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DEVELOPMENT OF A NEW FORMULATION FOR CALCULATING THE MOMENT OF INERTIA OF SWEEP BLADES OF HYDROKINETIC TURBINES

Clenilton Ribeiro dos Santos Junior*[1]
Jerson Rogério Pinheiro Vaz[1]

The moment of inertia of turbine blades is an important parameter in the dynamic modeling of hydrokinetic turbines because it affects turbine starting. This study aims to adapt a formulation to calculate the moment of inertia of sweep blades, using the HT-G1 hydrokinetic turbine developed by DCO as a reference, by incorporating geometric relationships that describe variations in blade radius and chord along the blade as a function of the sweep angle. The results are compared with those obtained through geometric modeling in SolidWorks and with an experimental estimate for the straight blade, the standard DCO configuration, calculated using a blade mass of 297 g and 16 cm between the center of mass and the axis of rotation. For the straight blade, the estimated moment of inertia is 0.0076032 kg.m², with relative errors of 1.32% for SolidWorks and 1.84% for the formulation. The analysis of sweep angles ranging from −30° to +30° showed that positive angles are associated with lower moments of inertia, whereas negative angles result in higher values, ranging from approximately 0.0053 kg.m² to 0.0090 kg.m², with results close to those obtained in SolidWorks. These findings indicate agreement between the evaluated methods and suggest that the formulation may be used to estimate the moment of inertia of the blade studied, although manufacturing sweep blades and obtaining experimental data are necessary for further validation.

Keywords: Hydrokinetic turbines, Sweep blades, Moment of inertia.

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[1] Universidade Federal do Pará (UFPA), Ananindeua, Pará, Brazil.
*Email: clenilton.junior@ananindeua.ufpa.br