

Numerical Investigation and Optimization of the Effect of Number of Blade and Blade Type on the Suction Pressure and Outlet Mass Flow Rate of a Centrifugal Fan

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Abstract : Number of blade and blade type of centrifugal fans are the most decisive factor on the field of application, noise level, suction pressure and outlet mass flow rate. Nowadays, in order to determine these effects on centrifugal fans, numerical studies are carried out in addition to experimental studies. In this study, it is aimed to numerically investigate the changes of suction pressure and outlet mass flow rate values of a centrifugal fan according to the number of blade and blade type. Centrifugal fans of the same size with forward, backward and straight blade type were analyzed by using a simulation program and compared with each other. This analysis was carried out under steady state condition by selecting k- ϵ turbulence model and air is assumed incompressible. Then, 16, 32 and 48 blade centrifugal fans were again analyzed by using same simulation program, and the optimum number of blades was determined for the suction pressure and the outlet mass flow rate. According to the results of the analysis, it was obtained that the suction pressure in the 32 blade fan was twice the value obtained in the 16 blade fan. In addition, the outlet mass flow rate increased by 45% with the increase in the number of blade from 16 to 32. There is no significant change observed on the suction pressure and outlet mass flow rate when the number of blades increased from 32 to 48. In the light of the analysis results, the optimum blade number was determined as 32.

Keywords : blade type, centrifugal fan, cfd, outlet mass flow rate, suction pressure

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