عنوان مقاله:

Eeffect of Blade Thickness on Noise Pollution of H-type Darrieus Wind Turbines: A Numerical study

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خلاصه مقاله:

Noise pollution is one of the biggest problems of wind turbines, especially when these turbines are located near residential areas. In this article, the effect of blade thickness is numerically investigated on the noise pollution of an H-type Darrieus wind turbine. The flow is first simulated using the unsteady Reynolds averaged Navier-Stokes equations and the SST-kω model at the tip speed ratio of ۲.۶۴. Then, the noise is calculated using Ffowcs Williams-Hawkings equations. Blade thickness is changed using NACA airfoils from NACA ۰۰۰۸ up to NACA ۰۰۲۴. It is concluded that noise calculation at only one point, known as a routine method in noise investigation of wind turbines, is insufficient to investigate the noise of this turbine. Here, maximum noise in directivity is defined as the criterion of noise pollution. The results show that changing the blade profile of the benchmark turbine from NACA ۰۰۲۱ to NACA ۰۰۱۵ increases the power coefficient from ۰.۳۱۸ to ۰.۳۷۱ and reduces the maximum noise from ۹۵.۶۷ dB (۷۶.۳۵ dB) to ۹۰.۱۹ dB (۷۱.۰۱ dB) at R = ۲ m (۸m). For NACA ۰۰۱۸, the power coefficient is ۰.۳۵۳, and the maximum noise is ۸۹.۷۸ dB (۷۰.۴۷ dB) at R = ۲ m (۸m). Overall, the highest output power is for NACA ۰۰۱۵, and the lowest noise pollution is for NACA ۰۰۱۸.

کلمات کلیدی:

Aerodynamics, CFD, Darrieus turbine, Ffowcs Williams-Hawkings equations, noise pollution, Vertical-axis wind turbine

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