Aerodynamically shaped vortex generators

An aerodynamically shaped vortex generator has been proposed, manufactured and tested in a wind tunnel. The effect on the overall performance when applied on a thick airfoil is an increased lift to drag ratio compared with standard vortex generators. Copyright © 2015 John Wiley & Sons, Ltd.

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Investigating the effect of extreme shear and yaw using an Actuator Line model

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Validation and modification of the Blade Element Momentum theory based on comparisons with actuator disc simulations

A comprehensive investigation of the Blade Element Momentum (BEM) model using detailed numerical simulations with an axis-symmetric actuator disc (AD) model has been carried out. The present implementation of the BEM model is in a version where exactly the same input in the form of non-dimensional axial and tangential load coefficients can be used for the BEM model as for the numerical AD model. At a rotor disc loading corresponding to maximum power coefficient, we found close correlation between the AD and BEM model as concerns the integral value of the power coefficient. However, locally along the blade radius, we found considerable deviations with the general tendency, that the BEM model underestimates the power coefficient on the inboard part of the rotor and overestimates the coefficient on the outboard part. A closer investigation of the deviations showed that underestimation of the power coefficient on the inboard part could be ascribed to the pressure variation in the rotating wake not taken into account in the BEM model. We further found that the overestimation of the power coefficient on the outboard part of the rotor is due to the expansion of the flow causing a non-uniform induction although the loading is uniform. Based on the findings we derived two small engineering sub-models to be included in the BEM model to account for the physical mechanisms causing the deviations. Finally, the influence of using the corrected BEM model, BEMcor on two rotor designs is presented. Copyright © 2009 John Wiley & Sons, Ltd.
A detailed investigation of the blade element momentum (BEM) model based on analytical and numerical results and proposal for modifications of the BEM model

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Analysis of power enhancement for a row of wind turbines using the actuator line technique
The effect of wake interaction for a row of three wind turbines in a wind farm is analysed using the actuator line technique. Both full wake and half wake situations are considered with the aim of deriving the optimal pitch setting of the foremost turbine, with respect to the total power from the row. The mutual distance between the turbines is 5 diameters and the turbines are considered to operate in a wind shear with an exponent of 0.15, with the rotor centre located at 1.4 radii from the ground. The main findings reveal clear effects of reducing the loading on the foremost turbine towards increased production of turbine 2 and 3 in a row.

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Towards the optimally loaded actuator disc

General information
Wind Turbine Research at the Department of Energy Engineering, Technical University of Denmark

Fast pitch step experiments in a wind tunnel and comparison with computational methods

Terrain Induced Loads on Pitch-regulated Wind Turbines
The ELKRAFT 1 MW Wind Turbine: Results from the Test Program

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