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无过载离心泵结构参数优化设计

Parameter optimization of non-overload centrifugal pump

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作者	单位
王 洋	江苏大学流体机械工程技术研究中心, 镇江 212013
刘洁琼	江苏大学流体机械工程技术研究中心, 镇江 212013
何文俊	江苏大学流体机械工程技术研究中心, 镇江 212013

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中文摘要:

低比转数离心泵轴功率曲线随流量的增大而急剧上升,最大轴功率与设计点功率之比远大于一般离心泵的相应值,很容易在大流量区引起配套电机过载。为了实现无过载性能、保证泵运行的可靠性,该文在前人研究成果的基础上,采用改变叶轮几何参数和堵塞部分叶轮流道相结合的方法,对IS50-32-160型无过载离心泵进行了优化设计。利用商业软件Fluent,对两叶片间流道有效部分出口和进口面积之比 FII/FI 与低比转数离心泵性能的关系进行了研究,当堵塞 $1/4$ 流道, FII/FI 为1.17时,效率曲线平坦,轴功率曲线在大流量区内出现极值,呈现出无过载特性。结果表明:采用该方法可以在实现无过载性能的前提下,有效地改善无过载离心泵的性能。

英文摘要:

The power curve of low specific speed centrifugal pump sharply rises with the increase of flow rate, the ratio of maximum power and power of design-point is much larger than the corresponding value of general centrifugal pumps. This feature could easily cause supporting electrical overload in large flow area. In order to achieve non-overload performance and ensure the reliability of pump operation, the IS50-32-160 non-overload centrifugal pump was optimally designed by changing geometrical parameters of the impeller and clogging part of flow passages. Software Fluent was used to research the relationship between the ratio of effective area between the inlet and the outlet of the flow passages between two blades which was called FII/FI , and the performance of the low specific speed centrifugal pump. When the quarter of flow passages were clogged and FII/FI was 1.17, the efficiency curve was smooth and the extreme value appeared in large flow area of the shaft power curve, then the non-overload performance came true. The method can effectively improve the hydraulic performance of non-overload pump on the premise of the non-overload performance.

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