史磊,刘波,张鹏,李俊,王雷.商用发动机10级高压压气机一维特性优化设计[J].航空动力学报,2013,28(7):1564~1569

商用发动机10级高压压气机一维特性优化设计

One-dimensional characteristic optimization design for ten-stage high pressure compressor in commercial engine

投稿时间： 2012-07-10

DOI：

中文关键词： HARIKA算法 特性计算 遗传算法 变几何压气机 一维优化设计

英文关键词:HARIKA algorithm characteristic calculation genetic algorithm variable geometry compressor one-dimensional optimization design

基金项目:国家自然科学基金(50976093)

作者	单位
史磊	西北工业大学 动力与能源学院, 西安 710072
刘波	西北工业大学 动力与能源学院, 西安 710072
张鹏	西北工业大学 动力与能源学院, 西安 710072
李俊	西北工业大学 动力与能源学院, 西安 710072
王雷	西北工业大学 动力与能源学院, 西安 710072

中文摘要：

采用HARIKA算法对某商用发动机10级高压压气机进行了一维特性预测.引入遗传算法优化设计手段,以压气机一维设计参数为优化变量,设计转速下特性线的峰值效率、裕度为优化目标函数.与初始特性线相比,压气机在优化后设计转速时特性线的峰值效率提高了12.3%,裕度由11.7%提高到25.13%.对变几何压气机特性进行了优化分析,给出不同换算转速下进口导叶及前3级静子叶片安装角的最佳调节规律.优化后的压气机在非设计转速下的效率特性得到了大幅提升,压比特性得到了提高,流通能力也得到了加强.将压气机一维优化的特性线与采用一维优化设计参数得到的全三维计算结果在1.0,0.9倍换算转速下进行了对比,两者预测出的喘振边界在最大偏差处不超过6.25%.

英文摘要：

HARIKA algorithm was applied to simulate the characteristic of a ten-stage high pressure compressor. With introduction of genetic algorithm (GA), one-dimensional design parameters were selected as optimum variables, and functions containing peak efficiency and margin were used as optimization objectives. Compared with initial characteristic, peak efficiency of characteristic after optimization at designed speed increased by 12.3%, and its margin increased from 11.7% to 25.13%. Then HARIKA algorithm was used to simulate variable geometry compressor characteristics. Setting angles of inlet guide vane and first three stage stators after optimization at different engine corrected speeds were presented. The performance characteristics of compressor including peak efficiency, peak pressure and flow margin were improved to great extent. Calculation results of compressor characteristics in one-dimensional and three-dimensional were compared at engine corrected speed of 1.0, 0.9. The maximum deviation of their margin was not more than 6.25%.

查看全文 查看/发表评论 下载PDF阅读器

关闭

友情链接： 中国航空学会 北京航空航天大学 EI检索 中国知网 万方 中国宇航学会 北京勤云科技