

Abstract

This research studied to evaluation of the performance of the vertical axis wind turbine that made with waste or plastic bins. The study was the relationship of the size of the wind turbine blades (A) to the rate of pumping (Q) from shallow wells or water tank and the relationship of wind speed (v) to the rate of pumping (Q) from shallow wells or water tank. The results showed the relationship of A (m²) and Q (m³/s) that the size of the wind turbine blades increasing were A1 = 0.895 m², A2 = 1.790 m², A3 = 2.685 m², and A4 = 3.580 m², respectively, vertical wind turbine could more pumping. The rate of pumping of vertical axis wind turbine was proportional to the size of the wind turbine blades as the equation was $Q = 0.1152 (A) - 0.0555$ with $R^2 = 0.798$ at the lowest average wind speed was 2.17 m/s and suction lift was 0.20 m. The result also showed the relationship of v (m/s) and Q (m³/s) that the increasing of wind speed was proportional to the increasing of the rate of pumping as the equation was $Q = 0.337 (v) - 0.3865$ with $R^2 = 0.89$ at the wind turbine blades was 3.58 m² and suction lift was 0.20 m. In addition, the study also suggested the relationship of suction lifts of the piston (h) and the rate of pumping (Q) that the range of piston pumps decreasing were h4 = 0.85 m., h3 = 0.60 m., h2 = 0.45 m., h1 = 0.20 m., respectively, the vertical wind turbine could more pumping. That was, the rate of pumping of a vertical axis wind turbine was inversely proportional to the distance of the piston pumping. This study also used the wastewater from the fish pond for planting. The assumption of this research expected that plants could use the nutrients that contained in the wastewater. The wastewater was treated using the aerobic technology on hydraulic retention times (HRTs) 1, 3, 5, and 7 days. The parameters were temperature, pH, DO, TKN, TP, TK, TS, SS, VSS, TDS, and COD. They were used to evaluate the performance of the wastewater treatment. The results of parameter analysis showed that the pH values of effluent were in the ranges of 7.33-8.0 with the temperature of 27°C-29°C. These ranges of pH and temperature value have litter effects or did not effect in significant to the performance. The total reductions on 1, 3, 5, and 7 days of hydraulics retention times of TDS, COD, TKN, TP and TK ranged from 20.4% to 70.0%, 52.0% to 79.0%, 12.23% to 50.56%, 8.33% to 33.33%, and 0% to 44.44%, respectively. The result of this study showed that plant could treat wastewater from fish pond. The result also showed the increasing of dissolved oxygen in wastewater of 1, 3, 5, and 7 days of hydraulics retention times

in DO ranged from 33.33% to 66.67%. The results obtained in these investigations show that it was possible to recover nutritious substances from fish processing wastewater by planting.

The result also showed the relationship of Q (m^3/s) and the volume of water (V : m^3) used to grow crops per day per rai. Three types of planting were sugarcane, cassava, and maize. The volume of water in sugarcane crop, cassava crop, and maize crop were 4.299, 6.776, and 4.346 m^3 per day per rai, respectively. The result also showed the maximum pumping rate of the vertical axis wind turbine was 0.561 m^3/s at the wind speed was 2.893 m/s, the minimum of suction lift was 0.20 m, and the maximum size of the wind turbine blades was 3.580 m^2 . This research also study aims to evaluate the approach to drip and sprinkler irrigation of crops that were of cultivated plants vertically and relationship of water usage of both systems to yield per planted area. The drip irrigation system could provide better performance than the sprinkler irrigation system. The drip irrigation was analyzed of economic value showed that PI values has greater than 1.0 and less than 2 year of payback period on the assessment of risk and depreciation for one year. The results also showed the analysis of IRR was 23.28% in the first year. This project was a worthwhile investment. Comparison the economic values of the use of the vertical axis wind turbine compared to the cost of pumping with the water pump in normal. The economic values were the cost of construction and energy use per unit of volume of water that was pumped by the pump. In general, the costs of pumping were the water pump and the oil and electrical power to the pump in a normal manner. The results showed the IRR was 14.24% per year, the B/C ratio was 2.42, and the payback period was 2.36 year.