

离心泵内部动静干涉作用的数值模拟 Numerical Simulation of Unsteady Flow in a Centrifugal Pump

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关键词: 离心泵 非定常 动静干涉 压力边界条件 数值模拟

摘要: 采用压力边界条件对一单级单吸蜗壳式离心泵进行了三维非定常数值模拟计算, 模拟过程中给定离心泵入口总压和出口静压, 结合滑移网格技术, 成功地捕捉了叶轮—蜗壳的动静干涉作用引起的非定常流动特性。计算结果表明, 离心泵内流场周期性脉动明显, 蜗壳内静压及叶片载荷分别以叶片旋转频率、叶轮旋转频率发生周期性变化。蜗壳几何形状的不对称性影响了动静干涉作用在离心泵内部的传播, 引起了离心泵内流动沿周向分布不均匀现象。Pressure boundary condition was used to investigate the unsteady 3-D flow characteristics in a single-stage single-suction centrifugal pump with vaneless volute. For the calculation, the total pressure and the static pressure were specified for inlet and outlet respectively, and the sliding mesh technique was used. The results show the capability of this numerical method in capturing the unsteady flow characteristics due to the impeller-volute interaction. The flow is characterized by periodic pulsation, blade passing frequency in volute and impeller rotating frequency in impeller. To a large extent, the asymmetric shape of the volute affects the propagation of impeller-volute interaction and results in the circumferential non-uniformity flow distribution in the pump.

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