

Numerical and Experimental Investigation of the Aerodynamic Performances of Counter-Rotating Rotors

Authors : Ibrahim Beldjilali, Adel Ghenaiet

Abstract : The contra-rotating axial machine is a promising solution for several applications, where high pressure and efficiencies are needed. Also, they allow reducing the speed of rotation, the radial spacing and a better flexibility of use. However, this requires a better understanding of their operation, including the influence of second rotor on the overall aerodynamic performances. This work consisted of both experimental and numerical studies to characterize this counter-rotating fan, especially the analysis of the effects of the blades stagger angle and the inter-distance between the rotors. The experimental study served to validate the computational fluid dynamics model (CFD) used in the simulations. The numerical study permitted to cover a wider range of parameter and deeper investigation on flow structures details, including the effects of blade stagger angle and inter-distance, associated with the interaction between the rotors. As a result, there is a clear improvement in aerodynamic performance compared with a conventional machine.

Keywords : aerodynamic performance, axial fan, counter rotating rotors, CFD, experimental study

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