PERANCANGAN PENGARAH ALIRAN PROFIL AIRFOIL NACA 0020 DENGAN VARIASI JUMLAH STATOR UNTUK MENINGKATKAN KINERJA TURBIN ANGIN SAVONIUS

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ABSTRAK

Turbin angin Savonius memiliki keunggulan berupa desain yang sederhana dan mampu berputar pada kecepatan angin rendah, namun memiliki koefisien daya yang rendah akibat gaya hambat (*drag force*) pada sudu yang bergerak melawan arah angin (*returning blade*). Penelitian ini bertujuan untuk menganalisis pengaruh penambahan stator *vane* berprofil airfoil NACA 0020 terhadap kinerja turbin angin Savonius, menentukan jumlah stator optimal, serta mengevaluasi efektivitasnya dalam mengonversi energi angin menjadi energi listrik. Penelitian ini merupakan penelitian eksperimental kuantitatif yang dilakukan di dalam *wind tunnel*. Variabel bebas dalam penelitian ini adalah kecepatan angin (2,5 m/s; 3,2 m/s; dan 3,7 m/s) dan jumlah stator *vane* (tanpa stator, 8, 10, dan 12 buah). Variabel terikat yang diukur adalah putaran poros (RPM), daya generator (Watt), dan efisiensi (%). Hasil penelitian menunjukkan bahwa penambahan stator NACA 0020 sangat dipengaruhi oleh kecepatan angin. Pada kecepatan angin rendah (2,5 m/s), turbin tanpa stator menghasilkan kinerja terbaik karena stator berperan sebagai penghalang aliran. Namun, pada kecepatan angin 3,2 m/s dan 3,7 m/s, stator berfungsi sebagai pengarah aliran (efek Venturi) yang meningkatkan kinerja turbin secara signifikan. Konfigurasi optimal dicapai pada variasi 12 stator *vane*. Pada kecepatan angin tertinggi (3,7 m/s), turbin dengan 12 stator menghasilkan putaran 134 RPM, daya 0,0373 Watt, dan efisiensi 1,6010%. Dibandingkan dengan turbin tanpa stator pada kecepatan yang sama, penggunaan 12 stator meningkatkan putaran sebesar 28,8%, daya sebesar 38,7%, dan efisiensi sebesar 38,5%.

Kata Kunci : Turbin Angin Savonius, Stator Vane, NACA 0020, Kinerja

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