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EFFECT ANALYSIS OF CASCADE SOLIDITY ON INDUCER PERFORMANCE

Abstract

The inducer plays a significant role in pump industry, since it is able to keep the pump of high head-rise performance even in severe cavitation conditions. The cascade solidity influences inducer's blade load and deviation angle, therefore, it plays a pivotal role in inducer. The cascade solidity is too small, it can not guarantee the fluid in the blade to get enough energy, when the cascade solidity is too large, the hydraulic loss increases, which leads to lower efficiency. As a consequence, for the purpose of studying the influence of the cascade solidity on inducer performance, four inducers are designed , whose cascade solidity are 1.6, 2.1, 2.5 and 3, and the numerical simulations are performed to study the characteristic of both non-cavitation state and cavitation state, and the criterion of the cascade solidity in the design process of the inducer is discussed. Through simulation analysis, the cavitation process is studied, which is as follows: the growth and distribution of vapors between the pressure surface and the suction surface of the inducer, and in the declining process of *NPSHa*, spreading and blocking of vapors in the leaves. The effect of the cascade solidity on the initial position of the inducer cavitation is studied, when the cascade solidity is 1.6, the surface of the blade begin to appear vapors, vapors appear at the leading edge of the blade later firstly, with the continuous decline of *NPSHa*, the vapors spread from the impeller inlet to the outlet gradually, and extend from the suction surface to pressure surface. With the continuous increase of the cascade solidity, the vapors' initial position of the inducer is changed, when the cascade solidity is greater than 2, another region appears vapors growth phenomenon, where is the blade angle is about 360 degrees, in addition to the leading edge of the blade later, the energy transfer of the inducer is seriously affected, leading to the decline in the performance of inducer. In order to study the influence of the initial position of cavitation on the energy characteristics of inducer, through the extraction of the interface pressure value, the energy change process of the inlet and outlet channel of inducer is obtained under different *NPSHa* conditions.