عنوان مقاله:

An Axial Hydro-Kinetic Turbine for Optimum Power Extraction using Tidal Dams

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خلاصه مقاله:

The present paper describes analytical optimization and numerical simulation of a modern hydro-kinetic turbine. It was a tidal turbine with twin elliptic-rotors. The turbines were installed within the twin ducts inside of a tidal dam. There was a gap between each of the turbines and the ducts for allowing vortex formation around each of turbines. The pitch angle distribution was optimized for highest energy extraction from water flow. The numerical simulations of the turbine have shown great power-coefficient that exceeds from 1.0 for tip-speed ratios greater than 3.5. According to power-coefficient curve, the runaway speed for the hydrokinetic turbine was eliminated and the extracted power has increased with a second order function at higher tip-speed ratios. Based on obtained data, an axial hydro-kinetic turbine can not only absorb flow kinetic energy of incoming flow, but also can extract energy from parallel flows over each turbine. The powercoefficient curve against tip-speed ratio encounters with a break point around tip-speed ratio of 3.0. Simultaneously a strong vortex ring has formed around each of turbines. Flow trajectories illustrate how the hydro-kinetic turbine was able to absorb much more energy from external flows than conventional axial hydro-kinetic turbines

کلمات کلیدی:

Energy resource,Power-coefficient,Renewable energy,Shape optimization,Tidal turbine

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