

张启华,徐燕,施卫东,高雄发,马栋棋,陆伟刚.多级离心泵圆周弯扭式导叶设计及性能试验[J].农业工程学报,2013,29(5):37-43

多级离心泵圆周弯扭式导叶设计及性能试验

Design and performance test of circumferential crankle guide vane of multistage centrifugal pumps

投稿时间: 2012-09-18 最后修改时间: 2013-02-20

中文关键词: [离心泵](#), [设计](#), [CFD](#), [导叶](#), [弯扭](#)

英文关键词: [centrifugal pumps](#) [design](#) [computational fluid dynamics](#) [guide vane](#) [crankle](#)

基金项目:国家自然科学基金资助项目(51279069), 江苏大学高级人才启动基金(11JDG085)

作者	单位
张启华	1. 江苏大学 流体机械工程技术研究中心, 镇江 212013
徐燕	1. 江苏大学 流体机械工程技术研究中心, 镇江 212013
施卫东	1. 江苏大学 流体机械工程技术研究中心, 镇江 212013
高雄发	1. 江苏大学 流体机械工程技术研究中心, 镇江 212013
马栋棋	2. 福建省机械科学研究院, 福州 350102
陆伟刚	1. 江苏大学 流体机械工程技术研究中心, 镇江 212013

摘要点击次数: **61**

全文下载次数: **36**

中文摘要:

为开发一种紧凑型多级泵,研究配套的一种圆周弯扭式导叶,其设计思路源自扭曲离心叶轮设计方法。通过固定导叶顶端曲线,将导叶底端曲线沿圆周方向向前延伸形成弯扭式曲面。该导叶结构具有2个优点。首先,导叶底端沿圆周向前延伸后保证了较大的喉部进水区域面积。其次,利用底端向前延伸的部分与下一个叶片的圆柱自然形成扩压器状的过流通道,增强了导叶的扩压能力。在二次开发技术的基础上开发出该结构的水力设计系统。利用该系统设计出多组方案,同时利用CFD计算分析过不同方案的比较,最终获得了优化的导叶模型,并通过样机试验验证该模型具有较好的水力性能。该设计方法将有利于多级泵的节能,同时该方法也为紧凑型多级泵发提供了有益的参考。

英文摘要:

To design compact multistage centrifugal pumps, a circumferential crankle guide vane was proposed to match their compact structure. The basic design principle originated from the twisted centrifugal impeller design method and the design method of this guide vane was investigated systematically. By fixing the top curve of the guide vane and extending bottom curve forward along a circumferential direction, a crankle surface is shaped. This design method has two merits. Firstly, the bottom curve of the first guide vane is extended circumferentially forward to guarantee a large throat flow area. And secondly, a diffuser-like passage is naturally formed by the extended surface and the cylindrical surface of the blade, which enhances its pressure recovery ability. In addition, the blade surface is divided into two segmented parts, that is, a full twisted surface and a cylindrical surface, thus casting and molding of the guide vane is more convenient. To reduce the design cycle of the guide vane, a hydraulic design system of the circumferential crankle guide vane was developed using the secondary development technique. Based on this system, different configurations of guide vane were developed. Through evaluation of the different configurations of guide vane, an optimal configuration was obtained by means of CFD analysis. To validate the CFD results, a prototype multistage pump was developed and manufactured. The prototype pump testing showed that the stage head was 9 m, and its efficiency was 57.8%, which could meet the design requirement. To conclude, the guide vane design method is beneficial for energy-saving in multistage centrifugal pumps, and this method could provide useful guidance for the development of compact multistage centrifugal pumps.

[查看全文](#) [下载PDF阅读器](#)

关闭