INTISARI

Energi sangat diperlukan dalam menjalankan aktivitas perekonomian Indonesia, baik untuk kebutuhan konsumsi maupun untuk aktivitas produksi berbagai sektor perekonomian. Eksplorasi sumber daya energi lebih banyak difokuskan pada energi fosil yang bersifat unrenewable resources sedangkan energi yang bersifat renewable relatif belum banyak dimanfaatkan. Kondisi ini menyebabkan ketersediaan energi fosil, khususnya minyak mentah, semakin langka yang menyebabkan Indonesia saat ini menjadi net importir minyak mentah dan produk-produk turunannya. Dari aspek konsumsi menunjukkan bahwa konsumsi energi Indonesia mengalami peningkatan dari tahun ke tahun. Pada periode 2000-2008, konsumsi energi akhir mengalami peningkatan rata-rata per tahun sebesar 2.73 persen dari 764.40 Juta SBM menjadi 945.52 Juta SBM.

Atas dasar kondisi sekarang ini, muncul adanya ide untuk menghasilkan energi alternatif yang tidak bisa habis, contohnya yakni angin, dengan melakukan penelitian terhadap kincir angin. Penelitian ini bertujuan untuk mengkaji unjuk kerja kincir angin yang diteliti seperti besar torsi, perbandingan daya, koefisien daya maksimal, dan *tip speed ratio*.Kincir angin poros horisontal tiga sudu, diameter 100 cm, lebar maksimum 13 cm pada jarak 20 cm dari sumbu poros. Terdapat tiga perlakuan kecepatan angin: kecepatan angin 10,2 m/s, 8,2 m/s dan 6,1 m/s. Kincir dihubungkan ke mekanisme pemebebanan lampu. Besarnya torsi diperoleh dari mekanisme timbangan digital, putaran kincir angin diukur mengunakan tachometer, kecepatan angin diukur menggunakan anemometer dan ketersediaan angin dengan menggunakan wind tunnel 15 Hp.

Dari hasil penelitian ini, kincir angin dengan kecepatan angin 6,1 m/s menghasilkan koefisien daya mekanis maksimal sebesar 37,2% pada *tip speed ratio* 4,48, daya sebesar 39,1 watt dan torsi sebesar 0,82 N.m. Kincir angin dengan kecepatan output angin 8,2 m/s menghasilkan koefisien daya maksimal sebesar 19,2% pada *tip speed ratio* 3,76, daya output sebesar 49 watt dan torsi sebesar 0,85 N.m. Kincir angin dengan kecepatan angin 10,2 m/s menghasilkan koefisien daya maksimal sebesar 11,9% pada *tip speed ratio* 3,31, daya output sebesar 58,9 watt dan torsi sebesar 0,93 N.m. Kincir angin dengan kecepatan angin 6,1 m/s memiliki nilai koefisien daya maksimal dan *tip speed ratio* paling tinggi.

Kata kunci: kincir angin propeller, koefisien daya, tip speed ratio.

ABSTRACT

Energy is extremely necessary in running the economic development in Indonesia, whether in terms ofconsumption needs or production activities. The energy resource exploration has been mostly focused on fossil energy, which is unrenewable, rather than the renewable one. Such a conditionmay cause the fossil availability, in particular crude oil, becomes rare that makes Indonesia as an oil net importer state along with other derivatives. From consumption point of view, it shows that Indonesia's energy consumption has been increasing annualy. Between 2000-2008,our energy consumption has been increasing for 2.73 percent each yeaf from 754.40 million DBM up to 945.52 million SBM.

Based on this current condition, an idea emerges to create a renewable alternative energy, for instance wind, through a research on windmill. This research aims to analyse the windmill's performance including the torque, power comparison, maximum power coefficient, and tip speed ratio. The three edge horizontalwindmill, maximum width of 13 cm on the distance from the pole of 20 cm. There are three treatments towards wind velocity: 10.2 m/s, 8.2 m/s, and 6.1 m/s. The windmill was then connected to a lightning mechanism. The torque value gained through a digital measurement mechanism, the windmill rotation measured by tachometer, the wind velocity measured by anemometer, and wind availability by wind tunnel 15 Hp.

This research shows that windmill with 6.1 m/s wind velocity creates maximum mechanic power coefficient of 37.2% at 4.48 tip speed ratio, 39.1 watr power, and 0.82 N.m torque. Windmill with wind velocity output of 8.2 m/2 creates maximum mechanix power of 19.2% at 3.76 tip speed rario, output power of 49 watt and 0.85 N.m torque. Windmill with 10.2 m/2 wind velocity creates 11.9% of maximum power coefficient at 3.31 tip speed ratio, output power of 58.9 watt and 0.93 N.m torque. Windmill with 6.1 m/s has the highest value of maximum power coefficient and tip speed ratio.

Keyword: propeller windmill, power coefficient, tip speed ratio.

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Summary

Energy is extremely necessary in running the economic development in Indonesia, whether in terms ofconsumption needs or production activities. The energy resource exploration has been mostly focused on fossil energy, which is unrenewable, rather than the renewable one. Such a conditionmay cause the fossil availability, in particular crude oil, becomes rare that makes Indonesia as an oil net importer state along with other derivatives. From consumption point of view, it shows that Indonesia's energy consumption has been increasing annualy. Between 2000-2008,our energy consumption has been increasing for 2.73 percent each yeaf from 754.40 million DBM up to 945.52 million SBM.

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