

NAFEMS UK Regional Conference 2018 - Abstract Submission

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Will you be the presenting author?	Yes
Presentation Title	Comparison of Different Techniques of Modelling an ultra-low speed Vertical Axis Wind Turbine
Relevant Themes / Keywords	VAWT, Savanious rotor, Ultra-low speed wind turbine

Abstract (plain text)

Performance of a given wind turbine geometry can be evaluated by knowing its torques and angular velocity. This can be done via computational simulation specifically CFD. There are several methods available. The most widely technique used is the sliding mesh approach where the final angular velocity is assumed to be varied with the tip speed ratio (TSR). An optimum angular velocity occurs at the highest power coefficient. The concept of rigid body rotation (RBD) on the other hand assumes the rotor blade as a rigid body. Therefore by defining its moment of inertia, its angular velocity can be predicted. Hence the approach is called flow driven method. The other method is based on the concept of fluid-structure interaction (FSI) where a large displacement of the rotor blade interacts with the incoming air flow. This co-simulation strategy involves the multi-physic coupling CFD and structural dynamic (FEM). This paper presents the results of the above techniques applied to a rotating helical Savonius rotor blade of 1m high and 0.5 in diameter. The prime objective of this study is to determine how close is the respective result obtained when compared with actual experimentation. By using a commercial CFD codes Acusolve, various simulation parameters such as computation domain & mesh sizes and other boundary conditions are set accordingly. This experiment will also investigate the influence of different turbulence models such as Sparlat Almaras, the K-Apsilon model, the K-Omega model and the K-Omega shear stress transport (SST) model on the accuracy of predicted quantities such as torque and rpm. Throughout the experiment, the inlet wind velocity ranges from 2 -4m/s are used to reflect the actual average wind speed experienced by many South East Asian countries like Malaysia. Finally, the simulated results are compared with the experimental data obtained by wind tunnel tests. The best technique will be used simulate and evaluate a mini ultra-low speed wind farm.

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