Design & Fabrication of Vertical Axis Wind Turbine (VAWT) with a Different Aerodynamic Model – A Review

S. Balakrishnan[1] V. P. Mouleeswaran[2] V. Ponvivek[3] S. Praveen[4] P. Praveenkumar[5]
[1]Assistant Professor [2,3,4,5]UG Student
[1,2,3,4,5]Department of Mechanical Engineering
[1,2,3,4,5]Nandha Engineering College, Erode, TamilNadu, India

Abstract— The aluminium blades are less cost and light weight when compared to carbon fibre and steel material. Among the advantages of this arrangements of gear box and generator can be placed close to the ground and the blade axis is perpendicular to the wind streamline. The aerofoil shape and manufacturing technique gives more lift, drag and further more power generation. The objective of this VAWT to generate electricity in urban areas with less setup cost. The main advantage is that, it is economically eco-friendly.

Key words: Vertical Axis Wind Turbine (VAWT), Aerodynamic Model

I. INTRODUCTION

The vertical axis wind turbine is type of wind turbine is the main rotor shaft is shift transverse to wind. While the main components are located at the base of the turbine. This arrangement allows the generator and gear box to be located close to the ground, facilitating service and repair. VAWTs do not need to be pointed into the wind, which removes the need for wind sensing and orientation mechanisms. Major drawbacks for early designs (savonius, egg type and giro mill) include the significant torque vibrations or ripple during each revolution, and large bending moments on the blades. A vertical axis wind turbine has its axis perpendicular to the wind streamlines and vertical to the ground. A more general term that includes this option "transverse axis wind turbine" or "cross flow wind turbine".

II. LITERATURE SURVEY

[1] E. D. Berg et al, The research institutions have carried at extensive research activities and developed the numerous designs based on the aerodynamic models. The main aerodynamic models that have been used or performance prediction and design of straight-bladed Darrius type VAWT. It has been found out that at present the most widely used models.

[2] H. Dumitrescu et al, VAWT with diffuser and without diffuser arrangements are considered for the experimental analysis .Five diffusers were since provided around its blades of VAWT which will placed under a pentagon shaped fabricated structure. The output power of the diffuser based on the VAWT generators.

[3] D. A. Spera and T. R. Richards, in this article structure implementation and optimum performance of the vertical axis wind turbine (VAWT) using magnetic levitation technology is articulated. The leading result ascending before traditional wind turbine can be demarcated as energy dissipation during rotation. Power is then generated with an axial flux generator which incorporates the utilization of permanent magnets and coils.

[4] Environment Canada, One of the major issues in this fast moving world is to meet the demand of energy in the most economical and environmental friendly way. The research work on designing of a vertical axis wind turbines (VAWT) that gives the solution which is comparatively a cheap alternative of renewable energy. The wind turbine can charge up to 12v battery and being closely monitored and battery chargers automatically without any harmful emissions or drawbacks.

[5] M.T. Iqbal, The sustainability of the fossil fuels while considering its rate of consumption has paved way for rediscovering the possible ways of converting and conversing one from of energy into another. This paper shows a unique design that recovers kinetic energy of the wind by allowing itself to appropriately align with the direction of the wind.

[6] Aslam Bhutta et al, The VAWT along with the merits and demerits, the design technique employed for VAWT design have also been reviewed along with their results. It was learned that coefficient of the power (cp) for various configurations is different and can be optimized with reference to tip speed ratio; flow field around the blade can also be investigated with the help of these design techniques for the safe operation.

[7] Mohammed Ashar Riyan Khan et al, A building design of vertical axis wind turbines (VAWT) was presented in the article. Two VAWT turbine models were compared and taking together with strengthens into consideration. Using CFD models, the air flow on two aerodynamic fins, symmetrical and asymmetrical at different angles of attack were tested. Due to uncertainty of trouble free operation of Darrius turbine on construction elements creating the basis.

[8] Jaroslaw Zwierzchowski, Vertical axis wind turbine (VAWT) have received growing interest for off shore application and in the urban areas mainly due to the Omni directional capacity scalability lower noise and costs, enhance their performance the impact of operational parameters such as tip speed ratio. The current study intends to systematically investigate the effect of these parameters in order to provide a deeper insight into their impact on aerodynamic performance of VAWT.

[9] S K Halli et al, This research work on designing of a vertical axis wind turbine (VAWT) that gives a solution which is comparatively a cheap alternative of renewable energy. The work demonstrates a vertical rotating prototype o windmill. The wind turbine can charge up to 12v battery.

[10] Abdolrahim Rezaeiha et al, The building design of vertical axis wind turbine (VAWT) was presented in the article. Two VAWT turbine models were compared Darrius and Lenz, taking their strengths and weakness into consideration. The air flow on two aerodynamic fins, symmetrical, at different angles of attack was tested. On the basis of flow simulation conducted in flow simulation, a symmetrical was chosen as the one showing greeter load flow simulation conducted in flow simulation, a symmetrical fin was chosen as the one showing greater load bearing

capacities. On the basis of the research components were designed and technical documentation was completed.

III. SUMMARY

From the above literature review, we conclude that Darrius type straight bladed vertical axis wind turbine gives higher efficiency with lower noise emission in lower wind speed. By using CFD methods, the air flows on the aerodynamic fins are tested with different angles.

REFERENCES

[1] E. D. Berg, D. T. Ashwill and J. H. Sutherland," A Retrospective of VAWT Design," Albuquerque, 2012.
[2] H. Dumitrescu, V. Cardos, A. Dumitrache and F. Frunzulica, "Low Frequency Noise Prediction of Vertical Axis Wind Turbines," The Publishing House of the Romanian Academy, 2010.
[3] D. A. Spera and T. R. Richards, "Modified Power Law Equations for Vertical Wind Profiles," US National Aeronautics and Space Administration, 1979.
[4] Environment Canada, "Historical Climate Data," [Online]. Available: http://climate.weather.gc.ca/. [Accessed 2014 January 2014].
[5] M. T. Iqbal, "A feasibility study of a zero energy home in Newfoundland," Pergamon, St. John's, 2003.
[6] AslamBhutta, Nasir Hayat, Sh. RehanJamil, "Various Configurations and Design Technique of VAWT" Lahore, 2011.
[7] Mohammed Ashar Riyan Khan, Sunil Thomas, "Design and Constructions of Prototype VAWT for battery charging" Birla Institute, 2018.
[8] Jaroslaw Zwierzchowshi, Slawomir Blasiak, Lukasz's Nowakowski , " Wind Turbine with Vertical Axis of Rotation type Lenz" Kiekece University, 2016.
[9] S K Halli, N.G.Meti, M.M. Dandinavar, "Low friction more efficient Magnetically levitated Wind Turbines" Hirasugar Institute, Vol 7, 2017.
[10] Abdolrahim Rezaeiha, Hamid Montazeri, Bert Blocken, "Energy Conservation Management" KU Leuven, 2018.

