

Influence of Rotating Stall on Aerodynamic Characteristics and Noise of a Sirocco Fan

Case Study - Nagasaki University

Evaluate the influence of aerodynamic noise and rotating stall by comparing the internal flows between different geometries of sirocco fans using SC/Tetra

Improving Efficiency and Reducing Noise

Noise reduction is a key issue in sirocco fans used for residential ventilation equipment. A fan shroud assists in improving aerodynamic characteristics of the fan by attaching the shroud to the front side of the blade wheel even though a large part of its fluid dynamic mechanism is still unknown. The influence of a shroud on the aerodynamic characteristics and the noise is evaluated based on performance test. The influence of rotating stall on a broadband noise is discussed based on the numerical simulation of internal flow.

Experimental Blade Wheels



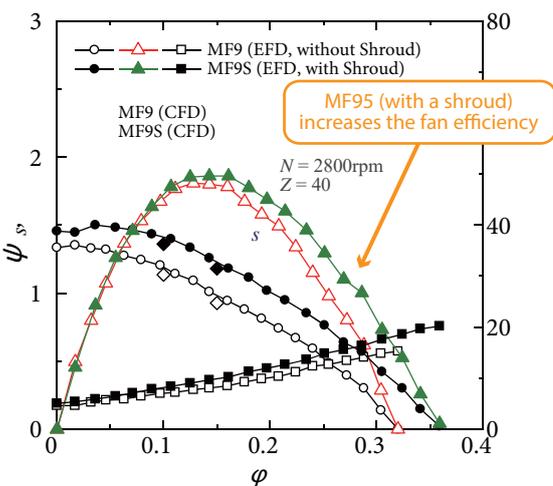
MF9 (without a shroud)



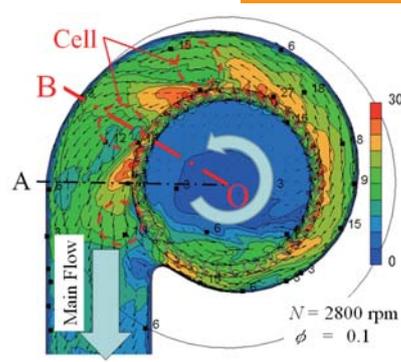
MF9S (with a shroud)

Simulation Results

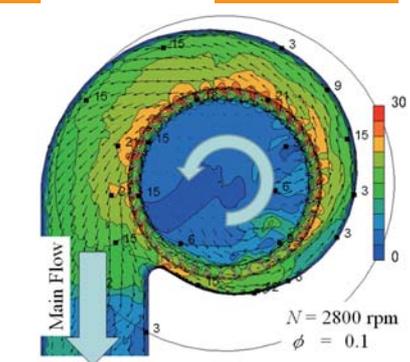
Experimental Results



without a shroud

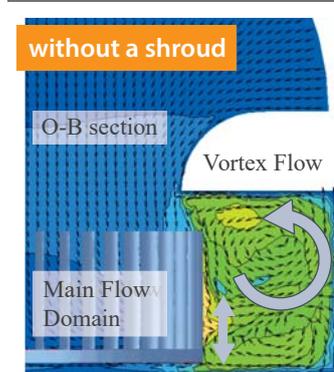


with a shroud

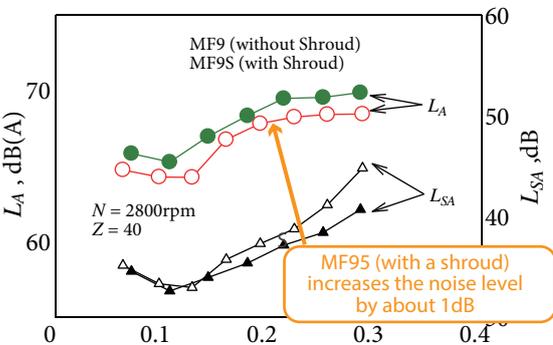


Rotating stall occurs in the fan without the shroud, but it does not occur in the fan with a shroud.

Influence of Rotating Stall on Broadband Noise



MF9S (with a shroud) delays rotating stall which, in turn, causes the low frequency noise to increase compared to that of MF9 near stalling speed. The blade wheel of MF9 does not fully increase the static pressure between the blades and results in a relatively low static pressure.



Customer Comments

SC/Tetra demonstrated the air flow through the fan and evaluated the influence of the rotating stall on a broadband noise of two fans. Aerodynamic characteristics and broadband noise contradict each other, but the specific noise level of MF9S is lower than that of MF9 in the area which has higher flow rate than the maximum efficiency point. It was determined with SC/Tetra that the shroud improved the overall performance of the sirocco fans.