

ABSTRAK

Energi merupakan kebutuhan pokok setiap masyarakat dalam kehidupan sehari-hari. Energi angin merupakan sumber energi terbarukan yang melimpah dan ramah lingkungan Indonesia. Saat ini pengembangan energi terbarukan angin di Indonesia dapat dikatakan masih rendah namun potensinya sangat besar. Tantangannya adalah menciptakan Turbin Angin yang mampu beroperasi pada kecepatan angin rendah berdasarkan kondisi geografis Indonesia. Pada penelitian ini dilakukan kajian baik secara ekperimental maupun teoritis terhadap kinerja desain TASV dengan blade model limas dan pengujian TASV dilakukan di lapangan (*field test*) di Tanggul Muara Baru, Jakarta Utara serta eksperimen dilakukan dengan tambahan atau tanpa menggunakan *planetary gearbox* dengan perbandingan 1:50. Kinerja turbin akan dievaluasi secara simultan melalui parameter-parameter terukur seperti kecepatan angin, kecepatan putaran turbin, nilai tegangan dan arus listrik dan nilai torsi, juga menganalisis Koefisien Daya (C_p), Koefisien Torsi (C_t) dan *Tip Speed Ratio* (TSR) sebagai parameter tidak terukur (non-dimensional). Hasil pengujian didapatkan melalui perhitungan dan analisis, dari hasil perhitungan dan analisis menghasilkan nilai optimum pada Koefisien Torsi (C_t) sebesar 0.6339 % pada kecepatan angin 3.0 m/s, Koefisien Daya (C_p) sebesar 0.00070 % pada kecepatan angin 5.0 m/s dan *Tip Speed Ratio* (TSR) sebesar 0.00253 pada kecepatan angin 5.6 m/s).

Kata Kunci: Turbin Angin Sumbu Vertikal (TASV); *Planetary Gearbox*; Koefisien Daya (C_p); Koefisien Torsi (C_t); *Tip Speed Ratio* (TSR)



EXPERIMENTAL STUDY OF VERTICAL AXIS WIND TURBINE 4 STORIES 8 BLADES ON NEW ESTUARY EMBANKMENT

ABSTRACT

Energy is a basic need for every society in everyday life. Wind energy is an abundant and environmentally friendly renewable energy source in Indonesia. Currently, the development of renewable wind energy in Indonesia can be said to be still low, but the potential is very large. The challenge is to create a wind turbine that is capable of operating at low wind speeds based on Indonesia's geographical conditions. In this research, both experimental and theoretical studies were carried out on the performance of the TASV design with a pyramid model blade and TASV testing was carried out in the field (field test) in Tanggul Muara Baru, North Jakarta and experiments were carried out with the addition or without using a planetary gearbox with a ratio of 1:50. Turbine performance will be evaluated simultaneously through measured parameters such as wind speed, turbine rotation speed, voltage and electric current values and torque values, also analyzing the Power Coefficient (C_p), Torque Coefficient (C_t) and Tip Speed Ratio (TSR) as parameters not measurable (non-dimensional). The test results were obtained through calculations and analysis, the results of the calculations and analysis produced optimum values for the Torque Coefficient (C_t) of 0.6339 % at a wind speed of 3.0 m/s, Power Coefficient (C_p) of 0.00070 % at a wind speed of 5.0 m/s and Tip Speed Ratio (TSR) of 0.00253 at a wind speed of 5.6 m/s).

Keywords: Vertical Axis Wind Turbine (TASV); Planetary Gearbox; Power Coefficient (C_p); Torque Coefficient (C_t); Tip Speed Ratio (TSR)

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