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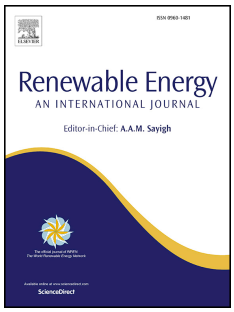

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Experimental study on scour profile of pile-supported horizontal axis tidal current turbine

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Abstract

The study aims to investigate the influence of tip clearance on the scour rate of pile-supported horizontal axis tidal current turbine (TCT) and also attempts to correlate time-dependent scour depth of TCT with the tip clearance. A physical model of TCT was placed in a flume for scour test and the scour rate of the fabricated model was investigated. The results suggest that the decrease in tip clearance increases the scour depth. In addition, the shortest tip clearance results in the fastest and most sediment transport. The maximum scour depth reached 18.5% of rotor diameter. Results indicate that regions susceptible to scour typically persist up to $1.0D_t$ downstream and up to $0.5D_t$ to either side of the turbine support centre. The majority of the scour occurred in the first 3.5 hr. The maximum scour depth reaches equilibrium after 24 hr test. An empirical formula to predict the time-dependent scour depth of pile-supported TCT is proposed.

Keywords: tidal energy; tidal-current turbine; wake; scour

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