OPTIMASI KINERJA TURBIN *VERTICAL AXIS TIDAL TURBINE* TIPE HUNTER TERHADAP VARIASI *BLOCKAGE RATIO* DAN *TSR* MENGGUNAKAN CFD

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ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh variasi *blockage ratio* dan *Tip Speed Ratio* (TSR) terhadap performa turbin pasang surut vertikal tipe Hunter menggunakan simulasi *Computational Fluid Dynamics* (CFD). Turbin Hunter dipilih karena desain bilahnya yang dapat menangkap energi aliran secara efisien. Variasi *blockage ratio* diperoleh dengan mengubah lebar domain aliran, sedangkan TSR divariasikan dengan pengaturan kecepatan sudut rotor. Proses simulasi dilakukan menggunakan perangkat lunak ANSYS Fluent, dengan validasi hasil Cp dibandingkan data eksperimen Derakhshan et al. (2017). Hasil penelitian menunjukkan bahwa peningkatan *blockage ratio* dan TSR berpengaruh signifikan terhadap kenaikan torsi dan koefisien daya turbin. Nilai torsi maksimum sebesar 81,685 Nm dan Cp tertinggi sebesar 0,237 diperoleh pada *blockage ratio* 0,316 dan TSR 1,012. Seluruh hasil Cp berada di bawah batas teoritis Betz Limit (0,593), sehingga validitas simulasi dapat diterima. Visualisasi kontur kecepatan juga menunjukkan perubahan distribusi aliran yang mendukung peningkatan performa turbin. Penelitian ini menyimpulkan bahwa kombinasi *blockage ratio* tinggi dan TSR optimal menjadi konfigurasi yang paling efektif dalam meningkatkan efisiensi daya turbin pasang surut.

Kata kunci: Turbin pasang surut, *blockage ratio*, *Tip Speed Ratio*, CFD

OPTIMIZATION OF VERTICAL AXIS TIDAL TURBINE PERFORMANCE OF HUNTER TYPE WITH VARIATION OF BLOCKAGE RATIO AND TSR USING CFD

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ABSTRACT

This study aims to analyze the effect of varying blockage ratio and Tip Speed Ratio (TSR) on the performance of a vertical axis tidal turbine of the Hunter type using Computational Fluid Dynamics (CFD) simulation. The Hunter turbine was selected due to its blade design, which efficiently captures the kinetic energy of the flow. The blockage ratio variation was achieved by modifying the flow domain width, while TSR was varied by adjusting the rotor's angular velocity. The simulation process was performed using ANSYS Fluent software, with Cp results validated against experimental data from Derakhshan et al. (2017). The results show that increasing the blockage ratio and TSR significantly affects the rise of torque and power coefficient of the turbine. The highest torque value of 81.685 Nm and maximum Cp of 0.237 were obtained at a blockage ratio of 0.323 and TSR of 1.012. All Cp results remained below the theoretical Betz Limit (0.593), confirming the simulation validity. The velocity contour visualization also demonstrated changes in flow distribution that support improved turbine performance. This study concludes that a combination of high blockage ratio and optimal TSR is the most effective configuration to enhance the power efficiency of tidal turbines.

Keywords: *Tidal turbine, blockage ratio, Tip Speed Ratio, CFD*