

Abstract Submitted
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Numerical simulation of a horizontal axis tidal turbine with a passive load-control system WEIDONG DAI, IGNAZIO MARIA VIOLA, University of Edinburgh, RICCARDO BROGLIA, CNR.Institute of Italian Ship Model Basin Insean — Load fluctuations on Horizontal Axis Tidal Turbines (HATT) may result in fatigue failures, and this is one of the main factors that affect the reliability and durability of tidal turbines. While passive load-control systems for horizontal axis wind turbine have been well studied, there are few studies about such systems for tidal turbines. We propose a passive pitching mechanism to mitigate the change of angle of attack and, in this way, to lower the fatigue loading. We studied the fluid mechanics of a HATT with and without the passive pitching mechanism in open channel flow conditions. The flow field around the blades and forces on the blades were computed numerically both with a commercial and an in-house finite-volume CFD code, and validated with experimental data. We found that the use of passive pitching mechanism can reduce the amplitudes of thrust fluctuations by around 80% without affecting the mean power generated. We also observed that this mechanism can mitigate the fluctuation of power output by around 20%.

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