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عنوان مقاله:

Numerical Investigation of Fluid Flow Mechanism in the Back Shroud Cavity of a Centrifugal Pump

محل انتشار:

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خلاصه مقاله:

A detailed analysis on the fluid flow distribution in the back shroud cavity is significant for accurately calculat-ing axial forces in the operation of centrifugal pumps. The numerical calculation results and the experimental results were basically consistent on the performance of the centrifugal pump and the fluid flow characteristics in the back shroud cavity. Distribution of velocity field was researched in the back shroud cavity. We plot the axial distribution curves of the dimensionless circumferential and radial components of velocity of the fluid inside the cavity with different angles and radii. We then analyze the fluid pressure distribution in the back shroud cavity and compare it with experimental results. Results show that the fluid flow in the back shroud cavity involves the core area and the fluid leakage. Results also show that the fluid in the core area behaves like a revolving rigid body. At the operating points of the same flow rate, the cross-sectional area of the volute directly affects the flow rate of the fluid in the back shroud cavity, significantly restricting the fluid flow in that component. How-ever, the flow pattern in the turbulent boundary layer is strongly affected by the leakage flow; hence, the distri-bution of velocity is not axially symmetric. When the flow rate increases from ۰.۸ Qsp to ۱.۲ Qsp, the radial dif-ferential pressure between the sealing ring and the volute decreases. Meanwhile, the disc friction loss of the impeller-to-wall inside the back shroud cavity tends to be more circumferentially or radially equal, whereas the radial leakage rate in the back shroud cavity tends to decrease. The fluid flow in the back shroud cavity compris-es the circumferential shear flow and radial differential pressure flow and is considered as a ۲D viscous laminar flow.

کلمات کلیدی:

Back shroud cavity, Centrifugal pump, Circumferential velocity component, Radial velocity component, Pres, sure

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