GEOMETRIC VARIATION ANALYSIS AFFECTING DIFFUSER PERFORMANCE ON DIFFUSER AUGMENTED WIND TURBINE

By: Deka Wahyu Purwanto
Student Identify Number: 2408201203
Supervisor: Dr.rer.nat. Aulia M.T. Nasution, MSc.

ABSTRACT

The Diffuser-Augmented Wind Turbine (abbreviated as DAWT) is wind turbine concept with a shroud (also known as diffuser) as concentrator, which is regarded suitable to be implemented in areas with low wind-speed regimes, like most areas in Indonesia. Initial study by experiments have been accomplished to measure the wind velocity augmentation in the conical diffuser of DAWT, which has a truncated cone configuration with two different interior’s profiles, i.e. plain- and curved surface profile. On axial wind speed measurements, curved interior configuration result velocity augmentation 30% higher compared to plain one. To get the best interior, configuration design was based on airfoil geometry which was chosen by optimization to get maximum L/D. Optimization result found that maximum camber is 5% located at 80% from leading edge with maximum thickness 7% and the angle of attack at 6°. These parameters shows that it is NACA 5807 with angle of attack at 6°. Proposed diffuser designed with the interior was based on NACA 5807 with expansion angle 6°. By simulation, the maximum axial velocity inside the diffuser is 7.38 m/s. Augmentation velocity at the axial achieved 184% compared to the free stream velocity at 4 m/s. Also by simulation, compared to plain interior configuration, the augmentation velocity improvement is 53%.

Key words: Diffuser-Augmented Wind Turbine (DAWT), curved interior, wind velocity augmentation