

Development of Mixed Vertical Axis Wind Turbine (MVAWT) for low wind condition

Abstract

Small-scaled renewable energy generation such as micro-hydro and domestic solar panel has become the recent trend of research in order to achieve sustainable energy generation and to eliminate the reliance of geographical selection and large farm area. As for the case of wind energy, a wind turbine that can operate at low wind condition are desirable. This paper presents a mixed design for Vertical Axis Wind Turbine comprises of Savonius and Darrieus rotors, being assembled together as a single rotor turbine. The mixed wind turbine model (MVAWT) was fabricated and tested in our lab as prove of concept. Experiments conducted on 5 MVAWT's configurations and being compared to a standalone Darrieus turbine with +3 degree pitch angle, showed promising result in lowering the self-start speed of the Darrieus turbine. It was observed that all the positive pitch angle MVAWTs has started to rotate at lower wind speed (about 1.8 m/s) while the standalone Darrieus turbine was only started to rotate at wind speeds more than 3.0 m/s. However, the lower self-start were also being compensated by lower turbine rotational speed. With the low self-start speed in the MVAWT, it will enable the wind energy capture for a longer period of time at a low wind condition site. This development should lead to an interesting research on optimizing the mixture of Savonius and Darrieus turbine for a localized low wind speed conditions in the future.