

عنوان مقاله:

Simulation of Rotor-Rotor Interaction and Noise of an Axial Counter-Rotating Fan

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی، دوره 16، شماره 5 (سال: 1402)

تعداد صفحات اصل مقاله: 15

نویسندگان:

I. Beldjilali - Energy Department, Faculty of Mechanical Engineering, University of Science and Technology Mohamed Boudiaf, BP ۱۵۰۵, Bir-El-Djir, ۳۱۰۰۰ Oran, Algeria

A. Ghenaiet - Laboratory of Energy Conversion Systems, Faculty of Mechanical Engineering and Process Engineering, University of Science and Technology Houari Boumediene, BP۳۲ El-Alia Bab-Ezzouar, ۱۶۱۱۱, Algiers, Algeria

L. Adjlout - Department of Marine Engineering, Faculty of Mechanical Engineering, University of Science and Technology Mohamed Boudiaf, BP ۱۵۰۵, Bir-El-Djir, ۳۱۰۰۰ Oran, Algeria

خلاصه مقاله:

The Counter-Rotating Fan (CRF) offers higher aerodynamic performance, in terms of pressure head and aerodynamic efficiency, compared to the single rotor fan, thus making it an attractive solution for equipment cooling and ventilation of mines and tunnels. Nevertheless, further investigations are required to understand the flow interactions between the front rotor (FR) and the rear rotor (RR), as these interactions are sources of noise emission. This numerical study used the Unsteady Reynolds Average Navier-Stokes (URANS) flow simulations and the Fast Fourier transformation (FFT) to analyse the rotor-rotor interactions and consequences on the aero-acoustic performance. The static pressure fluctuations were recorded at several locations and analysed by FFT to reveal the mechanisms of flow interactions and the effects of axial inter-distance between the two rotors. The inter-distance seems to influence the aerodynamic loading of RR more than that of FR and the total-to-static isentropic efficiency tends to drop. Over one chord distance, the noise level decreases but at the expense of isentropic efficiency. The balanced performance does not seem to improve for an inter-distance greater than ۱.۵ chords, considered the optimum distance in this study. Finally, a graphical correlation which can be used to estimate the Sound Pressure Level (SPL) is developed for this category of CRF.

کلمات کلیدی:

CRF, Aero-acoustic performance, Rotor-rotor interaction, Axial inter-distance, FFT

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/1620317>

