ABSTRAK

Krisis energi menjadi tantangan dimasa yang akan datang, menurunya cadangan sumber daya alam tak dapat diperbaharui (antaralain: batu bara, minyak bumi dan gas) upaya untuk menciptakan energi alternatif yang ramah lingkungan menjadi tantangan seorang *engineer*. Untuk itu pembangkit listrik tenaga angin menjadi alternatif. Tujuan dari penelitian ini adalah: (1) membuat model turbin angin kombinasi tipe Savonius dan giromill dengan panjang *chord* 18 cm dan tiga variasi diameter, (2) mengetahui hubungan torsi dengan kecepatan putar model turbin angin kombinasi tipe Savonius dan giromill menggunakan variasi tiga diameter, (3) mengetahui hubungan koefisien daya dengan *tip speed ratio* model turbin angin kombinasi tipe Savonius dan giromill meggunakan tiga variasi diameter, (4) mengetahui model turbin angin yang terbaik diantara tiga variasi model turbin angin yang di teliti.

Model turbin angin kombinasi tipe Savonius dan giromill ini adalah perpaduan antara dua tipe turbin angin *vertical axis wind turbine* (VAWT) menjadi satu. Tinggi turbin giromill 80 cm dengan variasi diameter 70 cm, 75 cm, 80 cm dan kincir angin Savonius dengan tinggi 60 cm dan diameter 60 cm. Penelitian dilakukan di Laboratorium Konversi Energi Teknik Mesin, Universitas Sanata Dharma Yogyakarta.

Hasil Penelitian model turbin angin kombinasi tipe Savonius dan giromill dengan panjang *chord* 18 cm dan tiga variasi diameter adalah (a) telah berhasil dibuat model turbin angin kombinasi tipe Savonius dan giromill, (b) diketahui semakin besar diameter turbin angin maka semakin besar pula nilai torsi yang didapatkan (c) diketahui bahwa dari tiga variasi model turbin angin kombinasi tipe Savonius dan giromill, koefisien daya (C_p) pada diameter 80 cm sebesar 4,35% dengan nilai *tip speed ratio* (λ) optimal sebesar 0,757, sedangkan koefisien daya (C_p) pada diameter 75 cm sebesar 4,09% dengan nilai *tip speed ratio* (λ) optimal sebesar 0,712 dan koefisien daya (C_p) pada diameter 70 cm sebesar 3,78% dengan nilai *tip speed ratio* (λ) optimal sebesar 0,668.(d) diketahui model turbin angin yang terbaik diantara tiga variasi model turbin angin yang di teliti adalah turbin angin berdiameter 80 cm.

Kata Kunci : Turbin angin kombinasi tipe Savonius dan giromil, *NACA*, *vertical axis wind turbine* (VAWT), koefisien daya, *tip speed ratio.*

ABSTRACT

Energy crisis becomes one challenge in the future. The decreasing of alternative irreversible natural resources (examples : coal, crude oil, and gas) and the effort to create alternative energy that is eco-friendly become the challenges for engineers. Therefore, wind turbine becomes an alternative. The purposes of this research are: (1) constructing combination model of wind turbine type Savonius and giromill with the chord length of 18 cm and three diameter varieties, (2) knowing the relationship between torsion and the rotating speed of wind turbine type Savonius and giromill using three diameter varieties, (3) knowing the relationship between power coefficient and tip speed ratio of combination model of wind turbine type Savonius and giromill using three diameter varieties, (4) knowing the best model of wind turbine among the three models of wind turbine examined.

The combination model of wind turbine type Savonius and giromill is the combination of two types of vertical axis wind turbine (VAWT). The height of giromill turbine is 80 cm with the diameter varieties of 70 cm, 75 cm, 80 cm, and the Savonius wind turbine with the height of 60 cm and the diameter of 60 cm. This research was done in The Energy Conversion Laboratory of Mechanical Engineering, Sanata Dharma University Yogyakarta.

The research results on the combination model of wind turbine type Savonius and giromill with the chord length of 18 cm and three diameter varieties are (a) the combination model of wind turbine type Savonius and giromill has been successfully constructed, (b) it is found that the bigger the diameter of wind turbine, the bigger torsion value obtained, (c) it is found that among the three diameter varieties of combination model of wind turbine type Savonius and giromill, the power coefficient (C_p) in the diameter of 80 cm is 4,35% with the optimum value of tip speed ratio of 0,757, while the power coefficient (C_p) in the diameter of 75 cm is 4,09% with the optimum value of tip speed ratio of 0,712, and the power coefficient (C_p) in the diameter of 70 cm is 3,78% with the optimum value of tip speed ratio of 0,668, (d) it is found that the best model of wind turbine among the three varieties examined is the wind turbine with the diameter of 80 cm.

Keywords : Combination model of wind turbine type Savonius and giromill, *NACA*, vertical axis wind turbine (VAWT), power coefficient, tip speed ratio.