by augmenting the mass of the double-cone, the span of the rails, the apex angle of the cones, the friction between cones and rails, the amplification factor of the gear-box, and the efficiency of the motor-generator. Such findings are useful to formulate a design methodology for the proposed wave-powered generator.

Keywords : amplification of angular speed differential, circular concentric rails, double-cone, wave-powered electrical generator

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