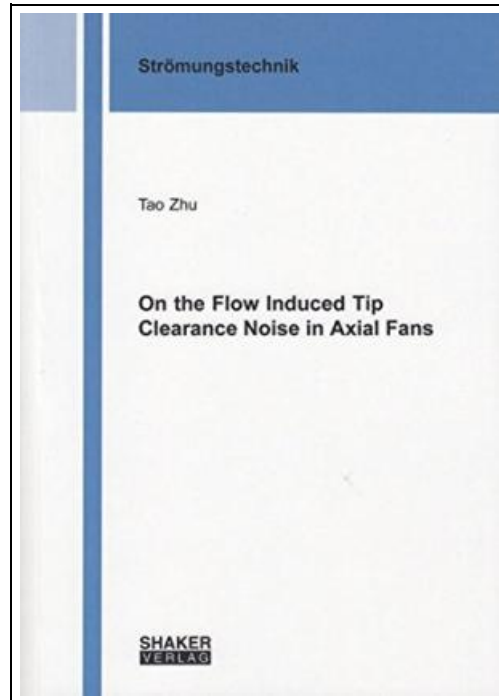


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Reviews

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Shaker Verlag Nov 2016, 2016. Taschenbuch. Condition: Neu. Neuware - The effect of unavoidable tip clearance in axial fans is significant since a large clearance does not only degrade the overall aerodynamic performance, but it also increases the sound radiation into the far-field dramatically. In this study comprehensive experimental and numerical investigations are conducted based on an impeller-only low pressure axial test fan in two tip clearance variations. Besides the overall aerodynamic and acoustic tests, the more detailed measurements of surface pressure fluctuations in the blade tip region show the footprints of the complex tip clearance flow. Various advanced numerical simulations, e.g. steady and unsteady Navier-Stokes based approaches as well as the Lattice-Boltzmann method are applied to understand the underlying 3D tip clearance flow field and its correlation with the acoustic field. Both experimental results and numerical predictions confirm the aforementioned well-known effects of an increase in tip clearance. The effect of a large tip clearance on the sound pressure spectrum is twofold: (i) an increase in the broadband floor and, (ii) specifically at lower volume flow rates, the appearance of pronounced narrowband humps. It is found that they result from the interactions of the impeller blades in the tip region with (i) the highly turbulent small vortex structures decayed from the tip clearance vortices during extending through the local blade passage and (ii) the global circumferentially coherent vortex structures, a superposition of circumferential modes of different mode orders, which rotate slower than the impeller blades. Based on these findings, a novel casing treatment is designed that is able to substantially suppress tip clearance vortex structures and hence significantly reduce the tip clearance noise. 156 pp. Englisch.



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