离心泵叶轮内部伴有盐析流场的PIV试验

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关键词： 离心泵 液固两相流动 盐析 PIV 图像处理

摘 要： 利用流场测试仪PIV对离心泵内部盐析液固两相流场进行测量，采用轴编码器结合分频电路保证了PIV测试旋转流场的同步性；基于VC++6.0编写了图像处理软件来区分流场中液固两相流动，对试验测得的液固两相的速度场进行分析可知：晶体颗粒的存在使得液相的相对速度场发生变化，其出口速度要比单液相时有所降低；提出流道中部区域晶体颗粒的相对速度比液体相对速度更偏向压力面，从而导致该区域晶体颗粒有向压力面运动的趋势。通过研究初步揭示了叶轮内部盐析两相流动规律，为防止叶轮内部盐析提供了理论依据。Advanced flow measurement equipment PIV (particle image velocimetry) was adopted to measure the internal salt-out flow in an innovated centrifugal pump. The synchronization problem during measurement was guaranteed by using shaft encoder and frequency dividing circuit. Based on the platform of Visual C++ 6.0, the special image processing kit was developed to differentiate solid and liquid particles in the flow images. Investigation of the two-phase velocity fields prove that the crystal particles changes the relative liquid velocity distribution, and the outlet liquid velocity decreases compared with that under single phase condition. It is also concluded that the crystal particles have the tendency of moving towards the pressure side in the middle of the channel. The characteristics of salt-out flow in the pump were obtained, and some guiding advices were presented to prevent salt-out in pump impeller.

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