Boundary layer and mesh refinement effects on aerodynamic performances of horizontal axis wind turbine (HAWT)

Y. El khchine [(1)] [*], M. Sriti [(2)]

[(1)] *Engineering Sciences Laboratory, Polydisciplinary Faculty of Taza, Sidi Mohamed Ben Abdellah University, BP 1223 Road of Oujda, Taza, Morocco*
[(2)] *Engineering Sciences Laboratory, Polydisciplinary Faculty of Taza, Sidi Mohamed Ben Abdellah University, BP 1223 Road of Oujda, Taza, Morocco*

[*] *Corresponding Author e-mail:* younes.elkhchine@usmba.ac.ma

Abstract: The design of rotor blades has a great effect on the aerodynamics performances of horizontal axis wind turbine and its efficiency. This work present the effects of mesh refinement and boundary layer on aerodynamics performances of wind turbine S809 rotor. Furthermore, the simulation of fluid flow is taken for S809 airfoil wind turbine blade using ANSYS/FLUENT software. The problem is solved by the conservation of mass and momentum equations for unsteady and incompressible flow using advanced SST k-ω turbulence model, in order to predict the effects of mesh refinement and boundary layer on aerodynamics performances. Lift and drag coefficients are the most important parameters in studying the wind turbine performance, these coefficients are calculated for four meshes refinement and different angles of attacks with Reynolds number is 10^6. The study is applied to a S809 blade airfoil 21% thick, specially designed by NREL for horizontal axis wind turbines.
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***Keywords*:** S809 airfoil, Aerodynamic performances, CFD Simulation, SST k-ω turbulence model, Boundary layer.

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