

Performance of A Horizontal Axis Wind Turbine

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ABSTRACT

This research contains design considerations, theoretical calculations and experimental testing of small Horizontal Axis Wind Turbine (HAWT). The aim of this thesis is easy to utilize the simple wind turbine in remote windy areas for fulfillment of electricity requirements in Myanmar. The prototype model of this research wind turbine design is based on Sagaing Wind velocity, yearly average wind velocity is 1.5 m/s. This value of wind velocity cannot be useful to install wind turbine. But the author focus on the two months of June and July, monthly average wind velocities are around 3 m/s. The generator for this turbine produce 100W for rated wind speed of 7 m/s. The number of blades are three. The rotor diameter is 2m and tip speed ratio is 7. Thin and unsymmetrical airfoil must be selected for low Reynolds number 100,000. Therefore, SG 6043, SD 7032, and GOE 285 airfoils are selected to compare their performance. SG 6043 at angle of attack 7° for design Reynolds number has higher lift to drag ratio than the other airfoils. So SG 6043 airfoil is used for this design. The rare of permanent magnet generator for wind turbine in Myanmar market and the low wind velocity of Sagaing need the balance to do this research. The design of this model wind turbine is to produce electrical power of 62 W at rated wind velocity 6 m/s. The blade material is Ya-Ma-Nay wood and carving with hand tools. This design wind turbine assembly is constructed and installed at Nationalities Youth Resource Development Degree College, Sagaing. This micro-wind turbine is tested in June and July. The data are collected every 30 min apart and calculated the average value of 5 minute recorded results when wind turbine was charged. The average wind velocity is around 2 m/s to 4.7 m/s. Therefore, electrical power output range is from 17.2 to 48.5 W because wind is fluctuated and low intensity of wind. The instantaneous wind

velocity occurred around 6 m/s. At the average of all maximum instantaneous wind velocity 5.8 m/s to do trial test in this area. That is why, this small wind turbine design is can be operate in low wind speed regions' electrification of yearly average wind velocity of 3 to 6 m/s.