SIMULATION OF PASSIVE PITCH MECHANISM USING FLAPPING WING ON DARRIEUS STRAIGHT-BLADED VERTICAL AXIS RIVER TURBINE BASED ON CFD

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Abstract

The passive pitch mechanism on Darrieus straight-bladed vertical axis river turbine with flapping wing mechanism has been simulated on CFD. The flapping wing mechanism simulation is carried out by rotate the turbin from azimuth 0 to 360° with pitch angle variation 10° and 20°. The CFD simulation result, shows that the value change pattern of \( F_x \), \( F_y \), force resultant between \( F_x \) and \( F_y \), and force resultant direction which generated by the turbine. On the other hand, the value change pattern of torque on x and y axis, torque resultant, and torque resultant direction has been obtained too. From the simulation, the maximum value of force and torque obtained were 37.36 N with tangential angle of -6.33 (quadrant IV) and 14.46 Nm with tangential angle of 83.67 (quadrant I), respectively, for azimuth value of 100. Based on CFD simulation result, the value of force and torque which generated by turbine is affected by the pressure distribution on the turbine. When the high value of force and torque is received, the pressure distribution on the turbine almost evenly on the third turbine foil, at azimuth 100 the value of pressure were received by the turbine of 228.4 Pa. The value change pattern phenomena of force, torque, and the influence of pressure distribution were not retrieved in experiments method can be obtained with simulation using CFD software.

Keywords: Flapping wing, CFD simulation, Pressure distribution, Force, Torque