

Design a Small-Scale Irrigation Wind-Powered Water Pump Using a Savonius Type VAWT

Authors : Getnet Ayele Kebede, Tasew Tadiwose Zewdie

Abstract : In this study, a novel design of a wind-powered water pump for small-scale irrigation application by using the Savonius wind turbine of Vertical Axis Wind Turbine(VAWT) with 2 blades has been used. Calculations have been made on the energy available in the wind and an energy analysis was then performed to see what wind speed is required for the system to work. The rotor has a radius of 0.53 m giving a swept area of 1.27 m² and this gives a solidity of 0.5, which is the minimum theoretical optimum value for wind turbine. The average extracted torque of the wind turbine is 0.922 Nm and Tip speed ratio is one this shows, the tips are moving at equal the speed of the wind and by 2 rotating of blades. This is sufficient to sustain the desired flow rate of (0.3125×10^{-3}) m³ per second with a maximum head of 10m and the expected working is 4hr/day, and also overcome other barriers to motion such as friction. Based on this novel design, we are able to achieve a cost-effective solution and simultaneously effective in self-starting under low wind speeds and it can catch the wind from all directions.

Keywords : Savonius wind turbine, Small-scale irrigation, Vertical Axis Wind Turbine, Water pump

Conference Title : ICAEEME 2020 : International Conference on Advances in Electronics, Electrical and Mechanical Engineering

Conference Location : New York, United States

Conference Dates : April 23-24, 2020