

# **Optimized energy extraction in tidal current technology using evolutionary algorithm**

## **ABSTRACT**

Renewable energy is gaining more popularity recently. Tidal currents are driven by two different connected bodies trying to equalize their level differences, hence there will be a flow of water from the high-pressure head to the low-pressure head. It is this kind of water flow that makes tidal current suitable for power generation. The main advantage of tidal power is that it can be forecasted easily. Aside from that, sea water has higher density as compared to air, therefore for the same amount of power, the power can be generated at a lower speed. The tidal current model is composed of a permanent magnet synchronous generator, tidal velocity profile, and another two sub-systems. This model is simulated in Matlab. The resultant tidal velocity is made up of 5 different partial tides. The tidal current turbine model is tested with different inputs of pitch angle and tidal current speed. The results show that the maximum generated output power is 295kW when the pitch angle is  $2.77^\circ$ . Furthermore, the higher the tidal current speed, the higher the generated output power. Aside from that, as the pitch angle is gradually increased while keeping the tidal speed constant, the power coefficient will decrease. Maximum Power Point Tracking algorithm which is based on Perturb and Observe (P&O) is used to locate the maximum power coefficient of the system. It can track the maximum power coefficient successfully but there will be oscillation at the steady state. Cuckoo Search via Levy Flight is able to overcome this problem as there will be no oscillation at steady state and this can prevent power loss. The convergence of Cuckoo Search via Levy Flight is two times faster than P&O.