虞跨海,岳珠峰,杨茜.涡轮冷却叶片气动与传热设计优化[J].计算力学学报,2010,27(2):310~314

涡轮冷却叶片气动与传热设计优化

Aerodynamic and heat transfer design optimization for cooling turbine blade

投稿时间： 2008-02-12

DOI：10.7511/jslx20102022

中文关键词： 涡轮冷却叶片 多目标优化 KS函数 参数化建模 流-热耦合

英文关键词:cooling turbine blade multi-objective optimization KS function parametric design coupled aero-thermal analysis

基金项目:国家自然科学基金(50375124,10472094);863计划(2006AA04Z401);高等学校学科创新引智计划(B07050)资助项目.

作者	单位
虞跨海	西北工业大学 力学与土木建筑学院, 西安 710072;河南科技大学 规划与建筑工程学院,洛阳 471003
岳珠峰	西北工业大学 力学与土木建筑学院, 西安 710072
杨茜	西北工业大学 材料学院,西安 710072

摘要点击次数： 88

全文下载次数： 102

中文摘要:

提出了航空发动机涡轮冷却叶片叶栅气动与传热自动优化方法,利用函数解析成型方法实现了冷却叶片几何模型的参数化与自动生成,可以建立任意冷却内腔数量的叶片模型;基于N-S方程实现叶片流体域与固体域的流-热耦合分析;采用KS函数方法将多目标优化问题转化为单目标函数进行优化,以总压损失、叶片最高温度和平均温度最小为优化目标进行了自动优化,改善了叶片性能。

英文摘要:

This paper presents an automated computer aid design optimization program for aerodynamic and heat transfer optimization of 2D internal cooling gas turbine blades. Parametric geometry models were developed with analytic function methods. The suction surface and pressure surface are presented by a series of quintic splines, the leading edge geometry and the trailing edge geometry were represented by circular arc which helps to maintain a smooth geometry connection at the end points of the pressure side and the suction side. Wall thickness functions were defined to get the coolant flow passage profile. A modeling program was developed to create the blade geometry automated without user intervention. Different number cavities blades could be built only by changing the number of rib. Coupled aero-thermal analysis method was used to solve the flow-field and solid-field based on compressible Navier-Stokes equation. The KS function method which transformed the multi-objective problems into single-objective was used for optimization. With the optimization of blade profiles, the total pressure loss, the maximal temperature and the average volume temperature were reduced significantly.

查看全文 查看/发表评论 下载PDF阅读器

关闭

您是第999233位访问者

版权所有:《计算力学学报》编辑部

本系统由 北京勤云科技发展有限公司设计