

ABSTRAK

RANCANG BANGUN DAN UJI PERFORMA STRUKTUR KERANGKA SULTAN SAVONIUS WIND TURBINE V.2 PADA BUILDING AUGMENTED WIND TURBINE

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Building Augmented Wind Turbine (BAWT) adalah Turbin Angin yang terintegrasi pada gedung yang bertujuan untuk mensupport kebutuhan daya konsumsi listrik pada suatu gedung. BAWT sudah banyak diterapkan di negara-negara maju, seperti di wilayah Skandinavia (Eropa Utara), Amerika, dan Timur Tengah. Berangkat dari ide tersebut, tercetus penelitian ini yang lokasi eksperimennya adalah Gedung Dekanat FT. Untirta. Tujuan penelitian ini adalah untuk mendapatkan desain struktur kerangka yang aman baik secara simulasi maupun perhitungan manual. Dilakukan penelitian awal dengan menentukan posisi ideal kerangka berdasarkan kriteria kecepatan anginnya. Dengan bermodalkan penelitian sebelumnya, yaitu Rotor Sultan Savonius V.2 dengan pengembangan Levitasi Magnet, rancangan dibuat dengan mempertibangkan spesifikasi komponen turbin yang sudah ada, ditambah dengan observasi lapangan. Dengan menggunakan metode perancangan desain produk, *Conceptual Design* dan model rangka dibuat menggunakan bantuan *Software Computer Aided Design (CAD)*. Struktur Rangka diinstallasi dan dilakukan uji lapangan. Uji performa produk *Alpha* yaitu eksperimen pengambilan data angin, rotor sudu, dan *electrical outputnya*. Hasil dari penelitian ini didapatkan bahwa, kerangka aman dengan melihat nilai Faktor Keamanan minimum yaitu 2, dengan minimal nilai yang harus terpenuhi berdasarkan persamaan manual yakni 1.877. Pada simulasi, didapatkan data dengan nilai *Stress* Maksimum yaitu sebesar $1.189 \times 10^8 \text{ N/mm}^2$, *Displacement* 15.69 mm, *Strain* 3.491×10^{-4} mm. Performa struktur rangka disimpulkan aman dengan meninjau dari hasil pengujian visual yang tidak terjadi kerusakan. Pada uji performa produk α (*alpha*) didapatkan Daya Rotor sebesar 0.526 watt dan Daya Listrik 1.338 watt pada kecepatan 3.53 m/s.

Kata Kunci: BAWT, Angin, Savonius, Kerangka, Simulasi, CAD, Safety Factor, Performa

ABSTRACT

DESIGN AND PERFORMANCE TEST FRAMEWORK STRUCTURE OF SULTAN SAVONIUS WIND TURBINE V.2 ON BUILDING AUGMENTED WIND TURBINE

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Building Augmented Wind Turbine (BAWT) is a Wind Turbine that integrated in the building which aims to support the power needs of electricity consumption in a building. BAWT has been widely applied in developed countries, such as in Scandinavia (Northern Europe), America, and the Middle East. Departing from this idea, this research was initiated whose experimental location is the Dean Building of Faculty of Engineering of Sultan Ageng Tirtayasa University. The purpose of this research is to obtain a safe frame structure design both by simulation and manual calculations. Initial research was conducted by determining the ideal position of the framework based on the velocity criteria. Based on previous research, namely the Sultan Savonius V.2 Rotor with Magnetic Levitation improvement, the design was made by considering the specifications of the existing turbine components, coupled with field observations. By using the product design method, Conceptual Design and frame models are created using the help of Computer Aided Design (CAD) Software. The Frame Structure is installed and field tested. Alpha product performance tests are experimental data collection of wind, blade rotor, and electrical output. The results of this study found that the safe framework by looking at the minimum Safety Factor value is 2, with a minimum value that must be met based on the manual equation, which is 1.877. In the simulation, obtained data with a maximum stress value of 1.189×10^8 N/mm², Displacement 15.69 mm, Strain 3.491×10^{-4} mm. The performance of the truss structure is concluded to be safe by reviewing the results of the visual test that there is no damage. In the product performance test (alpha), the Rotor Power is 0.526 watts and the Electrical Power is 1,338 watts at a speed of 3.53 m/s.

Keyword: BAWT, Wind, Savonius, Framework, Simulation, CAD, Safety Factor,
Performance

