AERODYNAMIC AND AEROACOUSTIC ANALYSIS OF A WIND TURBINE AIRFOIL ON ICING STATE CONDITION

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The influences of iced airfoils on aerodynamic and aeroacoustic properties were studied. In order to validate the aerodynamic performance, the experimental results and iced airfoils which were studied by W. J. Jasinski et al were used. Ice accretions on the two S809 wind turbine airfoils were predicted using the NASA LEWICE code. For analysis of aerodynamic performance, the computational fluid dynamics was used over the Reynolds number range 1-2 × 10^6. To validate aerodynamic performances, lift and drag coefficients were compared to the experimental result. The aeroacoustic analysis is estimated summating TIN noise and the airfoil self-noise. The airfoil self-noise is obtained using aerodynamics data such as a boundary layer thickness. Semi-empirical method proposed by Brooks et al was used. The turbulence inflow noise(TIN) is a dominant noise source because of a complicated shape of leading edge on the iced airfoil. For considering leading edge shapes, therefore, TIN modeling proposed by P. J. Moriarty et al was used. At the result, lift coefficients decreased 11%, 16% when angle of attack is 10 degree. The sound pressure level was increased 2 dB from the clean airfoils.

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