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Simple bucket curvature for designing a low-head turgo turbine for pico hydro application

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Abstrak

The geography of Indonesia renders it difficult to connect many areas to the national electricity grid. To overcome these problems, people need to be able to generate their own electricity. Pico hydro has been proven to be a cost-effective solution for electrification. The Turgo turbine is known for its reliability and strength, and it can perform efficiently with a range of flows. The Turgo’s blade consists of an inlet and outlet trail with a curve that joins them. The curve in this study will be made from a simple circle arc to improve manufacturability. Three blades were designed using a basic calculation derived from the velocity triangles, with each blade having a different circle radius. The Computational Fluid Dynamics (CFD) method is used to determine the stream flow through the blade at a level of detail that cannot be obtained using other methods. The boundary conditions used in the study include 2.7 meters of head and a 21 l/s flow rate, a steady-state homogenous multiphase, and the turbulent models used SST k-?. The result shows that the Turgo turbine with a 60 mm arc radius generated 477.7 Watts and has an efficiency of 85.97%, the highest when compared to the other two blades that used 50 mm and 55 mm arc radii, respectively.