CHAPTER V CONCLUSIONS AND RECOMENDATION

5.1 Conclusions

1. Variations in the taper ratio have been proven to affect the CoP value of the Savonius wind turbine. The larger the taper ratio, the power performance tends to increase. The 0.7 taper variation produces the highest CoP value of 0.48 at TSR = 1, followed by the 0.6 taper at 0.38 and the 0.5 taper at 0.31. This shows that increasing the taper ratio can improve the flow distribution on the advancing blade, thereby increasing the drag force and the power generated.
2. The variation in taper ratio also significantly affects the CTs value as an indicator of self-starting capability. A taper of 0.7 produces the highest maximum CTs value, but it has a negative torque region at certain angles, making the self-starting capability unstable. Conversely, tapers of 0.6 and 0.5 show all CTs values in the positive region, meaning the turbine can rotate on its own without external assistance.
3. The research results show that turbine performance is influenced by the combination of taper ratio and TSR, with a trade-off between power performance (CoP) and self-starting capability (CTs). The 0.7 taper variation excels in generating maximum power but is less stable in self-starting. Meanwhile, the 0.6 taper provides the best balance between a sufficiently high CoP and stable CTs without negative torque. Therefore, the recommended optimum taper ratio (K) is 0.6, as it can deliver the best overall performance.

5.2 Recomendations

Based on the results of the research that has been conducted, several suggestions that can be provided for the development of future research are as follows:

A. Testing with wind speed variations

This research was only conducted at low wind speeds (3 m/s), so it is recommended to perform simulations or experiments at different wind speed variations..

B. Experimental validation

The CFD simulation results should be further validated thru direct experimental testing in a laboratory or wind tunnel. This aims to ensure that the simulation results closely match real conditions.

C. Development of turbine design

A taper variation of 0.6 is recommended as the optimum configuration in this study, thus serving as a basis for the development of small-scale Savonius turbine designs. Further research can combine this taper with other modifications such as the addition of guide vanes to further enhance performance..

D. Analysis of economic aspects and implementation

To support real-world applications, further research is recommended to conduct an economic feasibility analysis and the potential implementation of Savonius turbines in low-wind-speed areas in Indonesia, so that the research results are not only technical but also applicable.