Theoretical model design for 0.5kW and 1kW of OSTEC using energy balance concept

ABSTRACT

Background: Salinity and temperature differences between two bodies of water have been found useful in generating electricity. A new renewable energy system which is Ocean Salinity and Temperature Energy Conversion or OSTEC has been developed based on this principle. Theoretical prediction models which are Density Model and viscosity Model have been formulated to perform power output prediction of OSTEC system. Using Viscosity Model, it was found that the power output from the system increases with higher salinity and temperature difference between the two types of water. With this, an OSTEC prototype is intended to be installed at the Jetty in Universiti Malaysia Sabah for testing demonstration and power output assessment. Objective: In this paper, an inverse calculation approach is used to determine the required OSTEC parameter to generate 0.5kW and 1kW of electricity using energy balance concept. The calculation approach on OSTEC model is performed by including the efficiencies of the appropriate selection of turbine runner and dynamo generator. Results: It was found that with other dimensions are fixed, the required up-tube diameter to produce 1kW of electricity is 0.12m compared to 0.09m for 0.5kW. This is corresponding to the increase of 33% in up-tube diameter to double the power output. Conclusion: This finding will be used as a guideline to construct the OSTEC prototype in the vicinity of Universiti Malaysia Sabah