Ice Accretion on Wind Turbine Blades

In this paper, both experimental and numerical simulations of the effects of ice accretion on a NACA 64-618 airfoil section with 7° angle of attack are presented. The wind tunnel tests were conducted in a closed-circuit climatic wind tunnel at Force Technology in Denmark. The changes of aerodynamic forces were monitored as ice was building up on the airfoil for glaze, rime and mixed ice. In the first part of the numerical analysis, the resulted ice profiles of the wind tunnel tests were compared to profiles estimated by using the 2D ice accretion code TURBICE. In the second part, Ansys Fluent was used to estimate the aerodynamic coefficients of the iced profiles. It was found that both reduction of lift coefficient and increase of drag coefficient is a nearly linear process. Mixed ice formation causes the largest flow disturbance and thus the most lift degradation. Whereas, the suction side of the rime iced ice profile follows the streamlines quite well, disturbing the flow the least. The TURBICE analysis agrees fairly with the profiles produced during the wind tunnel testing.

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