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动力机械与工程

小流量高压头离心鼓风机叶型优化设计

舒信伟[1];谷传纲[1];肖军[1]

上海交通大学机械与动力工程学院[1]

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摘要
提出了一种基于均匀设计方法和计算流体动力学(computational fluid dynamics，CFD)技术的离心鼓风机叶型优化设计方法。均匀设计方法用来生成试验样本点几何信息，各样本点性能评估分析则借助CFD技术来完成，样本点几何信息与其性能之间的关系则采用并行神经网络所映射的近似模型来给出，最后由遗传算法来对该近似模型进行全局寻优，并将其优化得到的相应结果加入样本点集中，重复最后两步，直到满足设定的终止准则。将该优化方法应用于某离心鼓风机叶型优化设计，以极大化等熵效率为目标函数，优化后叶轮的等熵效率提高了1.26%，说明该优化方法是有效的。

关键词 鼓风机 优化设计 均匀设计方法 计算流体力学 近似模型

分类号 TH 452

Blade Optimization Design for a Centrifugal Blower With Low Flowrate and High Pressure Head

Abstract
An optimization approach to centrifugal blower blade based on uniform design method and computational fluid dynamics (CFD) technique was presented. In this approach, uniform design method was employed to generate the geometric information of samples, whose performances are calculated by CFD technique; the relationship between the geometric information and its performances of samples is mapped by the approximate model constructed by parallel artificial networks (PANN); genetic algorithms is employed to find the global optimal of the approximate model, which is then evaluated by CFD technique and added to the samples database; and the last two steps of the loop are iterated until the stop criterion is satisfied. This proposed approach has been applied to the optimum design of a set of blower blades presented in this paper. The maximum isentropic efficiency is selected as objective function, and a 1.26% improvement of the objective function is obtained. The optimization results show that the proposed optimization approach is effective for the optimum design of blower blade.

Key words blower optimal regulation uniform design method protection approximate model

DOI:

通讯作者 舒信伟 sjtusxw@126.com

作者个人主页 舒信伟 谷传纲 肖军