

Performance Investigation of A Mix Wind Turbine Using A Clutch Mechanism At Low Wind Speed Condition

ABSTRACT

Wind energy is one of the methods that generates energy from sustainable resources. This technology has gained prominence in this era because it produces no harmful product to the society. There are two fundamental types of wind turbine generally used today, which are Horizontal axis wind turbine (HAWT) and Vertical axis wind turbine (VAWT). The VAWT technology is more preferable compared to HAWT because it gives better efficiency and cost effectiveness as a whole. However, VAWT is known to have distinct disadvantages compared to HAWT; self-start ability and efficiency at low wind speed condition. Different solutions have been proposed to solve these issues, which include custom design blades, variable angle of attack mechanism and mix wind turbine. A new type of clutch device was successfully developed in UMS to be used in a mix Savonius-Darrieus wind turbine configuration. The clutch system, which is barely audible when in operation, compared to a ratchet clutch system interconnects the Savonius and Darrieus rotor, allowing the turbine to self-start at low wind speed condition as opposed to a standalone Darrieus turbine. The Savonius rotor heights were varied at three different sizes in order to understand the effect of the Savonius rotor on the mix wind turbine performance. The experimental results show that the fabricated Savonius rotor shows that the height of the Savonius rotor affects the RPM of the turbine. The swept area (SA), aspect ratio (AR) and tip speed ratio (TSR) were also calculated in this paper. The highest RPM recorded in this study is 90 RPM for a Savonius rotor with a 0.22-meter height at 2.75 m/s. The Savonius rotor with a 0.22-meter height also gives the highest TSR for each range of speed from 0.75 m/s, 1.75 m/s and 2.75 m/s, where it gives 1.03 TSR, 0.76 TSR, and 0.55 TSR.