CALCULATION OF THE REAL PERFORMANCE CURVE OF RADIAL FLOW FAN IMPELLER

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The main aim of this paper is to introduce numerical procedures to calculate the real performance curve of a cylindrically bladed radial-flow fan-impeller. The characteristics of the flow belonging to different duty points of the fan also were determined by the numerical procedure. In this calculation, the blade effects as well as the effects of the fluid friction and the turbulence were taken into consideration separately. The effects of the blade were represented hydro-dynamically by a constrain force field. The frictional effect of the fluid and the turbulence of the flow were reflected by the analogy between the flow in a rectangular channel and the flow in the bladed space of the impeller. Distributions of the relative velocity, pressure and energy loss are calculated. By determining the energy loss belonging to different volume rates an approximate real performance curve of the impeller can also be determined belonging to different roughness of the inner surfaces of the impeller [1].

The first main step of the calculation is to determine the change of the moment of momentum of the absolute non-viscous flow needed to determine the constrain force field. Next to them it is also possible to calculate the volume rate Q_o at the optimal state of the fan impeller and the theoretical performance curve of the impeller. The second main step of the numerical procedure is to solve the system of the ordinary differential equation system based on the governing equations (equations of continuity, motion and energy) of the viscous relative flow on the main stream surface of the fan impeller. Applying the calculating results given by this way all the important characteristics of the flow can be determined. By using the calculated specific energy loss arisen in the impeller and theoretical performance curves of the impeller, the approximate real performance curves of the impeller can also be determined by subtracting from each other.

REFRENCE: [1] KALMÁR, L. Numerical Method for Viscous Flow in Radial-Flow Pumps (in Hungarian), Thesis for Ph.D., Miskolc, 1997