DESIGN AND DEVELOPMENT OF 2 BLADED SAVONIUS WIND TURBINE WITH SPLITTER ELEMENT SURROUNDED BY THE OMNIDIRECTIONAL GUIDE VANES

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Keywords:

Omni-Directional Guide Vane, Savonius wind turbine

Introduction:

- The performance of a Savonius wind turbine was studied for urban power system application.
- The aim of the study was to analyze the effect of Omni-Directional Guide Vane (ODGV) on the savonius rotor performance. The wind tunnel experiment had been carried out on a Savonius rotor model.
- The ODGV was placed around the Savonius rotor in order to increase the ambient wind velocity to the wind turbine.
- The tests were performed at a different ODGV slope angle and incoming wind direction. maximum power coefficient (Cp max), The maximum power coefficient of a Savonius wind turbine with ODGV was 21.46% higher than the Savonius wind turbine without ODGV.
- The result showed that the ODGV had the potential to increase the performance of the Savonius wind turbine

Objectives:

- To generate the power with lower wind velocity and can be utilized for domestic power generation.
- New concept of Splitter which is to be attached to the model and experimentation to be carried out and comparing the result of with Splitter and without splitter of Savonius turbines.
- Finally designed guide vane is attached to the Savonius wind turbine in order to reduce the negative torque. Hence to improve the performance and efficiency of the rotor.

- Experimentation to be conducted with different wind velocities of 3, 5, 7, 9 and 11 m/s in wind tunnel arrangement

Methodology:

- The wind tunnel experimental setup of a structured test bench supported the Omni Directional Guide Vanes (ODGV), a Splitter Savonius wind turbine, fan blower and measurement devices.
- The Splitter Savonius type turbines with two semi circular blades were used in the research it can be compared with conventional Savonius rotor. Also, omnidirectional guide vanes attached and its affects are studied.
- The measurement of the velocity distribution was conducted to study the effect of wind direction on the velocity distribution in front of Savonius wind turbine.

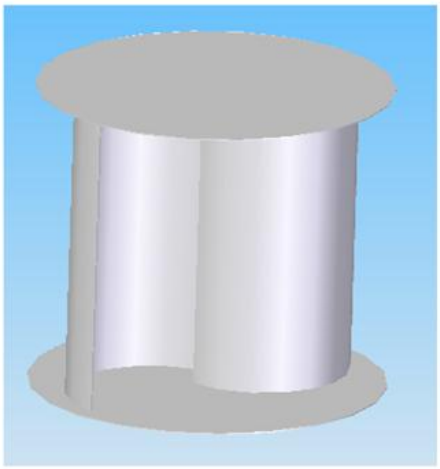

Fig 1: Conventional Savonius Wind Turbine

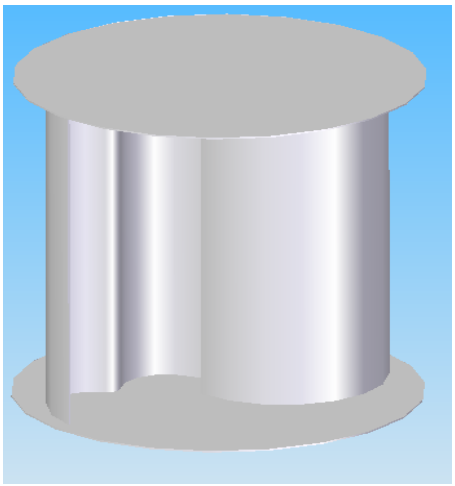

Fig 2: Splitter Savonius Wind Turbine

Overall Design:

1. Length of blade = 600 mm
2. Length of splitter = 560 mm
3. Diameter of blade = 160mm
4. Diameter of splitter = 80mm
5. Shaft Length = 630mm

Conclusion:

- The Savonius wind turbine is simple in design so it can easily fabricate and maintain at low cost, the cut in speed of this turbine is very low these devices are insensitive to the wind flow direction and thus are useful for specific location of variable wind speed.
- The introduction of splitter in conventional Savonius wind turbine which is helpful for proper pressure and velocity distribution in rotor surface. There is improvement of power coefficient in Splitter SWT as compared to that of Conventional Savonius Wind Turbine can be achieved.
- The main drawback concerned with Savonius wind turbine is negative torque that can be reduced by Omni directional guide vane.

Scope for future work:

- To generate the power with lower wind velocity and can be utilized for domestic power generation.
- New concept of Splitter which is to be attached to the model and experimentation to be carried out and comparing the result of with Splitter and without splitter of Savonius turbines.
- Finally designed guide vane is attached to the Savonius wind turbine in order to reduce the negative torque. Hence to improve the performance and efficiency of the rotor.
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