CHAPTER 10

CONCLUSION AND SCOPE OF FUTURE WORK

10.3 CONCLUSIONS

In theoretical analysis, using the blade-element-momentum theory, the effect of power coefficient for different blade angle, tip speed ratio, coefficient of drag, coefficient of lift and blade solidity were analysed and the recommended set of values to achieve the optimal performance are obtained. The full three-dimensional computational fluid dynamics approach used in modeling the wind turbine analysis using finite-volume method in ANSYS FLUENT 14.0 was able to evaluate the performance of HAWT. The effect of the umbrella scoop also has been studied. Countless hours of work were incorporated to plan, design, test, analyze and validate the work included in this thesis. This research work is divided into five modules. The optimization of wind turbine for an airfoil is performed using the blade element momentum theory, the raw data was collected from the existing wind farms, performance of the windmill is field tested, Umbrella scoop is designed for better performance, and performance with the umbrella scoop is studied.

The performance investigations of the HAWT led to the development of an umbrella scoop to improve the harnessing of wind by the wind electric generators. The BEM theory helps to investigate the effect of blade parameters and wind parameters to power coefficient. CFD helps to fill the gap between the designed power and the generated power using the
umbrella scoop attachment. The cost of the HAWT with this umbrella scoop will be a smaller incremental amount, but the power produced will be more than three times and with steady output power.

10.4 SCOPE OF FUTURE WORK

Researchers concentrate on the aerofoil to calculate the power coefficient either using CFD or theoretically. The present work is performed to harness the wind and generate power even at low wind speeds using umbrella scoop. In this thesis, the angle of the umbrella scoop is fixed and the power performance is evaluated. Properly changing the angle of the umbrella scoop depending on the varying wind velocity, the power can be steadily harnessed by the HAWT. This can be achieved by integrating the controllers for adjusting the angle of the scoop. Rather than changing the angle of the blade using controllers, the angle of the scoop be adjusted with the same controllers thereby there is no much increase in capital cost of the machine. More efficient output can be obtained by incorporating microprocessor to control the angle of the umbrella scoop with the wind turbine for betterment in power production.