

The effect of multi-stage modification on the performance of Savonius water turbines under the horizontal axis condition

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Abstract	<p>Indonesia has the abundant potential of hydropower but not yet processed optimally, which intensely depends on fossil fuel. Hydropower installed in Indonesia is only 11,272 MW, from the estimated potential approximately 94,476 MW. This data shows that 89% of the hydropower potential in Indonesia has not been processed. One of the present efforts to utilize this resource is addressed to develop the Savonius water turbine. Conventional water Savonius turbines have a comprehensible structure and easy to be applied. However, the turbines produce relatively small power, which requires further assessment to improve its performance. The current study is performed by considering geometric changes on the water Savonius turbine to observe their effect on power characteristics. Considered changes are made on the number of stages, and the angle between stages, specifically a single-stage, two-stage 0 degrees, Two-stage 90 degrees, three-stage 0 degrees, and three Stage 120 degrees. The research was carried out by designing simulation model using ANSYS software with CFX Solver. Water speed is determined to 0.8 m/s, while plates with 110 mm in diameter and 110 mm in height are incorporated as rotor configuration. Based on this study, it can be concluded that the addition of the stage affected improving the performance of the Savonius water turbine, where the multi-stage turbine experienced an increment compared to conventional water turbines. The interesting tendency was found on the two-stage rotors with angle of 0 degrees which produced a smaller C-pmax compared to the conventional water Savonius turbines.</p>
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