

复合叶轮离心泵数值模拟正交试验设计方法 Orthogonal Test Design Method Based on Numerical Simulation for Non-overload Centrifugal Pump with Complex Impeller

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关键词: 离心泵 复合叶轮 数值模拟 正交试验 全流场

摘要: 按无过载离心泵设计要求, 选择对复合叶轮离心泵性能影响比较关键的叶片出口安放角 β_2 、叶片出口宽度 b_2 、喉部面积 F_t 和短叶片进口直径 D_i 的4个参数为变化因素按正交方案设计了9台复合叶轮离心泵模型。采用Fluent全流场数值模拟方法对设计的9台模型泵进行正交试验, 得到了各几何参数对复合叶轮离心泵各性能指标影响的主次顺序, 并得出模型泵的最优设计方案。对最优设计方案的样机试验表明, 全流场数值模拟方法的选优结果在实现无过载的同时, 保持了较高效率, 达到了试验目的。研究结果验证了全流场数值模拟正交试验选优的可行性。 Based on the design requirements of non-overload centrifugal pump, blade outlet angle β_2 , blade outlet width b_2 , throat area F_t and the inlet diameter of short blade D_i , all of which affects the performance of centrifugal pump with complex impeller were chosen to design nine centrifugal pump models with complex impeller. Numerical simulation of whole flow field based on Fluent was adopted to do orthogonal test, the important order of geometric parameters affect the performance of centrifugal pump with complex impeller. The best design scheme for pump model was acquired. Through the test of specimen of the best design scheme, it demonstrated that the excellent selection by using numerical simulation of whole flow field was non-overload and high efficiency. Orthogonal test based on numerical simulation of whole flow field was verified by the research result.

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